Khaled Abed Alghani

Beyond the Nest

Navigating Strategic Challenges in Industry Platform Management

ACTA WASAENSIA 553

University of Vaasa
VAASAN YLIOPISTO

ISBN 978-952-395-188-4 (print)
978-952-395-189-1 (online)

ISSN 0355-2667 (Acta Wasaensia 553, print)
2323-9123 (Acta Wasaensia 553, online)

URN https://urn.fi/URN:ISBN:978-952-395-189-1

PunaMusta Oy, Joensuu, 2025.

ACADEMIC DISSERTATION

To be presented, with the permission of the Board of the School of Management of the University of Vaasa, for public examination on the 28th of March, 2025, at noon.

Article-based dissertation, School of Management, Strategic Management

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Tiivistelmä

Alustojen (industry platform) yleistyminen on herättänyt huomiota sekä teollisuuden ammattilaisten että akateemisten tutkijoiden keskuudessa. Yritykset ovat pyrkineet kehittämään alustoja taloudellisten verkostovaikutusten hyödyntämiseksi. Samanaikaisesti tutkijat ovat suunnanneet huomionsa tämän liiketoimintamallin tutkimiseen ymmärtääkseen sen monimutkaisia dynamiikkoja. Kaikki alustoja perustaneet yritykset eivät kuitenkaan ole onnistuneet hankkeissaan, ja tutkimukset, jotka ovat tarkastelleet alustanomistajien kohtaamia strategisia haasteita, eivät ole vielä tarjonneet kattavaa ymmärrystä näistä kysymyksistä tai strategioista, jotka ovat tarpeen alustan menestyksekkäälle perustamiselle. Tämä saattaa johtua siitä, että suurin osa keskusteluista on keskittynyt niin kutsuttuun muna-kana-dilemmaan, eli siihen, mitä toimijoita pitäisi houkutella alustalle ensin, esittäen muna-kana -dilemman pääasiallisena strategisena haasteena alustaa luotaessa. Tämä väitöskirja pyrkii paljastamaan alustojen hallinnan strategiset haasteet, etenkin alustan luomisprosessin aikana, ja strategiat näiden haasteiden voittamiseksi.

Ottaen huomioon tämän väitöskirjan tavoitteet ja alustojen dynaamisen, monimutkaisen luonteen, tutkimuksessa hyödynnetään seuraavanlaista lähestymistapaa sille asetettujen tavoitteiden saavuttamiseksi. Aluksi väitöskirja kartoittaa teollisuusalustojen kirjallisuutta tunnistamalla klusterit, jotka tutkivat alustailmiötä erilaisista näkökulmista. Kirjallisuuden rakenteen ymmärtämisen myötä tunnistetaan myös keskeiset prosessit teollisuusalustojen hallinnassa: luominen, integrointi, orkestrointi, navigointi ja evoluutio, joista muna-kana -dilemma sijoittuu harmaalle alueelle luomisen ja integroinnin prosessien välille. Empiirisen aineiston ja käsitteellisen analyysin avulla tämä väitöskirja väittää, että muna-kana -dilemma liittyy integrointiprosessiin, ei luomisprosessiin. Huolimatta niiden keskinäisestä riippuvuudesta, luomisprosessiin sisältyy strategisia haasteita, jotka edeltävät muna-kana -dilemmaa. Nämä haasteet ovat yhtä haastavia tai jopa haastavampia kuin muna-kana -dilemma, mutta ne on suurelta osin sivuutettu kirjallisuudessa. Lisäksi väitöskirja hahmottelee keskeisiä strategioita, joita alustan omistajat voivat sisällyttää käsitelläkseen tehokkaasti sekä luomisen että integroinnin prosessien haasteita. Näin ollen tämä väitöskirja edistää jatkuvia strategisen johtamisen keskusteluja alustoista, etenkin niitä keskusteluja, jotka käsittelevät luomisen ja integroinnin prosesseja.

Asiasanat: alustat, digitaaliset alustat, verkostovaikutukset, muna-kana-dilemma, alustojen johtaminen, strateginen johtaminen, liiketoimintamallit

Abstract

The proliferation of industry platforms has captured significant attention from both industry professionals and academic researchers. Practitioners have embraced industry platforms to harness the economic benefits of network externalities, while scholars have focused on examining this blockbuster business model to understand the intricate dynamics of managing industry platforms. Not all firms that have embraced industry platforms have succeeded, and studies examining the challenges faced by platform owners have not yet provided a comprehensive understanding of these challenges or the strategies required to successfully manage industry platforms. This might stem from the fact that the majority of academic discourse has extensively focused on the chicken-and-egg dilemma, or deciding whom to attract first, ultimately portraying it as the primary strategic challenge in managing industry platforms. Consequently, this dissertation aims to uncover the strategic challenges of managing industry platforms, as well as the strategies employed to overcome them.

Considering the objectives of this dissertation on one hand, and the dynamic and complex nature of industry platforms on the other, a structurationist approach is adopted to achieve its goals. Initially, this dissertation maps the landscape of the literature by exploring the diverse perspectives (clusters) that examine industry platforms. With a grasp of the field's structure and an aim to systematically identify the challenges, this dissertation outlines the processes central to managing industry platforms, namely creation, integration, orchestration, navigation, and evolution, and highlights the chicken-and-egg dilemma as falling in a gray area between the creation and integration processes. Drawing on empirical evidence, and supported by conceptual analysis, this dissertation examines the creation and integration processes, arguing that the chicken-and-egg dilemma is primarily associated with the integration process rather than the creation process. Despite their interdependence, the creation process involves strategic challenges that precede the chicken-and-egg dilemma and are at least as challenging, if not more, yet remain largely overlooked in the literature. Additionally, this dissertation outlines key strategies that platform owners can adopt to effectively address the challenges associated with the creation and integration processes. Therefore, this dissertation contributes to the ongoing strategic management discussions on industry platforms, particularly those addressing platform owners' management of industry platforms.

Keywords: Industry platforms, digital platforms, network externalities, chicken-and-egg dilemma, industry platform management, strategic management, business models

ACKNOWLEDGEMENT

I am grateful to be writing this section two years and eight months after beginning my PhD journey. This milestone would not have been possible without the support of many, both from the University of Vaasa and beyond. First of all, this journey would not have been possible without a great mentor and supervisor, and I was fortunate enough to have one. I cannot thank Mark Kohtamäki enough for his invaluable supervision and guidance throughout my PhD journey. THANK YOU, Marko!

I would like to thank Rodrigo Rabetino for his constant support and valuable advice whenever needed, and Adam Smale for continuously empowering our career development and growth. I also extend my gratitude to all members of the School of Management, particularly those in the Strategic Business Development (SBD) Research Group (I decided not to mention names here to avoid forgetting anyone). Further, I would also like to sincerely thank the Finnish Ministry of Education and Culture and the MIDAS Project for their financial support throughout this journey.

I am glad to have met great people here in Vaasa. At the top of the list is Nahil, who is much more than a friend, and of course, Hussein, Hassan, Omar, and Mohammad. Thank you guys for all the support! I also want to express my deep appreciation to Tayyab and Rimsha, who are more than just colleagues; they are like family to me here in Finland. I am also grateful to my childhood friends in my beloved home country, Lebanon. For over 20 years, our friendship has been a constant source of support and strength; you know who you are!

Even though they are mentioned last, my family will always come first. This journey would not have been possible without the support of Jamal, Mariam, Nour, and my beloved Rawan. You mean the world to me!

Khaled Abed Alghani

07/02/2025

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[1] Abed Alghani, K., Kohtamäki, M., & Kraus, S. (2024). Mapping the landscape: Unveiling the structural dynamics of industry platforms. European Journal of Innovation Management, 27(9). https://doi.org/10.1108/EJIM-09-2023-0748. © Khaled Abed Alghani, Marko Kohtamäki and Sascha Kraus. CC BY 4.0.

[2] Abed Alghani, K., & Kohtamäki, M. Unveiling the processes of industry platform management: A systematic literature review and research agenda.[1]

[3] Abed Alghani, K., Rabetino, R., & Kohtamäki, M. The Dynamics of Organizational Boundaries in Creating a B2B Industry Platform: Interplay and Repositioning Practices.[2]

[4] Abed Alghani, K., Kohtamäki, M., Kuusniemi, H. (2024). The New Space Ecosystem: Insights from the Architecture of Digital Platforms. In: Ojala, A., Baber, W.W. (eds) Space Business. Palgrave Macmillan, Singapore. https://doi.org/10.1007/978-981-97-3430-6_3. © 2024 The Author(s). CC BY 4.0.

[1] Reprinted with permission from the International Journal of Management Reviews. The manuscript is currently under revision and is scheduled to be submitted in June 2025 for the third round of review.

[2] Reprinted with permission from the Journal of Product Innovation Management. The manuscript is currently under revision and is scheduled to be submitted in April 2025 for the second round of review.

1 INTRODUCTION

1.1 Background

"For anyone who follows the world of business, it is now common knowledge that the most valuable firms on the planet and the first companies to surpass the trillion-dollar mark in value (albeit temporarily) are platforms. If we look at market values in late 2018, the top firms were Microsoft, Apple, Amazon, and Alphabet (the holding-company parent of Google since 2015). Also among the leaders were Facebook, Alibaba, and Tencent. Together, these seven companies at their peak represented close to $5 trillion in market value" (Cusumano et al., 2019, p. 4).

The advent of the platform business model has captured significant attention, likely because many of the most valuable companies by market capitalization operate on this model (Constantinides et al., 2018; Cusumano et al., 2019; Parker et al., 2016). Forbes has reported that in 2024, five of the top ten most valuable companies by market capitalization operate on a platform business model, collectively representing over USD 11 trillion in market value. These companies include Microsoft ($3.342 trillion), Apple ($3.160 trillion), Alphabet ($2.065 trillion), Amazon ($1.899 trillion), and Meta Platforms ($1.181 trillion). This significant attention is reflected not only in the academic field, with increasing research on this topic (Rietveld & Schilling, 2020), but also on the practical side, where several companies have begun the shift toward this blockbuster model to reap the benefits of strong network effects in specific markets and industries (Trabucchi & Buganza, 2023; Wortmann et al., 2024). However, not all companies that attempted to adopt this model succeeded, and many failed (Parker et al., 2016). It could be assumed that the failures in adopting this model are attributable to a range of factors; however, surprisingly, most academic discussions focus on a single aspect: overcoming the chicken-and-egg dilemma, or in other words, whether the platform should first attract buyers or sellers. This dilemma is inherently linked to network effects (Eisenmann et al., 2006; Eisenmann & Hagiu, 2007), which is the primary distinguishing factor between an industry platform and other types of platforms (Gawer, 2014; Gawer & Cusumano, 2014). Industry platforms are defined as "products, services, or technologies developed by one or more firms, and which serve as foundations upon which a larger number of firms can build further complementary innovations and potentially generate network effects" (Gawer & Cusumano, 2014, p. 420).

The majority of the research on industry platforms agrees that overcoming the chicken-and-egg dilemma is the most challenging process in managing an industry

platform (Caillaud & Jullien, 2003; Eisenmann et al., 2006; Rochet & Tirole, 2003). For instance, Parker et al. (2016, p. 26) argue that "platforms need to solve a chicken-or-egg problem that pipeline businesses don't suffer from: users won't come to a platform unless it has value, and a platform won't have value unless users use it. Most platforms fail simply because they never overcome this problem." The identification of the chicken-and-egg dilemma as a strategic challenge stems from the origins of the literature on industry platforms (Gawer, 2014), which bridged economics literature focused on competition (Rochet & Tirole, 2003, 2006) and engineering literature focused on innovation (Baldwin & Woodard, 2009). Specifically, the chicken-and-egg dilemma stems from the economics literature, notably Rochet and Tirole (2003), a central contributor to the industry platform literature. Rochet and Tirole's (2003, 2006) work primarily focuses on two-sided markets characterized by network effects. It draws extensively on the literature on the economics of network externalities (Katz & Shapiro, 1985) and discussions centered around the chicken-and-egg dilemma (Caillaud & Jullien, 2003). Subsequent discussions have attempted to determine whether it is most advantageous to attract the buyer or the seller side to the platform first (Armstrong, 2006; Bolt & Tieman, 2008; Eisenmann et al., 2006; Rochet & Tirole, 2006). The chicken-and-egg dilemma is then portrayed as a significant strategic challenge, to the extent that one might assume overcoming this dilemma is the starting point for establishing an industry platform (Eisenmann et al., 2006; Eisenmann & Hagiu, 2007).

While the chicken-and-egg dilemma has been widely discussed (Caillaud & Jullien, 2003), scholars have begun to emphasize that the process of creating industry platforms is an underexplored area that warrants more attention (de Reuver et al., 2018; Gawer & Cusumano, 2014; Shi et al., 2021; B. Tan et al., 2015; Teece, 2017). This shift does not diminish the significance of the chicken-and-egg dilemma as a strategic challenge; instead, it suggests that the existing literature on industry platforms has primarily focused on post-creation issues, such as identifying which participants to attract first (Bolt & Tieman, 2008; Economides & Katsamakas, 2006; Rochet & Tirole, 2003) or how to orchestrate the actors within the platform ecosystem (Eaton et al., 2015; Foerderer et al., 2021; Ghazawneh & Henfridsson, 2013; Zhang et al., 2022), rather than on the initial creation process itself. Despite this renewed focus, the topic of creating industry platforms is not entirely new. It was initially addressed by Gawer and Cusumano (2008) but has not received the necessary attention in subsequent research. Gawer and Cusumano (2008, p. 32) identified two main strategic options for becoming a platform leader: (1) coring, or "how to create a new platform where none existed before," and (2) tipping, or "how to win platform wars by building market momentum." The chicken-and-egg dilemma specifically pertains to the tipping strategy (Caillaud & Jullien, 2003; Gawer & Cusumano, 2008), which is where discussions on industry platforms began and

evolved from, thereby almost entirely neglecting the coring phase, or the process of creating an industry platform (de Reuver et al., 2018; Gawer & Cusumano, 2014; Shi et al., 2021; B. Tan et al., 2015).

This neglect of the coring phase may be due to the extensive theoretical discussions in the industry platform literature and the distancing from the practical aspects of creating an industry platform. A case in point is an interview with a Director of Digital Product Development from a Finnish-based multinational firm, who managed a five-year project to assess the feasibility of developing an industry platform. He mentioned, "I would say that the company began moving in this direction around 2016, and we received evidence that it was not working approximately five years later. This took a significant amount of time and money, as well as considerable effort, particularly as all companies began investing heavily in the platform business model." This evidence indicates that there are indeed phases preceding the chicken-and-egg dilemma that merit significant attention (de Reuver et al., 2018; Gawer & Cusumano, 2014; Shi et al., 2021; B. Tan et al., 2015). Simultaneously, this does not imply that no processes occur subsequent to the chicken-and-egg dilemma (Eaton et al., 2015; Foerderer et al., 2021; Ghazawneh & Henfridsson, 2013; Zhang et al., 2022).

1.2 Research objectives

The main objective of this dissertation is to explore the strategic challenges that platform owners face when managing their industry platforms and the approaches utilized to overcome these challenges. However, the complexity of this task is heightened by the various and contradictory terminologies, definitions, and classifications associated with the literature on technology platforms characterized by network effects, that is, industry platforms (Gawer & Cusumano, 2014). Consequently, Article 1 aims to map the structural landscape of the field and investigate the diverse scholarly approaches to studying these platforms. During the research process, the researcher reviewed most, if not all, definitions and classifications in the existing literature. The terminologies, definitions, and classifications proposed by Cusumano et al. (2019) and Gawer and Cusumano (2014) emerged as the most coherent and were subsequently adopted for this dissertation.

Furthermore, building on the comprehensive review of the industry platform literature provided in Article 1, the subsequent focus shifted to uncovering the various processes that platform owners engage in to manage their platforms, with the aim of identifying the strategic challenges in a structured and systematic approach. Article 2 thus reveals the five main processes that constitute the management of industry platforms: creation, integration, orchestration, navigation, and evolution,

with the chicken-and-egg dilemma ambiguously situated in a gray area between the creation and integration processes. To thoroughly investigate what is presumed to be the strategic challenge in managing industry platforms, Article 3 centers on an empirical study that examines the process of creating an industry platform and integrating the different actors into it. This study blends the theoretical insights from Article 2 with empirical evidence from an in-depth case study explored in Article 3 to closely examine the presumed strategic challenge. Further, Article 3 presents a novel approach to overcoming the strategic challenges that are associated with the processes of creation and integration. Finally, Article 4 delineates the architecture of the New Space Ecosystem by drawing parallels with industry platforms and conceptually examines the feasibility of creating industry platforms in new contexts, such as that of the New Space Ecosystem. The main aim of this article is to support the insights gained from Article 3 and to identify further challenges encountered by platform owners, thereby achieving the objectives of the dissertation.

1.3 Research questions and theoretical gaps

The primary research question of this dissertation is driven by an interest in exploring how platform owners manage their industry platforms. Specifically, it targets a comprehensive understanding of the processes that platform owners follow while managing industry platforms, the strategic challenges they encounter, and the approaches they employ to overcome them. These insights may clarify, though partially, why not all firms transition to or integrate industry platforms into their core business activities. Consequently, the overarching research question of this study is:

RQ: What are the strategic challenges in managing industry platforms, and how can platform owners address these challenges?

First, the diversity and fragmentation of the literature on industry platforms can be overwhelming, hindering obtaining a comprehensive understanding of such platforms. However, this diversity can be harnessed to explore the structure of the field and understand the various scholarly approaches to industry platforms. Consequently, as an initial step toward addressing the dissertation's main research question, it is imperative to familiarize oneself with the phenomenon under examination and to map the landscape of the field. Accordingly, the research question for Article 1 (RQ1) is: What are technological platforms associated with network effects, and how do different scholarly groups conceptualize and approach this phenomenon? Having obtained an understanding of the field's structure, the next step toward addressing the dissertation's main research question was to explore the different processes that platform owners face in managing their industry platforms.

Three main challenges hinder a comprehensive understanding of these different processes: examining these processes in an isolated manner, adopting a narrow perspective when examining each of the individual processes, and neglecting specific processes. Accordingly, the main research question of Article 2 (RQ2) is: What are the different processes a platform owner engages in to manage their industry platforms?

With a comprehensive theoretical understanding of the diverse processes and acknowledging that the chicken-and-egg dilemma represents a strategic challenge, particularly falling within a gray area between the creation and integration processes, Article 3 aims to examine these two processes empirically. This examination focuses on how a firm develops its organizational boundaries when shifting toward an industry platform, particularly emphasizing the creation and integration processes. Therefore, the main research question of Article 3 (RQ3) is: How does a platform owner develop its organizational boundaries when transitioning toward an industry platform? Bridging the theoretical knowledge gained from Articles 1 and 2 with the hands-on experience developed in Article 3, Article 4 contributes to the dissertation's main research question by conceptually examining the possibility of creating an industry platform in new contexts. This examination stems from the empirical findings in Article 3, which show that the chicken-and-egg dilemma is not the sole, and perhaps not the primary or most significant, strategic challenge platform owners face when creating an industry platform. Thus, in addition to uncovering the architecture of the New Space Ecosystem through parallels drawn with that of industry platforms, Article 4 contributes to the dissertation's overarching research question by providing insights into the following research question (RQ4): What challenges arise when creating an industry platform in new contexts?

1.4 Dissertation's positioning and contributions

The literature on industry platforms emerged from the intersection of two distinct fields (Gawer, 2014): economics and engineering (Baldwin & Woodard, 2009; Rochet & Tirole, 2003, 2006). Over the past 20 years, this literature evolved, with new streams emerging to address novel aspects of the industry platform phenomenon (Boudreau, 2010; Eisenmann et al., 2011). Accordingly, it is vital to position each of the four articles concerning the different streams of literature examining industry platforms, thereby properly positioning the entire dissertation in relation to these scholarly contexts. To elaborate, Article 1 contributes to the diverse discussions on industry platforms by conducting a bibliometric analysis of a broad spectrum of articles across different literature streams. Its primary objective is to map the landscape of the field and examine how various scholars engage with the topic. Unlike Article 1, which covers a broad range of discussions on industry platforms, Article 2

specifically examines the processes that platform owners undergo in managing their platforms. Consequently, this article has a narrower scope, focusing on the platform owner's perspective (Van Alstyne et al., 2016) and contributing to strategic discussions on industry platforms (Cusumano et al., 2019; Gawer, 2014; Gawer & Cusumano, 2014), primarily by bridging both the initial pillars of engineering and economics and the subsequent developments in the field.

Article 3 empirically examines the process of creating an industry platform and integrating various actors into the platform ecosystem, maintaining a focus on the platform owner's perspective (Van Alstyne et al., 2016), as is the case in Article 2. The process of creating an industry platform remains an underexplored area (de Reuver et al., 2018; Gawer & Cusumano, 2014; Shi et al., 2021; B. Tan et al., 2015; Teece, 2017), with academic exploration progressing slowly. Nevertheless, this topic is predominantly examined by strategic management scholars who started to address the subject, as demonstrated by several special issues that concentrate extensively on this aspect, e.g., Teece et al. (2022). Furthermore, given that the integration of various actors into the platform ecosystem has been primarily the focus of economic scholars (Armstrong, 2006; Economides & Katsamakas, 2006; Kaiser & Wright, 2006; Rochet & Tirole, 2003), this article makes a significant contribution to debates challenging early economic theories. Specifically, Article 3 highlights discussions that have favored non-pricing strategies as a means to attract and integrate diverse actors into the platform ecosystem. These strategies are viewed as less risky and more cost-effective than traditional pricing approaches (Eisenmann & Hagiu, 2007). This stream of research was initiated by Eisenmann and Hagiu (2007, p. 1), who were among the first to introduce a non-pricing-related strategy, namely the "vendor to two-sided platform strategy." Consequently, similar to Article 2, Article 3 primarily contributes to the strategic discussions on industry platforms. Lastly, similar to Articles 2 and 3, Article 4 primarily contributes to the perspective of the platform owner (Van Alstyne et al., 2016), particularly through its focused examination in the second-to-last chapter on assessing the strength of network effects and exploring the potential for creating industry platforms in uncharted territories.

As the main research question of this dissertation is addressed through four distinct sub-questions, each primarily answered in one of the four articles comprising this dissertation, the dissertation as a whole makes a significant contribution to strategic discussions on the management of industry platforms. It particularly focuses on the initial processes of platform creation and the integration of various actors into the platform ecosystem, which is the gray area where the chicken-and-egg dilemma arises (Caillaud & Jullien, 2003). Furthermore, although these processes are somewhat distant from the orchestration process that begins directly after onboarding the various actors into the platform ecosystem (Eaton et al., 2015;

Foerderer et al., 2018; Ghazawneh & Henfridsson, 2013), this dissertation remains closely aligned with discussions of interest to information systems scholars, especially as pioneers in the field are advocating for further exploration of industry platform creation, such as de Reuver et al. (2018). In brief, while this dissertation is more closely aligned with the discussions of strategic management scholars, it is not disconnected from other streams of literature, whether those that were bridged to form the foundation of industry platform studies or those that emerged later. This is particularly relevant because the foundations of strategic management discussions on industry platforms emerged from bridging diverse perspectives (Gawer, 2014), making this multidisciplinary approach inherent to this stream of literature since its commencement. Another important aspect is that most discussions on industry platforms focus on B2C or C2C contexts, leaving the B2B context relatively underexplored (Jovanovic et al., 2021). However, this does not imply that this dissertation does not contribute to the literature on B2B platforms. Instead, it serves as a foundation for further developing strategic management discussions on industry platforms within B2B contexts.

1.5 Dissertation's structure

The dissertation is divided into two main parts: the first serves as the introduction to the entire dissertation and comprises five distinct chapters, while the second consists of four different articles that constitute the dissertation. The first part begins with an introductory chapter, to which this section belongs, and serves primarily as a roadmap for the entire dissertation. Specifically, it highlights the research objectives, the central research question, and positions the study within the broader field. The second chapter introduces two main streams of literature: network externalities and industry platforms. Both subsections are organized similarly, with each divided into three parts: emergence, evolution, and current state of affairs. Following these, the dissertation presents three additional chapters: the third chapter discusses the methodology used throughout the dissertation; the fourth summarizes the four articles included; and the fifth and final chapter presents the discussion and conclusion. That concludes the first part. The second part of the dissertation comprises four distinct articles, as outlined in Table 1. Article 1, a published journal article, is co-authored by Abed Alghani, Kohtamäki, and Kraus. Article 2, an unpublished article, is co-authored by Abed Alghani and Kohtamäki and is currently in its third round of revision. Article 3, another unpublished article, is co-authored by Abed Alghani, Rabetino, and Kohtamäki and is in its first round of revision. Finally, Article 4 is a chapter of a published book co-authored by Abed Alghani, Kohtamäki, and Kuusniemi. Further, it is important to note that the researcher served as the lead author, primarily responsible for defining the scope of the study, conducting data

collection and analysis, writing the manuscript, and managing the review processes required for publication.

Table 1. Summary of the four articles

	Article 1	Article 2	Article 3	Article 4
Key contributions to the dissertation's main research question	Mapping the landscape of literature on industry platforms and identifying five different clusters, each with its own terminologies, definitions, classifications, and approaches to examining industry platforms	Identifying five different processes that platform owners engage in to manage their industry platforms, with the chicken-and-egg dilemma emerging as a strategic challenge between the initial processes of creation and integration	Thoroughly exploring the creation and integration processes, particularly through an empirical examination of how a platform owner develops its organizational boundaries as it transitions toward an industry platform	Uncovering the architecture of the New Space Ecosystem by drawing parallels with that of industry platforms, with a particular focus on the challenges of creating industry platforms in new contexts, such as that of the New Space
Research context	Industry platforms	Industry platforms – platform owner perspective	Industry platform in the manufacturing sector – platform owner perspective	New Space Ecosystem – platform owner perspective
Research method	Bibliometric methods and systematic review techniques	Systematic literature review	Qualitative case study	Systematic literature review
Unit of analysis	≥ CABS3 journal articles	Industry platform management processes	Organizational boundaries	The architecture of digital infrastructures (industry platforms)
Sample	458 journal articles	359 journal articles	A Finnish firm operating in the manufacturing industry	51 academic articles
Key data sources	Scopus	Scopus	13 in-depth interviews + comprehensive secondary data	Scopus

	Article 1	Article 2	Article 3	Article 4
The role of the PhD candidate	The researcher served as the lead author, primarily responsible for defining the scope of the study, conducting data collection and analysis, writing the manuscript, and managing the review processes required for publication	The researcher served as the lead author, primarily responsible for defining the scope of the study, conducting data collection and analysis, writing the manuscript, and managing the review processes required for publication	The researcher served as the lead author, primarily responsible for defining the scope of the study, conducting data collection and analysis, writing the manuscript, and managing the review processes required for publication	The researcher served as the lead author, primarily responsible for defining the scope of the study, conducting data collection and analysis, writing the manuscript, and managing the review processes required for publication

2 THEORETICAL BACKGROUND

This chapter presents the theoretical background of the dissertation, particularly focusing on network externalities and industry platforms. The discussions on each of these two theoretical underpinnings, Sections 2.1 and 2.2, are divided into three different subsections: (1) emergence, (2) evolution, and (3) current state of affairs. As the name suggests, the emergence subsections provide a brief overview of the discussions that paved the way for the emergence of the two literatures, including the initial discussions on the topics. Following that, the evolution subsections examine the discussions that evolved after the boundaries of the literature were defined, specifically after Katz and Shapiro's (1985) study relating to network externalities and Gawer's (2014) work on industry platforms. Finally, the current state of affairs subsections address the recent literature on these topics.

2.1 Network externalities

2.1.1 Emergence

When examining the network externality literature, the majority of studies refer to Katz and Shapiro's seminal work *Network Externalities, Competition, and Compatibility* (1985). However, the roots of the network externality literature can be traced back to studies that have challenged the demand theory, particularly the seminal work of the founder of neoclassical economics, Marshall (2013). The conventional idea of demand is that consumers tend to buy more when the prices of a certain product or service fall. In simpler terms, the demand curve slopes downward from left to right, with the price (P) on the y-axis and the quantity of the product or service sold (Q) on the x-axis. Consequently, the collective or aggregate demand is the sum of the quantities (Q) consumers buy at specific prices (P) in a certain period. This concept is known as additivity, where the total demand for a specific product or service is the sum of the demands of all individual consumers in the market. Morgenstern (1948) argues that the concept of additivity holds only if the demand functions of different individuals who purchase a certain quantity (Q) at a specific price (P) are independent of each other. He argues that "*even if everything were completely known for additive aggregate demand curves and found to be in order, that knowledge would only apply to a small part of aggregate demand; in the majority of empirical cases, non-additivity seems to prevail*" (Morgenstern, 1948, p. 175). The initial empirical examples that were given were in the fashion industry, where a person tends to buy a specific piece of clothing because another person has done so rather than due to a decrease in price as the quantity sold increases. Accordingly,

Morgenstern's (1948) main aim was to examine how variations in market prices can be addressed in the analysis of demand. Yet, to a certain extent, Morgenstern's (1948) work inherently criticized existing theories without offering practical solutions.

Building on the early work of Morgenstern (1948), Leibenstein (1950) examined the fashion industry and coined the term "*bandwagon effect*" (Leibenstein, 1950, p. 183), which is defined as "*the extent to which the demand for a commodity is increased due to the fact that others are also consuming the same commodity. It represents the desire of people to purchase a commodity in order to get into "the swim of things" in order to conform with the people they wish to be associated with; in order to be fashionable or stylish; or, in order to appear to be "one of the boys""* (Leibenstein, 1950, p. 189). However, the "*bandwagon effect*" did not receive much attention, and the ideas discussed by Leibenstein (1950, p. 183) remained dormant until the advent of studies that shifted their focus from the fashion industry to that of communication services. For instance, Rohlfs (1974) relied on the previously examined concept of interdependent demand to examine communication services, referring to the phenomenon that describes how the utility of a communication service user increases as more users adopt the same service as a "*classic case of external economies in consumption*" (Rohlfs, 1974, p. 16); and Oren and Smith (1981) examined communication services, labeling the phenomenon under examination as "*demand externality*" (Oren & Smith, 1981, p. 467). Therefore, although the initially discussed concepts, such as non-additivity (Morgenstern, 1948) and bandwagon effects (Leibenstein, 1950), remained dormant for some time, they were revived through the examination of the communication service sector (see, e.g., Rohlfs (1974) and Oren and Smith (1981)), thereby paving the way for the seminal work of Katz and Shapiro (1985).

Katz and Shapiro (1985) argue that network externalities occur when the "*utility that a user derives from consumption of the good increases with the number of other agents consuming the good*" (Katz & Shapiro, 1985, p. 424). They identified different sources of network externalities; however, these sources can be classified into (1) direct network externalities, such as telephone, data networks, and other communication technologies, and (2) indirect network externalities, such as personal computers, video games, video players and recorders, phonograph equipment, and the automobile market. The examination of the previously mentioned industries gave rise to the concept of a "*relevant network*" (Katz & Shapiro, 1985, p. 424), which is defined as a "*set of users who have compatible brands of hardware*" (Katz & Shapiro, 1985, p. 425). Put simply, identifying users within a specific relevant network depends on whether the products they use, which are developed by different firms, can work together or not. Accordingly, the concept of "*compatibility*" (Katz & Shapiro, 1985, p. 424) began to emerge in the literature, with early scholars arguing that

compatibility serves as a driver of demand-side economies of scale (Katz & Shapiro, 1985). For instance, if two systems are not compatible in the telecommunications industry, the network size is limited to the capacity of each system. However, when the two systems are compatible, the network size expands to include the combined capacity of both systems.

The examination of "*compatibility*" (Katz & Shapiro, 1985, p. 424) brought the topic of "*standardization*" (Farrell & Saloner, 1985, p. 70) to the forefront, particularly in early discussions on the topic of network externality. Farrell and Saloner (1986, p. 940) argue that "*the benefits from compatibility create demand-side economies of scale: there are benefits to doing what others do. These benefits make standardization a central issue in many important industries*," which aligns smoothly with Katz and Shapiro's (1985) arguments. However, unlike Katz and Shapiro (1985), who argue that a certain product or service is more valuable as the number of users increases, Farrell and Saloner (1986) argue that a product or service is more valuable when other users are more willing to use compatible goods. Perhaps the divergence in perspectives stems from the diverse examples that these scholars have drawn upon, particularly the communications industry examined by Katz and Shapiro (1985) and the QWERTY keyboard case discussed by Farrell and Saloner (1986), which builds on David (1985). Farrell and Saloner (1986) further argue that compatibility might hinder innovation and cause excess inertia, defined as "*a socially excessive reluctance to switch to a superior new standard when important network externalities are present in the current one*" (Farrell & Saloner, 1986, p. 940), primarily relying on the keyboard case as the phenomenon under examination (David, 1985). Accordingly, early scholars attributed market inefficiencies and failures to network externalities (Arthur, 1989), particularly in the examination of the Video Home System (VHS) versus Beta (Katz & Shapiro, 1986) and the QWERTY keyboard versus the Dvorak keyboard (David, 1985; Farrell & Saloner, 1986).

2.1.2 Evolution

Liebowitz and Margolis (1994) argue that the previously examined cases, namely the keyboard case (David, 1985; Farrell & Saloner, 1986) and the Video Cassette Recorder (VCR) (Katz & Shapiro, 1986), are often "*a combination of anecdotes and speculation*" (Liebowitz & Margolis, 1994, p. 146). They strongly criticize the idea that network externalities lead to market failures and advocate for a distinction between network externalities and *network effects* (Liebowitz & Margolis, 1994, p. 135). They argue that network externalities and network effects should not be used interchangeably unless the actors in a certain market fail to internalize these effects. Essentially, if adding more users makes something better for everyone and the

benefits are internalized, the outcome should be referred to as network effects. However, if adding more users affects only certain users, whether positively or negatively, and those effects are not fully internalized, the outcome should be referred to as network externalities (Liebowitz & Margolis, 1994).

Moreover, in addition to distinguishing between network effects and network externalities, Liebowitz and Margolis (1994) differentiated not only between direct and indirect network externalities but also between the various economic implications of direct and indirect network effects, a topic that was somewhat broadly addressed in early discussions on network externalities by Katz and Shapiro (1985). Direct network effects occur when the value of a product increases due to the growing number of users. At the same time, indirect network effects arise from the increased availability or reduced prices of complementary goods as the user base expands. Moreover, Liebowitz and Margolis (1994) argue that network externalities do not always lead to positive effects; they can also have negative consequences. For example, if a communication network becomes overloaded by users, the effect on each individual user will be negative due to network congestion.

In the 1990s, the distinction between direct and indirect effects became clearer (Katz & Shapiro, 1994), and concurrently, some attention was given to positive and negative externalities (Arthur, 1996). Moreover, there was a notable shift in focus toward the examination of software, e.g., Arthur (1996), Church and Gandal (1992), and Katz and Shapiro (1994), rather than the cases previously examined (Farrell & Saloner, 1986; Katz & Shapiro, 1986). This shift was mainly driven by the observation that "*indirect network effects are perhaps easiest to see when many firms offer differentiated software*" (Katz & Shapiro, 1994, p. 99). Besides, between the 1990s and early 2000s, particularly with the proliferation of personal computers and the internet, a stock market bubble was inflating before it burst in the early 2000s, incentivizing practitioners and scholars to realize that transforming network externalities into profits is easier said than done (C.-C. Wu et al., 2013). Accordingly, the examination of network externalities began to focus more on the different business models that could be adopted to generate profits from these externalities, with pricing emerging as a central topic in these discussions (Caillaud & Jullien, 2001b; Parker & Van Alstyne, 2005; Rochet & Tirole, 2002). Therefore, in addition to the previously mentioned issues and in line with Katz and Shapiro's (1994) argument that indirect network externalities are clearer in software, different scholars started examining software to understand network externalities, particularly focusing on strategies to generate profits in competitive environments characterized by network externalities (Caillaud & Jullien, 2001b, 2003; Rochet & Tirole, 2002, 2003).

Caillaud and Jullien (2001b) examined price competition between two software intermediaries, such as online dating services or search engines that match two different sides of the market. The research considered intermediation a source of indirect network externalities. The primary motivation for examining *cybermediaries* stems from the fact that they represented one of the four most revenue-generating activities associated with the internet by that time (Caillaud & Jullien, 2001b). Therefore, such software emerged as the perfect context for examining network externalities, as the value of the software for the buyer side depends on the number of goods sold and the number of sellers on the seller side; simultaneously, the value of the software for sellers depends on the size of the demand, that is the number of buyers on the buyer side (Armstrong & Wright, 2007; Eisenmann et al., 2006). Accordingly, in the same way that discussions on compatibility (Katz & Shapiro, 1985) paved the way for discussions on standardization (Farrell & Saloner, 1985) in the 1980s, discussions on various business models, particularly in terms of pricing, paved the way for discussions on (cross-) subsidizing the different users of the software to incentivize their participation (Armstrong & Wright, 2007; Economides & Katsamakas, 2006). Although their study was not the first to examine intermediaries, Caillaud and Jullien's (2001b) work was, as far as the researcher is aware, among the first to explore the "*potential rationing of demand*" (Caillaud & Jullien, 2001b, p. 799) within the context of intermediaries. In short, due to the possibility of restricted demand, companies compete to attract more users to their software, often through cross-subsidization. That involves raising the prices for one side while reducing, or even eliminating, them for the other (Rochet & Tirole, 2003), where the subsidized side is the one more valued by the opposite side of the platform (Economides & Katsamakas, 2006). However, attracting the different actors to the software is, again, easier said than done, as there are a variety of actors on the different sides of the market. Consequently, Caillaud and Jullien (2003) argue that indirect network externalities give rise to the chicken-and-egg dilemma. Simply put, "*to attract buyers, an intermediary should have a large base of registered sellers, but these will be willing to register only if they expect many buyers to show up*" (Caillaud & Jullien, 2003, p. 310).

"*Despite much theoretical progress made in the last two decades on the economics of network externalities and widespread strategy discussions of the chicken-and-egg problem, two-sided markets have received scant attention*" (Rochet & Tirole, 2003, p. 990). Accordingly, the discussions on network externalities (Farrell & Saloner, 1985, 1986; Katz & Shapiro, 1985, 1986) as well as the discussions on the chicken-and-egg dilemma (Caillaud & Jullien, 2003) were the two main pillars for subsequent discussions on markets with network externalities, currently referred to as "*two-sided markets*" (Rochet & Tirole, 2003, p. 990). Rochet and Tirole (2003) argue that many, if not all, of the markets associated with network externalities are two-sided,

where two different sides mainly benefit from interacting on a common platform, thereby advancing the observation provided by Caillaud and Jullien (2001b) regarding intermediation as a source of indirect network externalities. Accordingly, the owners of these platforms must address the chicken-and-egg dilemma to "*get both sides on board*" (Rochet & Tirole, 2003, p. 990). However, to overcome this chicken-and-egg dilemma, pricing emerged as a key tool to attract the different sides of the market, echoing what was previously mentioned by Caillaud and Jullien (2001b).

After the seminal work by Rochet and Tirole (2003), discussions shifted from purely focusing on network externalities to emphasizing two-sided markets. This shift was notable, particularly after Rochet and Tirole (2003, p. 1020) argued that "*markets with network externalities are predominantly two-sided markets*," ultimately defining them as "*A market with network externalities is a two-sided market its platforms can effectively cross-subsidize between different categories of end users that are parties to a transaction. That is, the volume of transactions on and the profit of a platform depend not only on the total price charged to the parties to the transaction but also on its decomposition*" (Rochet & Tirole, 2003, p. 1017). Therefore, to a certain extent, these two bodies of literature— network externalities and two-sided markets—collided to the point where it became difficult to differentiate between them as the mainstream of the network externality literature began examining this phenomenon in the context of two-sided markets (Rysman, 2009) or multi-sided markets (Hagiu & Wright, 2015). These two bodies of literature collided not only in terms of their definitions but also over the necessary conditions for the emergence of such markets. Evans (2003) argues that there are three essential conditions necessary for the emergence of two- or multi-sided markets: (1) the existence of at least two or more groups of users, (2) the existence of externalities associated between the different groups of users, and (3) the existence of an intermediary capable of internalizing the externalities created by one group for the other. Accordingly, this blended the majority of the key concepts examined in the early literature on network externalities, namely those by Farrell and Saloner (1985, 1986), Katz and Shapiro (1985, 1986), and Liebowitz and Margolis (1994), along with insights from the literature on two-sided markets, specifically those by Caillaud and Jullien (2001b, 2003) and Rochet and Tirole (2003, 2006).

2.1.3 Current state of affairs

More recently, the topic of network externalities not only overlapped with that of two-sided markets but also with other related topics, forming a nested web of inherently interrelated subjects. For instance, Armstrong (2006) identified three

main factors that impact the pricing structure in two-sided markets: (1) the size of the cross-group externality, (2) single-homing or multi-homing, and (3) fixed fees or per-transaction charges. Furthermore, Eisenmann et al. (2006) argue that for a firm to succeed in managing a two-sided market, it should (1) establish the right pricing, (2) avoid envelopment, and (3) cope with winner-take-all competition, where a networked market is more likely to be served by one platform when "*(1) multi-homing costs are high for at least one user side, (2) network effects are positive and strong at least for the users on the side of the network with high multi-homing costs, (3) neither side's users have a strong preference for special features*" (Eisenmann et al., 2006, p. 7). Therefore, the evolution of network externality literature paved the way for the discussion of diverse topics that were addressed, albeit indirectly, in the early literature (Arthur, 1989; Katz & Shapiro, 1986). These topics particularly relate to multi-homing (Armstrong & Wright, 2007; Bakos & Halaburda, 2020; Belleflamme & Peitz, 2019; Doganoglu & Wright, 2006, 2010; Eisenmann et al., 2006; Jeitschko & Tremblay, 2020; Wiegand et al., 2022), winner-take-all competition (Cennamo & Santalo, 2013; Eisenmann et al., 2006), and envelopment (Eisenmann et al., 2006, 2011), among others.

Other scholars have continued to explore network externalities in both two-sided and multi-sided markets. These studies include examining the competitive implications of customer loyalty when network effects are present (Chen & Xie, 2007), analyzing the interplay between consumer adoption and merchant card acceptance in the presence of network effects (Bounie et al., 2017), and discussing piracy in the presence of network externalities (Rasch & Wenzel, 2013). Furthermore, other scholars have examined the dynamics between network effects and various factors, such as the interplay between network effects and platform dominance (Srinivasan & Venkatraman, 2010), balancing network effects and differentiation in mergers (Farronato et al., 2024), and the interplay between network effects and decision rules (Varga et al., 2023). Some researchers have also examined how network effects impact other factors, like the influence of network effects on profit and market efficiency (Choi et al., 2012), while others have examined the impact of specific factors on network effects, such as the impact of geographical locality (Kim et al., 2022). However, the examination of pricing strategies in the presence of network externalities remains a central topic in discussions of network externalities (Chou et al., 2012; G. Dou et al., 2016; Kaiser & Wright, 2006; Rochet & Tirole, 2006; H. Tan & Wright, 2021; Tong et al., 2020; W. Wu et al., 2022).

In addition to the previously mentioned discussions, the estimation of network effects also attracted attention. Empirical studies on network effects began in the early 1990s and evolved similarly to the literature described above (Caillaud & Jullien, 2003; Katz & Shapiro, 1985, 1994; Liebowitz & Margolis, 1994; Rochet &

Tirole, 2003). Initially, these studies emerged in random contexts involving software and the internet (Caillaud & Jullien, 2001a; Katz & Shapiro, 1994) and then progressed to focus particularly on two-sided markets (Rochet & Tirole, 2003, 2006), thereby bypassing the early period when studies on network effects focused on examples like QWERTY keyboards (David, 1985), telecommunications (Farrell & Saloner, 1986; Katz & Shapiro, 1985), and VCRs (Katz & Shapiro, 1986). One of the first studies was that of Greenstein (1993), who examined the impact of the installed base on federal agencies' acquisition of commercial mainframe computer systems. Subsequently, Gandal (1994) investigated computer spreadsheet programs to empirically test the presence of network effects, particularly by assessing consumers' willingness to pay premium prices; Saloner and Shepard (1995) examined the adoption of Automated Teller Machines (ATMs) by banks, with a particular emphasis on analyzing the impact of the number of a bank's branches on its ATM adoption rates; Brynjolfsson and Kemerer (1996) conducted a longitudinal case study analyzing microcomputer software to examine the role of network effects, specifically focusing on the size of the product's installed base and its impact on pricing dynamics; and Gandal et al. (2000) focused on the CD industry to explore the diffusion of hardware/software systems, where they examined the impact of changes in CD player prices and the variety of CD titles on the overall adoption of CDs.

Thereafter, mirroring the evolution of the network externality literature and its intersection with that of two-sided markets (Rochet & Tirole, 2003, 2006), studies focusing on estimating or quantifying network effects shifted their focus to these markets, with Rysman's (2004) study being the first to examine network effects in two-sided markets. Rysman (2004) focused on the Yellow Pages industry and examined the impact of indirect network effects on consumer surplus and, consequently, on the market structure, whether it be monopoly, oligopoly, or competition. They mainly emphasized three key elements in their examination of network effects: (1) consumer demand for usage of a directory, (2) advertiser demand for advertising, and (3) a publisher's first-order condition (Rysman, 2004). In a similar vein, Clements and Ohashi (2005) examined indirect network effects by analyzing the interaction between hardware adoption decisions and software supply decisions on the product cycle, specifically focusing on pricing and software variety in the US video game industry from 1994 to 2002; and Chao and Derdenger (2013) focused on the same industry to examine the impact of mixed bundling on indirect network effects, particularly on the participation rates of the two different sides of the market. Tucker and Zhang (2010) were among the first to diverge from the approach of the majority of the studies that focused on indirect network effects and to address both direct and indirect network effects simultaneously. Tucker and Zhang (2010) examined the impact of advertising the user base on the number of buyers, the number of sellers, and the combined participation of buyers and sellers in two-

sided exchange networks, particularly focusing on a B2B website. More recently, an increasing number of studies have empirically examined both direct and indirect network effects, such as those by Voigt and Hinz (2015), Chu and Manchanda (2016), and Hinz et al. (2020). However, most studies have mainly focused on estimating indirect network effects, specifically in established markets or industries.

2.2 Industry platforms

2.2.1 Emergence

Industry platforms are defined as "products, services, or technologies developed by one or more firms, and which serve as foundations upon which a larger number of firms can build further complementary innovations and potentially generate network effects" (Gawer & Cusumano, 2014, p. 420). The term "industry platforms" initially appeared in Gawer and Cusumano's (2008, p. 28) paper, "How Companies Become Platform Leaders." Despite using the term industry platform, it lacked a clear definition at that time. To explain the concept, Gawer and Cusumano (2008) relied mainly on examples such as the Google Search Engine, Qualcomm wireless technology, EMC Corp.'s WideSky, and the Linux operating system, among others. By that time, the majority of studies relied extensively on case studies of Intel, Microsoft, and Cisco, e.g., Cusumano and Gawer (2002), Gawer and Cusumano (2008), Gawer and Henderson (2007), and Gawer and Phillips (2013), where the "base platform" (Cusumano & Gawer, 2002, p. 52) was the hardware and the applications were the software. Meanwhile, other scholars took a different approach to studying these platforms. For example, Boudreau (2010) considered the software, the platform, and the hardware to be the complementor. However, both research and practical experience have shown that network effects are not significantly present in the context of hardware (Boudreau, 2012). Therefore, Boudreau (2012) reverted to considering the hardware as the platform and the software (i.e., the applications) as the complementor. Subsequently, different scholars tried to examine and understand this new phenomenon, each from their own perspective.

Gawer (2014) bridged two dominant perspectives that examine technological platforms, each with its own terminologies, classifications, and level of analysis. The first perspective is the economics perspective, which views platforms as markets and focuses mainly on competition (Rochet & Tirole, 2003, 2006), while the other is the engineering perspective, which views platforms as technological architectures consisting of a core and a periphery and focuses mainly on innovation (Baldwin & Woodard, 2009). Accordingly, Gawer (2014) clearly distinguished between three

different types of technological platforms: (1) internal platforms, which exist at the level of the firm and include the firm and its subunits; (2) supply-chain platforms, which operate at the level of the supply chain and include the platform and its various suppliers; and (3) industry platforms, which function at the level of the industry ecosystem and include a firm acting as a platform owner and its complementors. This classification paved the way for a clear definition of industry platforms by Gawer and Cusumano (2014, p. 420), as mentioned in the first paragraph of the Introduction Section. Furthermore, not only did the definition of industry platforms become clear in the literature, but it also paved the way for a clear classification of these platforms. Cusumano et al. (2019) identified two main types of industry platforms based on their primary function: (1) transaction platforms, which facilitate transactions between different actors in the platform ecosystem, e.g., Google Play; and (2) innovation platforms, which allow third-party developers to develop complementary applications on top of the platform, e.g., Google Android. Furthermore, (3) hybrid platforms lie between these two types and share functionalities from each, e.g., Google.

Throughout this work, the researcher adopts the term "industry platforms" (Gawer & Cusumano, 2014, p. 420) to refer to technological platforms associated with network effects and adopts the classifications presented by Cusumano et al. (2019). However, industry platform is not the only term used to refer to platforms associated with network effects; other scholars use different terminologies to refer to such platforms. Economics scholars, for instance, refer to them as two-sided markets (Rochet & Tirole, 2006), two-sided platforms (Evans & Schmalensee, 2008), multi-sided platforms (Hagiu, 2014), or even platforms (Hagiu & Wright, 2018). Strategic management scholars, on the other hand, use terms such as industry platforms (Gawer & Cusumano, 2014), double-sided markets (Gawer, 2014), platforms (Cennamo et al., 2018), or digital platforms (Gawer, 2021). Information systems scholars often refer to them as software-based platforms (Tiwana et al., 2010), digital infrastructures (Tilson et al., 2010), platforms (Ghazawneh & Henfridsson, 2015), or digital and non-digital platforms (de Reuver et al., 2018). Additionally, other scholars use terms like innovation platforms (Baldwin & von Hippel, 2011) or two-sided networks (Parker & Van Alstyne, 2005). The issue also extends to the definition of these platforms, as different scholars provide varying definitions associated with each term. Further, different scholars offer distinct classifications for categorizing these platforms that are associated with the presence of network effects.

Despite the various terminologies, definitions, and classifications used to refer to the phenomenon under examination, the dynamics of industry platforms started to become clear, particularly in terms of what distinguishes them from other types of platforms (Gawer, 2014, 2021; Gawer & Cusumano, 2014) and what constitutes the

industry platform ecosystem (Van Alstyne et al., 2016). As mentioned previously, Gawer (2014) developed the concept of industry platforms by bridging two different literatures, one of which was economics (Evans, 2003; Rochet & Tirole, 2003, 2006; Rysman, 2009). Accordingly, drawing on the literature of two-sided markets (Rochet & Tirole, 2003, 2006), Gawer (2014) argues that network effects are the main distinguishing factor between industry platforms and other types of platforms. The presence of network effects as a differentiating factor is an issue that the majority of academic scholars agree on, and it is embedded in discussions about these platforms (Bakos & Halaburda, 2020; Hagiu & Wright, 2015; Rochet & Tirole, 2003), regardless of the terminology used. However, it turned out that the presence of network effects alone is not sufficient for distinguishing industry platforms from other types of platforms, particularly after Hagiu and Wright (2015) argued that two main features differentiate these platforms beyond indirect network effects or other requirements: (1) "They enable direct interactions between two or more distinct sides," and (2) "each side is affiliated with the platform" (Hagiu & Wright, 2015, p. 63). Accordingly, these three main factors represent the criteria for assessing whether a certain platform qualifies as an industry platform (Gawer, 2014; Gawer & Cusumano, 2014; Hagiu & Wright, 2015).

The three previously mentioned factors are more applicable to transaction platforms than to innovation platforms (Gawer, 2014; Gawer & Cusumano, 2014; Hagiu & Wright, 2015). Those factors alone are not sufficient to differentiate innovation platforms from other types of platforms, particularly transaction platforms (Cusumano et al., 2019). Somehow, this is linked to the ongoing debate of which industry platforms are considered digital platforms and which are not (de Reuver et al., 2018; Gawer, 2014; Gawer & Cusumano, 2014; Thomas et al., 2014). To be more specific, the definition of digital platforms aligns with the definition of innovation platforms, particularly in terms of allowing third-party complementors to develop complementary applications on top of the platform (Cusumano et al., 2019). de Reuver et al. (2018, p. 126) defined digital platforms as "purely technical artefacts where the platform is an extensible codebase, and the ecosystem comprises third-party modules complementing this codebase." Further, de Reuver et al. (2018) criticized the broad treatment of technological platforms. They suggested that some scholars, such as Gawer (2014) and Thomas et al. (2014), had not considered the technological aspect, particularly digitality, when examining platforms. Accordingly, the presence of an extensible codebase emerges as a fourth factor that sets an innovation platform apart from a transaction platform (Cusumano et al., 2019), both of which are industry platforms (Gawer, 2014; Gawer & Cusumano, 2014).

As for the different actors that are part of the platform ecosystem, Van Alstyne et al. (2016) argue that there are four main actors in a platform ecosystem: (1) the platform

owner, (2) the platform provider, which are at the core of the platform (Modol & Eaton, 2021), and (3) producers, and (4) consumers, which are at the periphery of the platform (Modol & Eaton, 2021). Despite the simplicity of this classification, it aligns more closely with discussions related to two-sided markets (Armstrong, 2006; Rochet & Tirole, 2003, 2006; Rysman, 2009). Due to the complexity of industry platforms (Hanseth & Lyytinen, 2010), it is almost impossible to have a single framework that encompasses all possible actors in the ecosystem, as these actors vary greatly from one platform to another and from one industry to another (Gawer & Cusumano, 2014). For that reason, to understand industry platforms, the majority of the literature starts with a two-sided market conceptualization to simplify this inherently complex phenomenon (Hanseth & Lyytinen, 2010). That is not something irrelevant to the literature, as it has been argued since the very early days of examining these platforms, where Rochet and Tirole (2004, p. 2) clearly state, "We focus on two-sided markets for expositional simplicity. Many markets or platforms are multisided, though".

2.2.2 Evolution

As mentioned earlier, scholars have adopted different terminology to refer to technological platforms associated with the presence of network effects, that is, industry platforms. While Gawer (2014) focused on industry platforms, particularly on bridging the economics (Rochet & Tirole, 2003, 2006) and engineering perspectives (Baldwin & Woodard, 2009), other scholars were deeply involved in discussing specific aspects of this phenomenon. To begin with, and to avoid repetition of the discussion on two-sided markets from the previous section, economics scholars inherently focused on platform competition, particularly on pricing strategies to overcome the chicken-and-egg dilemma and attract various actors to the platform ecosystem (Armstrong, 2006; Caillaud & Jullien, 2003; Economides & Katsamakas, 2006; Kaiser & Wright, 2006). These discussions gave rise to a vast array of interrelated topics, namely, winner-takes-all competition (Cennamo & Santalo, 2013; Eisenmann et al., 2006), multi-homing (Armstrong & Wright, 2007; Doganoglu & Wright, 2006, 2010), and envelopment (Eisenmann et al., 2006, 2011), among others. For instance, Eisenmann et al. (2006) argue that for an industry platform to succeed, it must adapt to the winner-take-all competition. Essentially, the increasing rates of returns can lead to a winner-take-all scenario (Arthur, 1996; Eisenmann et al., 2006), and platform owners should assess whether the market or industry they target can be served by a single platform (Eisenmann et al., 2006). Accordingly, several scholars started examining this topic further and exploring its intricacies (Belleflamme & Peitz, 2019; Wiegand et al., 2022), while others focused on challenging it, e.g., Anderson et al. (2014), with some even claiming that the winner

does not take all (Huotari et al., 2017). Additionally, as the topic of winner-take-all competition is directly linked to that of multi-homing (Eisenmann et al., 2006), several studies focused on either of the topics or both (Huotari et al., 2017; Xie et al., 2021), with different scholars examining these topics from different perspectives. In brief, most of these studies primarily focused on topics directly related to competition between platforms in a particular market or industry.

Similarly to how economics scholars primarily focused on competition and its various related topics (Eisenmann et al., 2006), information systems scholars shifted their attention to the ecosystem of industry platforms, particularly focusing on platform governance and its different related topics. For instance, Ghazawneh and Henfridsson (2010) relied on the innovation networks perspective, which focuses on platform governance regarding control versus coordination, and the boundary objects perspective, which examines the utilization and rationale behind the use of boundary resources. They utilized these perspectives to examine the governance of third-party developers in a platform ecosystem through the use of boundary resources (Ghazawneh & Henfridsson, 2010), which are defined as "*the software tools and regulations that serve as the interface for the arm's-length relationship between the platform owner and the application developer*" (Ghazawneh & Henfridsson, 2013: 175). Thereafter, different scholars started examining different types of boundary resources (Ghazawneh & Henfridsson, 2010), specifically application programming interfaces (Ghazawneh & Henfridsson, 2013), software libraries (Fink et al., 2020), and standardized development tools (Miric et al., 2022), among others. Further, other scholars started examining different routes to attain governance within an industry platform ecosystem (Foerderer et al., 2018; Parker & Van Alstyne, 2018). However, the common denominator among these studies is that all the governance mechanisms examined are directly related either to the use of control, such as control versus autonomy (Wareham et al., 2014), or to the offering of resources, such as knowledge boundary resources (Foerderer et al., 2019, p. 20), with the ultimate goal of orchestrating the behavior of the different actors in the platform ecosystem. In other words, most studies that initially examined ecosystem governance mainly emphasized hard governance mechanisms (Foerderer et al., 2021).

Other scholars have built on the discussions of platform governance to explore further aspects of industry platforms. For instance, some scholars have focused on the evolution of industry platforms, particularly that driven by the platform's architecture and the governance mechanisms employed (Baldwin & Woodard, 2009; Gawer & Cusumano, 2014; Tiwana et al., 2010). These discussions on evolution arise from the inherent link between the evolution of a platform and its ecosystem, and the platform's interfaces (Baldwin & Woodard, 2009; Constantinides et al., 2018; Tiwana et al., 2010). These interfaces are defined as "*specifications and design rules that*

describe how the platform and modules interact and exchange information" (Tiwana et al., 2010, p. 676). Simply put, controlling the platform's interfaces effectively means controlling the platform itself (Baldwin & Woodard, 2009). Baldwin and Woodard (2009) were not alone in linking platform evolution to interfaces. Tiwana et al. (2010) extended that perspective by relating the evolution of industry platforms not only to their architecture and the employed governance mechanisms but also to environmental dynamics. Similarly, Gawer and Cusumano (2014) linked the architecture of the platform and the employed governance mechanisms to the platform's evolution over time and its progression toward a leadership position in a specific market and industry. Accordingly, various scholars started examining the topic of platform evolution more closely, particularly through the lenses of architecture and governance (Baldwin & Woodard, 2009; Constantinides et al., 2018; Tiwana et al., 2010), with some even focusing on how governance mechanisms themselves evolve during the evolutionary process of an industry platform (Huber et al., 2017).

The previously mentioned streams are not the only ones to have examined industry platforms (Gawer, 2014; Gawer & Cusumano, 2014; Ghazawneh & Henfridsson, 2013; Rochet & Tirole, 2003, 2006; Tiwana et al., 2010); however, these were among the major streams to have explored the phenomenon. Other scholars have focused on topics related to the interplay between competition and innovation and were able to create their own niches in discussions on industry platforms (Gawer, 2014), such as Boudreau (2010) and Eisenmann et al. (2011). For instance, Boudreau (2010) focused on the open strategies of a platform and their interplay with innovation. Specifically, Boudreau (2010) examined handheld computer systems to identify possible approaches to opening up an industry platform, granting access, e.g., Apple, versus devolving control, e.g., Linux, and their impact on the firm's rate of innovation. Furthermore, Boudreau and Lakhani (2009) examined whether firms should manage external innovation through collaborative communities or competitive markets and consequently identified three factors that affect such a decision: the type of innovation, the motivation of external innovators, and the nature of the business model. Accordingly, this gave rise to discussions focusing on industry platforms not from the perspective of the platform owner, as was prevalent in previous studies, but from the perspective of third-party complementors (Miric et al., 2019; Nambisan et al., 2018; Srinivasan & Venkatraman, 2018), who are integral actors in the platform ecosystem (Van Alstyne et al., 2016). Accordingly, a new stream of research emerged that focuses on the innovation aspect of industry platforms, mainly viewing industry platforms as "*innovation platforms*" (Baldwin & von Hippel, 2011, p. 1412), yet different from the "*innovation platforms*" defined by (Cusumano et al., 2019, p. 20). They mainly considered any industry platform that allows the various actors within its ecosystem to participate in creating value for the platform and its ecosystem as an

"*innovation platform*" (Baldwin & von Hippel, 2011, p. 1412). A case in point is Facebook, which has "*features of both single-user innovation (each person designs her page) and open collaborative innovation (she and her friends contribute content to each others' pages)*" (Baldwin & von Hippel, 2011, p. 1411). According to Baldwin and von Hippel (2011), Facebook is an innovation platform; however, Cusumano et al. 's (2019) classification would have it as a transaction platform. Therefore, the varying terminology and classifications complicate understanding industry platforms.

2.2.3 Current state of affairs

As mentioned previously, most discussions among economics scholars have focused on competition (Armstrong, 2006; Eisenmann et al., 2006; Evans, 2003; Rochet & Tirole, 2003, 2006). Specifically, the discourse has centered on the (cross-subsidized) pricing strategy that aims to overcome the chicken-and-egg dilemma and attract the different actors to the platform ecosystem (Caillaud & Jullien, 2003). However, some scholars argue that pricing strategies can be both risky and costly for firms (Eisenmann & Hagiu, 2007). For that reason, several scholars started deviating from pricing strategies and began exploring non-pricing ones as a means to overcome the chicken-and-egg dilemma (Eisenmann & Hagiu, 2007; Hagiu & Spulber, 2013). For instance, Hagiu and Spulber (2013) argue that providing first-party content plays dual strategic roles, one of which aids the platform owner in overcoming the chicken-and-egg dilemma. Other scholars have examined different strategies to attract various actors to the platform ecosystem, such as introducing tokens (Cong et al., 2021), piggybacking (Y. Dou & Wu, 2021), and signaling output control (Adam et al., 2022), among others. Further, scholars not only shifted away from pricing strategies, which are inherently related to platform competition (Rochet & Tirole, 2003, 2006), to non-pricing strategies but also transitioned from competition-related topics to non-competition-related ones. Generally speaking, a platform owner must navigate not only the competitive environment (Eisenmann et al., 2006) but also the external factors that are not directly related to competition, such as technological advancements (Tiwana et al., 2010), piracy (Ishihara & Muller, 2020; Miric & Jeppesen, 2020), and trade policies (McCalman, 2022), among others.

In a similar vein to the observed shift from competition-related topics (Rochet & Tirole, 2003, 2006) to non-competition-related ones (Eisenmann & Hagiu, 2007; Hagiu & Spulber, 2013), namely the shift from examining pricing strategies to non-pricing strategies, there was also a notable shift in the examined governance mechanisms. As mentioned before, initial studies extensively focused on hard governance mechanisms (Ghazawneh & Henfridsson, 2013; Wareham et al., 2014), which involve some form of control or provision of resources (Foerderer et al., 2021).

However, these are not the only means of controlling the behavior of ecosystem actors. More recently, scholars started examining soft governance mechanisms (Foerderer et al., 2021), which, in simple terms, do not involve direct control or the provision of resources. For instance, Foerderer et al. (2021) examined the role of granting awards to complementors as a means to influence their behavior; Chan et al. (2022) examined the role of ratings and reviews on the behavior of ecosystem actors, namely buyers and suppliers; and Reuber and Fischer (2022) highlighted the roles of likes, endorsements, and hashtags, among others, in influencing the behavior of social media platform users. Besides, since the evolution of industry platforms is closely tied to governance mechanisms (Tiwana et al., 2010), particularly hard governance mechanisms (Foerderer et al., 2021), the observed shifts in examining various aspects of industry platforms have broadened scholars' perspectives, thereby influencing discussions on platform evolution. Accordingly, various scholars started exploring the evolution of industry platforms from perspectives other than governance and architecture. For instance, some scholars have related the evolution of industry platforms to changing the leverage logics (Thomas et al., 2014) or to the capabilities of the platform owner, namely innovative, environmental scanning and sensing, and integrative (Helfat & Raubitschek, 2018), or even to the design of the business model, as well as to entrepreneurial actions such as business model innovation and imitation (Y. Zhao et al., 2020).

The preceding sections, specifically 2.1.2, 2.1.3, and 2.2.1, demonstrate that discussions of industry platforms have been built upon the foundations of two distinct literatures (Gawer, 2014), namely economics and engineering (Baldwin & Woodard, 2009; Rochet & Tirole, 2003). However, the literature examining these platforms, including that addressing strategic management (Cennamo et al., 2018; Gawer, 2014; Gawer & Cusumano, 2014), has, to some extent, taken the presence of the platform for granted. That is evident in the early discussions, where the examination of these platforms started with a focus on attracting the different actors to the platform (Caillaud & Jullien, 2003; Rochet & Tirole, 2003, 2006) or on orchestrating the behavior of the actors already present in the platform ecosystem (Eaton et al., 2015; Ghazawneh & Henfridsson, 2013; Parker & Van Alstyne, 2018; Wareham et al., 2014). Accordingly, the issue of how these platforms are created did not receive sufficient attention in the literature (de Reuver et al., 2018; Gawer, 2014; Shi et al., 2021; Tan et al., 2015). Indeed, this topic was primarily addressed in the early discussions of Gawer and Cusumano (2008, p. 32), particularly the "*coring phase*," but subsequently, it remained somewhat dormant. More recently, several scholars noticed that the topic of platform creation deserves more attention, which prompted various journal special issues focusing on the creation process of industry platforms, such as that by Teece et al. (2022), as well as numerous studies empirically

examining the creation process, such as those by Cennamo et al. (2022) and Trabucchi and Buganza (2022).

3 METHODOLOGY

This chapter focuses on the dissertation's methodology, which is divided into two main sections: philosophical assumptions and research design. The first section outlines the dissertation's philosophical assumptions, positioning it with respect to the various paradigms utilized in social theory analysis. It identifies the ontological, epistemological, and methodological choices guiding the research. The second section outlines the research design, specifically addressing the research process, methods of data collection, and considerations regarding the validity and reliability of the research.

3.1 Philosophical assumptions

The nature of science can be approached from a subjective or an objective perspective. Further, the nature of society can be examined through two perspectives, either regulation or change (Burrell & Morgan, 1979). The combination of the two dimensions, the nature of science with its two ends of subjectivity and objectivity, and the nature of society with its two ends of regulation and change, gives rise to four different paradigms adopted in the analysis of social theory, radical humanist, radical structuralist, interpretive, and functionalist (Burrell & Morgan, 1979), each grounded in distinct ontological, epistemological, and methodological assumptions. Although researchers often adhere to a single research paradigm, this approach often results in a narrow focus that restricts researchers and the broader community from developing a comprehensive understanding of organizational reality (Gioia & Petre, 1990). For that reason, multiparadigmatic approaches emerged as a viable method for theorizing by bridging different paradigms (Gioia & Petre, 1990), such as the structurationist paradigm (Barley, 1986; Giddens, 1979; Riley, 1983). Considering the primary objective of this dissertation and acknowledging the dynamic and complex nature of industry platforms, this research adopts a structurationist perspective (Giddens, 1979).

The structurationist paradigm occupies the middle ground of the debate on the nature of social science and leans toward the regulation side regarding the nature of society, thereby focusing on maintaining and preserving the social order. Therefore, it lies in the "*transition zone*" between the interpretive and functionalist paradigms (Gioia & Petre, 1990, p. 592). The interpretive paradigm in philosophy and sociology centers on understanding the social world through the perspectives of individuals who are actively involved in social processes, particularly from a subjective standpoint (Burrell & Morgan, 1979). In contrast, the origins of the functionalist paradigm can be traced back to the sociology of regulation and the objective

perspective (Burrell & Morgan, 1979). Therefore, the structurationist paradigm primarily bridges the subjective and objective perspectives (Gioia & Petre, 1990), or in other words, "*cuts through the action::structure paradox*" (Poole & van de Ven, 1989, p. 575). Due to the complexity of industry platforms (Hanseth & Lyytinen, 2010), their dynamics can be better understood through diverse paradigmatic lenses that integrate both subjective and objective choices. This approach is particularly valuable because previous purely subjective or objective-oriented studies have limitations despite providing valuable insights (Gawer, 2021). Accordingly, the structurationist paradigm is ideal for achieving the dissertation's objectives, given its strength in bridging multiple perspectives (Gioia & Petre, 1990).

From a structurationist perspective, human action is not isolated from structures, particularly organizational structures, as argued by Giddens (1979, 1982, 1984). Instead, structures are shaped by human actions while simultaneously constraining and enabling them. This dual role makes structures both the medium and the outcome of social practices (Giddens, 1979). This is precisely the case with industry platforms. For instance, the different ecosystem actors can influence the structure of an industry platform by driving changes in its value propositions and business model configurations (Trabucchi & Buganza, 2022). Conversely, the structure of the industry platform, including its architecture and associated governance mechanisms (Tiwana et al., 2010), can shape the actions of the ecosystem actors by controlling or influencing their behavior (Eaton et al., 2015; Foerderer et al., 2021; Ghazawneh & Henfridsson, 2013). This continuous interplay between agency and structure, which is fundamental to the structurationist perspective (Giddens, 1979, 1982, 1984), can lead to the creation and evolution of platforms, as seen with industry platforms like Friendz (Trabucchi & Buganza, 2022). The following sections will elaborate on how this philosophical framework, the structurationist paradigm (Giddens, 1979), influences ontological, epistemological, and methodological choices.

3.1.1 Ontological choices

As mentioned at the beginning of this section, the nature of science can be approached either subjectively or objectively. Burrell and Morgan (1979) elaborated on this debate by identifying dimensions that illustrate the subjective-objective spectrum, one of which is ontological choices. Ontological choices concern what exists in the world, that is, the nature of reality, falling on a continuum between two extremes: nominalism and realism (Burrell & Morgan, 1979). Nominalism, on the subjective approach to social science, argues that anything beyond individual cognition is simply labels and names that people use to organize their perception of the real world (Burrell & Morgan, 1979). Conversely, realism, on the objective approach to social

science, argues that the social world external to an individual's cognition is real, characterized by tangible and immutable structures that can be empirically explorable. Further, it is worth noting that combining different ontological choices is possible (Weick, 1995), even though Burrell and Morgan (1979) do not support it. Weick (1995, p. 35) argues that "*that very mixing of ontologies is what drives Burrell and Morgan nuts. But it shouldn't. People who study sensemaking oscillate ontologically because that is what helps them understand the actions of people in everyday life who could care less about ontology*". In line with the philosophical assumptions discussed in the previous section, particularly the structurationist paradigm (Giddens, 1979; Gioia & Petre, 1990), the dissertation's ontological choices also occupy the middle ground between nominalism and realism. This balanced approach recognizes that a comprehensive understanding of reality emerges from the interplay between objective and subjective elements.

To clarify this positioning, it is essential to briefly reflect on the researcher's conceptualization of the examined phenomenon. The researcher asserts that the phenomenon under examination is not exclusively referred to as "*industry platforms*" (Gawer & Cusumano, 2014, p. 417). Different scholars and bodies of literature adopt various terminologies to refer to it, such as digital platforms (de Reuver et al., 2018), innovation platforms (Baldwin & von Hippel, 2011), two-sided markets (Armstrong, 2006), and multi-sided platforms (Hagiu, 2014), among others. Further, these diverse terminologies are often associated with different definitions and classifications (Boudreau & Lakhani, 2009; Cusumano et al., 2019; Eisenmann et al., 2006; Hagiu, 2014). However, the researcher argues that certain key characteristics set this phenomenon apart regardless of the terminologies, definitions, and classifications used. More specifically, this type of platform is distinct from others due to the potential generation of network effects or network externalities (Gawer & Cusumano, 2014), which are often used interchangeably in the literature despite the differences between the two terms (Liebowitz & Margolis, 1994). Additionally, other scholars identified further characteristics that set these platforms apart, namely the presence of interactions between the different sides of the platform and the affiliation with the platform (Hagiu & Wright, 2015). Accordingly, the dissertation's ontological positioning (Giddens, 1979), which occupies a middle ground between nominalism and realism, acknowledges that different labels, definitions, and classifications are applied to refer to the examined phenomenon, combined with the belief that it possesses distinct characteristics.

3.1.2 Epistemological choices

Another dimension on the continuum of the subjective-objective approach to the nature of science is epistemological choices (Burrell & Morgan, 1979), a branch of philosophy concerned with the nature of knowledge and how it is acquired (Fleetwood, 2005). Similar to ontological choices, epistemological choices also fall on a continuum between the subjective and objective approaches to social science, respectively, anti-positivism and positivism (Burrell & Morgan, 1979). Anti-positivism argues that knowledge is obtained through subjective experiences, meanings, and interpretations rather than relying solely on empirical evidence and scientific methods (Burrell & Morgan, 1979). In contrast, positivism is a philosophical approach that argues that knowledge can only be obtained through empirical evidence, scientific methods, and the causal relationships among the different components of the social world. Echoing the positioning initially explained in terms of the philosophical assumptions, namely the structurationist paradigm (Giddens, 1979; Gioia & Petre, 1990), the epistemological choices of this dissertation occupy a middle ground, falling on a continuum between anti-positivism and positivism

To further clarify the dissertation's epistemological choices, it is essential to briefly elaborate on how the researcher acquired knowledge about industry platforms. In other words, it involves exploring the origins and foundational concepts of industry platforms. The literature on industry platforms emerged by bridging two distinct bodies of literature that have examined this phenomenon from an objective perspective (Gawer, 2014): the economics literature focusing on competition (Rochet & Tirole, 2003, 2006) and the engineering literature focusing on innovation (Baldwin & Woodard, 2009). The literature on industry platforms has evolved over the past two decades, with new streams of research emerging that blend the topics of innovation and competition (Boudreau, 2010; Eisenmann et al., 2011; Gawer, 2014), extending to studies that examine the social interactions among the various actors of the platform ecosystem, e.g., Trabucchi and Buganza (2022). Therefore, while the researcher's understanding of industry platforms initially emerged from an objective viewpoint, particularly the economics literature with its extensive use of econometric models (Armstrong, 2006; Rochet & Tirole, 2003, 2006; Rysman, 2009), this understanding could not have evolved without shifting away from these purely objective perspectives. Notably, the adherence to the objective perspective was even criticized by Gawer (2021), one of the pioneers in this literature, for its treatment of platforms as black boxes and overlooking the social interactions within their ecosystems. Accordingly, this dissertation argues that researchers seeking a comprehensive understanding of industry platforms, especially within the strategic management domain to which the researcher belongs, cannot rely solely on either a positivist or anti-positivist approach. The researcher has developed their knowledge

of industry platforms by integrating objective and subjective approaches, significantly influencing their interpretations and understanding. For this reason, adopting a middle ground between these epistemological extremes seems to be an optimal approach for understanding this complex phenomenon.

3.1.3 Methodological choices

In addition to ontology and epistemology, methodology is another dimension that falls on the subjective-objective continuum in the study of social sciences (Burrell & Morgan, 1979). Methodology refers to the method or way of conducting certain research or inquiry, and akin to the previously examined dimensions, it encompasses choices that range between two extremes (Burrell & Morgan, 1979). On the subjective end lies the ideographic approach to social science, which favors getting close to a certain subject to scrutinize and understand it. On the objective end, the nomothetic approach advocates systematic techniques to study phenomena and identify general patterns. Reflecting the middle-ground perspectives previously discussed, particularly the structurationist paradigm (Giddens, 1979; Gioia & Petre, 1990), the dissertation's methodological choices integrate both ideographic and nomothetic approaches.

Article 1 and Article 3 represent the extremes of methodological choices, namely the nomothetic and ideographic approaches, respectively, while Article 2 and Article 4 occupy the middle ground, incorporating characteristics from both approaches. Article 1 is a literature review based on bibliometric analysis (Waltman et al., 2010; Zupic & Čater, 2015) that was then followed by systematic review techniques aimed at mapping the landscape of the literature on industry platforms. The bibliometric analysis conducted primarily focused on author co-citation analysis (Bayer et al., 1990; Jeong et al., 2014), grouping authors who are frequently cited together in other researchers' work, mainly because they discuss the same or similar topics (Zupic & Čater, 2015). Accordingly, this reduces the subjectivity of the researcher (Acedo et al., 2006; Di Stefano et al., 2010; Zupic & Čater, 2015), particularly as the researcher accepts the mappings provided by the software as given and then analyzes them to formulate generalizations about the topics discussed within each of the identified clusters (Waltman et al., 2010). Conversely, Article 3 strictly adheres to the ideographic approach, employing a qualitative strategy that focuses on an in-depth examination of a single case study (Eisenhardt, 1989; Eisenhardt & Graebner, 2007) to examine how a platform owner develops its organizational boundaries when creating an industry platform. As an initial step, the study involved a comprehensive analysis of the case firm's website and public documents, including blogs. This analysis helped the research team understand the firm's development over time,

identify key milestones, and gain insights into potential shifts in organizational boundaries. Subsequently, the research team created a semi-structured questionnaire and interviewed individuals with various organizational roles. The researchers became deeply immersed in the case study to understand how the firm's identity, power, competence, and efficiency evolved during the transition toward adopting an industry platform.

Regarding the articles that adopt a middle position between the ideographic and nomothetic approaches, Articles 2 and 4 exemplify this balanced approach. Both Articles 2 and 4 are systematic literature reviews (Kohtamäki et al., 2018; Spanuth & Urbano, 2023); Article 2 aims to uncover the processes crucial to managing industry platforms, while Article 4 focuses on exploring the architecture of the New Space Ecosystem and the possibility of creating industry platforms in new contexts. Generally speaking, when encountering the word "systematic," one might directly think of objectivity and thus assume that the methodology employed adheres to a nomothetic approach (Burrell & Morgan, 1979). However, that does not necessarily hold true, considering that a literature review is divided into two main processes: search and analysis (Spanuth & Urbano, 2023). The search process leans toward objectivity because the researcher accepts the selected list of articles as given; however, it is not entirely free from subjectivity, as the researcher is responsible for selecting the keywords, choosing the journals, and adjusting the final list of articles, among other tasks (Spanuth & Urbano, 2023).

While the search process tends to be more objective, the analysis process is not always objective, particularly when inductive coding is applied (Dubois & Gadde, 2002), as in Articles 2 and 4. The researcher did not start with predefined categories or coding schemes in either. A simple piece of evidence is the five processes identified in Article 2; other researchers might have identified only four, for instance. The orchestration process could easily have been linked with the evolution process and given a different name, particularly because the topics of platform architecture and governance are inherently linked to platform evolution (Tiwana et al., 2010). However, as the researcher immersed himself in the literature on industry platforms, particularly the studies by information systems scholars (Hanseth & Lyytinen, 2010; Tilson et al., 2010; Yoo et al., 2010), he foresaw a rationale for separating these processes due to their specific aspects that distinguish them. For instance, unlike hard governance mechanisms (Ghazawneh & Henfridsson, 2013; Tiwana et al., 2010), the applicability of soft governance mechanisms (Foerderer et al., 2021) has not been proven to be linked to the evolution of industry platforms. Therefore, in Articles 2 and 4, the search process leans toward objectivity regarding methodological choices, while the analysis process exhibits a stronger inclination toward subjectivity.

Therefore, both articles occupy a nuanced position between the idiographic and nomothetic approaches.

3.2 Research design

A research design is a dynamic process that bridges the development of the research question and data collection and analysis (Edmondson & McManus, 2007). This process is inherently non-linear, requiring iterative adjustments to ensure methodological fit among the various stages of the research process (Edmondson & McManus, 2007). The primary aim of this dissertation is to identify the strategic challenges in managing technological platforms associated with network effects and to explore how platform owners overcome these challenges. This main research question is addressed through four distinct articles that constitute this dissertation, collectively forming a funnel-based approach to achieving the dissertation's main objectives. Accordingly, the initial step involved acquiring an overview of the literature on technological platforms associated with network effects. For this purpose, Article 1 employed a bibliometric review, which reduces the researcher's subjectivity (Acedo et al., 2006; Di Stefano et al., 2010; Zupic & Čater, 2015), to map the structure of the field and understand how different scholars approach these platforms. Therefore, Article 1 not only facilitated a comprehensive understanding of the field's structure but also uncovered a well-defined terminology, "*industry platforms*" (Gawer & Cusumano, 2014, p. 417), which is associated with a precise definition and a clear classification of the various types of technological platforms associated with network effects (Gawer, 2014, 2021; Gawer & Cusumano, 2014). Having acquired a solid grasp of the field, the main aim was to understand the different processes that platform owners must undergo in managing their industry platforms. The most effective approach to addressing this research question was conducting a systematic review to identify the various processes, which became Article 2. This review revealed five crucial processes: creation, integration, orchestration, navigation, and evolution, with the chicken-and-egg dilemma identified as a strategic challenge that falls in a gray area between the creation and integration processes.

The insights derived from Article 2 stimulated interest in conducting an empirical study to explore the previously identified most strategic challenge; the result was Article 3. Accordingly, through an in-depth analysis of a single case study, Article 3 examined a firm involved in developing an industry platform and emphasized the findings presented in Article 2. Specifically, Article 3 indicates that while the creation and integration processes are closely related, they are distinct. It also highlights that the chicken-and-egg dilemma pertains specifically to the integration process; it is not

the primary strategic challenge that platform owners face in managing industry platforms, as other strategic challenges precede it. Consequently, Article 3 introduces a novel approach that assists platform owners in mitigating the challenges associated with the initial processes of industry platform management, specifically creation and integration. Subsequently, the observations from Article 3 sparked an interest in examining further challenges that platform owners might encounter when creating industry platforms in new contexts. Accordingly, the most effective approach was a conceptual paper (Article 4) that revealed the architecture of the New Space Ecosystem and focused on the potential challenges of creating industry platforms in new contexts.

Considering the overarching research question of the dissertation, each article is not only a stand-alone contribution but also a puzzle piece in an argument that aims to uncover distinct aspects related to the dissertation's main research question. As mentioned previously and shown in Figure 1, the main research question was addressed using a funnel-based approach, with Article 1 acting as the "*space ship*" (MacInnis, 2011, p. 138) to map the landscape of the industry platform literature and Article 2 serving as both the "*map*" and the "*architectural plan*", providing a framework that is both "*conceptual*" and "*integrative*" (MacInnis, 2011, p. 138). In addition, Article 3 specifically focused on two of the five processes identified in Article 2, the creation and integration processes, serving as a "*magnifying glass*" (MacInnis, 2011, p. 138) to provide a detailed examination of their interaction and mutual influence. Ultimately, the last article, Article 4, acts as a "*telescope*" (MacInnis, 2011, p. 138), revealing the architectural intricacies of a new field, the New Space Ecosystem. However, its main contribution with respect to the dissertation's research question is as "*evidence*" (MacInnis, 2011, p. 138) that the creation process indeed precedes the integration process, as discussed in Article 2, involving strategic challenges that are as complex as, if not more complex than, the chicken-and-egg dilemma, thus warranting significant attention.

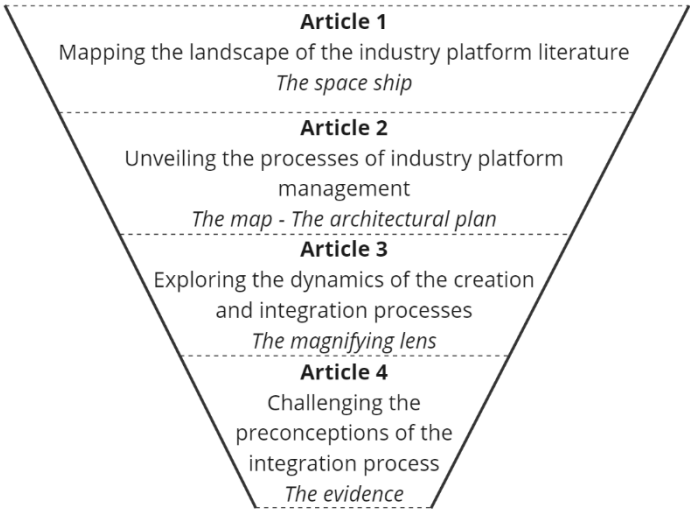


Figure 1. Research design: Funnel-based approach

3.2.1 Research process

The researcher's academic journey began in June 2022 when he enrolled in the PhD program in Economics at the University of Vaasa within the Strategic Business Development (SBD) Research Group. However, his interest in platforms predates this period to the time completing his master's degree at Politecnico di Milano. The researcher's master's thesis focused on how the utilization of platforms impacts the performance of incumbents, particularly examining how the activities of platform owners evolve from having only physical shops to incorporating websites and subsequently integrating social media platforms. The resultant longitudinal analysis focused primarily on the company's website and social media activity. However, perhaps due to his engineering background, the researcher found it challenging to neglect the objective aspect of this study. For this reason, he included a financial analysis covering a 30-year period to acquire a comprehensive overview of the platform owners' performance across three different eras: physical shops, e-commerce, and social commerce.

In short, the researcher's interest lies in exploring industry platforms and particularly how platform owners manage them. The academic literature discussing such platforms is rich with varied, and sometimes contradictory, terminologies, classifications, and approaches to examining these platforms. Consequently, along with his supervisor, the researcher foresaw an opportunity to start with a bibliometric review to map the literature landscape and explore how different scholars approach industry platforms, which formed the basis of Article 1. Article 1 thus enabled the research team to identify five clusters representing groups of scholars approaching the topic from different angles and discussing different aspects

of industry platforms. Meanwhile, as the researcher was working on Article 1, he also attended doctoral degree courses rated at 60 ECTS. During this period, he focused on courses in academic writing and qualitative research methods, including one specifically focused on conducting systematic literature reviews, which laid the groundwork for initiating Article 2. As seen in Table 2, after submitting Article 1 and mapping the landscape of the industry platform literature, the researcher started preparing for Article 2. That article focused on a specific aspect of these industry platforms, particularly uncovering the different processes fundamental to their management from the perspective of the platform owner. Article 2 has undergone three significant revisions. The initial revision followed its presentation at the Spring Servitization Conference 2023 in Helsinki, where the research team received valuable feedback from experts in the field. Subsequent revisions were conducted during the submission process, with the paper currently in the third round of revisions. Article 1 underwent two revisions, one major and one minor, before being published in the European Journal of Innovation Management.

Table 2. The research process

Year	June/2022 - May/2023						June /2023 - May /2024						June /2024 - March /2025				
Course Work																	
Article 1																	
Article 2																	
Article 3																	
Article 4																	
Dissertation																	

Having identified the five processes integral to managing industry platforms and recognizing the chicken-and-egg dilemma as particularly problematic, it was important to empirically examine the foundational industry platform management processes. Therefore, while composing Article 2, the primary focus was to identify a case study of a firm either in the process of creating an industry platform from scratch or transitioning from a pipeline model to a platform model. In Autumn 2023, the research team identified a suitable firm meeting the predefined criteria and decided

to conduct an empirical study to examine how a platform owner develops its organizational boundaries during the transition toward an industry platform. Accordingly, they began by collecting secondary data to acquaint themselves with the firm, developed a questionnaire, and conducted interviews with personnel. While writing Article 3, the researcher produced a book chapter focusing on the New Space Business, which became Article 4. The book chapter provided an opportunity to explore this emerging phenomenon from the perspective of industry platform architecture and also to examine the process of creating industry platforms in a new context from a conceptual perspective. Article 4 is the only book chapter included in this dissertation, and it underwent two rounds of revisions, one major and one minor, before being published by Palgrave Macmillan Singapore in the book *Space Business: Emerging Theory and Practice*. Article 3 has been submitted to a special issue and is undergoing its first revision round. The article was presented at the Spring Servitization Conference 2024 in Tilburg. The researcher took a leading role in writing all four articles, conducting the interviews for Article 3, and managing the various review processes.

As shown in Table 2, the four articles were composed sequentially, with each article's findings laying the foundations or the starting point of the subsequent one, forming a funnel-based approach to address the dissertation's main research question, as discussed in the previous section and illustrated in Figure 1. However, the funnel-based approach is not just a method for crafting this dissertation; it served as a framework to complete the researcher's PhD journey. That journey began with grasping the broader context and then focused on specific details crucial for addressing the main research question. Regarding the positioning within the structurationist paradigm discussed earlier (Giddens, 1979; Gioia & Petre, 1990), it extends beyond this dissertation and forms a foundational approach for the researcher's academic career. The researcher's educational background has significantly influenced this positioning, blending engineering studies at the bachelor's and master's levels with social sciences studies at the PhD level.

3.2.2 Data collection

Data collection in the four articles can be grouped into two distinct categories. Articles 1, 2, and 4 are all based on literature reviews; Article 1 features the bibliometric form, and the others the systematic form. However, Article 3, which is based on a single case study, adopts a completely different approach to data collection. Articles 1, 2, and 4 primarily follow Tranfield et al.'s (2003) guidelines centered on selecting the search terms, identifying target journals, and defining selection criteria. Accordingly, the search process shaping data collection was

systematic in all three articles (Kohtamäki et al., 2018; Spanuth & Urbano, 2023; Tranfield et al., 2003). Articles 1 and 2 share the same search strings. The first search string includes terminology referring to technological platforms associated with network effects. However, the second search string includes "network e*," which refers to "network effect," "network effects," "network externality," or "network externalities," the main distinguishing factor between industry platforms and other types of platforms (Gawer, 2014). Moreover, an additional third search string incorporating the journal titles was introduced. The decision served two purposes: (1) to focus on journals within specific disciplines and (2) to focus only on top-ranking journals, particularly those classified at the CABS3, CABS4, and CABS4* levels. However, the final number of publications reviewed and reported on in Article 1 is greater than that in Article 2, as the latter specifically focuses on studies conducted from the platform owner's perspective that address, directly or indirectly, the management of these platforms. Article 4 utilizes a single search string incorporating terminology referring to the *New Space* phenomenon without necessitating a second or third search string, owing to the limited number of articles on the topic. Additionally, it is important to note that in all three articles, the chosen keywords were specifically searched for within the titles, abstracts, or listed keywords of various scholarly papers (Newbert, 2007). These papers were identified and accessed through Elsevier's Scopus, which is widely regarded as a leading tool supporting literature searches (Falagas et al., 2008).

Article 3 is an empirical study, and the data collection followed a completely different procedure that required around six months to complete. As mentioned previously, the initial step involved familiarization with the case firm through secondary data, particularly the firm's website, blogs, and social media channels. This information provided a broad understanding of the firm's evolution, especially the phase prior to creating an industry platform. Subsequently, a semi-structured questionnaire was prepared, and 13 interviews were conducted with staff in managerial positions within the firm and with external stakeholders, such as board members. The semi-structured interviews provided both structure and flexibility, allowing for the discussion of new topics that arose and required elaboration. This approach aligns with the philosophical positioning of the structurationist paradigm discussed earlier (Giddens, 1979; Gioia & Petre, 1990), which embraces the structure, rules, and norms at one pole and human agency at the other. By allowing the interviewer to navigate and influence the direction of the conversation, semi-structured interviews effectively capture the dynamic interplay between structure and agency that is central to the structurationist approach. All 13 interviews were led by the researcher, sometimes accompanied by other research team members. All interviews were conducted via Microsoft Teams and recorded with the interviewees' permission, resulting in a total of 690 minutes of recordings. The recordings were automatically

transcribed using the software's features, resulting in 626 pages of text (Calibri, font size 11, single-spaced). Further, after each interview, the researcher reviewed the recording alongside the automatic transcription to ensure clarity, thereby facilitating the subsequent analysis process. The interview process ended once the additional evidence provided by new interviewees reached saturation (Yin, 2018).

3.2.3 Research quality

This section mirrors the approach of that on data collection but addresses the quality of the research. Articles 1, 2, and 4 will again be examined individually, and a separate discussion of Article 3 follows. The first set of articles, 1, 2, and 4, are based on different forms of literature review. Therefore, the reliability of these articles hinges on the ability of future scholars to replicate the same steps and achieve similar results (Eriksson & Kovalainen, 2008). In each of the three articles, the search process is discussed separately from the analysis process (Spanuth & Urbano, 2023). Regarding the search process, in Articles 1 and 2, the first two search strings were specifically designed to reveal articles examining technological platforms associated with network effects. The authors of both papers revised the search strings several times, and they were further refined during the presentation of Article 2 at the Spring Servitization Conference 2023 in Helsinki. In addition, the third search string focused exclusively on peer-reviewed journal articles rated as CABS3, CABS4, and CABS4* and thus excluded any sources not subject to peer review (Kohtamäki et al., 2018; Tranfield et al., 2003). The process described thus far represents the first phase of the search process.

The second phase of the search process (Spanuth & Urbano, 2023), which applied to Articles 1 and 2 but also to Article 4, involved a careful screening to filter the articles. For instance, data gathering for Articles 1 and 2 excluded publications that did not align with the intended use of the second search string, *network e**. Articles that featured the second search string criteria in the reference list alone rather than in the main text were also excluded. Furthermore, a more detailed screening was conducted after the initial selection for Articles 1, 2, and 4 (Kohtamäki et al., 2018; Spanuth & Urbano, 2023). That involved reviewing the titles, abstracts, keywords, and even the entire paper, when necessary, to exclude articles that did not contribute to the main research questions of Articles 1, 2, or 4. The authors of the articles discussed the exclusion decisions to ensure consensus. Furthermore, additional articles were identified by reviewing the reference lists of the initial set of articles or during the reading process. The authors of the papers then double-checked the list of newly added articles.

The analysis process (Spanuth & Urbano, 2023) was carefully documented at each step to ensure replicability (Eriksson & Kovalainen, 2008). The analysis commenced with the aggregation of first-order concepts, continued by grouping them into broader second-order themes, and finally, they were categorized into aggregate dimensions (Gioia et al., 2013). Of course, the way the data structure is "*set in motion*" differs across the three articles to address the specific research questions posed by each (Nag et al., 2007, p. 829). In summary, all three articles document the search and analysis processes in detail to ensure the studies are replicable (Spanuth & Urbano, 2023). While the researcher followed established practices rather than devising the methods, the aim was to build on and extend previous studies, namely Kohtamäki et al. (2018), Spanuth and Urbano (2023), and Tranfield et al. (2003), by providing more detailed documentation to enhance the replicability of future studies (Eriksson & Kovalainen, 2008).

Regarding Article 3, which focuses on an in-depth examination of a single case study, the quality and trustworthiness of the research primarily depend on the study's contextual validity (Ryan et al., 2002), or in other words, a demonstration that the "*researcher fully understands the case*" (Ihantola & Kihn, 2011, p. 42). Accordingly, the several steps taken ensure a thorough understanding of the case firm. First, the researcher gained a deeper understanding of the case firm by gathering and reviewing data from various secondary sources. Additionally, 13 interviews were conducted with a range of individuals, including both internal staff and external stakeholders, to capture a wide array of perspectives. A detailed data collection protocol was employed for both secondary and primary data (Yin, 2018). Moreover, communication between the researcher and the interviewees continued beyond the interview process, with follow-up contact made whenever clarification on specific topics was needed (Gibbert et al., 2008; Gibbert & Ruigrok, 2010; Yin, 2018). That triangulation of active and passive data sources helped ensure the accuracy of the data and improved the reliability of the study (Beverland & Lindgreen, 2010; Yin, 2018).

Feedback from three interviewees complemented the process reported above; they reviewed a manuscript draft before it was submitted to the journal, offering insights that enhanced the study's credibility. Furthermore, it is worth noting that the case firm has been used as a case study in several courses and projects designed by the research team. The various strategies employed in that body of research ensured the team had an extensive understanding of that case firm (Dubois & Gadde, 2002), which reinforced this study's contextual validity (Ryan et al., 2002). In addition, to avoid redundancy with the analysis process of Articles 1, 2, and 4, Gioia's methodology was utilized to analyze Article 3 (Gioia et al., 1994, 2013; Gioia & Thomas, 1996). Common words and phrases extracted from secondary sources and interviews were initially

categorized into first-order concepts, which were then grouped into second-order themes and subsequently formed into aggregate dimensions (Gioia et al., 2013). In summary, the quality and trustworthiness of this dissertation stem from the assured quality and reliability of the individual papers that constitute it.

4 ARTICLE SUMMARIES

This dissertation comprises four different articles focusing primarily on the management of industry platforms from the platform owner's perspective. Articles 1, 2, 3, and 4 are presented in order in the following four subsections.

4.1 Article 1: Mapping the landscape: unveiling the structural dynamics of industry platforms

Article 1, *Mapping the Landscape: Unveiling the Structural Dynamics of Industry Platforms*, focuses on understanding the structure of the industry platform literature. As mentioned, the literature emerged from bridging economics and engineering research literature. However, over time, discussions on industry platforms expanded as scholars focused on various aspects of platforms, which led to recognizable independent clusters. One of the most effective approaches to reveal the structure of a field is conducting bibliometric analysis, particularly author co-citation analysis, followed by systematic review techniques. In simple terms, author co-citation reviews the frequency of authors' co-citations in the reference lists of various articles to form clusters that map the landscape of the literature. Consequently, after developing the appropriate search string and selecting 458 relevant articles, they were analyzed using VOS Viewer for author co-citation analysis, which was then followed by a systematic review to examine the different clusters.

The co-citation analysis revealed five different clusters that examine industry platforms through diverse approaches (see Figure 2): two-sided markets, industry platforms, digital platforms, innovation platforms, and two-sided networks. The two-sided markets cluster is mainly dominated by economics scholars who view platforms as a black box; they primarily focus on examining the competition between platforms, particularly in terms of pricing. The industry platform cluster is dominated by strategic management scholars investigating topics related to industry platforms spanning competition to innovation; this mirrors the origins of the industry platform literature, which emerged from bridging the economics literature focusing on competition and the engineering literature focusing on innovation. The digital platforms cluster mainly focuses on topics related to the platform ecosystem, particularly the architecture and governance mechanisms utilized to orchestrate the various actors within the ecosystem. Unlike the rest of the clusters, the innovation platforms cluster and the two-sided networks cluster focus on the interplay between the topics of competition and innovation and have paved the way for novel discussions within the field of industry platforms.

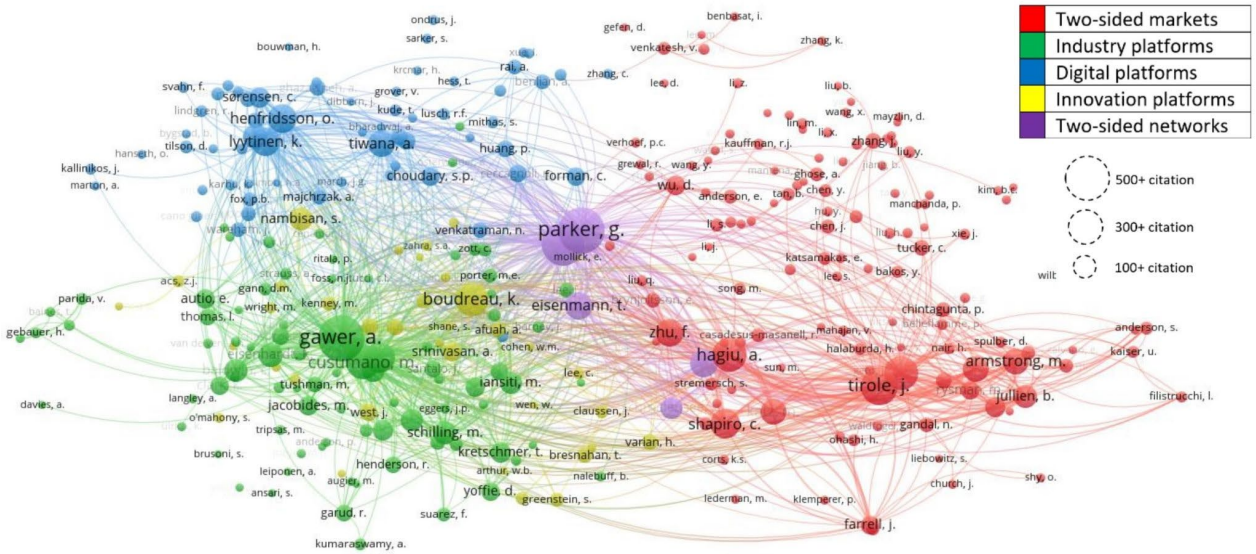


Figure 2. The five main clusters

Examining these five clusters highlighted three main research concerns: terminology, classification, and perspective. First, scholars employ different terminology to refer to technological platforms associated with network effects. However, the primary concern lies not only in the diversity but also in the contradictory terminology. For instance, a digital platform for one cluster is a non-digital platform for another, and an innovation platform for one cluster is a transaction platform for another. The inconsistent terminology confuses readers and can hinder the development of the field. Furthermore, the proliferation of terminology is accompanied by multiple classifications of technological platforms associated with network effects, which adds another layer of complexity to understanding industry platforms. Lastly, examining the five clusters clarified that most of them explore platforms from the perspective of the platform owner. However, the platform owner is just a single actor within the industry platform ecosystem. If we seek a comprehensive understanding of these platforms, we should be investigating the perspectives of all the actors in the ecosystem. That is because, in such a business model, value is not created by a single actor but is co-created by the diverse ecosystem actors.

Accordingly, this article improves the understanding of industry platforms by exploring how the research clusters approach and examine them; this not only clarifies the current landscape but also paves the way for exploring neglected means of examining platforms. As mentioned, the article highlights three main concerns requiring further attention: terminology, classification, and perspective. The primary aim in addressing the first two concerns, terminology and classification, is to achieve coherence in academic discourse. Harmonizing these aspects can foster interdisciplinary collaborations and enrich the perspectives of different clusters

examining industry platforms, facilitating a more comprehensive understanding of this evolving field rather than examining their different facets through isolated approaches. Further, the main goal in addressing the last concern, perspective, is to encourage scholars to examine industry platforms from perspectives beyond that of the platform owner. Addressing the platform owner's perspective alone could hinder obtaining a complete understanding of industry platforms.

4.2 Article 2: Unveiling the processes of industry platform management: A systematic literature review and research agenda

Article 2 was motivated by the researcher's interests and inspired by the clear landscape explored in Article 1, particularly the dispersed discussions on industry platforms evident in the disconnect among the five clusters shown in Figure 2. The article aimed to address the ambiguity surrounding the processes the platform owner must apply to ensure effective platform management. Accordingly, the main aim of Article 2, "*Unveiling the processes of industry platform management: A systematic literature review and research agenda*," is to uncover the different processes of industry platform management from the perspective of the platform owner. For that reason, an in-depth systematic literature review emerged as the optimal approach to uncover these processes. After developing the appropriate search string, which is mainly based on that developed in Article 1, and after systematically selecting the relevant articles, totaling 359, a systematic approach was adopted in the analysis process by examining the articles, coding them, and extracting the various activities and processes implemented by platform owners.

Figure 3 presents the five processes that constitute the management of industry platforms, as identified through the systematic literature review: (1) the creation process, which focuses on establishing an industry platform, either through an incumbent-led approach, where platforms are created by incumbent firms, or an entrepreneurial-led approach, where platforms are developed in an entrepreneurial manner; (2) the integration process, which revolves around attracting parties to and integrating them into the platform ecosystem, either through pricing strategies, such as cross-subsidization, or through non-pricing strategies, such as marketing efforts; (3) the orchestration process, which centers around influencing the behavior of different ecosystem actors, either through hard governance approaches, which entail a certain degree of control and resource provision, or through soft governance approaches, which entail non-monetary or non-control approaches; (4) the navigation process, which involves strategically maneuvering external environmental dynamics that are exogenous to the ecosystem, mainly focusing on the

competitive environment and challenges directly related to competition, or on the broader macro-environment that includes challenges either unrelated or indirectly related to competition; and (5) the evolution process, which focuses on adapting and transforming the platform and its ecosystem over time, achieved through changes in platform architecture, governance, and control mechanisms, that is, architecture-driven evolution, or in platform functionality and value propositions, that is, function-driven evolution.

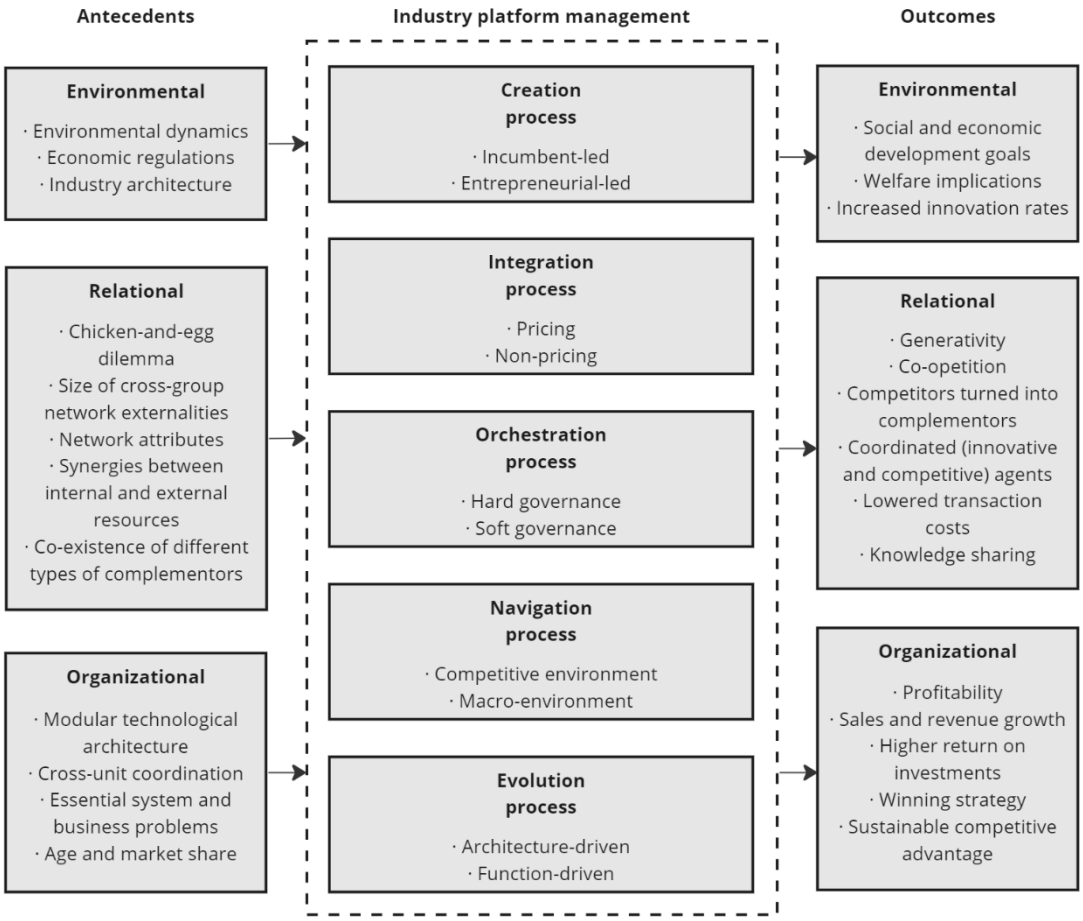


Figure 3. The dynamics of industry platform management

In addition to identifying the processes that constitute the management of industry platforms, the antecedents and outcomes of these processes were also identified. The process also revealed the few studies that have examined the interplay between the various processes. Consequently, these various examinations, including the processes themselves, their antecedents, outcomes, and the interplay between them, paved the way for presenting a clear definition of industry platform management as the "*interrelated and iterative processes of creation, integration, orchestration, navigation, and evolution that operate simultaneously, reflecting the dynamic nature of*

industry platforms." On top of this, a comprehensive research agenda is presented that focuses on opening avenues for novel research questions within each of the five processes discussed. Further, the research agenda proposes future research questions for each process and highlights the potential for generating novel questions from the interplay between these processes. That can be primarily achieved by building on the tables and figures presented in Article 2, thereby effectively addressing the issue of dispersed discussions on industry platforms.

In brief, Article 2 builds upon the landscape explored in Article 1, specifically in addressing identified flaws in the literature on industry platforms, namely the disconnections among the different clusters. These flaws spur a novel research question focused on understanding industry platform management. Three main shortcomings in the industry platform literature hinder the understanding of the processes crucial to managing industry platforms: (1) the tendency to examine various facets of industry platforms in isolation, particularly when exploring the managing processes; (2) the narrow approach to studying specific aspects, particularly when examining individual processes; and (3) the oversight of certain aspects related to industry platforms, particularly their creation and evolution. This comprehensive systematic literature review identified five processes that paved the way for a clear definition of industry platform management. Furthermore, examining the diverse processes revealed the challenging nature of certain ones, particularly those related to creation and integration. This complexity primarily stems from the emergence of the chicken-and-egg dilemma in a gray area between the creation and integration processes, where various scholars have identified this dilemma as a strategic challenge.

4.3 Article 3: The Dynamics of Organizational Boundaries in Creating a B2B Industry Platform: Interplay and Repositioning Practices

Motivated by the pre-identification of the most challenging processes in managing industry platforms, Article 3, "*The Dynamics of Organizational Boundaries in Creating a B2B Industry Platform: Interplay and Repositioning Practices,*" empirically examines the emergence of an industry platform. It focuses on the issues around creating an industry platform and integrating various actors into the platform ecosystem. This article relies on a single case study to meet its objectives. The case firm is a B2B company that initially started as a consulting firm, shifted to become a software enterprise, and ultimately transformed into an industry platform. This transition occurred after the firm saw an opportunity to shift its primary focus from offering consultancy services to selling software to manufacturers and, ultimately, facilitating

interactions between the various actors in the ecosystem, namely manufacturers and suppliers. Further, the article applies an organizational boundaries lens to scrutinize the creation and integration processes. Specifically, it explores how a platform owner develops its organizational boundaries, namely identity, power, competence, and efficiency, during the transition toward creating a B2B industry platform.

As mentioned previously, the case firm went through two main phases that preceded creating an industry platform, meaning there were three distinct phases. Accordingly, there were two main transitions between the three phases, as shown in the upper part of Figure 4. The first transition was from a consulting firm to a software enterprise, which involved developing a stand-alone software product tailored to the needs of manufacturers. The primary focus during this shift was manufacturers, who would later represent just one side of the platform. The second transition was from a software enterprise to an industry platform, where the company's focus shifted from emphasizing the stand-alone product and the inherent value of manufacturers to emphasizing the intrinsic value of suppliers and, ultimately, the ecosystem value, which includes both manufacturers and suppliers. The changes to the firm's identity, power, competence, and efficiency in the two main transitions were individually examined. Furthermore, the interplay among these boundary lenses during each transition was also examined, as illustrated in the lower part of Figure 4, as the shift toward becoming an industry platform cannot be fully understood solely from investigating each organizational boundary. Analyzing the interplay among these boundary lenses is crucial to fully capture the dynamics of the transition.

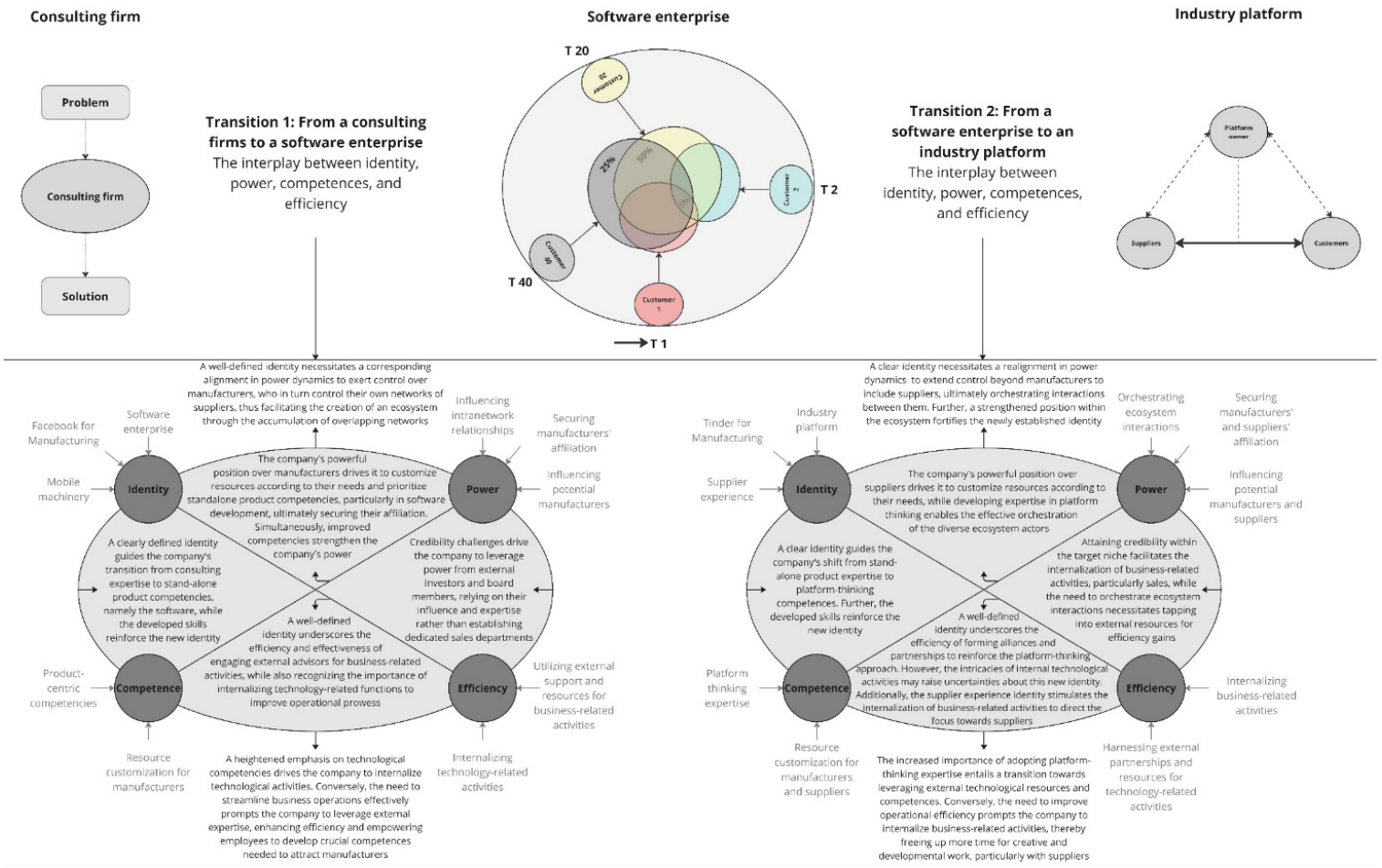


Figure 4. The interplay among the diverse boundary lenses

During the initial transition phase, the interplay between identity, power, competencies, and efficiency played a pivotal role in shaping the emergence of a bounded ecosystem. That was primarily achieved by focusing on manufacturers, leading to the accumulation of overlapping manufacturer networks. In the second transition phase, the interplay between identity, power, competencies, and efficiency played a pivotal role in shaping the dynamics of the established bounded ecosystem. This shift is primarily achieved by extending the focus from only manufacturers to both manufacturers and suppliers, ultimately orchestrating interactions between these two sides. This expansion was mainly facilitated by the indirect network externalities emerging within the established ecosystem. While examining the diverse organizational boundaries in the two distinct phases of the transition toward an industry platform provided valuable insights, the primary contribution of this article lies in examining the interplay between the boundary lenses within each transition phase, along with the development of organizational boundaries across those phases. Accordingly, a novel approach for establishing an industry platform was uncovered through the accumulation of overlapping customer networks, facilitated by initially attracting the most influential side to the platform ecosystem as a strategy to create an industry platform and overcome the chicken-and-egg dilemma. Consequently, a managerial framework that elucidates the dynamics of organizational boundaries when creating an industry platform is presented, as shown in Figure 5. This framework involves leveraging a stand-alone product as a transitional phase, offering it initially to the more influential party.

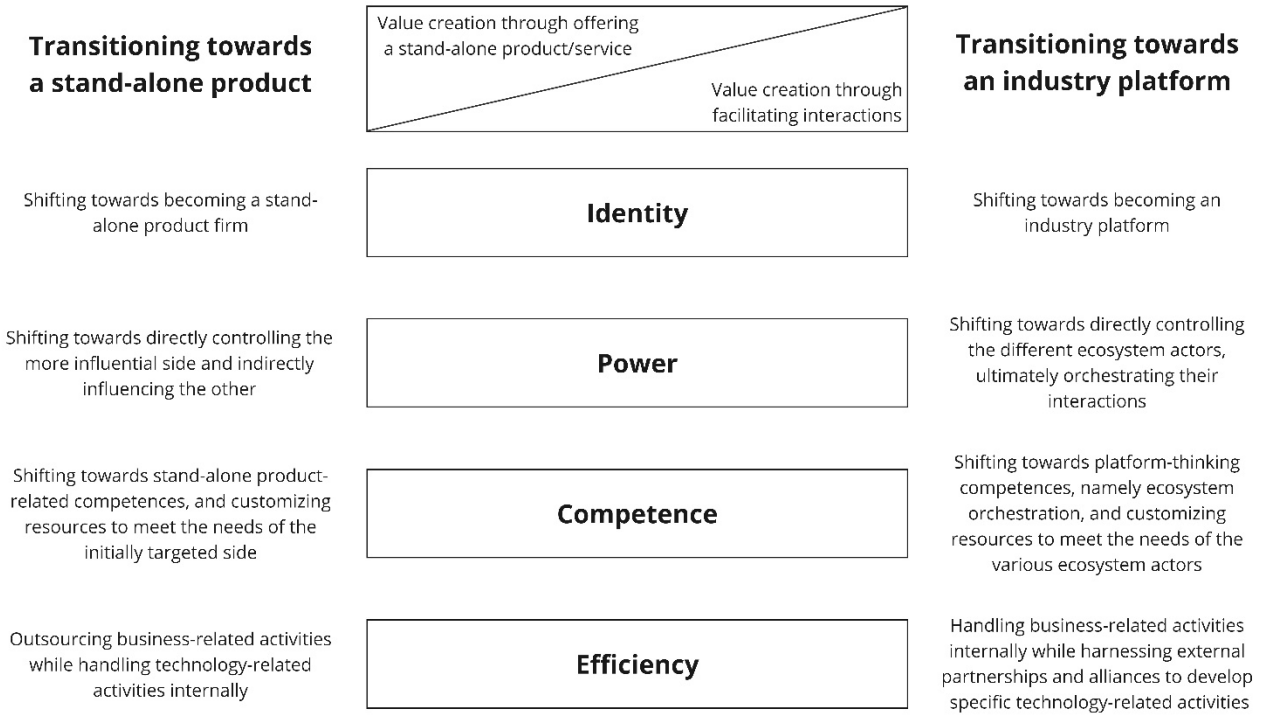
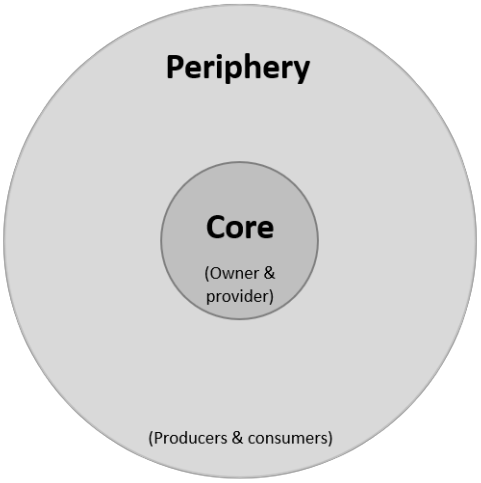


Figure 5. The development of organizational boundaries across the two main transitions

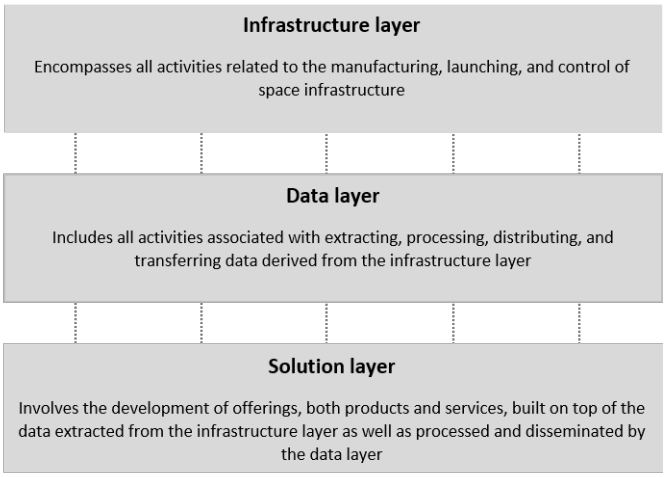
In brief, Article 3 mainly focuses on the first two processes identified in Article 2, which in turn builds upon the mapping explored in Article 1. This article provides clear evidence that the industry platform processes are interrelated and interdependent and cannot be examined in isolation, a point already made in Article 2. Furthermore, Article 3 clearly shows that creating an industry platform does not revolve around the chicken-and-egg dilemma, as the majority of early studies proposed. Instead, the chicken-and-egg dilemma is primarily associated with the integration process, that is, the process of attracting various actors to the platform ecosystem. However, the creation process precedes the integration process and the chicken-and-egg dilemma, as evidenced by the case firm. Article 3 clearly shows that the process of creating an industry platform did not begin with the question of whom to attract first to the platform. Instead, it started with solving an essential business problem, specifically identifying the solution manufacturers initially needed to connect with their own network of suppliers and subsequently with potential suppliers within the ecosystem. In addition to the previously mentioned insights, Article 3 presents a novel and innovative approach to creating an industry platform, overcoming its strategic challenges, and addressing the challenges of the integration process, including the chicken-and-egg dilemma.

4.4 Article 4: The New Space Ecosystem: Insights from the Architecture of Digital Platforms

The observations examined in Article 3, particularly regarding the simultaneous distinction and interdependence between the creation and integration processes, paved the way to explore these processes in a novel context that is attracting academic attention. This field, referred to as *New Space*, began attracting attention with the entry of the private sector into space-related activities. Accordingly, the main aim of Article 4, "*The New Space Ecosystem: Insights from the Architecture of Digital Platforms*," is to examine the architecture of this new context through the lens of the architectural configuration of industry platforms and explore the challenges platform owners face when creating an industry platform in new contexts, such as the New Space one. Prior to further exploring these challenges, Article 4 started with a systematic literature review of 51 articles that revealed the architectural intricacies of the New Space Ecosystem. While the is no consensus on the definition of the New Space Ecosystem, three main dynamics influenced its emergence: (1) the arrival of the private sector to space-related activities, (2) the miniaturization of satellites, and (3) the proliferation of space data applications, mainly driven by digitalization.



The core-periphery structure of the digital platform ecosystem



The layered structure of the New Space Ecosystem

Figure 6. The layered structure of the New Space Ecosystem

The systematic literature review identified three main layers that form the architecture of the New Space Ecosystem (see Figure 6, right-hand side). Those are (1) the infrastructure layer, (2) the data layer, and (3) the application layer. The infrastructure layer covers all activities directly related to infrastructure, such as manufacturing, launching, and controlling infrastructure, for example, *Space X*. The data layer encompasses all activities related to the data generated from the

infrastructure, including extracting, processing, distributing, and transferring it to other stakeholders, for example, *SkyWatch*. Finally, the application layer involves the products or services developed based on the data extracted from the infrastructure layer and processed and disseminated by the data layer, such as *Orbital Insight*.

Furthermore, examining the architecture of the New Space Ecosystem established that parallels can be drawn with another digital infrastructure-based ecosystem—the industry platform ecosystem associated with a core-periphery structure (see Figure 6, left-hand side). The platform owner layer corresponds with the infrastructure layer, the platform provider layer corresponds with the data layer, producers correspond with the application layer, and consumers are present in both, as shown in Figure 6 and Table 3. However, after a careful examination of both architectures, it became evident that the architecture of the New Space Ecosystem does not align with the core-periphery structure of the industry platform ecosystem. It aligns more closely with a layered architecture consisting of the three previously mentioned layers—infrastructure, data, and application—mainly due to the absence of a single orchestrator, as with industry platforms.

Table 3. Comparison of roles across the diverse layers: Digital platform ecosystem versus New Space Ecosystem

Digital Platform Ecosystem		**New Space Ecosystem**	
Layer	Role/s	**Layer**	Role/s
Platform owner	Controls the platform and decides on participation eligibility and criteria, e.g., Google (owning Android)	**Infrastructure layer**	Encompasses all activities related to the manufacturing, launching, and control of space infrastructure, e.g., Space X
Platform provider	Manages the platform interfaces, or, in other words, responsible for the provision of the APIs, e.g., Samsung (providing Android)	**Data layer**	Includes all activities associated with extracting, processing, distributing, and transferring data, e.g., APIs, derived from the infrastructure layer, e.g., SkyWatch

Digital Platform Ecosystem		New Space Ecosystem	
Producers	Develop complementary applications on top of the APIs provided by the platform provider, e.g., Angry Birds	**Application layer**	Develop complementary applications built on top of the data extracted from the infrastructure layer as well as processed and disseminated by the data layer, e.g., Orbital Insight
Consumers	Purchase or use the developed applications	**Consumers**	Purchase or use the developed applications

Three main future directions were identified after exploring the architecture of the New Space Ecosystem, particularly through parallels drawn with that of industry platforms. These directions align with the initial aim presented earlier, focusing on the creation process, integration process, and their corresponding strategic challenges. First, assessing the potential power of network effects within the New Space Ecosystem is vital. This is particularly important because as more actors join each layer, their impact cascades to other layers, thereby increasing the value of being part of this ecosystem. For instance, more satellites joining the infrastructure layer lead to more data being generated and, consequently, a wide array of applications being developed. Furthermore, the second main future research direction explores the possibility of adopting the industry platform business model within each of the three identified layers and across them. Consequently, these two future directions primarily relate to the first two processes identified in Article 2 and empirically examined in Article 3, creation and integration. Additionally, a third research direction was identified, focusing on the possibility of orchestrating the New Space Ecosystem, which can primarily benefit from drawing parallels with the orchestration process identified in Article 2.

5 DISCUSSION AND CONCLUSIONS

The main objective of this dissertation is to advance knowledge on the management of industry platforms, specifically highlighting the strategic challenges platform owners face when managing their platforms, with a particular emphasis on the early stages. Furthermore, this dissertation examines the approaches available to platform owners to mitigate risks and overcome challenges. These discussions are closely aligned with those of strategic management scholars who have clearly defined the borders of the industry platform literature (Cusumano et al., 2019; Gawer & Cusumano, 2014), particularly through bridging insights from different streams (Gawer, 2014), which is exactly the approach of this dissertation. Therefore, the main contributions of this dissertation relate to research on industry platforms, specifically focusing on discussions about the creation process of such platforms, or the "*coring phase*" (Gawer and Cusumano, 2008, p. 38). Accordingly, this final chapter presents the theoretical and managerial contributions of the work, its limitations, and future research directions, as well as a conclusion encapsulating the key insights of the dissertation.

5.1 Theoretical contributions

Addressing the strategic challenges platform owners face when managing their industry platforms requires a comprehensive understanding of the various management processes platform owners navigate. That understanding relies on a thorough review of literature congested with terminology, definitions, classifications, and approaches used to examine such platforms. Accordingly, the first contribution of this dissertation is mapping the landscape of the literature that examines technology platforms associated with network effects, that is, "*industry platforms*" (Gawer & Cusumano, 2014, p. 417), by identifying five distinct clusters. Each cluster is characterized by its unique terminology, definitions, classifications, and approaches, which are often examined in isolation from the other clusters. Subsequently, with a grasp of the field's clusters and through bridging the different streams of literature (Gawer, 2014), the second contribution of this dissertation is the development of a framework that identifies the processes that platform owners implement in managing their industry platforms. In particular, Article 2 defines industry platform management as an interrelated and iterative process that encompasses creation, integration, orchestration, navigation, and evolution, which operate simultaneously, thereby reflecting the dynamic nature of industry platforms.

In alignment with the dissertation's main research question, the focus shifted to the early stages of industry platform management, placing the creation and integration

processes at the forefront. This shift is mainly attributable to the emergence of the chicken-and-egg dilemma, which the majority of scholars consider a strategic challenge during the early stages of platform creation (Caillaud & Jullien, 2003; Eisenmann et al., 2006; Rochet & Tirole, 2003), in a gray area between the creation and integration processes. Therefore, the focus on these two processes paved the way for the third and most important contribution of this dissertation, which can be divided into three elements. First, the empirical examination of Article 3 indicates that the chicken-and-egg dilemma is a strategic challenge for platform owners (Caillaud & Jullien, 2003; Rochet & Tirole, 2003). However, this challenge is encountered when attracting parties to the platform ecosystem, that is, the integration process identified in Article 2, and not during the creation process. Focusing only on overcoming the chicken-and-egg dilemma as the key to a platform's success or failure, as seen in the works of influential figures like Rochet and Tirole (2003) and Eisenmann et al. (2006), has led scholars to overlook the actual process of creating an industry platform. Perhaps this is why that process has been understudied since the seminal work of Rochet and Tirole (2003), as subsequent studies have focused on pricing strategies implemented to counter the chicken-and-egg dilemma and establish an industry platform. Notable examples include studies by Armstrong (2006), Bolt and Tieman (2008), Economides and Katsamakas (2006), and Kaiser and Wright (2006). Consequently, the dynamics prior to the chicken-and-egg challenge have been largely overlooked.

Second, the creation process is closely intertwined with the integration process, a point that is theoretically highlighted in Article 2 and empirically examined in Article 3. However, the creation process involves strategic challenges that precede the chicken-and-egg dilemma. While these challenges could be industry-related, they revolve around three major questions. The first and last are related to the business actions that the platform owner should consider when creating an industry platform, and the second concerns the technology involved (Gawer & Cusumano, 2008). The questions are: (1) How can a platform owner solve a business problem for potential clients in a specific market or industry by creating an industry platform? (2) What technological actions should the platform owner consider when implementing the business solution developed? and (3) How can the platform owner assess the potential strength of network effects in a promising market or industry? These challenges precede those of the chicken-and-egg dilemma but have not received sufficient attention in the literature, an issue that will be discussed further in Section 5.4. Thirdly, this dissertation presents a novel non-pricing approach to overcoming the strategic challenges of the creation and integration processes by accumulating overlapping bounded networks.

In addition to the main contributions flowing from its main research question, this dissertation offers several contributions to the broader industry platform literature. First, Article 1 maps the landscape of the literature on industry platforms, providing a broad overview of the structure of the field. As the different clusters examine platforms in isolation, Article 1 serves as a "*space ship*" for scholars (MacInnis, 2011, p. 138), enabling them to explore different fields and consider adopting novel insights and perspectives from clusters they may not be fully aware of. Additionally, Article 1 emphasizes the importance of harmonizing the terminology and classification used when referring to technology platforms associated with network effects. Harmonization advances the literature in contrast to the dominant fragmented approach that tends to hinder its evolution. Furthermore, it highlights the importance of examining platforms from perspectives other than that of the platform owner to develop a comprehensive understanding of platforms and their corresponding ecosystems. Second, in a similar vein to Article 1's broad contribution, Article 2 identifies the antecedents and outcomes of each of the five processes, thereby presenting a wide-ranging "*map*" that uncovers the management of industry platforms (MacInnis, 2011, p. 138). Additionally, Article 2 offers a comprehensive research agenda that opens new avenues for future research by focusing not only on the individual processes but also on their intersections, thereby encouraging cross-collaboration between the current literature streams.

Besides its broad contributions to the industry platform literature, this dissertation offers insights into specific streams that examine industry platforms. Article 3 presents a novel approach to the challenges of the creation and integration processes, which contributes to non-pricing discussions on resolving the chicken-and-egg dilemma. These discussions were initiated by Eisenmann and Hagiu (2007) and criticize early economics literature on industry platforms, specifically targeting the pricing strategies for their inherent risks and the substantial financial resources required (Armstrong, 2006; Caillaud & Jullien, 2003; Rochet & Tirole, 2003). In response, Eisenmann and Hagiu (2007) and other scholars introduced non-pricing strategies, which they perceived as less costly and risky, to resolve the chicken-and-egg dilemma. However, this dissertation argues that non-pricing strategies are neither less risky nor less costly than pricing strategies. They can actually be as risky and costly as pricing strategies and often complement rather than replace pricing strategies. Therefore, Article 3 contributes to this specific niche by challenging the initial beliefs that shaped the evolution of this stream of literature. Finally, Article 4, to the best of the researcher's knowledge, is among the first to examine the New Space Ecosystem from the perspective of the industry platform architecture. In addition to uncovering the architecture of this emerging ecosystem, Article 4 opens new avenues for research, particularly for information systems scholars. It encourages the exploration of the New Space Ecosystem from both architectural and governance

perspectives (Modol & Eaton, 2021; Tiwana et al., 2010), thereby contributing to the ongoing discussions about the orchestration of this complex ecosystem.

5.2 Managerial contributions

The four articles constituting this dissertation offer managerial implications for practitioners, whether entrepreneurs or managers, who are either in the process of creating an industry platform or shifting their firm's boundaries from a pipeline to a platform model (Van Alstyne et al., 2016). The dissertation's managerial implications can be categorized into those that relate directly to the dissertation's main research question and those that do not, while addressing other aspects of industry platforms.

As for the first part of the managerial contributions, it mainly focuses on the topic of creating industry platforms, whether they are entrepreneurial- or incumbent-led (Teece et al., 2022). Any practitioner considering the development of an industry platform must first understand their dynamics. Upon approaching different academic resources, whether articles or books, a practitioner may be overwhelmed by the terminology, definitions, and classifications applied to such platforms (Boudreau and Lakhani, 2009; Gawer and Cusumano, 2014; Rochet and Tirole, 2003; Sharma et al., 2008). Accordingly, Article 1 maps the landscape of the field by identifying five main clusters of research examining industry platforms from different perspectives and focusing on their specific aspects. Each cluster targets particular types of industry platforms within a limited range of industries. Furthermore, Article 1 emphasizes that exploring industry platforms solely from the perspective of the platform owner will hinder acquiring a comprehensive understanding (Benlian et al., 2015; Rolland et al., 2018). Other perspectives should also be considered, such as those of platform providers, producers, and consumers (Van Alstyne et al., 2016). As the main objective was to learn more about the strategic challenges a platform owner faces in managing an industry platform, a practitioner might be interested in exploring the underlying processes. These processes are discussed in the literature but in a fragmented manner, with some even being overlooked. Accordingly, Article 2 makes a significant contribution by identifying five key processes that constitute the management of industry platforms: creation, integration, orchestration, navigation, and evolution, with the chicken-and-egg dilemma highlighted as a strategic challenge in the early stages of platform management (Caillaud & Jullien, 2003; Eisenmann et al., 2006; Rochet & Tirole, 2003). After reading several academic papers on this dilemma, a practitioner might conclude that the most strategic challenge in creating industry platforms is overcoming the chicken-and-egg dilemma, which seems to fall into a gray area between the creation and integration processes. However, Article 2

(conceptually) differentiates between these two processes while arguing that they are inherently interdependent and occur simultaneously.

With a clear understanding of the field's landscape and a comprehensive overview of the various processes that constitute the management of industry platforms, a practitioner might be interested in exploring the creation and integration processes more deeply. Therefore, Article 3 provides an empirical, in-depth examination of an incumbent firm transitioning toward creating an industry platform. It not only highlights the clear separation between the creation and integration processes but also emphasizes their interdependence and the importance of maintaining a long-term vision during the creation phase. Such foresight is crucial, particularly when planning the integration process involving the chicken-and-egg dilemma, as conceptualized in Article 3. Additionally, this article highlights that creating an industry platform entails adjustments to the diverse organizational boundaries, namely identity, power, competencies, and efficiency (Santos & Eisenhardt, 2005), which cannot be addressed independently or overlooked (Huikkola et al., 2020; Kohtamäki et al., 2019). Instead, practitioners should consider the interplay between these organizational boundaries to overcome the challenges of the creation and integration processes. Consequently, Article 3 presents a novel framework that elucidates the dynamics involved in the creation of an industry platform. This framework employs a stand-alone product as an intermediary stage before transitioning toward an industry platform, with the stand-alone product being offered to the more influential side. Moreover, Article 4 not only delineates the architecture of the New Space Ecosystem but also highlights key issues that practitioners should consider when creating an industry platform in a novel context, such as that of the New Space. Specifically, it emphasizes the importance of assessing the potential power of network effects, whether quantitatively, qualitatively, or both, in a promising market or industry prior to creating an industry platform.

The second part of the managerial contributions does not necessarily pertain to the creation and integration processes, particularly since these are not the only processes involved in managing industry platforms. As mentioned before, Articles 1 and 2 serve as a "*space ship*" and a "*map*" (MacInnis, 2011, p. 138), respectively, not only for academics but also for practitioners. Both articles offer practitioners valuable insights into the other processes involved in managing industry platforms, namely, orchestration, navigation, and evolution. For instance, they discuss the orchestration of platform ecosystems through both hard and soft governance mechanisms (Foerderer et al., 2021; Ghazawneh & Henfridsson, 2013; Parker & Van Alstyne, 2018). Further, Article 1 provides valuable insights into the evolution of industry platforms, particularly from the perspective of platform architecture (Tiwana et al., 2010), while Article 2 elaborates on how the evolution of these platforms is not only

linked to the platform's architecture but also to its function (B. Tan et al., 2015; Thomas et al., 2014; D. Zhao & Chen, 2019). The same applies to other aspects, such as competing with other platforms and navigating the external environment (Belleflamme & Peitz, 2019; Cennamo & Santalo, 2013; Miric & Jeppesen, 2020; Wang et al., 2019). Moreover, Article 2 highlights critical aspects that practitioners should consider, particularly in terms of balancing the strategies involved in various processes. For instance, while there are two distinct approaches to orchestrating the platform ecosystem—hard governance and soft governance (Foerderer et al., 2021)—a platform owner might employ both, thus requiring practitioners to balance different strategies. Further, this dissertation, and particularly Article 2, provides a holistic overview of the antecedents and outcomes of each of the five processes. This overview comprehensively informs practitioners of the factors to consider before engaging in the various processes and the potential outcomes of each (Kohtamäki et al., 2018).

Apart from the processes, this dissertation, particularly Article 1, presents a broader perspective that is not limited to the five processes nor confined to the platform owner's perspective. It introduces novel topics emerging from nascent clusters, particularly those bridging insights from platform competition and platform innovation (Boudreau, 2010; Eisenmann et al., 2011; Gawer, 2014). Accordingly, Article 1 explores those studies, thereby opening new avenues for thought and providing valuable insights for practitioners from diverse perspectives. In addition, Article 4 serves as a valuable resource for practitioners seeking to comprehend the dynamics and architecture of the New Space Ecosystem. It not only helps them understand its architectural intricacies but also enables them to evaluate whether their organizations could engage with this promising ecosystem, either within a single layer or across multiple layers. Above all, this article highlights the importance of having a space strategy for any company (Weinzierl et al., 2022), which can potentially be achieved through the creation of industry platforms across the different layers of the New Space Ecosystem, as argued in Article 4.

5.3 Limitations and future research directions

This dissertation, similar to any other scholarly work, has its limitations that can be addressed in future research, thereby opening new avenues for further understanding the phenomenon of industry platforms. As mentioned previously, this dissertation is a collection of four distinct studies, each with its own limitations outlined in the respective papers. However, some limitations apply to the entire dissertation and are not (directly) linked to the individual papers; rather, they relate to the overarching research question. In the following four paragraphs, four different

limitations are introduced. The first highlights the limitation pertaining to the platform owner's perspective. The second addresses the scope of the dissertation, the third concerns the methodological approaches, and the fourth focuses on the overemphasis on the creation process.

The first limitation concerns the perspective adopted to approach the dissertation's main objective, specifically that of the platform owner. As mentioned in different parts of this dissertation, the platform owner is just a single actor in the industry platform ecosystem (Van Alstyne et al., 2016). Therefore, keeping in mind that the value in industry platforms is not created but co-created by the different ecosystem actors (Ceccagnoli et al., 2012) and considering Adner's (2017, p. 40) definition of ecosystems as "*the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize*," this dissertation argues that two main conditions must be met to achieve a holistic understanding of industry platforms and their ecosystems. First, researchers should examine industry platforms from the perspectives of the diverse actors in the ecosystem: the platform owner, provider, producers, and consumers (Van Alstyne et al., 2016), as illustrated by studies from Ansari et al. (2016), Benlian et al. (2015), and Rolland et al. (2018). Second, scholars should consider the relational perspective between the various actors in the platform ecosystem, as shown in the studies of Eaton et al. (2015) and Trabucchi and Buganza (2022). Studies examining industry platforms from diverse or relational perspectives are scarce in the literature, thus highlighting the need for future research to adopt novel approaches to explore those platforms.

The second limitation of this study concerns its scope. The knowledge of industry platforms the researcher developed was mainly shaped by the readings and results from Articles 1 and 2, whether that was of the different clusters that define the landscape of the industry platform literature or the five distinct processes that constitute the management of industry platforms. However, this knowledge has limitations, particularly stemming from the methodologies adopted in these two articles (Jeong et al., 2014; Kohtamäki et al., 2018; Spanuth & Urbano, 2023; Tranfield et al., 2003). For instance, the articles examined in both studies focused only on CABS3, CABS4, and CABS4* ranked journals, thereby excluding book chapters and other journals from different tiers or ratings (Kohtamäki et al., 2018). Thus, future research could broaden the range of selected studies, perhaps by including additional journals and book chapters to extend the literature landscape established in Article 1 or by incorporating industry documents, such as annual reports, to enhance the industry platform management framework developed in Article 2. Consequently, there is potential to further develop and complement this knowledge through future research, whether by expanding upon the current insights, criticizing them, or even

introducing new perspectives that could benefit both the academic community and practitioners alike.

The third limitation relates to the methodological approach to the dissertation's main research question, particularly the empirical aspect, which is based on an in-depth examination of a single case study. Although our primary aim is to achieve abstraction and conceptual generalizations (Yin, 2018), offering broad generalizations proves challenging for three main reasons. First, the case firm is an industry platform with two primary sides in its ecosystem (Rochet & Tirole, 2003): manufacturers and suppliers. Second, the case firm specifically facilitates transactions between the different sides of the platform, making it a transaction platform as defined by Cusumano et al. (2019). Therefore, future research could examine the applicability of the dissertation's empirical insights in the context of multi-sided platforms (Hagiu & Wright, 2015), innovation platforms, or even hybrid platforms (Cusumano et al., 2019; Gawer, 2021). Lastly, the case firm operates in the manufacturing industry, specifically within a B2B context. However, the relationships between entities in a B2B context differ from those in B2C or C2C contexts (Loux et al., 2020). B2B relationships tend to be longer-term oriented, with parties generally being less willing to take risks and more rational in their decision-making processes than typical consumers (Luoto et al., 2017). The situation signals new avenues for future research in B2B contexts (Jovanovic et al., 2021), particularly on topics mainly explored in B2C and C2C contexts related to the relationships between the different actors in the platform ecosystem. The topics include multi-homing (Bakos & Halaburda, 2020), pricing strategies (Rochet & Tirole, 2003), non-pricing strategies (Eisenmann & Hagiu, 2007), hard governance mechanisms (Ghazawneh & Henfridsson, 2013), and soft governance mechanisms (Foerderer et al., 2021), among others. Simultaneously, there are opportunities for future research in the B2C and C2C contexts, particularly in terms of testing the empirical insights of this dissertation.

The fourth limitation of this study relates to the overemphasis on the creation process of industry platforms. The dissertation's main objective is to uncover the strategic challenges platform owners face when managing their industry platforms, and the challenges encountered in the creation process are not the only ones they face. There are other significant challenges in various processes, which are mainly highlighted in the future research agenda of Article 2. However, this dissertation argues that the challenges encountered during the creation process are strategically significant, as they can hinder achieving long-term objectives. Above all, this emphasis was driven by the literature itself, specifically its overemphasis on the chicken-and-egg dilemma as the primary strategic challenge when approaching the industry platform business model (Armstrong, 2006; Caillaud & Jullien, 2003; Rochet & Tirole, 2003), as highlighted in Articles 1 and 2. For that reason, the remaining Articles 3 and 4

scrutinized the creation and integration processes where the chicken-and-egg dilemma seems to be relevant (Caillaud & Jullien, 2003). Although it might be perceived as a limitation, this overemphasis on the creation processes was central to uncovering the strategic challenges that precede the chicken-and-egg dilemma and are as challenging as, if not more challenging than, that dilemma itself. In Section 5.1, specifically in the third paragraph, three questions are raised and elaborated upon in Section 5.4. These questions can both open new research avenues on industry platforms and also address the current gap around the creation process.

5.4 Conclusions

The main goal of this dissertation is to explore the strategic challenges that platform owners face when managing their industry platforms and to identify potential approaches to address those challenges. However, this question cannot be answered simply by reading a few papers from the literature on industry platforms. Perhaps extensive reading on the topic could provide sufficient answers; however, the argument in this dissertation is that the existing literature does not fully capture the actual challenges. This realization has guided the researcher throughout this PhD journey, which is reflected in this dissertation by dividing the main research question into four sub-questions, each addressed in an independent study. Each of the four studies advanced this dissertation a little closer to revealing the reality of the strategic challenges faced by platform owners and the potential approaches to overcome them.

Upon exploring the literature on technological platforms associated with network effects, the researcher came across a wide range of terminologies, definitions, and classifications used to describe this phenomenon (Boudreau & Lakhani, 2009; Gawer & Cusumano, 2014; Rochet & Tirole, 2003; Sharma et al., 2008). The main problem is that the terminology, definitions, and classifications vary and can be contradictory, reflecting the diverse perspectives adopted when examining such platforms. Accordingly, the first sub-question arises: What are technological platforms associated with network effects, and how do different scholarly groups conceptualize and approach this phenomenon? Therefore, the first step toward addressing the dissertation's main research question was to map the literature landscape (Kohtamäki et al., 2022). Article 1 applies bibliometric analysis and systematic review techniques to identify five clusters: two-sided markets, industry platforms, digital platforms, innovation platforms, and two-sided networks. The term favored in this dissertation is *industry platform* (Gawer & Cusumano, 2014, p. 417). That choice reflects the researcher's extensive acquired knowledge of the field and review of its terminology, definitions, and classifications. This term is not only the clearest and

most consistent in its terminology, definition, and classification, but it also aligns with the researcher's area of contribution, the strategic management discussions on industry platforms (Cusumano et al., 2019; Gawer & Cusumano, 2014).

Subsequently, identifying the challenges that platform owners face became the next goal. However, a more structured and systematic approach than randomly searching for challenges was to explore the different processes platform owners engage in to manage their industry platforms (Kohtamäki et al., 2018) before identifying the challenges associated with each process. The second sub-question is thus: What are the different processes a platform owner engages in to manage their industry platforms? Article 2 reports a systematic literature review and presents five key processes that constitute the management of industry platforms: creation, integration, orchestration, navigation, and evolution. The processes reveal several challenges that have prompted scholarly discussions; however, the mainstream literature focuses on one major challenge, which is portrayed as a strategic challenge when creating an industry platform. This challenge revolves around overcoming the chicken-and-egg dilemma (Caillaud & Jullien, 2003), or in other words, whether the platform should first attract buyers or sellers (Rochet & Tirole, 2003, 2006). However, two major concerns raised questions about whether this is a platform owner's first and foremost strategic challenge. The first concern is the ambiguity of that challenge, as it seems to fall in a gray area between the first two processes, creation and integration. The second concern is the limited attention paid to the creation process itself (de Reuver et al., 2018; Gawer & Cusumano, 2014; Teece, 2017).

A closer examination of the creation and integration processes was necessary, thereby addressing the third sub-question: How does a platform owner develop its organizational boundaries when transitioning toward an industry platform? Article 3 reports a comprehensive analysis of a single case study (Yin, 2018) to detail a novel approach to creating an industry platform through the staged accumulation of overlapping networks. This approach rests on two main pillars: (1) providing a stand-alone product as a transitional stage and (2) strategically leveraging the power dynamics within the (potential) platform ecosystem, particularly by offering the stand-alone product to the most influential party during the transitional stage. This novel approach assists platform owners in overcoming the strategic challenges associated with the initial processes of creation and integration.

Building on Teece et al.'s (2022, p. 20) argument that industry platforms are either entrepreneurial- or incumbent-led, the fourth sub-question arises: What challenges arise when creating an industry platform in new contexts? Article 4 thus contributes to the dissertation's primary research question by conceptually examining the

creation processes of industry platforms in new contexts to identify further challenges. In addition to uncovering the architectural configuration of the New Space Ecosystem (Bousedra, 2023), Article 4, particularly through the parallels drawn with the architecture of industry platforms (Baldwin & Woodard, 2009; Modol & Eaton, 2021; Tiwana et al., 2010), helped the researcher adopt the perspective of a platform owner creating an industry platform in that ecosystem. This conceptual approach highlighted a widely overlooked strategic challenge in the industry platform literature and also the network externality literature (Gawer & Cusumano, 2014; Katz & Shapiro, 1985). That challenge primarily concerns assessing the potential power of network effects in promising markets or industries prior to creating an industry platform and integrating the different actors into its ecosystem.

The dissertation's main research question has two main parts. The first concerns the strategic challenges facing platform owners when managing industry platforms, and the second addresses the approaches that platform owners adopt to overcome them. With regard to the first part, this dissertation provides a detailed overview of the different processes integral to the management of industry platforms, each of which has its challenges. However, the industry platform literature is weighted toward one main challenge: resolving the chicken-and-egg dilemma of which party to attract first to the platform (Rochet & Tirole, 2003, 2006). In reference to the processes identified in Article 2, this challenge seems to fall into a gray area between the creation and integration processes, where scholars portray it as the initial strategic challenge when approaching the platform business model. This dissertation argues that the chicken-and-egg dilemma pertains specifically to the integration rather than the creation process. Furthermore, it argues that the creation process is distinct from the integration process. However, these processes are not addressed in isolation, thereby highlighting the interrelatedness of the diverse processes. Despite their interdependence, the creation process involves strategic challenges that precede the chicken-and-egg dilemma. These challenges are as or even more challenging than the chicken-and-egg, yet are largely overlooked in the literature. This dissertation argues that the strategic challenge when addressing the creation process is not who to attract first but rather what exactly to attract them to. Specifically, there should be a defined business problem that can be solved by creating an industry platform so the owner can offer a solution that appeals to the different sides of the platform, or at least to one. Accordingly, the first strategic challenge in the creation process involves identifying the business actions appropriate to address potential customers' key issues. A case in point is Google Wave, which was discontinued less than two years after its launch because it failed to address a specific user problem; it was indeed a solution, but for a problem that did not exist.

Subsequently, the second strategic challenge arises, which involves the technological actions a platform owner must execute when implementing the previously identified business solution. This challenge is not as simple as it sounds. Article 3 reports that the case firm had a solution for its prospective customers; however, it took nearly ten years to develop the technology required to deliver it. On top of the insights gained from Article 3, the identification of this challenge was further motivated by the new contexts that are gaining traction in recent literature, particularly in studies focusing on the dynamics of industry platforms in B2B contexts (Jovanovic et al., 2021; Loux et al., 2020). In contrast to B2C users who are likely to have access to hardware such as smartphones or tablets to access industry platforms (Constantinides et al., 2018), parties to a B2B arrangement often require specific hardware to access the platform and benefit from it. An illustrative example is Kongsberg's development of Vessel Insight, bespoke hardware to facilitate access to Kognifai's Marketplace. Therefore, considerations related to technology actions, such as hardware development, are crucial regardless of the examined context (Gawer & Cusumano, 2008). This challenge precedes the chicken-and-egg dilemma and pertains to the creation process. However, it has not yet received adequate attention, primarily because most scholars have taken for granted the existence of hardware, such as mobile phones or game consoles.

Furthermore, while addressing these two strategic challenges, another challenge emerges related to the platform owner's ability to assess the potential power of network effects within a promising market or industry. This particular challenge stems from the absence of effective frameworks and business tools that assist owners in the platform creation process. Further, the conventional business tools and established frameworks commonly used in pipeline businesses often fail to consider the potential power of network effects (Van Alstyne et al., 2016). This emphasis on "potential" is mainly due to the dominance of studies focusing on assessing existing network effects (e.g., Hinz et al. 2020; Rysman 2004; Tucker and Zhang 2010; Voigt and Hinz 2015). The majority of such studies, if not all, were conducted in established markets or industries rather than in potential or promising ones. The absence of such tools and frameworks is evident not only in the literature on industry platforms but also in the network externality literature (Gawer & Cusumano, 2014; Katz & Shapiro, 1985), which represents the foundation of the discussions on the chicken-and-egg dilemma (Caillaud & Jullien, 2003). Adding to this and aligning with the structurationist perspective followed in this dissertation (Giddens, 1979), such tools may not necessarily be objective or quantitative. Article 3 has shown that it is possible to base such examinations on subjective frameworks rather than strictly objective ones. Subjective frameworks might not replace objective, primarily quantitative, ones, but they can certainly complement them.

The aforementioned challenges precede the chicken-and-egg dilemma; however, as argued in Article 2, the different processes are interrelated. Therefore, even when immersed in the creation process, a platform owner must plan for the other processes, mainly the integration one. Accordingly, this leads to the second part of the dissertation's main research question. This dissertation, particularly in Article 3, presents a novel and innovative approach that spans the two processes of creation and integration, which could help platform owners mitigate the strategic challenges associated with them. Despite the limitations mentioned in Section 5.3, the identified strategy offers a viable approach to creating an industry platform, addressing its strategic challenges, and overcoming the pivotal strategic challenge in the integration process, the chicken-and-egg dilemma. Specifically, three key logics can be derived from this strategy: (1) phased-challenge management, which emphasizes the implementation of strategic approaches that divide the strategic challenges into distinct phases, allowing the platform owner to tailor business and technological actions to each side of the platform at different stages; (2) milestone-driven flexibility, which focuses on treating the outcome of each phase as a critical milestone, empowering the platform owner with the necessary agility to pivot back to previous milestones in the event of setbacks, rather than discontinuing operations entirely; and (3) proactive harnessing of network externalities, which highlights the possibility of leveraging network externalities at an early stage, even before fully internalizing them and harnessing the power of network effects.

References

Acedo, F. J., Barroso, C., & Galan, J. L. (2006). The resource-based theory: Dissemination and main trends. *Strategic Management Journal*, *27*(7), 621–636. https://doi.org/10.1002/smj.532

Adam, M., Croitor, E., Werner, D., Benlian, A., & Wiener, M. (2022). Input control and its signalling effects for complementors' intention to join digital platforms. *Information Systems Journal*. https://doi.org/10.1111/isj.12408

Adner, R. (2017). Ecosystem as Structure: An Actionable Construct for Strategy. *Journal of Management*, *43*(1), 39–58. https://doi.org/10.1177/0149206316678451

Anderson, E. G., Parker, G. G., & Tan, B. (2014). Platform Performance Investment in the Presence of Network Externalities. *Information Systems Research*, *25*(1), 152–172. https://doi.org/10.1287/isre.2013.0505

Ansari, S. S., Garud, R., & Kumaraswamy, A. (2016). The disruptor's dilemma: TiVo and the U.S. television ecosystem. *Strategic Management Journal*, *37*(9), 1829–1853. https://doi.org/10.1002/smj.2442

Armstrong, M. (2006). Competition in two-sided markets. *The RAND Journal of Economics*, *37*(3), 668–691. https://doi.org/10.1111/j.1756-2171.2006.tb00037.x

Armstrong, M., & Wright, J. (2007). Two-sided Markets, Competitive Bottlenecks and Exclusive Contracts. *Economic Theory*, *32*(2), 353–380. https://doi.org/10.1007/s00199-006-0114-6

Arthur, W. B. (1989). Competing Technologies, Increasing Returns, and Lock-In by Historical Events. *The Economic Journal*, *99*(394), 116–131. https://doi.org/10.2307/2234208

Arthur, W. B. (1996). Increasing Returns and the New World of Business. *Harvard Business Review*, *74*(4), 100–109.

Bakos, Y., & Halaburda, H. (2020). Platform Competition with Multihoming on Both Sides: Subsidize or Not? *Management Science*, *66*(12), 5599–5607.

Baldwin, C. Y., & von Hippel, E. (2011). Modeling a Paradigm Shift: From Producer Innovation to User and Open Collaborative Innovation. *Organization Science*, *22*(6), 1399–1417. https://doi.org/10.4337/9781849807630.00024

Baldwin, C. Y., & Woodard, C. J. (2009). The Architecture of Platforms: A Unified View. In A. Gawer, *Platforms, Markets, and Innovation* (pp. 19–44). Edward Elgar Publishing Limited. http://www.ssrn.com/abstract=1265155

Barley, S. R. (1986). Technology as an Occasion for Structuring: Evidence from Observations of CT Scanners and the Social Order of Radiology Departments. *Administrative Science Quarterly*, *31*(1), 78–108. https://doi.org/10.2307/2392767

Bayer, A. E., Smart, J. C., & McLaughlin, G. W. (1990). Mapping intellectual structure of a scientific subfield through author cocitations. *Journal of the American Society for Information Science*, *41*(6), 444–452. https://doi.org/10.1002/(SICI)1097-4571(199009)41:6<444::AID-ASI12>3.0.CO;2-J

Belleflamme, P., & Peitz, M. (2019). Platform competition: Who benefits from multihoming? *International Journal of Industrial Organization*, *64*, 1–26. https://doi.org/10.1016/j.ijindorg.2018.03.014

Benlian, A., Hilkert, D., & Hess, T. (2015). How open is this Platform? The Meaning and Measurement of Platform Openness from the Complementers' Perspective. *Journal of Information Technology*, *30*(3), 209–228. https://doi.org/10.1057/jit.2015.6

Beverland, M., & Lindgreen, A. (2010). What makes a good case study? A positivist review of qualitative case research published in Industrial Marketing Management, 1971–2006. *Industrial Marketing Management*, *39*(1), 56–63. https://doi.org/10.1016/j.indmarman.2008.09.005

Bolt, W., & Tieman, A. F. (2008). Heavily skewed pricing in two-sided markets. *International Journal of Industrial Organization*, *26*(5), 1250–1255. https://doi.org/10.1016/j.ijindorg.2007.11.003

Boudreau, K. (2010). Open Platform Strategies and Innovation: Granting Access vs. Devolving Control. *Management Science*, *56*(10), 1849–1872. https://doi.org/10.1287/mnsc.1100.1215

Boudreau, K. (2012). Let a Thousand Flowers Bloom? An Early Look at Large Numbers of Software App Developers and Patterns of Innovation. *Organization Science*, *23*(5), 1409–1427. https://doi.org/10.1287/orsc.1110.0678

Boudreau, K., & Lakhani, K. R. (2009). How to Manage Outside Innovation. *MIT Sloan Management Review*, *50*(4), 68–76.

Bounie, D., François, A., & Van Hove, L. (2017). Consumer Payment Preferences, Network Externalities, and Merchant Card Acceptance: An Empirical Investigation. *Review of Industrial Organization*, *51*(3), 257–290. https://doi.org/10.1007/s11151-016-9543-y

Bousedra, K. (2023). Downstream Space Activities in the New Space Era: Paradigm Shift and Evaluation Challenges. *Space Policy*, *64*, 101553. https://doi.org/10.1016/j.spacepol.2023.101553

Brynjolfsson, E., & Kemerer, C. F. (1996). Network Externalities in Microcomputer Software: An Econometric Analysis of the Spreadsheet Market. *Management Science*, *42*(12), 1627–1647. https://doi.org/10.1287/mnsc.42.12.1627

Burrell, G., & Morgan, G. (1979). *Sociological paradigms and organisational analysis: Elements of sociology of corporate life* (2nd ed). Routledge.

Caillaud, B., & Jullien, B. (2001a). *Chicken & Egg: Competing Matchmakers.* CEPR Discussion Papers 2885, C.E.P.R. Discussion Papers.

Caillaud, B., & Jullien, B. (2001b). Competing cybermediaries. *European Economic Review*, *45*(4–6), 797–808. https://doi.org/10.1016/S0014-2921(01)00123-4

Caillaud, B., & Jullien, B. (2003). Chicken & Egg: Competition among Intermediation Service Providers. *The RAND Journal of Economics*, *34*(2), 309–328. https://doi.org/10.2307/1593720

Ceccagnoli, M., Forman, C., Huang, P., & Wu, D. J. (2012). Cocreation of Value in a Platform Ecosystem: The Case of Enterprise Software. *MIS Quarterly*, *36*(1), 263–290. https://doi.org/10.2307/41410417

Cennamo, C., Oliveira, P., & Zejnilovic, L. (2022). Unlocking Innovation in Healthcare: The Case of the Patient Innovation Platform. *California Management Review*, *64*(4), 47–77. https://doi.org/10.1177/00081256221101657

Cennamo, C., Ozalp, H., & Kretschmer, T. (2018). Platform Architecture and Quality Trade-offs of Multihoming Complements. *Information Systems Research*, *29*(2), 461–478. https://doi.org/10.1287/isre.2018.0779

Cennamo, C., & Santalo, J. (2013). Platform competition: Strategic trade-offs in platform markets: Platform Competition. *Strategic Management Journal*, *34*(11), 1331–1350. https://doi.org/10.1002/smj.2066

Chan, H., Yang, M. X., & Zeng, K. J. (2022). Bolstering ratings and reviews systems on multi-sided platforms: A co-creation perspective. *Journal of Business Research*, *139*, 208–217. https://doi.org/10.1016/j.jbusres.2021.09.052

Chao, Y., & Derdenger, T. (2013). Mixed Bundling in Two-Sided Markets in the Presence of Installed Base Effects. *Management Science*, *59*(8), 1904–1926. https://doi.org/10.1287/mnsc.1120.1688

Chen, Y., & Xie, J. (2007). Cross-Market Network Effect with Asymmetric Customer Loyalty: Implications for Competitive Advantage. *Marketing Science*, *26*(1), 52–66. https://doi.org/10.1287/mksc.1060.0238

Choi, D. O., Oh, J., Kim, Y., & Hwang, J. (2012). Competition in the Korean Internet Portal Market: Network Effects, Profit, and Market Efficiency. *Review of Industrial Organization*, *40*(1), 51–73. https://doi.org/10.1007/s11151-011-9317-5

Chou, M. C., Sim, C. K., Teo, C.-P., & Zheng, H. (2012). Newsvendor Pricing Problem in a Two-Sided Market: Newsvendor Pricing Problem in a Two-Sided Market. *Production and Operations Management*, *21*(1), 204–208. https://doi.org/10.1111/j.1937-5956.2011.01235.x

Chu, J., & Manchanda, P. (2016). Quantifying Cross and Direct Network Effects in Online Consumer-to-Consumer Platforms. *Marketing Science*, *35*(6), 870–893. https://doi.org/10.1287/mksc.2016.0976

Church, J., & Gandal, N. (1992). Network Effects, Software Provision, and Standardization. *The Journal of Industrial Economics*, *40*(1), 85–103. https://doi.org/10.2307/2950628

Clements, M. T., & Ohashi, H. (2005). Indirect Network Effects and The Product Cycle: Video Games In The U.S., 1994-2002*. *Journal of Industrial Economics*, *53*(4), 515–542. https://doi.org/10.1111/j.1467-6451.2005.00268.x

Cong, L. W., Li, Y., & Wang, N. (2021). Tokenomics: Dynamic Adoption and Valuation. *The Review of Financial Studies*, *34*(3), 1105–1155. https://doi.org/10.1093/rfs/hhaa089

Constantinides, P., Henfridsson, O., & Parker, G. G. (2018). Platforms and Infrastructures in the Digital Age. *Information Systems Research*, *29*(2), 381–400. https://doi.org/10.1287/isre.2018.0794

Cusumano, M. A., & Gawer, A. (2002). The elements of platform leadership. *MIT Sloan Management Review*, *43*(3), 51–58. https://doi.org/10.1109/EMR.2003.1201437

Cusumano, M. A., Gawer, A., & Yoffie, D. B. (2019). *The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power*. Harper Business.

Cusumano, M., Gawer, A., & Yoffie, D. (2019). *The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power*. Harper Business.

David, P. (1985). Clio and the Economics of QWERTY. *American Economic Review*, *75*(2), 332–337.

de Reuver, M., Sørensen, C., & Basole, R. C. (2018). The Digital Platform: A Research Agenda. *Journal of Information Technology*, *33*(2), 124–135. https://doi.org/10.1057/s41265-016-0033-3

Di Stefano, G., Peteraf, M., & Verona, G. (2010). Dynamic capabilities deconstructed: A bibliographic investigation into the origins, development, and future directions of the research domain. *Industrial and Corporate Change*, *19*(4), 1187–1204. https://doi.org/10.1093/icc/dtq027

Doganoglu, T., & Wright, J. (2006). Multihoming and compatibility. *International Journal of Industrial Organization*, *24*(1), 45–67. https://doi.org/10.1016/j.ijindorg.2005.07.004

Doganoglu, T., & Wright, J. (2010). Exclusive dealing with network effects. *International Journal of Industrial Organization*, *28*(2), 145–154. https://doi.org/10.1016/j.ijindorg.2009.07.006

Dou, G., He, P., & Xu, X. (2016). One-side value-added service investment and pricing strategies for a two-sided platform. *International Journal of Production Research*, *54*(13), 3808–3821. https://doi.org/10.1080/00207543.2016.1148275

Dou, Y., & Wu, D. J. (2021). Platform Competition Under Network Effects: Piggybacking and Optimal Subsidization. *Information Systems Research*, *32*(3), 820–835. https://doi.org/10.1287/isre.2021.1017

Dubois, A., & Gadde, L.-E. (2002). Systematic combining: An abductive approach to case research. *Journal of Business Research*, *55*(7), 553–560. https://doi.org/10.1016/S0148-2963(00)00195-8

Eaton, B., Elaluf-Calderwood, S., Sørensen, C., & Yoo, Y. (2015). Distributed Tuning of Boundary Resources: The Case of Apple's iOS Service System. *MIS Quarterly*, *39*(1), 217–243. https://doi.org/10.25300/MISQ/2015/39.1.10

Economides, N., & Katsamakas, E. (2006). Two-Sided Competition of Proprietary vs. Open Source Technology Platforms and the Implications for the Software Industry. *Management Science*, *52*(7), 1057–1071. https://doi.org/10.1287/mnsc.1060.0549

Edmondson, A. C., & McManus, S. E. (2007). Methodological fit in management field research. *Academy of Management Review*, *32*(4), 1246–1264. https://doi.org/10.5465/amr.2007.26586086

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *The Academy of Management Review*, *14*(4), 532–550. https://doi.org/10.2307/258557

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory Building From Cases: Opportunities And Challenges. *Academy of Management Journal*, *50*(1), 25–32. https://doi.org/10.5465/amj.2007.24160888

Eisenmann, T., & Hagiu, A. (2007). Staging Two-Sided Platforms. *Harvard Business School Background Note 808-004*.

Eisenmann, T., Parker, G. G., & Van Alstyne, M. (2006). Strategies for Two-Sided Markets. *Harvard Business Review*, *84*(10), 92-101+149.

Eisenmann, T., Parker, G. G., & Van Alstyne, M. (2011). Platform envelopment. *Strategic Management Journal*, *32*(12), 1270–1285. https://doi.org/10.1002/smj.935

Eriksson, P., & Kovalainen, A. (2008). *Qualitative Methods in Business Research*. SAGE Publications Ltd. https://doi.org/10.4135/9780857028044

Evans, D. S. (2003). The Antitrust Economics of Multi-Sided Platform Markets. *Yale Journal on Regulation*, *20*(253), 325–381.

Evans, D. S., & Schmalensee, R. (2008). Markets with Two-Sided Platforms. *Competition Law and Policy*, *1*(28), 667–693.

Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., & Pappas, G. (2008). Comparison of PubMed, Scopus, Web of Science, and Google Scholar: Strengths and weaknesses. *The FASEB Journal*, *22*(2), 338–342. https://doi.org/10.1096/fj.07-9492LSF

Farrell, J., & Saloner, G. (1985). Standardization, Compatibility, and Innovation. *The RAND Journal of Economics*, *16*(1), 70–83. https://doi.org/10.2307/2555589

Farrell, J., & Saloner, G. (1986). Installed Base and Compatibility: Innovation, Product Preannouncements, and Predation. *The American Economic Review*, *76*(5), 940–955.

Farronato, C., Fong, J., & Fradkin, A. (2024). Dog Eat Dog: Balancing Network Effects and Differentiation in a Digital Platform Merger. *Management Science*, *70*(1), 464–483. https://doi.org/10.1287/mnsc.2023.4675

Fink, L., Shao, J., Lichtenstein, Y., & Haefliger, S. (2020). The ownership of digital infrastructure: Exploring the deployment of software libraries in a digital innovation cluster. *Journal of Information Technology*, *35*(3), 251–269. https://doi.org/10.1177/0268396220936705

Fleetwood, S. (2005). Ontology in Organization and Management Studies: A Critical Realist Perspective. *Organization*, *12*(2), 197–222. https://doi.org/10.1177/1350508405051188

Foerderer, J., Kude, T., Mithas, S., & Heinzl, A. (2018). Does Platform Owner's Entry Crowd Out Innovation? Evidence from Google Photos. *Information Systems Research*, *29*(2), 444–460. https://doi.org/10.1287/isre.2018.0787

Foerderer, J., Kude, T., Schuetz, S. W., & Heinzl, A. (2019). Knowledge boundaries in enterprise software platform development: Antecedents and consequences for platform governance. *Information Systems Journal*, *29*(1), 119–144. https://doi.org/10.1111/isj.12186

Foerderer, J., Lueker, N., & Heinzl, A. (2021). And the Winner Is …? The Desirable and Undesirable Effects of Platform Awards. *Information Systems Research*, *32*(4), 1155–1172. https://doi.org/10.1287/isre.2021.1019

Gandal, N. (1994). Hedonic Price Indexes for Spreadsheets and an Empirical Test for Network Externalities. *The RAND Journal of Economics*, *25*(1), 160–170. https://doi.org/10.2307/2555859

Gandal, N., Kende, M., & Rob, R. (2000). The Dynamics of Technological Adoption in Hardware/Software Systems: The Case of Compact Disc Players. *The RAND Journal of Economics*, *31*(1), 43–61. https://doi.org/10.2307/2601028

Gawer, A. (2014). Bridging differing perspectives on technological platforms: Toward an integrative framework. *Research Policy*, *43*(7), 1239–1249. https://doi.org/10.1016/j.respol.2014.03.006

Gawer, A. (2021). Digital platforms' boundaries: The interplay of firm scope, platform sides, and digital interfaces. *Long Range Planning*, *54*(5), 102045. https://doi.org/10.1016/j.lrp.2020.102045

Gawer, A., & Cusumano, M. A. (2008). How companies become platform leaders. *MIT Sloan Management Review*, *49*(2), 28–35.

Gawer, A., & Cusumano, M. A. (2014). Industry Platforms and Ecosystem Innovation: Platforms and Innovation. *Journal of Product Innovation Management*, *31*(3), 417–433. https://doi.org/10.1111/jpim.12105

Gawer, A., & Henderson, R. (2007). Platform Owner Entry and Innovation in Complementary Markets: Evidence from Intel. *Journal of Economics & Management Strategy*, *16*(1), 1–34. https://doi.org/10.1111/j.1530-9134.2007.00130.x

Gawer, A., & Phillips, N. (2013). Institutional Work as Logics Shift: The Case of Intel's Transformation to Platform Leader. *Organization Studies*, *34*(8), 1035–1071. https://doi.org/10.1177/0170840613492071

Ghazawneh, A., & Henfridsson, O. (2010). Governing Third-party Development through Boundary Resources. *ICIS 2010 Proceedings*. International Conference on Information Systems (ICIS), St. Louis.

Ghazawneh, A., & Henfridsson, O. (2013). Balancing platform control and external contribution in third-party development: The boundary resources model: Control and contribution in third-party development. *Information Systems Journal*, *23*(2), 173–192. https://doi.org/10.1111/j.1365-2575.2012.00406.x

Ghazawneh, A., & Henfridsson, O. (2015). A Paradigmatic Analysis of Digital Application Marketplaces. *Journal of Information Technology*, *30*(3), 198–208. https://doi.org/10.1057/jit.2015.16

Gibbert, M., & Ruigrok, W. (2010). The '"What"' and '"How"' of Case Study Rigor: Three Strategies Based on Published Work. *Organizational Research Methods*, *13*(4), 710–737. https://doi.org/10.1177/1094428109351319

Gibbert, M., Ruigrok, W., & Wicki, B. (2008). What passes as a rigorous case study? *Strategic Management Journal*, *29*(13), 1465–1474. https://doi.org/10.1002/smj.722

Giddens, A. (1979). *Central Problems in Social Theory: Action, structure and contradiction in social analysis* (1st ed.). Macmillan Education LTD. https://doi.org/10.1007/978-1-349-16161-4

Giddens, A. (1982). *Profiles and Critiques in Social Theory*. Macmillan Education UK. https://doi.org/10.1007/978-1-349-86056-2

Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration*. Polity Press.

Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking Qualitative Rigor in Inductive Research: Notes on the Gioia Methodology. *Organizational Research Methods*, *16*(1), 15–31. https://doi.org/10.1177/1094428112452151

Gioia, D. A., & Petre, E. (1990). Multiparadigm Perspectives on Theory Building. *Academy of Management Review*, *15*(4), 584–602. https://doi.org/10.2307/258683

Gioia, D. A., & Thomas, J. B. (1996). Identity, Image, and Issue Interpretation: Sensemaking During Strategic Change in Academia. *Administrative Science Quarterly*, *41*(3), 370–403. https://doi.org/10.2307/2393936

Gioia, D. A., Thomas, J. B., Clark, S. M., & Chittipeddi, K. (1994). Symbolism and Strategic Change in Academia: The Dynamics of Sensemaking and Influence. *Organization Science*, *5*(3), 363–383. https://doi.org/10.1287/orsc.5.3.363

Greenstein, S. M. (1993). Did Installed Base Give an Incumbent any (Measureable) Advantages in Federal Computer Procurement? *The RAND Journal of Economics*, *24*(1), 19–39. https://doi.org/10.2307/2555951

Hagiu, A. (2014). Strategic Decisions for Multisided Platforms. *MIT Sloan Management Review*, *55*(2), 92–93.

Hagiu, A., & Spulber, D. (2013). First-Party Content, Commitment and Coordination in Two-Sided Markets. *Management Science*, *59*(4), 933–949.

Hagiu, A., & Wright, J. (2015). Multi-sided platforms. *International Journal of Industrial Organization*, *43*, 162–174. https://doi.org/10.1016/j.ijindorg.2015.03.003

Hagiu, A., & Wright, J. (2018). Controlling versus enabling. *Management Science*, *65*(2), 577–595. https://doi.org/10.1287/mnsc.2017.2956

Hanseth, O., & Lyytinen, K. (2010). Design Theory for Dynamic Complexity in Information Infrastructures: The Case of Building Internet. *Journal of Information Technology*, *25*(1), 1–19. https://doi.org/10.1007/978-3-319-29272-4_4

Helfat, C. E., & Raubitschek, R. S. (2018). Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems. *Research Policy*, *47*(8), 1391–1399. https://doi.org/10.1016/j.respol.2018.01.019

Hinz, O., Otter, T., & Skiera, B. (2020). Estimating Network Effects in Two-Sided Markets. *Journal of Management Information Systems*, *37*(1), 12–38. https://doi.org/10.1080/07421222.2019.1705509

Huber, T. L., Kude, T., & Dibbern, J. (2017). Governance Practices in Platform Ecosystems: Navigating Tensions Between Cocreated Value and Governance Costs. *Information Systems Research*, *28*(3), 563–584. https://doi.org/10.1287/isre.2017.0701

Huikkola, T., Rabetino, R., Kohtamäki, M., & Gebauer, H. (2020). Firm boundaries in servitization: Interplay and repositioning practices. *Industrial Marketing Management*, *90*, 90–105. https://doi.org/10.1016/j.indmarman.2020.06.014

Huotari, P., Järvi, K., Kortelainen, S., & Huhtamäki, J. (2017). Winner does not take all: Selective attention and local bias in platform-based markets. *Technological Forecasting and Social Change*, *114*, 313–326. https://doi.org/10.1016/j.techfore.2016.08.028

Ihantola, E., & Kihn, L. (2011). Threats to validity and reliability in mixed methods accounting research. *Qualitative Research in Accounting & Management*, *8*(1), 39–58. https://doi.org/10.1108/11766091111124694

Ishihara, M., & Muller, E. (2020). Software piracy and outsourcing in two-sided markets. *Quantitative Marketing and Economics*, *18*(1), 61–124. https://doi.org/10.1007/s11129-019-09221-7

Jeitschko, T. D., & Tremblay, M. J. (2020). Platform Competition with Endogeneous Homing. *International Economic Review*, *61*(3), 1281–1305. https://doi.org/10.1111/iere.12457

Jeong, Y. K., Song, M., & Ding, Y. (2014). Content-based author co-citation analysis. *Journal of Informetrics*, *8*(1), 197–211. https://doi.org/10.1016/j.joi.2013.12.001

Jovanovic, M., Sjödin, D., & Parida, V. (2021). Co-evolution of platform architecture, platform services, and platform governance: Expanding the platform value of industrial digital platforms. *Technovation*, *118*(6), 102218. https://doi.org/10.1016/j.technovation.2020.102218

Kaiser, U., & Wright, J. (2006). Price structure in two-sided markets: Evidence from the magazine industry. *International Journal of Industrial Organization*, *24*(1), 1–28. https://doi.org/10.1016/j.ijindorg.2005.06.002

Katz, M. L., & Shapiro, C. (1985). Network Externalities,Competition, and Compatibility. *The American Economic Review*, *75*(3), 424–440.

Katz, M. L., & Shapiro, C. (1986). Technology Adoption in the Presence of Network Externalities. *Journal of Political Economy*, *94*(4), 822–841. https://doi.org/10.1086/261409

Katz, M. L., & Shapiro, C. (1994). Systems Competition and Network Effects. *Journal of Economic Perspectives*, *8*(2), 93–115. https://doi.org/10.1257/jep.8.2.93

Kim, J., Newberry, P., Wagman, L., & Wolff, R. (2022). Local Network Effects in the Adoption of a Digital Platform*. *The Journal of Industrial Economics*, *70*(3), 493–524. https://doi.org/10.1111/joie.12296

Kohtamäki, M., Parida, V., Oghazi, P., Gebauer, H., & Baines, T. (2019). Digital servitization business models in ecosystems: A theory of the firm. *Journal of Business Research*, *104*, 380–392. https://doi.org/10.1016/j.jbusres.2019.06.027

Kohtamäki, M., Rabetino, R., & Möller, K. (2018). Alliance capabilities: A systematic review and future research directions. *Industrial Marketing Management*, *68*(1), 188–201. https://doi.org/10.1016/j.indmarman.2017.10.014

Kohtamäki, M., Whittington, R., Vaara, E., & Rabetino, R. (2022). Making connections: Harnessing the diversity of strategy-as-practice research. *International Journal of Management Reviews*, *24*(2), 210–232. https://doi.org/10.1111/ijmr.12274

Leibenstein, H. (1950). Bandwagon, Snob, and Veblen Effects in the Theory of Consumers' Demand. *The Quarterly Journal of Economics*, *64*(2), 183–207. https://doi.org/10.2307/1882692

Liebowitz, S. J., & Margolis, S. E. (1994). Network Externality: An Uncommon Tragedy. *Journal of Economic Perspectives*, *8*(2), 133–150. https://doi.org/10.1257/jep.8.2.133

Loux, P., Aubry, M., Tran, S., & Baudoin, E. (2020). Multi-sided platforms in B2B contexts: The role of affiliation costs and interdependencies in adoption decisions. *Industrial Marketing Management*, *84*, 212–223. https://doi.org/10.1016/j.indmarman.2019.07.001

Luoto, S., Brax, S. A., & Kohtamäki, M. (2017). Critical meta-analysis of servitization research: Constructing a model-narrative to reveal paradigmatic assumptions. *Industrial Marketing Management*, *60*, 89–100. https://doi.org/10.1016/j.indmarman.2016.04.008

MacInnis, D. J. (2011). A Framework for Conceptual Contributions in Marketing. *Journal of Marketing*, *75*(4), 136–154. https://doi.org/10.1509/jmkg.75.4.136

Marshall, A. (2013). *Principles of Economics* (8th ed.). Palgrave Macmillan UK. https://doi.org/10.1057/9781137375261

McCalman, P. (2022). Trade policy with FANG's (aka trade policy and multi-sided platforms). *Journal of International Economics*, *138*, 103655. https://doi.org/10.1016/j.jinteco.2022.103655

Miric, M., Boudreau, K., & Jeppesen, L. B. (2019). Protecting their digital assets: The use of formal & informal appropriability strategies by App developers. *Research Policy*, *48*(8). https://doi.org/10.1016/j.respol.2019.01.012

Miric, M., & Jeppesen, L. B. (2020). Does piracy lead to product abandonment or stimulate new product development?: Evidence from mobile platform-based developer firms. *Strategic Management Journal*, *41*(12), 2155–2184. https://doi.org/10.1002/smj.3208

Miric, M., Ozalp, H., & Yilmaz, E. D. (2022). Trade-offs to using standardized tools: Innovation enablers or creativity constraints? *Strategic Management Journal*. https://doi.org/10.1002/smj.3457

Modol, J. R., & Eaton, B. (2021). Digital infrastructure evolution as generative entrenchment: The formation of a core–periphery structure. *Journal of Information Technology*, *36*(4), 342–364. https://doi.org/10.1177/02683962211013362

Morgenstern, O. (1948). Demand Theory Reconsidered. *The Quarterly Journal of Economics*, *62*(2), 165–201. https://doi.org/10.2307/1883219

Nag, R., Corley, K. G., & Gioia, D. A. (2007). The Intersection of Organizational Identity, Knowledge, and Practice: Attempting Strategic Change Via Knowledge Grafting. *Academy of Management Journal*, *50*(4), 821–847. https://doi.org/10.5465/amj.2007.26279173

Nambisan, S., Siegel, D., & Kenney, M. (2018). On open innovation, platforms, and entrepreneurship. *Strategic Entrepreneurship Journal*, *12*(3), 354–368. https://doi.org/10.1002/sej.1300

Newbert, S. L. (2007). Empirical research on the resource-based view of the firm: An assessment and suggestions for future research. *Strategic Management Journal*, *28*(2), 121–146. https://doi.org/10.1002/smj.573

Oren, S. S., & Smith, S. A. (1981). Critical Mass and Tariff Structure in Electronic Communications Markets. *The Bell Journal of Economics*, *12*(2), 467–487. https://doi.org/10.2307/3003567

Parker, G. G., & Van Alstyne, M. (2005). Two-Sided Network Effects: A Theory of Information Product Design. *Management Science*, *51*(10), 1494–1504. https://doi.org/10.1287/mnsc.1050.0400

Parker, G. G., & Van Alstyne, M. (2018). Innovation, Openness, and Platform Control. *Management Science*, *64*(7), 3015–3032. https://doi.org/10.1287/mnsc.2017.2757

Parker, G. G., Van Alstyne, M. W., & Choudary, S. P. (2016). *Platform revolution: How networked markets are transforming the economy—And how to make them work for you*. W. W. Norton & Company.

Poole, M. S., & van de Ven, A. H. (1989). Using Paradox to Build Management and Organization Theories. *The Academy of Management Review*, *14*(4), 562–578. https://doi.org/10.2307/258559

Rasch, A., & Wenzel, T. (2013). Piracy in a two-sided software market. *Journal of Economic Behavior & Organization*, *88*, 78–89. https://doi.org/10.1016/j.jebo.2013.01.009

Reuber, A. R., & Fischer, E. (2022). Relying on the engagement of others: A review of the governance choices facing social media platform start-ups. *International Small Business Journal: Researching Entrepreneurship*, *40*(1), 3–22. https://doi.org/10.1177/02662426211050509

Rietveld, J., & Schilling, M. A. (2020). *Platform Competition: A Systematic and Interdisciplinary Review of the Literature*. *47*(6), 1528–1563. https://doi.org/10.1177/0149206320969791

Riley, P. (1983). A Structurationist Account of Political Culture. *Administrative Science Quarterly*, *28*(3), 414–437. https://doi.org/10.2307/2392250

Rochet, J.-C., & Tirole, J. (2002). Cooperation among Competitors: Some Economics of Payment Card Associations. *The RAND Journal of Economics*, *33*(4), 549–570. https://doi.org/10.2307/3087474

Rochet, J.-C., & Tirole, J. (2003). Platform Competition in Two-Sided Markets. *Journal of the European Economic Association*, *1*(4), 990–1029. https://doi.org/10.1162/154247603322493212

Rochet, J.-C., & Tirole, J. (2004). *Two-Sided Markets: An Overview*. 1-44. Institut d'Economie Industrielle working paper.

Rochet, J.-C., & Tirole, J. (2006). Two-sided markets: A progress report. *The RAND Journal of Economics*, *37*(3), 645–667. https://doi.org/10.1111/j.1756-2171.2006.tb00036.x

Rohlfs, J. (1974). A Theory of Interdependent Demand for a Communications Service. *The Bell Journal of Economics and Management Science*, *5*(1), 16–37. https://doi.org/10.2307/3003090

Rolland, K. H., Mathiassen, L., & Rai, A. (2018). Managing Digital Platforms in User Organizations: The Interactions Between Digital Options and Digital Debt. *Information Systems Research*, *29*(2), 419–443. https://doi.org/10.1287/isre.2018.0788

Ryan, B., Scapens, R. W., & Theobald, M. (2002). *Research method and methodology in finance and accounting* (2. ed., reprinted). Thomson.

Rysman, M. (2004). Competition between Networks: A Study of the Market for Yellow Pages. *The Review of Economic Studies*, *71*(2), 483–512. https://doi.org/10.2139/ssrn.300450

Rysman, M. (2009). The Economics of Two-Sided Markets. *Journal of Economic Perspectives*, *23*(3), 125–143. https://doi.org/10.1257/jep.23.3.125

Saloner, G., & Shepard, A. (1995). Adoption of Technologies with Network Effects: An Empirical Examination of the Adoption of Automated Teller Machines. *The RAND Journal of Economics*, *26*(3), 479–501. https://doi.org/10.2307/2555999

Santos, F. M., & Eisenhardt, K. M. (2005). Organizational Boundaries and Theories of Organization. *Organization Science*, *16*(5), 491–508. https://doi.org/10.1287/orsc.1050.0152

Sharma, A., Iyer, G. R., & Evanschitzky, H. (2008). Personal Selling of High-Technology Products: The Solution-Selling Imperative. *Journal of Relationship Marketing*, *7*(3), 287–308. https://doi.org/10.1080/15332660802409639

Shi, X., Li, F., & Chumnumpan, P. (2021). Platform Development: Emerging Insights From a Nascent Industry. *Journal of Management*, *47*(8), 2037–2073. https://doi.org/10.1177/0149206320929428

Spanuth, A., & Urbano, D. (2023). Exploring social enterprise legitimacy within ecosystems from an institutional approach: A systematic literature review and research agenda. *International Journal of Management Reviews*, *26*(2), 211–231. https://doi.org/10.1111/ijmr.12349

Srinivasan, A., & Venkatraman, N. (2010). Indirect Network Effects and Platform Dominance in the Video Game Industry: A Network Perspective. *IEEE Transactions on Engineering Management*, *57*(4), 661–673. https://doi.org/10.1109/TEM.2009.2037738

Srinivasan, A., & Venkatraman, N. (2018). Entrepreneurship in digital platforms: A network-centric view. *Strategic Entrepreneurship Journal*, *12*(1), 54–71. https://doi.org/10.1002/sej.1272

Tan, B., Pan, S., Lu, X., & Huang, L. (2015). The Role of IS Capabilities in the Development of Multi-Sided Platforms: The Digital Ecosystem Strategy of Alibaba.com. *Journal of the Association for Information Systems*, *16*(4), 248–280. https://doi.org/10.17705/1jais.00393

Tan, H., & Wright, J. (2021). Pricing distortions in multi-sided platforms. *International Journal of Industrial Organization*, *79*, 102732. https://doi.org/10.1016/j.ijindorg.2021.102732

Teece, D. J. (2017). Dynamic Capabilities and (Digital) Platform Lifecycles. In J. Furman, A. Gawer, B. S. Silverman, & S. Stern (Eds.), *Advances in Strategic Management* (Vol. 37, pp. 211–225). Emerald Publishing Limited. https://doi.org/10.1108/S0742-332220170000037008

Teece, D. J., Pundziene, A., Heaton, S., & Vadi, M. (2022). Managing Multi-Sided Platforms: Platform Origins and Go-to-Market Strategy. *California Management Review*, *64*(4), 5–19. https://doi.org/10.1177/00081256221109961

Thomas, L. D. W., Autio, E., & Gann, D. M. (2014). Architectural Leverage: Putting Platforms in Context. *Academy of Management Perspectives*, *28*(2), 198–219. https://doi.org/10.5465/amp.2011.0105

Tilson, D., Lyytinen, K., & Sørensen, C. (2010). Digital Infrastructures: The Missing IS Research Agenda. *Information Systems Research*, *21*(4), 748–759. https://doi.org/10.1287/isre.1100.0318

Tiwana, A., Konsynski, B., & Bush, A. A. (2010). Platform Evolution: Coevolution of Platform Architecture, Governance, and Environmental Dynamics. *Information Systems Research*, *21*(4), 675–687. https://doi.org/10.1287/isre.1100.0323

Tong, T., Dai, H., Xiao, Q., & Yan, N. (2020). Will dynamic pricing outperform? Theoretical analysis and empirical evidence from O2O on-demand food service market. *International Journal of Production Economics*, *219*, 375–385. https://doi.org/10.1016/j.ijpe.2019.07.010

Trabucchi, D., & Buganza, T. (2022). Entrepreneurial dynamics in two-sided platforms: The influence of sides in the case of Friendz. *International Journal of Entrepreneurial Behavior & Research*, *28*(5), 1184–1205. https://doi.org/10.1108/IJEBR-01-2021-0076

Trabucchi, D., & Buganza, T. (2023). *Platform thinking: Read the past. Write the future* (First edition). Business Expert Press.

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. *British Journal of Management*, *14*(3), 207–222. https://doi.org/10.1111/1467-8551.00375

Tucker, C., & Zhang, J. (2010). Growing Two-Sided Networks by Advertising the User Base: A Field Experiment. *Marketing Science*, *29*(5), 805–814. https://doi.org/10.1287/mksc.1100.0560

Van Alstyne, M., Parker, G. G., & Choudary, S. P. (2016). Pipelines, Platforms, and the New Rules of Strategy. *Harvard Business Review*, *94*(4), 54–62.

Varga, S., Cholakova, M., Jansen, J. J. P., Mom, T. J. M., & Kok, G. J. M. (2023). From platform growth to platform scaling: The role of decision rules and network effects over time. *Journal of Business Venturing*, *38*(6), 106346. https://doi.org/10.1016/j.jbusvent.2023.106346

Voigt, S., & Hinz, O. (2015). Network effects in two-sided markets: Why a 50/50 user split is not necessarily revenue optimal. *Business Research*, *8*(1), 139–170. https://doi.org/10.1007/s40685-015-0018-z

Waltman, L., van Eck, N. J., & Noyons, E. C. M. (2010). A unified approach to mapping and clustering of bibliometric networks. *Journal of Informetrics*, *4*(4), 629–635. https://doi.org/10.1016/j.joi.2010.07.002

Wang, S., Chen, H., & Wu, D. (2019). Regulating platform competition in two-sided markets under the O2O era. *International Journal of Production Economics*, *215*, 131–143. https://doi.org/10.1016/j.ijpe.2017.10.031

Wareham, J. D., Fox, P. B., & Cano Giner, J. L. (2014). Technology Ecosystem Governance. *Organization Science*, *25*(4), 1195–1215. https://doi.org/10.2139/ssrn.2201688

Weick, K. E. (1995). *Sensemaking in organizations*. Sage Publications.

Weinzierl, M., (Raj) Choudhury, P., Khanna, T., MacCormack, A., & Rosseay, B. (2022). Your Company Needs a Space Strategy. Now. *Harvard Business Review*. https://hbr.org/2022/11/your-company-needs-a-space-strategy-now

Wiegand, N., Peers, Y., & Bleier, A. (2022). Software multihoming to distal markets: Evidence of cannibalization and complementarity in the video game console industry. *Journal of the Academy of Marketing Science*, *51*(2), 393–417. https://doi.org/10.1007/s11747-022-00893-4

Wortmann, F., Jung, S., & Gassmann, O. (2024). *The Platform Business Navigator The Strategies Behind the World's Most Successful Platform Companies.pdf*. Pearson.

Wu, C.-C., Chen, Y.-J., & Cho, Y.-J. (2013). Nested Network Effects in Online Free Games with Accessory Selling. *Journal of Interactive Marketing*, *27*(3), 158–171. https://doi.org/10.1016/j.intmar.2013.04.001

Wu, W., Huang, X., Wu, C.-H., & Tsai, S.-B. (2022). Pricing strategy and performance investment decisions in competitive crowdfunding markets. *Journal of Business Research*, *140*, 491–497. https://doi.org/10.1016/j.jbusres.2021.11.018

Xie, J., Zhu, W., Wei, L., & Liang, L. (2021). Platform competition with partial multi-homing: When both same-side and cross-side network effects exist. *International Journal of Production Economics*, *233*, 108016. https://doi.org/10.1016/j.ijpe.2020.108016

Yin, R. K. (2018). *Case study research and applications: Design and methods* (Sixth edition). SAGE.

Yoo, Y., Henfridsson, O., & Lyytinen, K. (2010). The New Organizing Logic of Digital Innovation: An Agenda for Information Systems Research. *Information Systems Research*, *21*(4), 724–735. https://doi.org/10.1287/isre.1100.0322

Zhang, Y., Li, J., & Tong, T. W. (2022). Platform governance matters: How platform gatekeeping affects knowledge sharing among complementors. *Strategic Management Journal*, *43*(3), 599–626. https://doi.org/10.1002/smj.3191

Zhao, D., & Chen, M. (2019). Ex-ante versus ex-post destination information model for on-demand service ride-sharing platform. *Annals of Operations Research*, *279*(1–2), 301–341. https://doi.org/10.1007/s10479-019-03316-w

Zhao, Y., von Delft, S., Morgan-Thomas, A., & Buck, T. (2020). The evolution of platform business models: Exploring competitive battles in the world of platforms. *Long Range Planning*, *53*(4), 101892. https://doi.org/10.1016/j.lrp.2019.101892

Zupic, I., & Čater, T. (2015). Bibliometric Methods in Management and Organization. *Organizational Research Methods*, *18*(3), 429–472. https://doi.org/10.1177/1094428114562629

EJIM
27,9

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Received 11 September 2023
Revised 2 December 2023
Accepted 29 January 2024

Mapping the landscape: unveiling the structural dynamics of industry platforms

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Abstract

Purpose – The proliferation of industry platforms has disrupted several industries. Firms adopting a platform business model have experienced a substantial expansion in size and scale, positioning themselves as the foremost valuable entities in market capitalization. Over the past two decades, there has been a substantial expansion in the body of literature dedicated to platforms, and different streams of research have emerged. Despite considerable efforts and the significant progress made in recent years toward a comprehensive understanding of industry platforms, there is still room for further harnessing the field's diversity. As a result, the aim of this article is to examine the field's structure, identify research concerns and provide suggestions for future research, thereby enhancing the overall understanding of industry platforms.

Design/methodology/approach – We conducted a thorough examination of 458 articles on the topic using bibliometric methods and systematic review techniques.

Findings – Through co-citation analysis, we identified five distinct clusters rooted in various bodies of literature: two-sided markets, industry platforms, digital platforms, innovation platforms and two-sided networks. Furthermore, the examination of these five clusters has revealed three key areas that demand further consideration: (1) terminologies, (2) classifications and (3) perspectives.

Originality/value – While previous reviews have provided valuable insights into the topic of industry platforms, none have explored the structure of the field so far. Consequently, as a first step toward advancing the field, we uncover the structure of the literature, identifying three major areas of concern. By addressing these concerns, our goal is to converge different clusters, thereby harnessing the diversity in the field and enhancing the overall understanding of industry platforms.

Keywords Two-sided markets, Industry platforms, Digital platforms, Innovation platforms, Two-sided networks, Network effects, Literature review, Business models & strategy

Paper type Literature review

1. Introduction

The proliferation of industry platforms has disrupted several conventional businesses operating in different industries, such as transportation (Uber), software development (Apple iOS) and hospitality (AirBnB). Platform businesses nowadays rank among the most valuable

This paper is a product of the MIDAS (Mastering the Next Industrial Revolution: From product-service solutions to Autonomous Systems) research project. The financial support of the Finnish Academy is gratefully acknowledged.

European Journal of Innovation Management
Vol. 27 No. 9, 2024
pp. 280-304
Emerald Publishing Limited
1460-1060
DOI 10.1108/EJIM-09-2023-0748

entities in relation to market capitalization, e.g. Alphabet, Microsoft and Amazon. Industry platforms are defined as "products, services, or technologies developed by one or more firms, and which serve as foundations upon which a larger number of firms can build further complementary innovations and potentially generate network effects" (Gawer and Cusumano, 2014, p. 420). Over the last two decades, academic scholars have extensively explored various facets of platforms. Some have immersed themselves in the intricacies of platform competition (e.g. Rochet and Tirole, 2003; Armstrong, 2006; Rysman, 2009). Others have synthesized insights from economics and engineering design literature, aiming to bridge these domains and propel the field of strategic management research forward (e.g. Gawer, 2014; Gawer and Cusumano, 2014). Other scholars have conducted in-depth investigations into platform governance (such as Ghazawneh and Henfridsson, 2013; Eaton *et al.*, 2015; Lin *et al.*, 2022; Zhang *et al.*, 2022), initially emphasizing hard governance mechanisms (e.g. Ghazawneh and Henfridsson, 2015) and gradually transitioning to more nuanced, soft governance approaches (e.g. Foerderer *et al.*, 2021). Lastly, some scholars have focused on the dynamic interplay between innovation and competition, opening avenues for exploration into novel topics that were previously unexplored (e.g. Boudreau, 2010; Eisenmann *et al.*, 2011).

Despite significant efforts and the substantial progress made in recent years to understand platforms and their ecosystems comprehensively, there is still room to advance the harnessing of diversity within the field further, as the current picture is still missing many puzzle pieces. For instance, obtaining an economic perspective that delves into the topic of platform boundaries and breaking "the atomistic view on platforms" (Gawer, 2021, p. 2) would be highly beneficial. Besides, the current understanding not only lacks significant pieces of the puzzle but also overlooks nuanced, yet critical, aspects. For instance, there remains uncertainty regarding what qualifies as a digital platform and what is not, despite the distinction made by de Reuver *et al.* (2018). Similarly, the classification of innovation platforms lacks consensus and a unified definition, given the different perspectives presented by Baldwin and von Hippel (2011) and Gawer (2021). Further, ambiguity persists concerning the various classifications of platform business models, with each classification, such as those by Evans and Schmalensee (2008), Ghazawneh and Henfridsson (2015) or Cusumano *et al.* (2019), presenting its own distinct categories. Consequently, the evolution of these platforms over time remains unclear, with scholars proposing different trajectories based on the diverse classifications of these platforms. In brief, our comprehensive understanding of industry platforms still contains notable gaps, leaving ample opportunity for the advancement of the literature to more advanced stages.

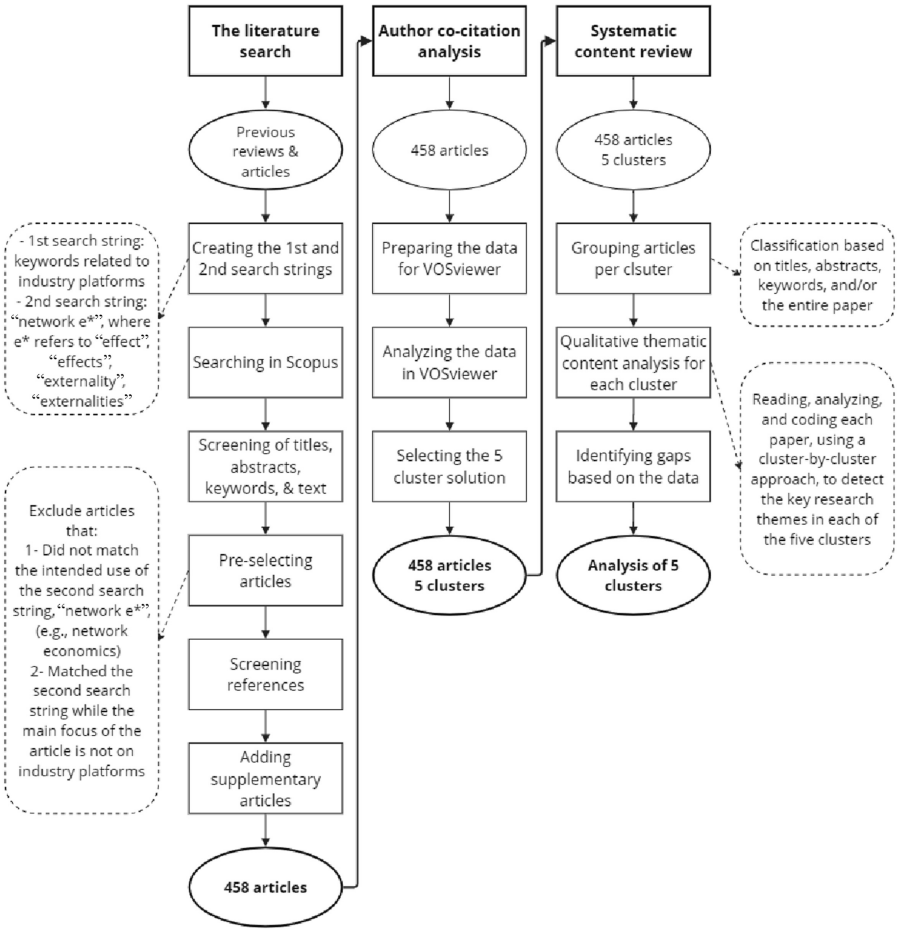
As an initial step toward the goal of elevating the harnessing of the field to a more advanced level, we consider it crucial to grasp the underlying structure of the domain. Hence, we undertook a comprehensive analysis of 458 articles, employing bibliometric methods and systematic review techniques (Kraus *et al.*, 2022, 2024; Sauer and Seuring, 2023). The current study adds significant value by uncovering the literature's underlying structure, identifying key research concerns and providing suggestions for future research. Using co-citation analysis, we have identified five distinct clusters grounded in various bodies of literature: two-sided markets, industry platforms, digital platforms, innovation platforms and two-sided networks. Additionally, our analysis of these five clusters has unveiled three primary critical areas requiring further consideration: (1) terminologies: distinct clusters not only employ varying terms for the same phenomena but also introduce inconsistent terminologies; (2) classifications: akin to terminologies, different clusters present divergent classifications for the same phenomena; and (3) perspectives: the predominant focus across clusters has been on examining platforms from the perspective of the platform owner, neglecting the fact that the owner is just one of four major players within the ecosystem (Van Alstyne *et al.*, 2016a). By addressing these concerns, we aim to advance the harnessing of this diverse literature, contributing to its enrichment within and across different clusters and enhancing the overall understanding of industry platforms.

2. Methodology

As a first step toward conducting a systematic literature review, we began by selecting keywords to help us identify articles potentially relevant to the field of industry platforms. Next, we searched for the chosen keywords in peer-reviewed scholarly articles (Tranfield *et al.*, 2003; Zupic and Čater, 2015), both published and "in press," using Elsevier's Scopus database, which is commonly recognized as the most effective tool for conducting literature searches (Falagas *et al.*, 2008). The term "platform" is a very broad term, and a search using it generates thousands of scholarly articles that are distant from our scope of work. Therefore, we had to select our keywords meticulously to ensure a specific focus on industry platforms. We aimed to choose articles that contained one of the following keywords in the title, abstract or keywords (Newbert, 2007): "tech* platform*" or "external platform*" or "industry platform*" or "transaction platform*" or "innovation platform*" or "hybrid platform*" or "digital platform*" or "software platform*" or "software based platform*" or "software-based platform*" or "internet platform*" or "two sided market*" or "two-sided market*" or "twosided market*" or "two sided platform*" or "two-sided platform*" or "twosided platform*" or "platform logic" or "platform competition" or "platform evolution" or "platform governance" or "platform leader*" or "platform ecosystem*" or "platform based ecosystem*" or "platform-based ecosystem*" or "multi sided market*" or "multi-sided market*" or "multisided market*" or "multi sided platform*" or "multi-sided platform*" or "multisided platform*". However, to focus solely on industry platforms, and because an industry platform is distinct from an internal, company, product or supply-chain platform due to its ability to generate network effects (Gawer and Cusumano, 2014), we included a second search string that required the selected articles to include "network e*" in their full text. This phrase, "network e*", refers to "network effect," "network effects," "network externality" or "network externalities." This search strategy, "network e*", was validated against the search results using the keywords "network effect," "network effects," "network externality" or "network externalities."

The Scopus search generated 446 articles, and after an initial screening of the titles, abstracts and keywords, we excluded articles that (1) do not match the intended use of the second search string, which includes words such as "network economics," for instance, and those that (2) match the second search string but the major focus of the paper is not on industry platforms. Besides, after reviewing the reference lists of the selected articles, we identified additional articles not included in our initial set. Consequently, based on the reference lists of the initial set, we incorporated the supplementary articles. Therefore, we were left with 458 articles to structure the field.

This study utilized author co-citation analysis, a method introduced in 1981 and considered a key approach in the context of bibliometric research (Jeong *et al.*, 2014). Author co-citation analysis identifies, traces and visualizes the structure of a particular academic field by aggregating the occurrence of co-citations within a specific body of literature. It involves the co-citation of one author's publications with those of another within the reference sections of citing documents (Bayer *et al.*, 1990). Thus, author co-citation analysis aids in classifying authors who discuss roughly similar or consistent concepts (Zupic and Čater, 2015). In addition, author co-citation analysis assists in uncovering the intellectual structure of a scientific knowledge domain (see, e.g. Acedo *et al.*, 2006; Jeong *et al.*, 2014) while excluding the expert subjectivity, which is typically embedded in conventional literature reviews (Acedo *et al.*, 2006; Di Stefano *et al.*, 2010; Zupic and Čater, 2015). To conduct an author co-citation analysis and establish a preliminary structure for the examined field (see, e.g. Nerur *et al.*, 2008), we used VOSviewer Software (Waltman *et al.*, 2010). However, we were also aware of alternative textual analysis methods, such as Leximancer (Wilden *et al.*, 2016). Consequently, the bibliometric analysis was executed based on the 458 articles, which was then followed by a systematic review to clarify the structure of the field, examine each cluster, identify research concerns and provide suggestions for future research (Zupic and Čater, 2015).



Source(s): Own elaboration

Figure 1.
Review process

Once the clusters were identified using the author co-citation analysis, we categorized each article into the corresponding cluster based on its title, abstract, keywords and/or the entire paper. The process was executed by the first author and then double-checked by the two co-authors. Besides, no significant conflicts arose during the classification process, as we ensured familiarity with the various clusters before commencing. As a next step, we read, analyzed and coded each paper, using a cluster-by-cluster approach, to detect the findings and key themes of the clusters. The review methodology is depicted in Figure 1, while Table 1 provides the classification of the various clusters and summarizes the key points in each.

3. Mapping the structure of the field

Based on the central themes and the terminologies adopted in each of the five clusters, we labeled the clusters as follows: two-sided markets, industry platforms, digital platforms, innovation platforms and two-sided networks. The literature on industry platforms has

significantly expanded over the past two decades, as depicted in Figure 2, which clearly illustrates the increasing number of publications since the early 2000s.

Figure 3 delves deeper into the mapping of the five distinct clusters. In Figure 3, different colors indicate cluster membership, the size of the circle describes the number of citations the authors have received, and the distances between the circles reflect the frequency of co-citation. For example, Parker is cited more than 500 times and is often co-cited with Van Alstyne, whereas he is not cited as often with Eisenmann. Therefore, in Figure 3, Parker and Van Alstyne are close in terms of the distance between their circles, whereas Parker and Eisenmann are more distant.

3.1 Two-sided markets

The origins of the literature on two-sided markets are often traced back to the economics of network externalities and strategic discussions on the chicken-and-egg dilemma. A

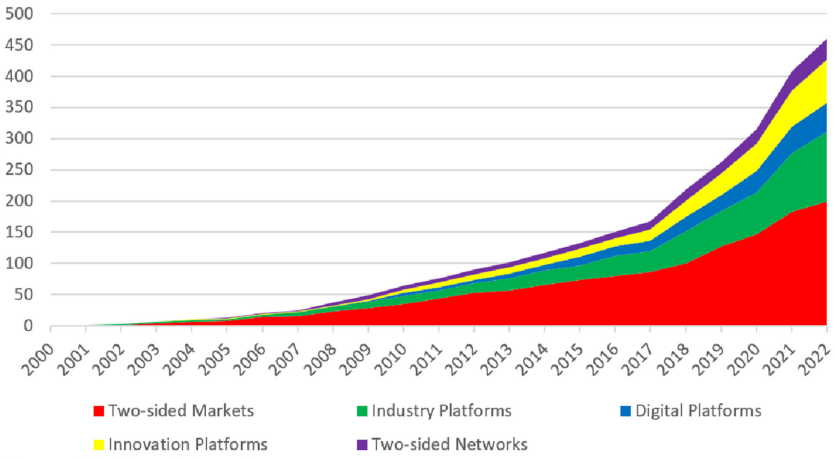


Figure 2.
Number of articles per cluster

Source(s): Own elaboration

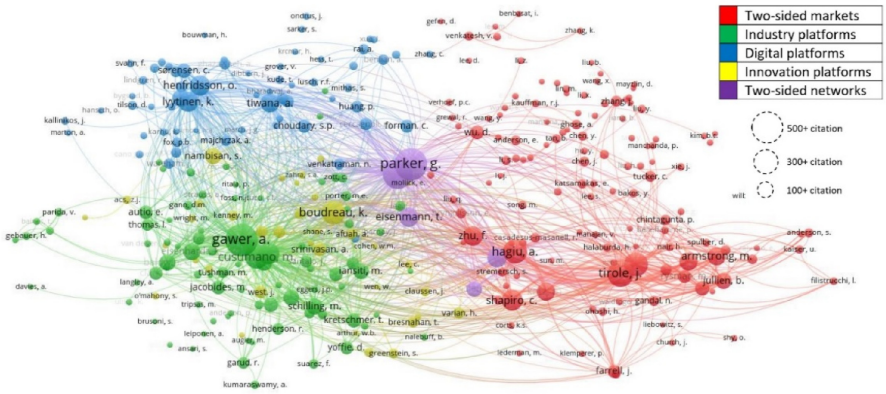


Figure 3.
The five main clusters

Source(s): Own elaboration

fundamental challenge in this context is the platform's capacity to attract diverse actors and foster interactions between them, as exemplified by the relationship between advertisers and users. However, this leads to the chicken-and-egg dilemma, or which side should the platform attract first? Despite significant theoretical advancements in the economics of network externalities and discussions on the chicken-and-egg problem by scholars like Katz and Shapiro (1985) and Caillaud and Jullien (2001, 2003), limited attention was given to two-sided markets until the early 2000s. Evans (2003) recognized two-sided markets by identifying cross-network externalities among different participant groups. Rochet and Tirole (2006) expanded this definition, stating that a two-sided market is characterized by transaction volumes between end-users influenced by the market structure rather than merely the overall fees charged by the platform. However, both Rysman (2009) and Hagiu and Wright (2015) noted limitations in these definitions. In response, Hagiu (2014) proposed two key features as indispensable: the facilitation of direct interactions among two or more autonomous sides and the affiliation of each side with the platform.

Later, the literature on two-sided markets began to shift its focus from price dimensions to non-price dimensions (Correia-da-Silva *et al.*, 2019; Calvano and Polo, 2021). One of the initial deviations was presented by Hagiu (2007) who compared two contrasting strategies for market intermediation: two-sided platforms, where affiliated sellers directly sell to buyers, and the merchant mode, involving the firm purchasing from sellers and selling to buyers. More recently, Hagiu and Wright (2015) focused on the economic tradeoffs a firm faces when positioning itself either nearer or more distant from a multi-sided platform business model. They compared this approach to other alternatives, namely, vertically integrated firms, e.g. Sony PlayStation vs Atari (Hagiu and Wright, 2018), and resellers, e.g. eBay vs pure resellers (Hagiu and Wright, 2015). Further, Hagiu *et al.* (2022) delved into the question of whether platforms are permitted to sell on their own marketplaces. While various studies have begun to emphasize non-price dimensions, this does not imply a complete shift away from price dimensions, examples include Gerlach and Li (2021) and Wu *et al.* (2022), among others.

The majority of the current work in the two-sided markets cluster is, to a certain extent, theoretical and operationalized with stylized analytic models. During the early 2000s, two-sided markets were studied in various contexts, including limited industries such as payment cards, advertising-supported media, operating systems and shopping malls. The literature primarily focused on pricing policies (Rochet and Tirole, 2003, 2006; Kaiser and Wright, 2006), network externalities (Caillaud and Jullien, 2003; Armstrong, 2006) and competition (Armstrong and Wright, 2007). Despite some existing empirical research in the field, it remains relatively nascent (Sriram *et al.*, 2015). One of the first empirical studies assessing network effects in a two-sided context was conducted by Rysman (2004), who examined the importance of network effects in the Yellow Pages market. Additionally, Kaiser and Wright (2006) estimated the parameters of their model using data from nine different two-magazine groups in Germany over 30 years. Furthermore, Sun *et al.* (2019) relied on publicly available resources from the Chinese car-hailing market to determine the most effective pricing strategy for online car-hailing.

3.2 Industry platforms

The preliminary studies in this cluster examined platforms from a component or product perspective, e.g. Cusumano and Gawer (2002) and Gawer and Henderson (2007), and allocated limited attention to platform dynamics, particularly network effects. The shift from the product perspective was marked by a differentiation between two major types of technological platforms: internal platforms and industry platforms (Gawer and Cusumano, 2008). The industry platforms cluster laid its foundations on three different bodies of literature: product development, where the term "platform" denotes projects that create a new

family of products; technology strategy, which characterizes a platform as valuable points of control and rent extraction; and industrial economics, where platforms enable transactions among the various market sides (Baldwin and von Hippel, 2011). These three bodies of literature have mutual roots in engineering design, specifically in the architecture of platforms, which consist of a stable core (platform) and a variable periphery (complementors). Additionally, Gawer (2014) identified the creation of value through economies of scope in supply and/or demand as another vital commonality and conceptualized platforms as evolving organizations or meta-organizations that "(1) federate and coordinate constitutive agents who can innovate and compete; (2) create value by generating and harnessing economies of scope in supply or/and in demand; and (3) entail a modular technological architecture composed of a core and a periphery" (Gawer, 2014, p. 1239). This conceptualization is built on the economics literature, which views platforms as two-sided markets focusing on pricing and competition, and on the engineering literature, which views platforms as technological architectures emphasizing innovation.

Recently, the topic of platform ecosystems has garnered significant attention in this cluster. Adner (2017, p. 40) defined an ecosystem as "the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize." However, Jacobides *et al.* (2018) argue that the majority of studies have focused either on the definition of ecosystems or on the way they operate, as seen in works by Teece (2007), Ceccagnoli *et al.* (2012) and Adner (2017), among others. Jacobides *et al.* (2018) delved into the reasons behind the emergence of ecosystems and what sets them apart from other governance forms. They argued that modularity facilitates the emergence of ecosystems and defined them as "groups of firms that must deal with either unique or supermodular complementarities that are nongeneric, requiring the creation of a specific structure of relationships and alignment to create value" (Jacobides *et al.*, 2018, p. 2263). However, this definition has been perceived as broad since it does not necessitate the presence of a platform or interface standards (Teece, 2018).

The preliminary empirical studies in the industry platform cluster extensively relied on case studies of Intel, Microsoft and Cisco, e.g. Gawer and Henderson (2007), and Gawer and Cusumano (2008). However, later on, the cluster's empirical research expanded to include examinations of several industries. One of the first empirical studies exploring the interaction between industry platforms and industry architecture was conducted by Tee and Gawer (2009), focusing on the i-Mode services in two different territories. Additionally, the topic of disruptive innovation was addressed in the context of industry platforms. Ozalp *et al.* (2018) focused on intergenerational platform-technology transitions, basing their longitudinal study on the launch of 12 different video game consoles. In contrast, Ansari *et al.* (2016) examined disruptive innovation from the complementor's perspective through a longitudinal case study of a digital video recorder startup firm.

3.3 Digital platforms

The pervasiveness of digitalization has transformed the nature of information technology (IT), creating new customer experiences and altering interactions. Consequently, the Information Systems (IS) literature has shifted its attention beyond administrative systems, well-bounded organizational contexts, and industry boundaries. Emphasizing the importance of understanding the new dynamics in this context, Tilson *et al.* (2010) highlighted that digital infrastructures facilitate the emergence of new combinations of services and competencies, e.g. platforms (Hanseth and Lyytinen, 2010), which are a subcategory of digital infrastructures that feature specific control arrangements. Furthermore, Yoo *et al.* (2010) argued that the IS literature had disregarded the transformative impact of digitalization. They contended that, due to the pervasiveness of

	Two-sided markets	Industry platforms	Digital platforms	Innovation platforms	Two-sided networks
Central themes/ Keywords	- Two-sided markets - Competition - Multi-sided markets - Pricing strategies - Network effects - Multihoming	- Industry platforms - Platform ecosystem - Value creation - Business models - Strategic management - Digital platforms	- Digital platforms - Digital infrastructures - Governance - Boundary resources - Control - Platform ecosystem	- Innovation platforms - Digital entrepreneurs - Entrepreneurship - Innovation and competition - Digital platforms	- Two-sided networks - Network effects - Innovation - Competition - Revisiting conventional approaches and paradigms
Foundations of the cluster	- Network economics - Network externalities - Strategy discussions on the chicken-and-egg problem - Multi-product pricing - Vertical integration - Theory of the firm	- Product development - Technology strategy - Industrial economics - Engineering design (modularity) - Economies of scope in supply and demand	- Digital infrastructures - Layered architecture - Modular architecture - Software-based systems - Innovation networks	- Competition and innovation - (Layered) Modular architecture - User Innovation - (Digital) Innovation - (Digital) Entrepreneurship	- Network externalities - Price discrimination - Product differentiation - Competition and innovation - Revisiting conventional approaches, assumptions, and paradigms
Methodological approaches	- Econometric models are quite relevant in this cluster - Single case study - Multiple case studies - Surveys - Interviews - Longitudinal case studies	- Multiple case studies - Single case study - Longitudinal case studies - Interviews - Comparative case studies	- Single case study - Multiple case studies - Longitudinal case studies - Surveys - Comparative case studies - Interviews	- Multiple case studies - Single case study - Longitudinal case studies - Interviews - Surveys	- Econometric models are relevant in this cluster - Comparative case studies - Multiple case studies - Longitudinal case studies - Single case study - Interviews

(*continued*)

Table 1.
Comparative analysis of the five clusters

	Two-sided markets	Industry platforms	Digital platforms	Innovation platforms	Two-sided networks
Examples of studies	- Evans (2003) - Caillaud and Jullien (2003) - Rochet and Tirole (2003) - Armstrong (2006) - Hagiu and Wright (2015) - Hagiu *et al.* (2020) - Hagiu *et al.* (2022)	- Cusumano and Gawer (2002) - Gawer and Cusumano (2008) - Gawer and Cusumano (2014) - Gawer (2014) - Adner (2017) - Jacobides *et al.* (2018) - Teece (2018)	- Tiwana *et al.* (2010) - Tilson *et al.* (2010) - Yoo *et al.* (2010) - Ghazawneh and Henfridsson (2013) - Wareham *et al.* (2013) - de Reuver *et al.* (2018) - Modol and Eaton (2021)	- Boudreau (2010) - Baldwin and von Hippel (2011) - Boudreau (2012) - Boudreau and Jeppesen (2015) - Eckhardt *et al.* (2018) - Srinivasan and Venkatraman (2018) - Miric *et al.* (2019)	- Eisenmann *et al.* (2011) - Parker *et al.* (2016) - Parker and Van Alstyne (2018) - Parker *et al.* (2021) - Van Alstyne and Parker (2017) - Tan *et al.* (2020) - Parker *et al.* (2021)
Examples of examined contexts/ industries	- Payment cards - Newspapers/ magazines - E-commerce - Gaming industry - Internet portals	- Video games - Advertising - Sharing economy - E-commerce - Servitization	- Application developers - Software developers - Mobile platforms - Enterprise software - Smart cities	- Sharing economy - Crowdfunding - Software developers - Online communities - Crowdsourcing	- Video games - Software developers - Sharing economy - Internet intermediaries - Blockchain technology

Source(s): Own elaboration

Table 1.

digital technologies, a novel type of product architecture had emerged, the layered modular architecture, combining the modular architecture of physical products with the layered architecture of digital technology. Furthermore, Tiwana *et al.* (2010) argued that the IS literature had given limited attention to the emergence of software-based platforms. Thus, the digital platforms cluster has established its foundations in the engineering literature, which draws from both (physical) product development and software development, easily linking with software architecture.

The majority of studies in this cluster focus on the ecosystem's governance mechanisms, such as boundary resources (Ghazawneh and Henfridsson, 2013) or entry into the complementor's market (Foerderer *et al.*, 2018; Young Kang and Suarez, 2022). Eaton *et al.* (2015) argue that boundary resources are modified through distributed tuning involving a heterogeneous set of actors and artifacts, revealing the bilateral power in the tuning of boundary resources. Consequently, the conceptualization of technological platforms in the digital platforms cluster aligns with the industry platforms cluster's perspective of platforms as organizations or meta-organizations (Gawer, 2014), where the role of actors is vital in the development and management of digital platforms (Rolland *et al.*, 2018). Besides, following Tilson *et al.*'s (2010) suggestion, Henfridsson and Bygstad (2013) employed a multimethod research design, which included a thorough case study and a case survey. They identified three generative mechanisms of digital infrastructure: adoption, innovation and scaling. More recently, Modol and Eaton (2021) provided an overview of a 20-year period, illustrating how the concept of digital infrastructure evolved through three different phases – namely, the entrenchment of the periphery, the mutual entrenchment of the core and the periphery and the entrenchment of the core – and took the architectural form of a digital platform consisting of a core and a periphery.

One of the first empirical studies to examine platform ecosystem governance was that of Wareham *et al.* (2013), who conducted an in-depth investigation of a business software ecosystem and identified the tensions embedded within it. As the transformative effects of digitalization are better observed over prolonged time frames, longitudinal case studies are quite relevant in this cluster. Ondrus *et al.* (2015) conducted a longitudinal multi-case study on the mobile payment industry, introducing a decision model that aids the pre-launch decision-making process concerning platform openness. Additionally, Sandberg *et al.* (2020) examined the transformation of a product platform into an industry platform over a 40-year period by embracing digitization. Nevertheless, the majority of the previously mentioned studies have examined platform governance from the perspective of the platform owner, although a handful of exceptions exist, e.g. Benlian *et al.* (2015) and Rolland *et al.* (2018). Rolland *et al.* (2018) conducted a longitudinal interpretive case study to examine the interplay between digital options and digital debt from a user-centric perspective. They argue that the user-centric perspective complements the platform owner-centric perspective.

3.4 Innovation platforms

The innovation platforms cluster initially focused on computer platforms characterized by an integrated combination of hardware and software architecture. Boudreau (2010) delved into handheld computer systems, aiming to identify possible approaches to opening up a technological platform, whether by granting access, as seen with Apple, or devolving control, as in the case of Linux, and assessing their impact on the firm's rate of innovation. According to Boudreau (2010), in a handheld computer system, the platform is the software or the operating system, with the hardware serving as the complementor. However, network effects do not seem significant in the context of hardware development, as both research and practice have challenged their viability (Boudreau, 2010). Moreover, through conducting a

longitudinal case study, Boudreau (2012) argues that the performance of handheld computers is impacted by the number of application producers. Nevertheless, unlike Boudreau's (2010) study, this research considers the handheld computer as the platform and the applications as the complementors.

Due to the rapid technological development and the widespread adoption of modular design architectures, open collaborative and single-user innovations have extended beyond traditional contexts of the internet and personal computers (Baldwin and von Hippel, 2011). Boudreau and Jeppesen (2015) argued that platforms have evolved beyond multi-sided markets, with complementors now engaging beyond traditional pricing systems. Despite not being paid, complementors are motivated by various sources, including intrinsic and learning motivations (Boudreau and Jeppesen, 2015). With the advent of digitalization and the evolution of platform architecture, digital entrepreneurs have taken center stage. Platform firms heavily depend on digital entrepreneurs to develop third-party applications, as exemplified by Apple's iOS (Srinivasan and Venkatraman, 2018). Consequently, digital entrepreneurs play a significant role in supporting digital platforms (Eckhardt *et al.*, 2018; Srinivasan and Venkatraman, 2018). Nambisan *et al.* (2018) argue that two distinct phenomena have influenced the nature of entrepreneurship: open innovation, characterized by the emergence of open and distributed modes of innovation, and platformization, marked by the widespread prevalence of digital platforms. As a result, new forms of entrepreneurship have emerged, where entrepreneurs function as complementors to existing digital platforms (Nambisan *et al.*, 2018), operating in nontraditional environments (Miric *et al.*, 2019).

Initially, this cluster heavily relied on empirical studies related to computer platforms. Subsequently, these studies transitioned from traditional contexts to novel innovation activities. Boudreau (2017) investigated boundary choices in mobile computing platforms over 20 years, revealing that the openness vs control tradeoff is avoidable, as firms can simultaneously open up their platforms and maintain coordination. Additionally, Nucciarelli *et al.* (2017) explored the effects of crowdfunding, an implementation of open innovation, on the value created by opening up the business model to the crowd. They employed a multiple case study approach in the digital game industry, demonstrating that crowdfunding benefits surpass those of traditional fundraising. Also, Boudreau (2021) utilized a mixed-methods approach to study an online game and examined funders' motivations to crowdfund entrepreneurial ventures. Consequently, they identified three specific motivations: empathy and common cause, encouraging other funders and reciprocity. Moreover, relying on an information-based theory of entrepreneurial activity and testing it with 1,000 complementary apps, Eckhardt *et al.* (2018) argue that complementors who launch a free introductory application are more likely to commercialize it in response to specific types of information.

3.5 Two-sided networks

Despite having its roots in the network externality literature, an increased interest in the interactions between platform innovation and platform competition has been one of the main drivers behind the emergence of this cluster, akin to the innovation platforms cluster. Eisenmann *et al.* (2011) integrated research from both network theory and bundling to illustrate the economic and strategic motivations of platform envelopment. Platform envelopment represents a novel market entry path distinct from Schumpeter's theory of innovation, where the user base is the valuable resource, and managing envelopment is considered a dynamic capability (Eisenmann *et al.*, 2011). Furthermore, upon studying developers' role in inverting platforms, Parker *et al.* (2016) examined key strategic decisions that platforms face: the level of openness and the duration of intellectual property in a platform ecosystem. These decisions are influenced by competition and vertical integration levels, the number of developers and

innovation risk. However, they, in turn, impact developers' innovation capacity and sponsors' pricing power (Parker and Van Alstyne, 2018). Consequently, the innovation versus access tradeoff was taken a step further with the inclusion of intellectual property duration, linking the innovation literature to developers' competition, spillovers, and network effects (Parker *et al.*, 2016; Parker and Van Alstyne, 2018).

Rethinking conventional approaches, assumptions and paradigms is particularly relevant in this cluster. In the internet economy, supply-side economies of scale are no longer the driving force, and managing high fixed-cost resources does not guarantee market power. Instead, Van Alstyne *et al.* (2016a), and Van Alstyne and Parker (2017) argue that demand-side economies of scale are the new driving force, and network effects now serve as the foundation for gaining a competitive edge. Additionally, Anderson *et al.* (2014) found that the conventional winner-takes-all wisdom no longer applies in the presence of strong cross-network externalities. Further, while Porter's Five Forces Model can still be applied to platforms, Van Alstyne *et al.* (2016a) emphasize that the forces behave differently, and new factors, such as network effects, should be considered. Even the pricing results of the existing platform literature were revisited; Tan *et al.* (2020) argued that reducing prices on one side and increasing them on the other might be suboptimal in the face of integration investment. Similarly, conventional merger policies that were adopted during the industrial era can no longer be applied (Parker *et al.*, 2021). More recently, Li *et al.* (2021) introduced the two-zoned network (2ZN) model as a comprehensive framework that better illustrates platform competition, as the two-sided network model failed to fully capture the dynamics of platform competition.

Econometric models dominate this cluster, with a paucity of empirical studies. To examine the challenges that platform managers face, Eisenmann (2008) conducted a multi-year research project on platform strategies, including interviews with thirty companies. Additionally, to identify the factors that induce platform owners to close or open their platforms, Eisenmann *et al.* (2008) compared openness by role in platform-mediated networks, including Linux, Windows, Macintosh and iPhone. Besides, upon developing the platform envelopment framework, Eisenmann *et al.* (2011) created a database of academic papers on both network effects and platforms, developed econometric models to examine the economics of envelopment strategies and established a collection of case study data to test the novel framework. Furthermore, by studying success and failure case studies, Van Alstyne *et al.* (2016b) identified six reasons underlying the failure of platform firms. Additionally, after presenting their new 2ZN model, Li *et al.* (2021) conducted four distinct case studies to illustrate the features of the new model and compare them with those of the two-sided network model.

4. The three fundamental concerns

The co-citation analysis and examination of the five clusters have disclosed the structure of the industry platforms literature, revealing the existence of fundamental concerns within this body of work. Table 2 provides a comprehensive overview of the diverse research concerns across these five clusters: terminologies, definitions and classifications, and perspectives. Accordingly, we pose several research questions to address the identified concerns.

4.1 Terminologies

Throughout this article, we adopted the term *"industry platforms"* (Gawer and Cusumano, 2014, p. 420) to refer to technological platforms that are associated with network effects. However, this term is relevant in only the second cluster, that is, the industry platforms

cluster. Other clusters have completely different designations for such platforms, as shown in Table 2. For instance, the term "multi-sided markets" is widely used in the two-sided markets cluster. On one hand, upon classifying technological platforms as product or industry platforms, Gawer and Cusumano (2014, p. 422), who are the pioneers of the industry platforms cluster, argue that "... not all multi sided markets are industry platforms as we describe them in this paper. Double sided markets where the role of the platform is purely to facilitate exchange or trade, without the possibility for other players to innovate on complementary markets, seem to belong to the supply-chain category. A multi sided market that stimulates external innovation could be regarded as an industry platform. However, while all industry platforms function in this way, not all multi sided markets do." Therefore, multi-sided markets fall in a gray area between supply-chain platforms and industry platforms. Besides, according to the industry platforms cluster, unlike industry platforms, supply-chain platforms are not associated with the presence of network effects (Gawer and Cusumano, 2008). Thus, multi-sided markets that facilitate transactions between different actors are supply-chain platforms, which are not associated with network effects, while those that allow complementors to innovate on top of the platform are industry platforms, which are associated with network effects. On the other hand, based on the two-sided markets cluster, multi-sided platforms are associated with the presence of network effects (Evans, 2003). Also, according to Hagiu *et al.* (2020), all the following firms are referred to as multi-sided platforms: Airbnb, Alibaba, eBay, Expedia, Facebook, Tencent, Apple Store and Force.com. Take eBay as an example. In simplistic terms, eBay facilitates transactions between buyers and sellers. Thus, according to the industry platforms cluster, eBay is categorized as a multi-sided market falling into the supply-chain category, which is not associated with network effects. However, from the lens of the two-sided markets cluster, eBay is seen as a multi-sided platform that is associated with network effects. So, what are multi-sided platforms? Are they associated with network effects or not? Furthermore, even gyms, which are a more physical example, are considered multi-sided platforms, as many gyms have started renting out parts of their facilities to specialty studios that offer classes to gym members (Hagiu *et al.*, 2020).

Not only are there naming differences, but inconsistencies in terminology also arise among various clusters. The digital platforms cluster adopted the term "digital platforms" to describe software-based platforms, including, Ghazawneh and Henfridsson (2015) and de Reuver *et al.* (2018), to mention a few. More recently, the industry platforms cluster has adopted the same term to denote platforms previously called industry platforms, including Helfat and Raubitschek (2018), Bonina *et al.* (2021) and Gawer (2022), among others. However, this shift has led to criticism from the digital platforms cluster, asserting that, when tackling the topic of digital platforms, the industry platforms cluster overlooks the theoretical significance of technology, or digitality in particular (de Reuver *et al.*, 2018). This critique by de Reuver *et al.* (2018) highlights the industry platforms cluster's broad treatment and classification of technological platforms. The digital platforms cluster, as defined by de Reuver *et al.* (2018, p. 126), characterizes digital platforms as "purely technical artefacts where the platform is an extensible codebase, and the ecosystem comprises third-party modules complementing this codebase." This definition aligns with the industry platforms cluster's concept of innovation platforms, which serve as a technological foundation for complementary innovations, exemplified by Apple iOS (Cusumano *et al.*, 2019). However, innovation platforms represent only one category of industry platforms. The second category, transaction platforms, focuses on facilitating transactions between different actors, illustrated by the Apple AppStore (Cusumano *et al.*, 2019). Thus, the definition of transaction platforms deviates from that of digital platforms as defined by the digital platforms cluster. Despite their omnipresence and potential status as the iconic

organizational form in the era of digitalization (Gawer, 2022), digital platforms *per se* remain undefined (Bonina *et al.*, 2021). This ambiguity raises the question of whether all industry platforms can be categorized as digital platforms, or if a distinction exists between digital and non-digital platforms. Furthermore, are all multi-sided platforms digital ones? Is eBay considered a digital platform or not? According to the digital platforms cluster, eBay is not a digital platform since it does not provide an extensible codebase. Therefore, is the presence of an extensible codebase the distinguishing factor between a digital platform and a non-digital one?

Inconsistencies also arise in the application of the term "innovation platforms." This term is mainly used in two different clusters, the industry platforms cluster and the innovation platforms cluster. According to Gawer (2021, p. 8), an innovation platform "serves as a technological foundation upon which other firms develop complementary innovations," e.g. Apple iOS. However, Baldwin and von Hippel (2011, p. 1412) offer a different perspective, "Innovation platforms are components that provide a stable framework or binding surface that serves to support and organize the innovation contributions of many complementors (Gawer and Cusumano, 2002; Gawer and Henderson, 2007; Baldwin *et al.*, 2009; Gawer, 2009). Platforms can range from interface standards such as an application programming interface or a screw thread specification, to open source software platforms like Apache or Linux, to social networking sites like Facebook." Consequently, Baldwin and von Hippel (2011) classified social networking sites, such as Facebook, as innovation platforms. However, according to Cusumano *et al.* (2019) and Gawer (2021), Facebook for developers qualifies as an innovation platform, while Facebook's social network is labeled a transaction platform rather than an innovation platform. This discrepancy prompts the question: which platforms can be classified as innovation platforms, and which ones cannot?

These were just a few examples from the literature, yet it is clear that inconsistent terminologies exist in the literature. These variations create confusion for any reader, whether academic or not, and have the potential to impede the field's evolution due to the associated confusion they generate. In light of the aforementioned considerations, we pose the following research questions: Why are different terminologies employed to refer to the same phenomena, namely, platforms associated with network effects? How have these terminologies evolved over time within the industry platforms literature, and what factors contributed to the evolution of these terminologies and conceptualizations? How might interdisciplinary collaboration contribute to a more integrated and cohesive conceptualization of platforms that are associated with network effects? How can the inconsistencies in terminologies across different clusters be addressed to establish a more standardized language in the field of industry platforms, thereby fostering clearer communication and coherence within the discipline?

4.2 Classifications

The differences arise not only in the terminologies of industry platforms but also in their classifications. In the two-sided markets cluster, Evans and Schmalensee (2008) were among the very few scholars who classified two-sided platforms into four different categories: (1) exchanges: platforms that assist buyers and suppliers in searching for feasible contracts and accordingly facilitate transactions between the different sides, e.g. eBay; (2) advertiser-supported media: platforms that either create content, e.g. magazines, or buy content, e.g. free television; (3) transaction devices: platforms that connect merchants and their customers, e.g. payment cards; and (4) software platforms: platforms that provide services for application developers, e.g. video game industry. Besides, in the industry platforms cluster, Gawer and Cusumano (2008) identified two major types of

technological platforms: internal platforms and industry platforms. Furthermore, supply-chain platforms represent a distinct category of internal platforms where external firms supply intermediate components to the platform owner. This special type of platform differs from industry platforms in that, in the latter, external firms do not necessarily trade with each other, nor do they belong to the same supply chain (Gawer and Cusumano, 2014). Furthermore, Cusumano *et al.* (2019) identified two different categories of industry platforms based on their primary functions: (1) transaction platforms, which facilitate transactions between different actors, e.g. Apple AppStore; and (2) innovation platforms, which facilitate complementary innovations as the platform serves as a technological foundation, e.g. Apple iOS. Additionally, hybrid platforms fall in between and share functions of the two main categories, e.g. Apple (Cusumano *et al.*, 2019). In the digital platforms cluster, de Reuver *et al.* (2018) distinguished between two types of platforms based on their degree of digitality: (1) digital platforms, which provide an extensible codebase for third-party complementors to develop on; and (2) non-digital platforms, which solely mediate transactions between the different sides of the platform without providing an extensible codebase. Furthermore, Ghazawneh and Henfridsson (2015) examined digital application marketplaces, identifying four distinct types based on their control arrangements and the functional scope: (1) closed marketplaces, where control is centralized and application functionality is narrow, e.g. Army Software Marketplace; (2) censored, where control is centralized and application functionality is broad, e.g. Apple AppStore; (3) focused, where control is decentralized and application functionality is narrow, e.g. Taobao App Market; and (4) open marketplaces, where control is decentralized and application functionality is broad, e.g. Jolla Store. Additionally, the innovation platforms cluster has its own classifications. Upon examining the non-price instruments that multi-sided platforms rely on to regulate their platforms and ecosystems, Boudreau and Hagiu (2008) explored two digital multi-sided platforms, Facebook and TopCoder, and two non-digital multi-sided platforms, Roppongi Hills and Harvard Business School. Thereby, classifying multi-sided platforms into two distinct types: digital and non-digital multi-sided platforms. Also, Boudreau and Lakhani (2009) classified platforms based on their corresponding business models: (1) integrator platform, where the platform owner acts as a middle-man between customers and external innovators, e.g. app stores; (2) product platform, where the platform serves as a foundation for third-party complementors to develop and sell their offerings to customers, e.g. Google Cloud Computing Services; and (3) two-sided or multi-sided platform, where third-party innovators can directly transact with customers but should affiliate with the platform, e.g. Facebook advertisers. Even the two-sided networks cluster has its own classification. Eisenmann (2008) identified four distinct types of platforms based on both the role of the platform and the number of firms in each role: (1) proprietary: a single provider and a single sponsor, e.g. PlayStation; (2) shared: multiple providers and multiple sponsors, e.g. DVD; (3) licensing: multiple providers and a single sponsor, e.g. Palm operating system; and (4) joint venture: a single provider and multiple sponsors, e.g. CareerBuilder.

In light of this discussion, several questions arise regarding the different definitions and classifications. Why do different classifications exist to categorize the same phenomena, namely platforms associated with network effects? In what manner did the classifications evolve over time, and did they mirror the evolution of diverse terminologies within the industry platforms' literature? In what ways can interdisciplinary collaboration contribute to the synthesis of definitions and classifications, drawing insights from fields such as sociology, economics and technology studies to create a more holistic understanding? How could a unified framework for defining and classifying industry platforms be developed to consider the diverse perspectives and classifications found across different clusters, fostering a more cohesive and comprehensive understanding within the field?

Table 2. Fundamental areas of concerns in the literature on industry platforms

	Two-sided markets	Industry platforms	Digital platforms	Innovation platforms	Two-sided networks
Terminologies	- Two-sided markets - Two-sided platforms - Multi-sided platforms - Platforms	- Industry platforms - Platforms - Digital platforms - Double-sided markets	- Digital platforms - Software-based platforms - Digital infrastructures - Platforms	- Innovation platforms - Multi-sided platforms - Digital platforms - Two-sided platforms - Platforms	- Two-sided networks - Platforms - Two-sided markets - Multi-sided platforms
Definitions	"technologies, products or services that create value primarily by enabling direct interactions between two or more customer or participant groups" (Hagiu, 2014, p. 71)	"products, services or technologies developed by one or more firms, and which serve as foundations upon which a larger number of firms can build further complementary innovations and potentially generate network effects" (Gawer and Cusumano, 2014, p. 420)	"purely technical artefacts where the platform is an extensible codebase, and the ecosystem comprises third-party modules complementing this codebase" (de Reuver *et al.*, 2018, p. 126)	"components that provide a stable framework or binding surface that serves to support and organize the innovation contributions of many complementors" (Baldwin and von Hippel, 2011, p. 1412)	"products and services that bring together groups of users in two-sided networks" (Eisenmann *et al.*, 2006, p. 2)
Classifications	Classified two-sided platforms into four different types (Evans and Schmalensee, 2008) - Exchanges - Advertiser-supported media - Transaction devices - Software platforms	Classified platforms based on their primary function (Cusumano *et al.*, 2019) - Transaction platforms - Innovation platforms - Hybrid platforms	- Classified platforms based on the degree of digitality (de Reuver *et al.*, 2018) . Digital platforms . Non-digital platforms - Identified four distinct digital application marketplaces based on the control arrangements and on the functional scope (Ghazawneh and Henfridsson, 2015) . Closed marketplaces . Censored marketplaces . Focused marketplaces . Open marketplaces	Classified platforms based on their corresponding business models (Boudreau and Lakhani, 2009) - Integrator platforms - Product platforms - Two-sided or multi-sided platforms	Classified platforms based on the role of the platform and the number of firms in each role (Eisenmann *et al.*, 2008) - Proprietary platforms - Shared platforms - Licensing platforms - Joint venture platforms
Perspectives	The platform owner's perspective is relatively dominant	The platform owner's perspective is relatively dominant with very few exceptions, e.g. Ansari *et al.* (2016)	Platform owner's perspective is relatively dominant with very few exceptions, e.g. Benlian *et al.* (2015), and Rolland *et al.* (2018)	- Complementor's perspective - Platform owner's perspective - Dyadic perspective	The platform owner's perspective is relatively dominant

Source(s): Own elaboration

4.3 Perspectives

The majority of the industry platforms literature has initially focused on platforms from the perspective of the platform owner. The two-sided markets cluster, the pioneering cluster, has consistently explored competition between platforms. Even in the early case studies of Intel, Microsoft and Cisco, the industry platforms cluster approached the examination of industry platforms primarily through the lens of the platform owner. Similarly, the digital platforms cluster has consistently examined the topic of governance from the perspective of the platform owner. Likewise, the two-sided networks cluster has always examined the interaction between platform innovation and platform competition through the lens of the platform owner. Nevertheless, it is important to recognize that platform dynamics can be examined at different levels and from various perspectives. Tiwana (2015) argues that the majority of previous studies have focused on competition among platforms rather than within them. We argue that platform competition occurs at least at three different levels: (1) competition between platforms themselves, e.g. Apple iOS vs Samsung Android; (2) competition between platforms and their complementors, e.g. Microsoft Edge vs Google Chrome; and (3) competition between complementors themselves, e.g. Battlefield vs Call of Duty. The same holds true for platform ecosystem governance and platform openness, which is a governance-related concept, as the majority of relevant studies have discussed these topics from the perspective of the platform owner, or, the macro level. However, the topic of governance can also be examined from the perspective of third-party developers, that is the micro level, as demonstrated by Benlian *et al.* (2015), or even from the user-organization perspective, as shown by Rolland *et al.* (2018). Rolland *et al.* (2018) argue that the user-centric perspective does not diminish the owner-centric perspective; rather, it complements it. Also, Constantinides *et al.* (2018) argue that the complementor perspective is as important as the platform owner perspective, but the former is examined less frequently in the literature. In contrast to other clusters, the innovation platforms cluster, particularly in recent literature, has dedicated significant attention to the perspective of third-party complementors, as shown by Nambisan *et al.* (2018), Srinivasan and Venkatraman (2018), Boudreau (2021), Miric *et al.* (2019), and Wu *et al.* (2022), among others. However, it is essential to note that the platform owner's perspective continues to hold significance within this cluster. Additionally, several studies have contributed to both perspectives, namely, those of the platform owner and third-party complementors. For example, Srinivasan and Venkatraman (2020) analyzed platform providers' actions, the strategic choices of external complementors, and how these actions coevolve. This analysis provided insights into platform evolution and architectural convergence from a dyadic and dynamic perspective. Accordingly, we argue that a holistic view of platforms and their ecosystems cannot be achieved until various topics are explored from the perspectives of the different actors in the ecosystem, which includes four different players: platform owner, platform provider, producers, and consumers (Van Alstyne *et al.*, 2016a).

The perspective adopted by certain clusters has hindered the exploration of understudied aspects of industry platforms. In the two-sided markets cluster, the different sides of the market, including complementors, are perceived as simple consumers (Gawer, 2014). For instance, innovation built upon the platform is considered a decision related to consumption (Gawer, 2014). Consequently, when viewing the different sides as consumers, the two-sided markets cluster overlooks the competitive interactions occurring between the platform owner and the external complementors, as well as among the external complementors themselves. Thus, from the perspective of the two-sided markets cluster, competition in the context of industry platforms is exclusively between one platform and another. For this reason, the two-sided markets cluster has consistently examined competition from the platform owner's perspective. This tendency is also observed in the industry platforms cluster and the two-sided networks cluster, as they have been strongly influenced by the conceptualizations of

the two-sided markets cluster. Besides, the digital platforms cluster's consistent focus on the platform owner's perspective may be attributed to the cluster's perception of the platform owner sitting at the center of the ecosystem, bearing the responsibility of governing the various ecosystem actors.

Given this discussion, several questions emerge concerning the dominance of the platform owner's perspective in the industry platforms literature. How has the dominance of the platform owner's perspective influenced the overall trajectory of research within the industry platforms literature? To what extent does the platform owner's perspective contribute to potential biases in the analysis and interpretation of industry platform dynamics, and how might this impact the broader understanding of the field? In what ways can research efforts be redirected or expanded to ensure a more balanced exploration of industry platform dynamics, considering perspectives beyond that of the platform owner? To what degree do alternative perspectives, such as those of third-party developers or users, offer valuable insights that may be overlooked when primarily examining the industry platforms from the platform owner's viewpoint? How might the industry platforms literature benefit from incorporating a more pluralistic approach, considering the interplay of perspectives from various stakeholders, to enhance the richness and depth of research insights?

5. Conclusion

The industry platforms literature has experienced substantial growth over the past 20 years, giving rise to various research streams. However, the comprehension of platforms is dispersed across these streams, each delving into distinct aspects of industry platforms. We suggest that the harnessing of this diverse body of knowledge can be pushed further, aiming to deepen our understanding of industry platforms and foster a holistic view of platforms and their ecosystems. As an initial step toward achieving this objective, we conducted an extensive analysis of 458 articles using bibliometric methods and systematic review techniques. Our aim is to reveal the underlying structure of the literature, identify key research concerns and offer insightful suggestions for future research. First, through co-citation analysis, we identified five clusters based on diverse bodies of literature: two-sided markets, industry platforms, digital platforms, innovation platforms and two-sided networks. The roots of the industry platforms literature are often attributed to the economics of network externalities and strategic discussions regarding the chicken-and-egg dilemma, namely, the two-sided markets cluster (Katz and Shapiro, 1985; Caillaud and Jullien, 2001, 2003; Rochet and Tirole, 2003). Consequently, the two-sided markets cluster was the first to gain traction, primarily focusing on the issue of competition between platforms. Subsequently, the industry platforms cluster emerged, serving as a bridge between the economics literature, which emphasizes competition, and the engineering design literature, which focuses on innovation (Gawer, 2014). Around 2010, the rest of the clusters began to emerge. The digital platforms cluster gained prominence following the works of Tilson *et al.* (2010), Tiwana *et al.* (2010), and Yoo *et al.* (2010), who highlighted the limited attention given to the topic by IS scholars. Additionally, the innovation platforms cluster and the two-sided networks cluster emerged due to the increased interest in the interaction between competition and innovation topics (Gawer, 2014), as evidenced by the publications of Boudreau (2010) and Eisenmann *et al.* (2011).

Our bibliometric analysis, coupled with our systematic review, unveiled three critical areas of concern that demand attention for a more effective harnessing of this diverse body of work: terminologies, definitions and classifications, and perspectives. As for the terminologies, the issue extends beyond various terminologies being used to refer to the same phenomena. Inconsistent terminologies are being adopted, creating a sense of confusion that might lead to different interpretations of research findings when harnessing knowledge

from diverse fields. Furthermore, various clusters employ different classifications for industry platforms. Consequently, there is still uncertainty regarding the various types of existing platforms and business models, as well as the evolutionary pathways these platforms take over time. For example, while some scholars have explored the transition of a two-sided platform into a multi-sided platform (Zhao and Chen, 2019), others have investigated the evolution of a hub-and-spoke multi-sided platform into a networked multi-sided platform, ultimately transforming into a symbiotic multi-sided platform (Tan *et al.*, 2015). Therefore, to further optimize the effective utilization of this diverse body of knowledge, we suggest fostering collaboration among scholars, both within and across different clusters, in order to adopt a common language, encompassing shared terminologies, definitions and classifications. Furthermore, the majority of the literature on industry platforms has examined platforms from a single perspective, the platform owner's perspective. Nevertheless, the platform owner is only one player in the ecosystem, which includes four different players: platform owner, platform provider, producers and consumers (Van Alstyne *et al.*, 2016a). Therefore, to contribute to the progress of the literature and the development of a holistic view of platforms and their ecosystems, it is essential to examine platforms not only from the perspective of the platform owner but also from the viewpoints of the different players within the ecosystem.

Lastly, like any other research paper, our paper is not without limitations. First, we relied solely on Scopus to obtain the articles for our bibliometric analysis and systematic review. However, other databases, such as the Web of Science (Falagas *et al.*, 2008), could be used, or they could even be combined with Scopus to generate a new list of articles. Additionally, we used VOSviewer to conduct our bibliometric analysis. However, other software, such as Leximancer (Wilden *et al.*, 2016) could also be utilized to conduct a bibliometric analysis.

References

Acedo, F.J., Barroso, C. and Galan, J.L. (2006), "The resource-based theory: dissemination and main trends", *Strategic Management Journal*, Vol. 27 No. 7, pp. 621-636, doi: 10.1002/smj.532.

Adner, R. (2017), "Ecosystem as structure: an actionable construct for strategy", *Journal of Management*, Vol. 43 No. 1, pp. 39-58, doi: 10.1177/0149206316678451.

Anderson, E.G., Parker, G.G. and Tan, B. (2014), "Platform performance investment in the presence of network externalities", *Information Systems Research*, Vol. 25 No. 1, pp. 152-172, doi: 10.1287/isre.2013.0505.

Ansari, S.S., Garud, R. and Kumaraswamy, A. (2016), "The disruptor's dilemma: TiVo and the U.S. television ecosystem", *Strategic Management Journal*, Vol. 37 No. 9, pp. 1829-1853, doi: 10.1002/smj.2442.

Armstrong, M. (2006), "Competition in two-sided markets", *The RAND Journal of Economics*, Vol. 37 No. 3, pp. 668-691, doi: 10.1111/j.1756-2171.2006.tb00037.x.

Armstrong, M. and Wright, J. (2007), "Two sided markets, competitive bottlenecks and exclusive contracts", *Economic Theory*, Vol. 32 No. 2, pp. 353-380, doi: 10.1007/s00199-006-0114-6.

Baldwin, C. and von Hippel, E. (2011), "Modeling a paradigm shift: from producer innovation to user and open collaborative innovation", *Organization Science*, Vol. 22 No. 6, pp. 1399-1417, doi: 10.4337/9781849807630.00024.

Baldwin, C.Y., Woodard, C.J. and Gawer, A. (2009), "The architecture of platforms: a unified view", in *Platforms, Markets and Innovation*, Edward Elgar, London, pp. 19-44.

Bayer, A.E., Smart, J.C. and McLaughlin, G.W. (1990), "Mapping intellectual structure of a scientific subfield through author cocitations", *Journal of the American Society for Information Science*, Vol. 41 No. 6, pp. 444-452, doi: 10.1002/(SICI)1097-4571(199009)41:63.0.CO;2-J.

Benlian, A., Hilkert, D. and Hess, T. (2015), "How open is this platform? The meaning and measurement of platform openness from the complementers' perspective", *Journal of Information Technology*, Vol. 30 No. 3, pp. 209-228, doi: 10.1057/jit.2015.6.

Bonina, C., Koskinen, K., Eaton, B. and Gawer, A. (2021), "Digital platforms for development: foundations and research agenda", *Information Systems Journal*, Vol. 31 No. 6, pp. 869-902, doi: 10.1111/isj.12326.

Boudreau, K. (2010), "Open platform strategies and innovation: granting access vs devolving control", *Management Science*, Vol. 56 No. 10, pp. 1849-1872, doi: 10.1287/mnsc.1100.1215.

Boudreau, K. (2012), "Let a thousand flowers bloom? An early look at large numbers of software app developers and patterns of innovation", *Organization Science*, Vol. 23 No. 5, pp. 1409-1427, doi: 10.1287/orsc.1110.0678.

Boudreau, K. (2017), "Platform-based organization and boundary choices: 'opening-up' while still coordinating and orchestrating", *SSRN Electronic Journal*. doi: 10.2139/ssrn.2929725.

Boudreau, K. (2021), "Promoting platform takeoff and self-fulfilling expectations: field experimental evidence", *Management Science*, Vol. 67 No. 9, pp. 5953-5967, doi: 10.1287/mnsc.2021.3999.

Boudreau, K. and Hagiu, A. (2008), "Platform rules: multi-sided platforms as regulators", in Gawer, A. (Ed.), *Platforms, Markets and Innovation*, Edward Elgar Publishing, pp. 163-191.

Boudreau, K. and Jeppesen, L.B. (2015), "Unpaid crowd complementors: the platform network effect mirage", *Strategic Management Journal*, Vol. 36 No. 12, pp. 1761-1777, doi: 10.1002/smj.2324.

Boudreau, K. and Lakhani, K.R. (2009), "How to manage outside innovation", *MIT Sloan Management Review*, Vol. 50 No. 4, pp. 68-76.

Caillaud, B. and Jullien, B. (2001), "Competing cybermediaries", *European Economic Review*, Vol. 45 Nos 4-6, pp. 797-808, doi: 10.1016/S0014-2921(01)00123-4.

Caillaud, B. and Jullien, B. (2003), "Chicken and egg: competition among intermediation service providers", *The RAND Journal of Economics*, Vol. 34 No. 2, pp. 309-328, doi: 10.2307/1593720.

Calvano, E. and Polo, M. (2021), "Market power, competition and innovation in digital markets: a survey", *Information Economics and Policy*, Vol. 54, 100853, doi: 10.1016/j.infoecopol.2020.100853.

Ceccagnoli, M., Forman, C., Huang, P. and Wu, D.J. (2012), "Cocreation of value in a platform ecosystem: the case of enterprise software", *MIS Quarterly*, Vol. 36 No. 1, pp. 263-290, doi: 10.2307/41410417.

Constantinides, P., Henfridsson, O. and Parker, G.G. (2018), "Platforms and infrastructures in the digital age", *Information Systems Research*, Vol. 29 No. 2, pp. 381-400, doi: 10.1287/isre.2018.0794.

Correia-da-Silva, J., Jullien, B., Lefouili, Y. and Pinho, J. (2019), "Horizontal mergers between multisided platforms: insights from Cournot competition", *Journal of Economics and Management Strategy*, Vol. 28 No. 1, pp. 109-124, doi: 10.1111/jems.12309.

Cusumano, M.A. and Gawer, A. (2002), "The elements of platform leadership", *MIT Sloan Management Review*, Vol. 43 No. 3, pp. 51-58, doi: 10.1109/EMR.2003.1201437.

Cusumano, M.A., Gawer, A. and Yoffie, D.B. (2019), *The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power*, Harper Business, New York.

de Reuver, M., Sørensen, C. and Basole, R.C. (2018), "The digital platform: a research agenda", *Journal of Information Technology*, Vol. 33 No. 2, pp. 124-135, doi: 10.1057/s41265-016-0033-3.

Di Stefano, G., Peteraf, M. and Verona, G. (2010), "Dynamic capabilities deconstructed: a bibliographic investigation into the origins, development, and future directions of the research domain", *Industrial and Corporate Change*, Vol. 19 No. 4, pp. 1187-1204, doi: 10.1093/icc/dtq027.

Eaton, B., Elaluf-Calderwood, S., Sørensen, C. and Yoo, Y. (2015), "Distributed tuning of boundary resources: the case of Apple's iOS service system", *MIS Quarterly*, Vol. 39 No. 1, pp. 217-243, doi: 10.25300/MISQ/2015/39.1.10.

Eckhardt, J.T., Ciuchta, M.P. and Carpenter, M. (2018), "Open innovation, information, and entrepreneurship within platform ecosystems", *Strategic Entrepreneurship Journal*, Vol. 12 No. 3, pp. 369-391, doi: 10.1002/sej.1298.

Eisenmann, T. (2008), "Managing proprietary and shared platforms", *California Management Review*, Vol. 50 No. 4, pp. 31-53, doi: 10.2307/41166455.

Eisenmann, T., Parker, G.G. and Van Alstyne, M. (2006), "Strategies for two-sided markets", *Harvard Business Review*, Vol. 84 No. 10, pp. 1-11.

Eisenmann, T., Parker, G.G. and Van Alstyne, M. (2008), "Opening platforms: how, when and Why?", in Gawer, A. (Ed.), *Platforms, Markets and Innovation*, Edward Elgar Publishing, pp. 131-162.

Eisenmann, T., Parker, G.G. and Van Alstyne, M. (2011), "Platform envelopment", *Strategic Management Journal*, Vol. 32 No. 12, pp. 1270-1285, doi: 10.1002/smj.935.

Evans, D.S. (2003), "The antitrust economics of multi-sided platform markets", *Yale Journal on Regulation*, Vol. 20 No. 253, pp. 325-381.

Evans, D.S. and Schmalensee, R. (2008), "Markets with two-sided platforms", *Competition Law and Policy*, Vol. 1 No. 28, pp. 667-693.

Falagas, M.E., Pitsouni, E.I., Malietzis, G.A. and Pappas, G. (2008), "Comparison of PubMed, Scopus, Web of science, and Google scholar: strengths and weaknesses", *The FASEB Journal*, Vol. 22 No. 2, pp. 338-342, doi: 10.1096/fj.07-9492LSF.

Foerderer, J., Kude, T., Mithas, S. and Heinzl, A. (2018), "Does platform owner's entry crowd out innovation? Evidence from Google photos", *Information Systems Research*, Vol. 29 No. 2, pp. 444-460, doi: 10.1287/isre.2018.0787.

Foerderer, J., Lueker, N. and Heinzl, A. (2021), "And the winner is . . .? The desirable and undesirable effects of platform awards", *Information Systems Research*, Vol. 32 No. 4, pp. 1155-1172, doi: 10.1287/isre.2021.1019.

Gawer, A. (2009), "Platform dynamics and strategies: from products to services", *Platforms, Markets and Innovation*, Edward Elgar, London, pp. 45-76.

Gawer, A. (2014), "Bridging differing perspectives on technological platforms: toward an integrative framework", *Research Policy*, Vol. 43 No. 7, pp. 1239-1249, doi: 10.1016/j.respol.2014.03.006.

Gawer, A. (2021), "Digital platforms' boundaries: the interplay of firm scope, platform sides, and digital interfaces", *Long Range Planning*, Vol. 54 No. 5, 102045, doi: 10.1016/j.lrp.2020.102045.

Gawer, A. (2022), "Digital platforms and ecosystems: remarks on the dominant organizational forms of the digital age", *Innovation: Organization and Management*, Vol. 24 No. 1, pp. 1-15, doi: 10.1080/14479338.2021.1965888.

Gawer, A. and Cusumano, M.A. (2002), *Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation*, Harvard Business School Press, Boston.

Gawer, A. and Cusumano, M.A. (2008), "How companies become platform leaders", *MIT Sloan Management Review*, Vol. 49 No. 2, pp. 28-35.

Gawer, A. and Cusumano, M.A. (2014), "Industry platforms and ecosystem innovation: platforms and innovation", *Journal of Product Innovation Management*, Vol. 31 No. 3, pp. 417-433, doi: 10.1111/jpim.12105.

Gawer, A. and Henderson, R. (2007), "Platform owner entry and innovation in complementary markets: evidence from Intel", *Journal of Economics and Management Strategy*, Vol. 16 No. 1, pp. 1-34, doi: 10.1111/j.1530-9134.2007.00130.x.

Gerlach, H. and Li, J. (2021), "Platform competition, vertical differentiation and price coherence", *The Journal of Law and Economics*, Vol. 64 No. 3, pp. 439-477, doi: 10.1086/713453.

Ghazawneh, A. and Henfridsson, O. (2013), "Balancing platform control and external contribution in third-party development: the boundary resources model: control and contribution in third-party development", *Information Systems Journal*, Vol. 23 No. 2, pp. 173-192, doi: 10.1111/j.1365-2575.2012.00406.x.

Ghazawneh, A. and Henfridsson, O. (2015), "A paradigmatic analysis of digital application marketplaces", *Journal of Information Technology*, Vol. 30 No. 3, pp. 198-208, doi: 10.1057/jit.2015.16.

Hagiu, A. (2007), "Merchant or two-sided platform?", *Review of Network Economics*, Vol. 6 No. 2, pp. 115-133, doi: 10.2139/ssrn.950100.

Hagiu, A. (2014), "Strategic decisions for multisided platforms", *MIT Sloan Management Review*, Vol. 55 No. 2, pp. 92-93.

Hagiu, A. and Wright, J. (2015), "Multi-sided platforms", *International Journal of Industrial Organization*, Vol. 43, pp. 162-174, doi: 10.1016/j.ijindorg.2015.03.003.

Hagiu, A. and Wright, J. (2018), "Controlling versus enabling", *Management Science*, Vol. 65 No. 2, pp. 577-595, doi: 10.1287/mnsc.2017.2956.

Hagiu, A., Jullien, B. and Wright, J. (2020), "Creating platforms by hosting rivals", *Management Science*, Vol. 66 No. 7, pp. 3234-3248, doi: 10.1287/mnsc.2019.3356.

Hagiu, A., Teh, T. and Wright, J. (2022), "Should platforms be allowed to sell on their own marketplaces?", *The RAND Journal of Economics*, Vol. 53 No. 2, pp. 297-327, doi: 10.1111/1756-2171.12408.

Hanseth, O. and Lyytinen, K. (2010), "Design theory for dynamic complexity in information infrastructures: the case of building internet", *Journal of Information Technology*, Vol. 25, pp. 1-19, doi: 10.1007/978-3-319-29272-4_4.

Helfat, C.E. and Raubitschek, R.S. (2018), "Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems", *Research Policy*, Vol. 47 No. 8, pp. 1391-1399, doi: 10.1016/j.respol.2018.01.019.

Henfridsson, O. and Bygstad, B. (2013), "The generative mechanisms of digital infrastructure evolution", *MIS Quarterly*, Vol. 37 No. 3, pp. 907-931, doi: 10.25300/MISQ/2013/37.3.11.

Jacobides, M.G., Cennamo, C. and Gawer, A. (2018), "Towards a theory of ecosystems", *Strategic Management Journal*, Vol. 39 No. 8, pp. 2255-2276, doi: 10.1002/smj.2904.

Jeong, Y.K., Song, M. and Ding, Y. (2014), "Content-based author co-citation analysis", *Journal of Informetrics*, Vol. 8 No. 1, pp. 197-211, doi: 10.1016/j.joi.2013.12.001.

Kaiser, U. and Wright, J. (2006), "Price structure in two-sided markets: evidence from the magazine industry", *International Journal of Industrial Organization*, Vol. 24 No. 1, pp. 1-28, doi: 10.1016/j.ijindorg.2005.06.002.

Katz, M.L. and Shapiro, C. (1985), "Network Externalities,Competition, and compatibility", *The American Economic Review*, Vol. 75 No. 3, pp. 424-440.

Kraus, S., Breier, M., Lim, W.M., Dabić, M., Kumar, S., Kanbach, D., Mukherjee, D., Corvello, V., Piñeiro-Chousa, J., Liguori, E., Palacios-Marqués, D., Schiavone, F., Ferraris, A., Fernandes, C. and Ferreira, J.J. (2022), "Literature reviews as independent studies: guidelines for academic practice", *Review of Managerial Science*, Vol. 16 No. 8, pp. 2577-2595, doi: 10.1007/s11846-022-00588-8.

Kraus, S., Bouncken, R.B. and Yela Aránega, A. (2024), "The burgeoning role of literature review articles in management research: an introduction and outlook", *Review of Managerial Science*, Vol. 18 No. 2024, pp. 299-314, doi: 10.1007/s11846-024-00729-1.

Li, Z., Shao, B.B.M. and Goul, M. (2021), "A model of two-zoned network for platform competition", *Decision Support Systems*, Vol. 146 No. 3, 113547, doi: 10.1016/j.dss.2021.113547.

Lin, F., Tian, H., Zhao, J. and Chi, M. (2022), "Reward or punish: investigating output controls and content generation in the multi-sided platform context", *Internet Research*, Vol. 33 No. 2, pp. 578-605, doi: 10.1108/INTR-05-2021-0292.

Miric, M., Boudreau, K. and Jeppesen, L.B. (2019), "Protecting their digital assets: the use of formal and informal appropriability strategies by App developers", *Research Policy*, Vol. 48 No. 8, 103738, doi: 10.1016/j.respol.2019.01.012.

Modol, J.R. and Eaton, B. (2021), "Digital infrastructure evolution as generative entrenchment: the formation of a core–periphery structure", *Journal of Information Technology*, Vol. 36 No. 4, pp. 342-364, doi: 10.1177/02683962211013362.

Nambisan, S., Siegel, D. and Kenney, M. (2018), "On open innovation, platforms, and entrepreneurship", *Strategic Entrepreneurship Journal*, Vol. 12 No. 3, pp. 354-368, doi: 10.1002/sej.1300.

Nerur, S.P., Rasheed, A.A. and Natarajan, V. (2008), "The intellectual structure of the strategic management field: an author co-citation analysis", *Strategic Management Journal*, Vol. 29 No. 3, pp. 319-336, doi: 10.1002/smj.659.

Newbert, S.L. (2007), "Empirical research on the resource-based view of the firm: an assessment and suggestions for future research", *Strategic Management Journal*, Vol. 28 No. 2, pp. 121-146, doi: 10.1002/smj.573.

Nucciarelli, A., Li, F., Fernandes, K.J., Goumagias, N., Cabras, I., Devlin, S., Kudenko, D. and Cowling, P. (2017), "From value chains to technological platforms: the effects of crowdfunding in the digital game industry", *Journal of Business Research*, Vol. 78, pp. 341-352, doi: 10.1016/j.jbusres.2016.12.030.

Ondrus, J., Gannamaneni, A. and Lyytinen, K. (2015), "The impact of openness on the market potential of multi-sided platforms: a case study of mobile payment platforms", *Journal of Information Technology*, Vol. 30 No. 3, pp. 260-275, doi: 10.1057/jit.2015.7.

Ozalp, H., Cennamo, C. and Gawer, A. (2018), "Disruption in platform-based ecosystems", *Journal of Management Studies*, Vol. 55 No. 7, pp. 1203-1241, doi: 10.1111/joms.12351.

Parker, G.G. and Van Alstyne, M. (2018), "Innovation, openness, and platform control", *Management Science*, Vol. 64 No. 7, pp. 3015-3032, doi: 10.1287/mnsc.2017.2757.

Parker, G.G., Van Alstyne, M. and Jiang, X. (2016), "Platform ecosystems: how developers invert the firm", *MIS Quarterly*, Vol. 41 No. 1, pp. 255-266, doi: 10.2139/ssrn.2861574.

Parker, G.G., Petropoulos, G. and Van Alstyne, M. (2021), "Platform mergers and antitrust", *Industrial and Corporate Change*, Vol. 30 No. 5, pp. 1307-1336, doi: 10.1093/icc/dtab048.

Rochet, J.-C. and Tirole, J. (2003), "Platform competition in two-sided markets", *Journal of the European Economic Association*, Vol. 1 No. 4, pp. 990-1029, doi: 10.1162/154247603322493212.

Rochet, J.-C. and Tirole, J. (2006), "Two-sided markets: a progress report", *The RAND Journal of Economics*, Vol. 37 No. 3, pp. 645-667, doi: 10.1111/j.1756-2171.2006.tb00036.x.

Rolland, K.H., Mathiassen, L. and Rai, A. (2018), "Managing digital platforms in user organizations: the interactions between digital options and digital debt", *Information Systems Research*, Vol. 29 No. 2, pp. 419-443, doi: 10.1287/isre.2018.0788.

Rysman, M. (2004), "Competition between networks: a study of the market for yellow pages", *The Review of Economic Studies*, Vol. 71 No. 2, pp. 483-512, doi: 10.2139/ssrn.300450.

Rysman, M. (2009), "The economics of two-sided markets", *Journal of Economic Perspectives*, Vol. 23 No. 3, pp. 125-143, doi: 10.1257/jep.23.3.125.

Sandberg, J., Holmstrom, J. and Lyytinen, K. (2020), "Digitization and phase transitions in platform organizing logics: evidence from the process automation industry", *MIS Quarterly*, Vol. 44 No. 1, pp. 129-153, doi: 10.25300/MISQ/2020/14520.

Sauer, P.C. and Seuring, S. (2023), "How to conduct systematic literature reviews in management research: a guide in 6 steps and 14 decisions", *Review of Managerial Science*, Vol. 17 No. 5, pp. 1899-1933, doi: 10.1007/s11846-023-00668-3.

Srinivasan, A. and Venkatraman, N. (2018), "Entrepreneurship in digital platforms: a network-centric view", *Strategic Entrepreneurship Journal*, Vol. 12 No. 1, pp. 54-71, doi: 10.1002/sej.1272.

Srinivasan, A. and Venkatraman, V.N. (2020), "Architectural convergence and platform evolution: empirical test of complementor moves in videogames", *IEEE Transactions on Engineering Management*, Vol. 67 No. 2, pp. 266-282, doi: 10.1109/TEM.2018.2881560.

Sriram, S., Manchanda, P., Bravo, M.E., Chu, J., Ma, L., Song, M., Shriver, S. and Subramanian, U. (2015), "Platforms: a multiplicity of research opportunities", *Marketing Letters*, Vol. 26 No. 2, pp. 141-152, doi: 10.1007/s11002-014-9314-1.

Sun, L., Teunter, R.H., Babai, M.Z. and Hua, G. (2019), "Optimal pricing for ride-sourcing platforms", *European Journal of Operational Research*, Vol. 278 No. 3, pp. 783-795, doi: 10.1016/j.ejor.2019.04.044.

Tan, B., Pan, S., University of New South Wales, Lu, X., Fudan University, Huang, L. and Fudan University (2015), "The role of IS capabilities in the development of multi-sided platforms: the digital ecosystem strategy of Alibaba.com", *Journal of the Association for Information Systems*, Vol. 16 No. 4, pp. 248-280, doi: 10.17705/1jais.00393.

Tan, B., Anderson, E.G. and Parker, G.G. (2020), "Platform pricing and investment to drive third-party value creation in two-sided networks", *Information Systems Research*, Vol. 31 No. 1, pp. 217-239, doi: 10.1287/isre.2019.0882.

Tee, R. and Gawer, A. (2009), "Industry architecture as a determinant of successful platform strategies: a case study of the i-mode mobile Internet service", *European Management Review*, Vol. 6 No. 4, pp. 217-232, doi: 10.1057/emr.2009.22.

Teece, D.J. (2007), "Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance", *Strategic Management Journal*, Vol. 28 No. 13, pp. 1319-1350, doi: 10.1002/smj.640.

Teece, D.J. (2018), "Profiting from innovation in the digital economy: enabling technologies, standards, and licensing models in the wireless world", *Research Policy*, Vol. 47 No. 8, pp. 1367-1387, doi: 10.1016/j.respol.2017.01.015.

Tilson, D., Lyytinen, K. and Sørensen, C. (2010), "Digital infrastructures: the missing IS research agenda", *Information Systems Research*, Vol. 21 No. 4, pp. 748-759, doi: 10.1287/isre.1100.0318.

Tiwana, A. (2015), "Evolutionary competition in platform ecosystems", *Information Systems Research*, Vol. 26 No. 2, pp. 266-281, doi: 10.1287/isre.2015.0573.

Tiwana, A., Konsynski, B. and Bush, A.A. (2010), "Platform evolution: coevolution of platform architecture, governance, and environmental dynamics", *Information Systems Research*, Vol. 21 No. 4, pp. 675-687, doi: 10.1287/isre.1100.0323.

Tranfield, D., Denyer, D. and Smart, P. (2003), "Towards a methodology for developing evidence-informed management knowledge by means of systematic review", *British Journal of Management*, Vol. 14 No. 3, pp. 207-222, doi: 10.1111/1467-8551.00375.

Van Alstyne, M. and Parker, G.G. (2017), "Platform business: from resources to relationships", *NIM Marketing Intelligence Review*, Vol. 9 No. 1, pp. 24-29, doi: 10.1515/gfkmir-2017-0004.

Van Alstyne, M., Parker, G.G. and Choudary, S.P. (2016a), "Pipelines, platforms, and the new rules of strategy", *Harvard Business Review*, Vol. 94 No. 4, pp. 54-62.

Van Alstyne, M., Parker, G.G. and Choudary, S.P. (2016b), "6 reasons platforms fail", *Harvard Business Review*, Vol. 94 No. 4, pp. 2-5.

Waltman, L., van Eck, N.J. and Noyons, E.C.M. (2010), "A unified approach to mapping and clustering of bibliometric networks", *Journal of Informetrics*, Vol. 4 No. 4, pp. 629-635, doi: 10.1016/j.joi.2010.07.002.

Wareham, J.D., Fox, P.B. and Cano Giner, J.L. (2013), "Technology ecosystem governance", *Organization Science*, Vol. 25 No. 4, pp. 1195-1215, doi: 10.2139/ssrn.2201688.

Wilden, R., Devinney, T.M. and Dowling, G.R. (2016), "The architecture of dynamic capability research identifying the building blocks of a configurational approach", *Academy of Management Annals*, Vol. 10 No. 1, pp. 997-1076, doi: 10.5465/19416520.2016.1161966.

Wu, W., Huang, X., Wu, C.-H. and Tsai, S.-B. (2022), "Pricing strategy and performance investment decisions in competitive crowdfunding markets", *Journal of Business Research*, Vol. 140, pp. 491-497, doi: 10.1016/j.jbusres.2021.11.018.

Yoo, Y., Henfridsson, O. and Lyytinen, K. (2010), "The new organizing logic of digital innovation: an agenda for information systems research", *Information Systems Research*, Vol. 21 No. 4, pp. 724-735, doi: 10.1287/isre.1100.0322.

Young Kang, H. and Suarez, F.F. (2022), "Platform owner entry into complementor spaces under different governance modes", *Journal of Management*, Vol. 49 No. 5, 014920632210947, p. 1800, doi: 10.1177/01492063221094759.

Zhang, Y., Li, J. and Tong, T.W. (2022), "Platform governance matters: how platform gatekeeping affects knowledge sharing among complementors", *Strategic Management Journal*, Vol. 43 No. 3, pp. 599-626, doi: 10.1002/smj.3191.

Zhao, D. and Chen, M. (2019), "Ex-ante versus ex-post destination information model for on-demand service ride-sharing platform", *Annals of Operations Research*, Vol. 279 Nos 1-2, pp. 301-341, doi: 10.1007/s10479-019-03316-w.

Zupic, I. and Čater, T. (2015), "Bibliometric methods in management and organization", *Organizational Research Methods*, Vol. 18 No. 3, pp. 429-472, doi: 10.1177/1094428114562629.

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Sascha Kraus can be contacted at: sascha.kraus@zfke.de

Unveiling the processes of industry platform management: A systematic literature review and research agenda

Abstract

The literature on industry platforms has provided valuable insights into particular aspects of how platform owners can manage their industry platforms. However, possessing valuable insights does not equate to a comprehensive understanding of the processes inherent in managing these platforms. Three fundamental challenges hinder our comprehension of industry platform management, or in other words, the diverse processes that industry platform owners need to address for effective platform management: (1) the tendency to examine distinct processes in isolation, (2) the narrow focus when examining individual processes, and (3) the overlooking of certain processes. Accordingly, these challenges collectively impede a holistic understanding of industry platform management. To address these shortcomings, we conducted a systematic review of 359 articles from top-tier journals dedicated to industry platforms. Hence, this study provides three crucial contributions: (1) an in-depth examination of the diverse processes essential for the effective management of industry platforms, including both their antecedents and outcomes, (2) a comprehensive definition of industry platform management through integrating insights from various studies that have explored industry platforms from diverse perspectives, and (3) the formulation of a thorough research agenda aimed at unveiling new avenues for future studies. Overall, we argue that the industry platform management encompasses interrelated and iterative processes of creation, integration, orchestration, navigation, and evolution that operate simultaneously, reflecting the dynamic nature of industry platforms.

1. Introduction

The discussions on industry platforms commenced with an exploration of pricing as a pivotal approach for attracting and integrating diverse actors into the platform ecosystem (Caillaud and Jullien, 2001; Rochet and Tirole, 2003; Parker and Van Alstyne, 2005; Eisenmann et al., 2006). While pricing plays a crucial role in enticing actors' participation, its significance extends to the realm of competition between different platforms and firms (Armstrong, 2006; Economides and Katsamakas, 2006; Kaiser and Wright, 2006; Rochet and Tirole, 2006). Thus, early discussions in the field centered on the process of integrating actors into the platform and navigating the competitive environment. Simultaneously, other scholars directed their attention to the architectural aspects of industry platforms, conceptualizing them as structures, with core and periphery components, that facilitate innovation (Baldwin and Woodard, 2009). By integrating insights from both the economics and engineering literature, Gawer (2014) bridged the two perspectives and coined the term "industry platforms" (Gawer and Cusumano, 2008: 28). These platforms are defined as "products, services, or technologies developed by one or more firms, serving as foundations upon which a larger number of firms can build further complementary innovations, potentially generating network effects" (Gawer and Cusumano, 2014: 420), where network effects occur when more entities join the platform, resulting in an increased value for each individual entity (Katz and Shapiro, 1994). Further, following seminal works by Tilson et al. (2010), Tiwana et al. (2010), Yoo et al. (2010), which highlighted the limited attention given to the topic in information systems literature, a shift occurred as information systems scholars started exploring the architecture of industry platforms. This exploration specifically focused on orchestrating the ecosystem actors (Ghazawneh and Henfridsson, 2013; Huber et al., 2017; Foerderer et al., 2021), a process intricately linked to behavioral complexities (Constantinides et al., 2018). However, as the platform architecture is intricately connected to the evolution of the ecosystem (Baldwin and Woodard, 2009; Tiwana et al., 2010), scholars began addressing, albeit indirectly, the process of industry platform evolution (Ghazawneh and Henfridsson, 2013; Huber et al., 2017). In short, since the outset of exploring industry platforms, diverse groups of scholars have explored various processes that platform owners must address to effectively manage their industry platforms (Eisenmann et al., 2006; Ghazawneh and Henfridsson, 2013; Teece et al., 2022; Thomas et al., 2022).

Despite numerous works in the literature providing valuable insights into distinct processes (Rochet and Tirole, 2003; Eisenmann et al., 2006; Foerderer et al., 2021; Teece et al., 2022; Thomas et al., 2022), these processes were often examined in isolation. Achieving a comprehensive understanding of how platform owners manage their industry platforms requires an integrated perspective that considers all the

interconnected processes, as they resemble pieces of a larger puzzle. However, the problem extends beyond the examination of these processes in isolation. Another issue arises from the narrow examination of these processes (Gawer, 2021). The economics literature, for instance, has offered valuable insights into processes related to pricing, specifically addressing how to attract diverse actors to the ecosystem and how to compete with rivals (Caillaud and Jullien, 2001; Rochet and Tirole, 2003; Armstrong, 2006; Eisenmann et al., 2006). However, the integration of actors into the platform ecosystem is not solely achieved through pricing (Eisenmann and Hagiu, 2007; Hagiu and Spulber, 2013), and navigating the external environment involves more than just competition (Tiwana et al., 2010; Shujahat et al., 2019; Sen et al., 2020). This principle extends to other processes as well. Lastly, another issue arises from the fact that certain processes were somewhat entirely overlooked in the literature, perhaps due to the isolated and narrow focus. As mentioned earlier, the exploration of industry platforms initially centered on attracting actors to the platform and competing with rivals. However, a critical aspect was overlooked, specifically related to the process of creating these industry platforms (Gawer and Cusumano, 2014; Tan et al., 2015; de Reuver et al., 2018; Shi et al., 2021). Further, the same gap exists in the understanding of the evolution process (Gawer, 2021). Consequently, these issues give rise to a major shortcoming in our understanding of industry platforms: What exactly are the different processes that platform owners should undergo in managing their industry platforms?

While previous reviews have offered valuable insights into the field, as depicted in Table 1, none of them has conducted a comprehensive examination of industry platform management (Roson, 2005; McIntyre and Subramaniam, 2009; McIntyre and Srinivasan, 2017; Constantinides et al., 2018; de Reuver et al., 2018; Rietveld and Schilling, 2020; Kapoor et al., 2021). Therefore, our primary objective is to identify and thoroughly examine the diverse processes crucial to the management of industry platforms. To accomplish this, we conducted a systematic literature review of 359 articles from top-tier journals, covering a range of works related to industry platforms. In addition to identifying the various processes, we explored the factors that trigger these processes (antecedents) and examined the consequences arising from them (outcomes). Further, we have highlighted some of the few studies that have examined the interplay between the different processes while also providing a clear definition for the construct of industry platform management. Lastly, we presented a thorough research agenda with the goal of paving the way for novel research inquiries, not only within distinct processes but also at the crossroads where these processes intersect.

Table 1: Previous reviews on industry platforms

Title	Reference	Journal	Research focus	Methodology	Findings
Two-Sided Markets: A Tentative Survey	Roson (2005)	Review of Network Economics	The emerging two-sided markets literature, summarizing recent research that deals with markets characterized by bilateral network externalities	- Methodology: not specified - List of articles: initial articles that focus on two-sided markets	- Characteristics of two-sided markets - Pricing principles in two-sided markets - Diverse competition types in two-sided markets - Implications for competition policy
Strategy in Network Industries: A Review and Research Agenda	McIntyre and Subramaniam (2009)	Journal of Management	The pivotal role of strategy in industries marked by the presence of network effects	- Methodology: not specified - List of articles: articles situated at the intersection of strategy and network effects	A research framework that centers around three key avenues: - Strategic drivers of network intensity - Approaches to assess variations in network intensity - Effective strategies for leveraging network intensity
Networks, Platforms, and Strategy: Emerging Views and Next Steps	McIntyre and Srinivasan (2017)	Strategic Management Journal	A strategic management perspective on the prevailing literature concerning networks and platforms	- Methodology: not specified - List of articles: articles that explore networks and platforms from various fields	Five key areas that aim to guide future research: - Strength of network effects - Platform quality - Drivers of indirect network effects - Nature and actions of complementors - Leveraging complementor dynamics for competitive advantage
Platforms and infrastructure in the Digital Age	Constantinides et al. (2018)	Information Systems Research	A simultaneous emphasis on platforms and infrastructures	- Methodological approach: not specified - List of articles: articles that delve into the intersection of platforms and infrastructures	- Emerging research themes, which are at the crossroads of platforms and infrastructures - Contributions made by the six articles included in the special issue - A research agenda for future examinations in this area
The Digital Platform: A Research Agenda	de Reuver et al. (2018)	Journal of Information Technology	Paving the way for the digital platform topic to become mainstream in the information systems literature	- Methodological approach: not specified - List of articles: articles that examine platforms, ecosystems, infrastructures, and two-sided markets	- Three key recommendations for future studies on digital platforms - Six distinct research questions for further exploration in this domain
Platform Competition: A Systematic and Interdisciplinary Review of the Literature	Rietveld and Schilling (2020)	Journal of Management	Platform competition, particularly how platform firms compete to create and capture value	- Methodology: a systematic literature review - List of articles: 333 articles generated through a combination of Boolean search queries and backward citations	- The evolution of the literature on platform competition - Four key themes that are of common interest to scholars - Areas for future research based on the four identified themes
A socio-technical view of platform ecosystems: Systematic review and research agenda	Kapoor et al. (2021)	Journal of Business Research	A comprehensive review of both the social and technical aspects of platform ecosystems	- Methodology: a systematic literature review - List of articles: 70 articles that examine platform ecosystems	- A socio-technical systems framework, offering a holistic perspective on the literature concerning the functioning and sustainability of platform ecosystems - Providing research directions based on the interactions and overlaps among the various dimensions within the socio-technical framework

2. Methodology

This systematic literature review follows Tranfield et al.'s (2003) widely recognized guidelines, which entail defining search terms, establishing selection criteria, and identifying target journals. These steps constitute the initial phase of our comprehensive search process (Spanuth and Urbano, 2023). Our primary aim was to identify articles containing specific keywords in their titles, abstracts, or keywords (Newbert, 2007). These keywords encompassed a wide range of terms related to industry platforms, as shown in Figure 1. However, to focus only on industry platforms, and because an industry platform is set apart from an internal, company, product, or supply chain platform by the potential generation of network effects (Gawer and Cusumano, 2014), we included a second search string where we required that selected articles incorporate the term, "network e*", which refers to "network

effect", "network effects", "network externality", or "network externalities", within their full text. The effectiveness of this search strategy, "network e*", was validated by comparing it with search results using the more explicit "network effect", "network effects", "network externality", or "network externalities" keywords. We utilized Elsevier's Scopus, which is widely regarded as the premier tool for conducting literature searches (Falagas et al., 2008), to identify and search for the selected keywords. We specifically focused our search on academic journal articles, which undergo peer review and are published in the English language. Furthermore, we restricted the scope of articles to specific disciplines, as depicted in Figure 1. Additionally, we aimed to focus exclusively on top-ranking journals, particularly those classified as CABS3 and CABS4 level. To fulfill this objective, we introduced a third search string, incorporating the names of the top-tier journals in each of the aforementioned disciplines. Consequently, the initial phase of the search process yielded 448 articles.

After the initial screening of the selected articles, we realized that certain articles should be excluded as they (1) did not align with the intended use of the second search string, e.g., "network era", (2) matched the second search string in the reference list rather than in the main body of the article, (3) focused exclusively on the third-party complementor's perspective without contributing to the perspective of platform owners, or (4) matched the second search string, but their main focus was on internal or supply-chain platforms. To ensure the accuracy of this elimination process, criteria 3 and 4 were double-checked by the authors of the paper. Additionally, after screening the reference lists of the retained articles, we identified some additional articles that should be included, resulting in a final count of 359 articles as the final outcome of the search process.

Further, our current review is systematic not only in the search process but also in the analysis process (Kohtamäki et al., 2018; Spanuth and Urbano, 2023). In the initial phase of the analysis process, where we employed an inductive approach, we meticulously examined the articles, coded them, extracted the various activities and processes performed by platform owners, and organized them into first-order categories. Subsequently, we worked collaboratively to categorize the first-order groups into second-order categories and further into subdimensions (Nag et al., 2007), effectively unveiling the five processes that constitute the management of industry platforms. Furthermore, in our attempt to address the proposed research question, we identified (1) the factors influencing these processes, that is the antecedents, (2) the consequences of these endeavors, referred to as the outcomes, and (3) the interplay between the different processes. As a result of this endeavors, we were able to systematically develop a comprehensive definition of industry platform management and identify a comprehensive research agenda encompassing

the five processes and their intersections. In brief, several steps have been taken to ensure the systematic nature of this review, in both the search and analysis processes, with the final aim of making this study transparent and replicable (Spanuth and Urbano, 2023). Overall, Figure 1 visually illustrates the systematic approach employed, showcasing the various steps involved.

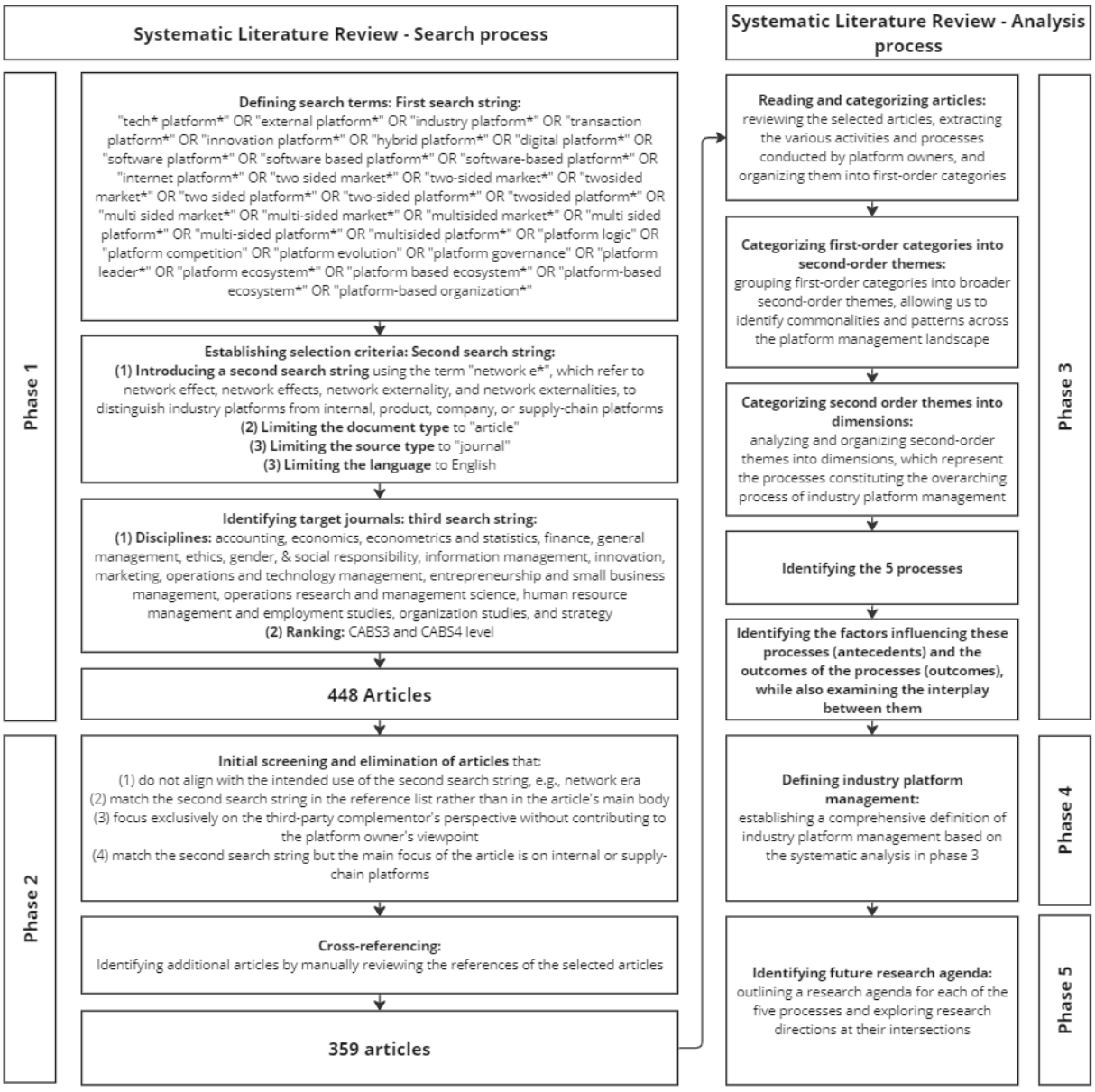

Figure 1: Search and analysis processes

3. Findings

Based on our systematic literature review, the management of industry platforms encompasses five distinct processes: (1) the creation process, which focuses on establishing an industry platform; (2) the integration process, which involves attracting and integrating different actors into the platform ecosystem; (3) the orchestration process, which centers around influencing the behavior of the different ecosystem actors; (4) the navigation process, which entails strategically maneuvering the external environmental dynamics that are exogenous to the ecosystem; and (5) the evolution process, which encompasses adapting and transforming the platform over time. In Section 3.1, we provide clarification on the construct of industry platform management and outline the five distinct processes that are integral to its structure. Figure 2 visually represents our identification of these five dimensions, derived from a comprehensive systematic review of existing literature. First-order categories represent individual concepts discussed in the literature, while second-order themes group these categories into broader, related themes. Finally, the dimensions organize the second-order themes into larger topics, representing the five distinct processes. After presenting the main findings in Section 3.1, we proceed to discuss the antecedents and outcomes of these processes in Sections 3.2 and 3.3, respectively. Table 2 presents a summary of the antecedents, processes, and outcomes associated with the five distinct processes. Further, in Section 3.4, we highlight a minority of studies that, unlike the majority of the literature, did not focus solely on a single process but instead explored the interplay between different processes. We conclude with Section 3.5, summarizing the antecedents, processes, and outcomes of industry platform management and providing a comprehensive definition of the construct.

3.1. Industry Platform Management

Before exploring the five different processes, it's crucial to clarify the construct of industry platform management. Industry platform management is of two essential components: industry platforms and management. First, *"industry platforms"* (Gawer and Cusumano, 2008: 28) is not the only terminology used to refer to technological platforms that are associated with network effects. Different scholars adopt different terms to refer to these platforms. Throughout this paper, we will adopt the terminologies and classifications that were introduced by Gawer (2014), Gawer and Cusumano (2014), and Cusumano et al. (2019), as they provide clear and straightforward distinctions between different types of platforms. Gawer and Cusumano (2014) distinguished between three different types of technological platforms: (1) internal, company, or product platforms, (2) supply-chain platforms,

and (3) industry or external platforms (Gawer and Cusumano, 2014). However, what sets an industry platform apart from others is its potential generation of network effects. Further, Cusumano et al. (2019) identified two different types of industry platforms based on their primary function: (1) transaction platforms, which facilitate transactions between the different actors, e.g., Apple AppStore; and (2) innovation platforms, which facilitate complementary innovations as the platform serves as a technological foundation, e.g., Apple iOS. Additionally, hybrid platforms fall in between and share functions of the two main categories, e.g., Apple (Cusumano et al., 2019).

As for the other part, management, a unified definition for the term is lacking. However, an in-depth exploration of various managerial processes in top-tier journals highlights the presence of three fundamental and commonly shared phases that constitute the core structure of a management process. By incorporating the crisis management viewpoint into the strategic management process, Preble (1997) distinguished three distinct phases of strategic management: formulation, implementation, and evaluation. These phases entail a series of interactive and iterative processes that collectively shape the comprehensive strategic management process, encompassing the perspective of crisis management. In a similar vein, when investigating the components of the customer relationship management processes, Reinartz et al. (2004) delineated three distinct stages within the customer relationship management: initiation, maintenance, and termination, where these stages encompasses a range of specific processes and activities. Therefore, they define a customer relationship management process as a *"systematic process to manage customer relationship initiation, maintenance, and termination across all customer contact points to maximize the value of the relationship portfolio"* (Reinartz et al., 2004: 294). In a similar vein, after presenting various definitions for the knowledge management process, Shujahat et al. (2019) argue that knowledge management processes can unfold as knowledge creation, knowledge sharing, and knowledge utilization, with each of these representing a distinct process that collectively comprise the overarching construct of knowledge management. Accordingly, the construct of management encompasses a minimum of three distinct phases, each comprising a range of specific processes: (1) the initial identification or establishment of the subject under management, (2) its ongoing maintenance, and (3) its continual evolution over time.

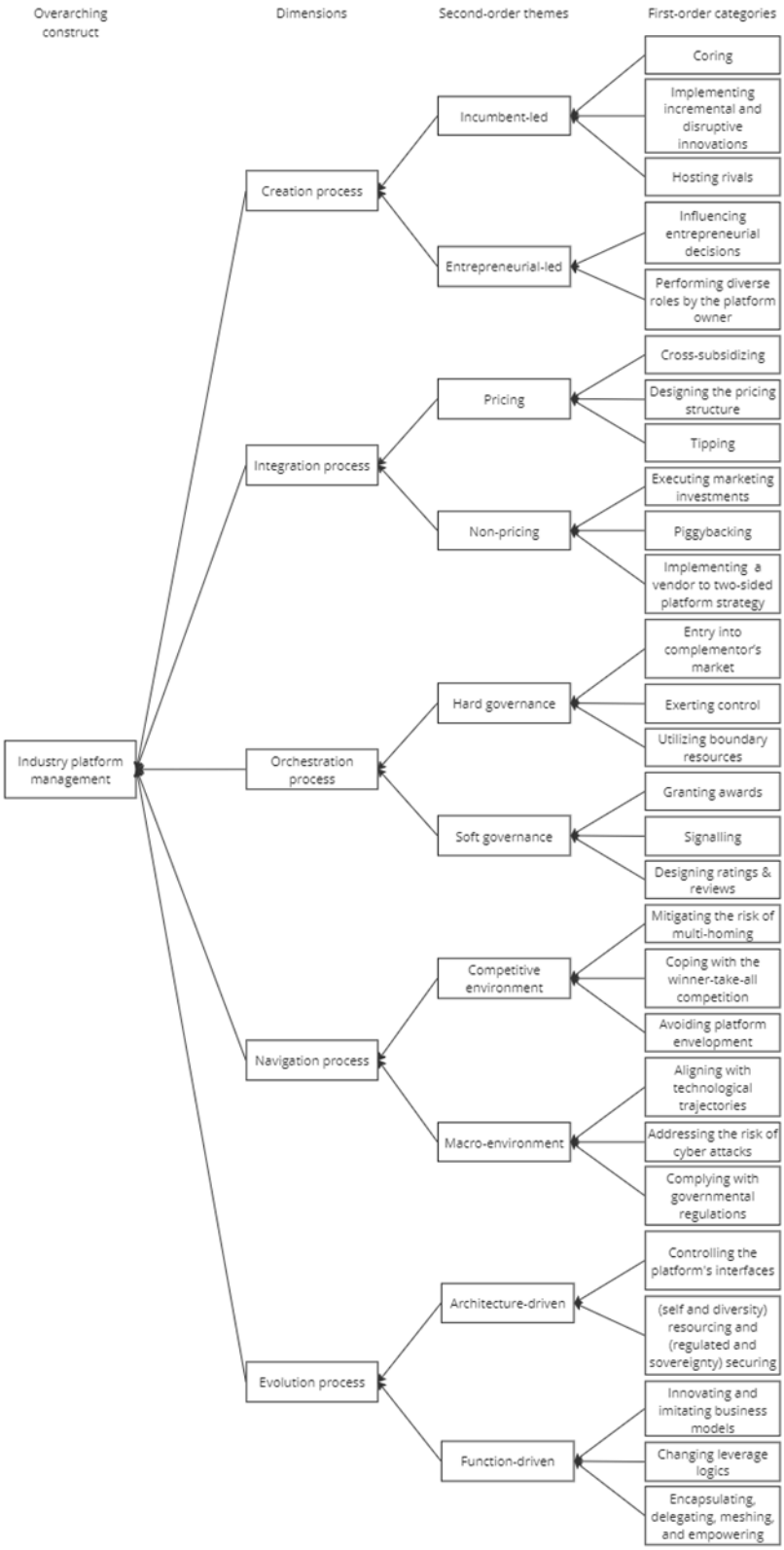

Figure 2: The five processes of industry platform management

3.1.1. Creation process

The creation process is the act of establishing an industry platform. The topic of platform emergence, or the process of creating industry platforms (Gawer and Cusumano, 2008), has been under-researched in academic literature (Gawer, 2014; Tan et al., 2015; de Reuver et al., 2018; Shi et al., 2021). Recently, Teece et al. (2022) proposed a classification system for platforms, which classifies them according to their origins and value proposition in the value chain. This classification includes incumbent-born platforms, created by incumbent firms targeting existing customers, platform-born adjacent, created by incumbent companies targeting new customers in different markets, and born-platform startups, created by entrepreneurs offering innovative products and services using new technology to target new customers (Teece et al., 2022). Given this classification and based on our review, the creation process unfolds through two distinct approaches: incumbent-led and entrepreneurial-led.

On one hand, the incumbent-led approach refers to platforms that originate from incumbent firms (Teece et al., 2022). Gawer and Cusumano (2008) argue that any firm, regardless of its size, can create an industry platform by addressing specific business and technological challenges. To achieve this, a firm must consider two strategic processes: (1) coring, which refers to creating a new platform in a previously non-existent market, and (2) tipping, which refers to gaining market momentum to win platform competition. Besides, Gawer (2014) posits that a firm can transition from an internal, company, or product platform to a supply-chain platform and eventually to an external or industry platform by increasing platform openness. However, Thomas et al. (2014) suggest that the evolution of an internal platform to an industry platform is influenced not only by platform openness but also by various leverage logics. They argue that a platform can concurrently undergo changes in platform openness and leverage logic, which are classified into three different logics: transaction, innovation, and production (Thomas et al., 2014). Furthermore, Hagiu et al. (2020) examine the strategies available to a multi-product company aiming to transition into a thriving industry platform by hosting competing firms. Also, Wichmann et al. (2022) recognized the challenges that brands face when constructing flagship platforms, which are a specific type of industry platforms owned by brands, and developed a comprehensive guide to assist brands in the process of establishing an industry platform. Furthermore, by conducting multiple longitudinal case studies on the US and European broadcast industry, Pagani (2013) contends that incremental innovations have the potential to shift vertically integrated networks into loosely coupled ones, while disruptive innovations across industry boundaries can lead to the transformation of loosely coupled networks into two-sided markets.

Alternatively, the entrepreneurial-led approach refers to platforms created by entrepreneurs and start-up firms (Teece et al., 2022). The majority of the literature has focused on incumbent-born platforms, however, there have been limited studies on born-platforms. Through a five-year longitudinal case study of Friendz, an Italian two-sided platform, Trabucchi and Buganza (2022) examined the impact of the different actors on the entrepreneurial decisions of platform providers which led to the creation of the platform. Consequently, they outline a four-step progression that shows how entrepreneurs can start by using an existing platform to launch a new business and subsequently transition to developing their own platform. The findings of the study emphasize how the different actors of the platform can influence the entrepreneurial choices of platform providers, and consequently lead to the creation of a new industry platform. Also, Cennamo et al. (2022) examined Patient Innovation, which is a prominent platform in Europe that provides user-generated innovative solutions in the healthcare industry, where they argue that applying the generic strategies that are adopted for other industry platforms might be challenging due to the unique attributes of the healthcare industry. Consequently, Cennamo et al. (2022) identify three roles that a platform owner should play in order to diffuse patient innovation and thereby create an industry platform: community organizer, market matchmaker, and innovation manager.

3.1.2. Integration process

The integration process is the act of attracting and integrating diverse actors into the platform ecosystem, where an ecosystem is *"the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize"* (Adner, 2017: 40). Whether a platform is created by an incumbent firm or a start-up, attracting and integrating the different actors into the platform is one of the key challenges for the platform owner (Eisenmann et al., 2006). The primary focus of the earlier literature has been centered exclusively on pricing approaches for the purpose of attracting and integrating the different actors on board (Rochet and Tirole, 2003; Armstrong, 2006; Rochet and Tirole, 2006; Rysman, 2009). Nevertheless, several authors have contended that pricing approaches are not the sole means of integration, and have examined non-pricing approaches as well (Eisenmann and Hagiu, 2007; Hagiu and Spulber, 2013). Therefore, the integration process manifests through two distinct approaches: pricing and non-pricing.

The emergence of the industry platform literature can be traced back to the early 2000s when authors began directing their attention toward pricing as a means of enticing the participation of diverse actors (Rochet and Tirole, 2003; Parker and Van Alstyne, 2005; Armstrong, 2006; Eisenmann et al., 2006). Caillaud and Jullien (2001) argue that a platform owner can employ cross-subsidization by subsidizing one market segment in order to attract it and enhance their appeal to the other market

segment. In a similar vein, Rochet and Tirole (2003) posit that a two-sided market ought to be capable of cross-subsidizing the distinct market actors effectively. Nevertheless, Rochet and Tirole (2003) argue that not only is the value of the price charged to the different market segments consequential, but also the manner in which the price is decomposed; consequently, *"A market is two-sided if the platform can affect the volume of transactions by charging more to one side of the market and reducing the price paid by the other side by an equal amount; in other words, the price structure matters, and platforms must design it so as to bring both sides on board"* (Rochet and Tirole, 2006: 664). Therefore, the structure of the price is significant (Armstrong, 2006; Kaiser and Wright, 2006; Rochet and Tirole, 2006), and firms should be able to set the right prices for the different actors to incentivize their participation (Eisenmann et al., 2006).

Although there has been a significant emphasis on pricing, a number of authors have demonstrated that various non-pricing approaches can be employed to effectively engage the different actors in the market. Eisenmann and Hagiu (2007) contend that conventional methods of attracting the various actors of the market, namely pricing, can be both expensive and hazardous. As a result, they have proposed a cost-effective phased strategy for the integration process, the vendor to two-sided platform approach. This approach involves the platform owner acting as a vendor to integrate the first side of the market and then subsequently drawing in the other actors in later phases. Also, Sridhar et al. (2011) underscored the significance of the marketing investments made by platform owners in driving demand among the diverse parties involved; and Hagiu and Spulber (2013) argue that, under specific conditions, utilizing first-party content can serve as an attraction mechanism to attract sellers. Lately, Fang et al. (2021) investigated the impact of temporary gatherings, which are organized by platform owners, in inducing third-party complementors to join a software platform; Dou and Wu (2021) examined piggybacking, which is defined as *"the ability of a platform to connect with an existing user base from a different platform and stage the creation of value units to recruit those users to participate"* (Dou and Wu, 2021: 821), as a non-pricing approach to attract the different actors on board; and Adam et al. (2022) contend that a moderate degree of signalling input control possesses the potential to exert a considerable influence over the expectations of third-party complementors, which, in turn, can affect their decision to join a platform.

3.1.3. Orchestration process

The orchestration process is the act influencing the behavior and interactions of the diverse ecosystem actors, with the ultimate goal of orchestrating their activities to achieve desired outcomes and optimize the ecosystem's performance. According to Baldwin and Woodard (2009), the architecture of the platform consists of three specific elements: (1) a stable core with limited variety, (2) a variable periphery with

a high variety, and (3) interfaces, which are defined as *"specifications and design rules that describe how the platform and modules interact and exchange information"* (Tiwana et al., 2010: 676); where controlling the interfaces equates to controlling the platform itself (Baldwin and Woodard, 2009). As a result, the focus of platform architecture lies on the structural intricacies of platforms, while governance primarily addresses their behavioral intricacies (Constantinides et al., 2018). Therefore, drawing upon the analysis and in alignment with the categorization by Foerderer et al. (2021), the orchestration process can be realized via two distinct governance approaches: hard and soft governance.

Hard governance refers to influencing the behavior of complementors through resource provision and control exertion (Foerderer et al., 2021). According to earlier scholarly works, boundary resources play a significant role in influencing the behavior of complementors and in establishing arm's length relationships between the owner of the platform and external complementors (Ghazawneh and Henfridsson, 2013; Eaton et al., 2015). Boundary resources, e.g., standardized development tools (Miric et al., 2022), software libraries (Fink et al., 2020), and, application programming interfaces (Ghazawneh and Henfridsson, 2013), are defined as *"the software tools and regulations that serve as the interface for the arm's-length relationship between the platform owner and the application developer"* (Ghazawneh and Henfridsson, 2013: 175). Besides, Foerderer et al. (2019) highlight the importance of knowledge boundary resources in accessing and extending the platform's functionality. Additionally, control is perceived as a hard governance approach that enables platforms to exercise the option of either opening or closing their platforms (Parker and Van Alstyne, 2018); the entry of a platform into complementary markets is recognized as a hard governance approach that enables the coordination of complementors (Foerderer et al., 2018; Young Kang and Suarez, 2022); and agreements and rules, selective promotion, and joint problem solving are distinct governance approaches that enable the owner of the platform to manage complementary innovation (Jingyao et al., 2022). Moreover, despite being more commonly discussed in the context of innovation platforms, the importance of governance is equally significant in the realm of transaction platforms. For instance, in the context of social media platforms, Reuber and Fischer (2022) examined distinct types of governance approaches, namely, those regulating user behavior, and those concerning user identification and status; and in the context of E-commerce content platforms, Lin et al. (2022) examined the impact of controlling the output through allocating monetary rewards and punishments.

While most of the literature has focused on hard governance, soft governance, which influence complementors' behavior through non-monetary and non-control means (Foerderer et al., 2021), have received less attention in research. To fill this gap,

Foerderer et al. (2021) proposed the use of awards as a soft governance approach that can effectively influence the behavior of complementors. Also, soft governance approaches were examined in the context of transaction platforms. For instance, in the context of social media platforms, Reuber and Fischer (2022) examined distinct governance approaches, namely, those structuring user relationships, e.g., likes or endorsements, and those directing user attention, e.g., hashtags. Additionally, Chan et al. (2022), introduced the concept of the strategic design of ratings and reviews, and Hukal et al. (2020) introduced the utilization of signalling, opportunity and endorsement signals, as means for influencing the behavior of complementors.

3.1.4. Navigation process

The navigation process is the act of strategically maneuvering the external environmental dynamics that are exogenous to the ecosystem. Broadly, managing a platform is a complex task that cannot be accomplished by simply applying strategies that have worked in traditional contexts (Eisenmann et al., 2006), as relying on such strategies is often insufficient to ensure success. Eisenmann et al. (2006) argue that platform owners need to coordinate competitive challenges, e.g., winner-take-all scenario, envelopment, and multihoming, to mention a few. However, the external environment extends beyond rivals; platform owners must also navigate challenges that emerge within the broader macro environment, e.g., technology advancements, cyberattacks, and regulations. As a result, the navigation process unfolds through two-distinct approaches, the competitive environment and the macro-environment.

On one hand, the competitive environment includes challenges that are directly related to competition, including, winner-takes-all scenarios, multi-homing, and envelopment (Eisenmann et al., 2006), among others. Platform owners should cope with the winner-take-all competition; in other words, it is essential for the platform owner to determine whether the market can be served by a single platform or not, and whether they should try to maintain proprietary rights or share the platform (Eisenmann et al., 2006). The winner-take-all topic was discussed by several scholars, including Doganoglu and Wright (2006), Cennamo and Santalo (2013), Belleflamme and Peitz (2019), Wiegand et al. (2022), among others; however, some authors have challenged the winner-take-all hypothesis in the realm of industry platforms, including, Anderson et al. (2014) and Huotari et al. (2017). Besides, one of the conditions that gives rise to the winner-takes-all situation is the height of the multihoming costs (Eisenmann et al., 2006). Unlike the early literature which examined multihoming in the absence of exclusive contracts (Caillaud and Jullien, 2003; Rochet and Tirole, 2003; Armstrong, 2006; Doganoglu and Wright, 2006), Armstrong and Wright (2007) argue that introducing exclusive contracts play a significant role in preventing multihoming on the seller's side of the platform. Nevertheless, the effectiveness of such contracts in preventing multihoming was

challenged later on by Doganoglu and Wright (2010). Additionally, platform owners should avoid envelopment, where other companies leverage overlapping user bases to enter a different market (Eisenmann et al., 2006). Nevertheless, the aforementioned challenges are not the sole ones that require attention. Platform owners encounter a variety of challenges, such as managing disruptive innovation (Ansari et al., 2016), mitigating the risk of market entries (Cozzolino et al., 2021), and implementing effective market entry strategies (Eisenmann et al., 2011; Barile et al., 2022).

On the other hand, the macro environment comprises a range of issues related to the broader environment, including technological advancements, government regulations, and cyberattacks, among others. Tiwana et al. (2010) emphasize the significance of giving more attention to technological trajectories as a critical issue within a platform's external environment, as the emergence of complementary and substitutive technologies is happening rapidly, unevenly, and on a broad scale, posing significant challenges for platform owners. Furthermore, Wang et al. (2019) examine the influence of government regulations on platforms; and Miric and Jeppesen (2020) argue that digital piracy poses a significant strategic challenge due to the potential loss of income and the perceived negative impact on innovation. Though, in contrast to the predominant focus of most studies on the negative effects of cyberattacks and hacker activities, Sen et al. (2020) argue that the existence of malicious hackers can foster a more competitive market, whereas their absence may hinder competition. Besides, Stähler and Stähler (2022) examine the consequences of the new Directive on Copyright in the Digital Single Market implemented by the European Union on small-scale content platforms, demonstrating how the directive facilitates the consolidation of market power among dominant platforms. Other scholars have explored the impact of other external factors, such as digitalization (Frishammar et al., 2018) and policy and antitrust law (Spinello, 2005; H. Wang, 2022), among others.

3.1.5. Evolution process

The evolution process is the act of adapting and transforming the platform over time. Numerous studies have identified platform architecture and governance as critical factors that drive platform evolution (Modol and Eaton, 2021). Thomas et al. (2022) argue that the early architecture and governance decisions of a platform owner have a significant effect on the evolutionary trajectory of a platform and its associated ecosystems. While platform architecture and governance play crucial roles, the evolution of platforms extends beyond these dimensions (Helfat and Raubitschek, 2018). Platforms must continuously innovate and adapt their business models to the changing competitive landscape (Helfat and Raubitschek, 2018) to remain competitive as markets and technologies continue to evolve (Gawer and Cusumano,

2014). Consequently, the evolution process can be realized through two distinct approaches, architecture-driven and function-driven.

Architecture-driven evolution is related to the evolution driven by changes in platform architecture, governance, and control mechanisms. Architectural control is seen as significant by scholars as it enables platform owners to shape the platform's evolution and direction. Baldwin and Woodard (2009) argue that having control over the interfaces of a platform is tantamount to controlling the platform itself and its evolution. However, Tiwana et al. (2010) argue that platform evolution is not only influenced by its architecture, but also by the coevolution of governance, environmental dynamics, and architecture. Additionally, Gawer and Cusumano (2014) argue that platform owners use architectural control to maintain competition, or to increase it, among third-party complementors and thus drive the platform's evolution towards a leadership position. Besides, after developing the boundary resources model, Ghazawneh and Henfridsson (2013) utilized it to analyze the evolutionary process of Apple's iPhone platform and identified four distinct stages of evolution: (1) self-resourcing: when complementors create novel resources to overcome limitations caused by excessive platform governance, (2) regulated securing: when platform owners control their platform through administrative legislation instead of technical restrictions, (3) diversity resourcing: when platform owners diversify their platform through third-party development to transform their enterprise and stimulate new application areas, and (4) sovereignty securing: when platform owners take actions to control platform evolution. Besides, in the initial phases of platform evolution, platform owners tend to adopt broad governance approaches and establish an arm's length relationship with external complementors; however, as the platform matures, platform owners tend to move beyond these broad rules and establish partnerships with appealing complementors (Huber et al., 2017).

Function-driven evolution is related to the evolution driven by changes in the platform's functionality and value propositions. Zhao and Chen (2019) argue that the evolution process from a two-sided platform to a multi-sided one is primarily fueled by business model innovation and imitation. Nevertheless, sustaining a leadership position necessitates ongoing innovation and redesign of the business model (Helfat and Raubitschek, 2018). Besides, Tan et al. (2015) acknowledged the relevance of the coring and tipping strategies, which were introduced by Gawer and Cusumano (2008) and previously discussed in the platform creation process, yet they argue that these strategies are only relevant during the nascent stage of platform development. Consequently, they proposed four development strategies: encapsulating, delegating, meshing, and empowering; where encapsulating and delegating are relevant in the formative stage, while meshing and empowering are relevant in the matured stage (Tan et al., 2015). In a similar vein, Au et al. (2020) argue that there are unique

strategies and outcomes associated with each evolutionary stage, where they classified the evolution of peer-to-peer lending platforms into three distinct stages. Each of the three stages focuses on the development of a specific actor: partners, lenders, and borrowers.

Table 2: Industry platform management: antecedents, processes, and outcomes

Antecedents of creation process	**CREATION PROCESS** ***Incumbent-led*** • Coring (Gawer and Cusumano, 2008) • Implementing incremental and disruptive innovations (Pagani, 2013) • Increasing the level of openness (Gawer, 2014) • Changing the logics of leverage (Thomas et al., 2014) • Hosting rivals (Hagiu et al., 2020) ***Entrepreneurial-led*** • Influencing entrepreneurial decisions (Trabucchi and Buganza, 2022) • Performing diverse roles by the platform owner (Cennamo et al., 2022)	**Outcomes of creation process**
• Essential system and business problems (Gawer and Cusumano, 2008) • Modular technological architecture (Gawer, 2014) • IS Capabilities (Tan et al., 2015) • Modularity (Jacobides et al., 2018) • Co-existence of different types of complementors (Jacobides et al., 2018) • Vertically integrated network (Pagani, 2013); internal and/or supply-chain platforms (Gawer, 2014); multiproduct firm (Hagiu et al., 2020); product brands (Wichmann et al., 2022)		• Solved essential system and business problems (Gawer and Cusumano, 2008) • Coordinated innovative and competitive agents, economies of scope in supply and/or demand, and value creation (Gawer, 2014) • Economies of scope in innovation (Gawer, 2014) • Competitors turned into complementors (Hagiu et al., 2020) • Addressed unfulfilled needs (Tan et al., 2015) • Profitability (Hagiu et al., 2020) • Boosted innovation (Cennamo et al., 2022)
Antecedents of integration process	**INTEGRATION PROCESS** ***Pricing*** • Cross-subsidizing (Caillaud and Jullien, 2001) • Designing the pricing structure (Rochet and Tirole, 2003; Armstrong, 2006; Kaiser and Wright, 2006; Rochet and Tirole, 2006) • Developing pricing strategies (Economides and Katsamakas, 2006) • Setting the right prices (Eisenmann et al., 2006) • Applying skewed pricing (Bolt and Tieman, 2008) • Tipping (Gawer and Cusumano, 2008)	**Outcomes of integration process**
• Indirect network externalities (Caillaud and Jullien, 2001; Caillaud and Jullien, 2003; Rochet and Tirole, 2003; Parker and Van Alstyne, 2005; Armstrong, 2006; Economides and Katsamakas, 2006; Eisenmann et al., 2006; Rochet and Tirole, 2006; Rysman, 2009; Dou and Wu, 2021) • Chicken-and-egg dilemma (Caillaud and Jullien, 2003)		• Different actors attracted to the platform (Caillaud and Jullien, 2001; Caillaud and Jullien, 2003; Rochet and Tirole, 2003; Parker and Van Alstyne, 2005; Armstrong, 2006; Economides and Katsamakas, 2006; Eisenmann et al., 2006; Rochet and Tirole, 2006; Rysman, 2009; Dou and Wu, 2021) • Consumer welfare (Parker and Van Alstyne,

• Size of the cross-group network externalities (Armstrong, 2006) • Transaction costs among users, constraints on pricing, and membership fixed costs (Rochet and Tirole, 2006) • Elasticity of the demand (Bolt and Tieman, 2008) • Expectations of the different market actors (Hagiu and Spulber, 2013) • Legitimacy (Ingram Bogusz et al., 2019) • Non-competitive and exclusive access to external users (Dou and Wu, 2021)	***Non-pricing*** • Implementing a vendor to two-sided platform strategy (Eisenmann and Hagiu, 2007) • Providing services (J. Wang et al., 2016) • Executing marketing investments (Sridhar et al., 2011) • Introducing tokens (Cong et al., 2021) • Utilizing first-party content (Hagiu and Spulber, 2013) • Piggybacking (Dou and Wu, 2021) • Signalling input control (Adam et al., 2022)	2005; Amelio and Jullien, 2012) • Profitability and volume of transactions (Rochet and Tirole, 2003) • Asymmetric market structure (Ambrus and Argenziano, 2009) • Profitability and welfare implications (Choi and Jeon, 2021) • Improved platform performance, higher return on investments, and extraction of surplus from buyers and sellers (Hagiu and Spulber, 2013) • Lowered users' transaction costs (Cong et al., 2021) • Prisoner's dilemma (Dou and Wu, 2021) • Better performance and effort expectancy (Adam et al., 2022)
Antecedents of orchestration process • Modularity (Baldwin and Woodard, 2009) • Layered modular architecture (Yoo et al., 2010) • Digital infrastructures (Tilson et al., 2010) • IT capabilities (Hanseth and Lyytinen, 2010) • Information infrastructures (Hanseth and Lyytinen, 2010) • Intensity of network effects (Niculescu et al., 2018) • Entrant's absorptive capacity (Niculescu et al., 2018) • App market conditions (Xue et al., 2019) • Sellers' local environment (Koo and Eesley, 2021)	**ORCHESTRATION PROCESS** ***Hard governance*** • Utilizing boundary resources (Ghazawneh and Henfridsson, 2013; Eaton et al., 2015) • Entry into complementor's market (Foerderer et al., 2018; Young Kang and Suarez, 2022) • Utilizing knowledge boundary resources (Foerderer et al., 2019) • Exerting control vs. fostering autonomy (Wareham et al., 2014) • Exerting control (Parker and Van Alstyne, 2018) • Gatekeeping (Zhang et al., 2022) • Exercising output control through performance-based rewards and punishments (Lin et al., 2022)	**Outcomes of orchestration process** • Generativity (Tilson et al., 2010) • Increased innovation rates (Boudreau, 2010) • Control over the platform (Ghazawneh and Henfridsson, 2013) • Enhanced platform scope and diversity (Ghazawneh and Henfridsson, 2013) • Intraplatform competition (Tiwana, 2015) • Revenue growth (Wessel et al., 2017) • Destabilization of the ecosystem (Wessel et al., 2017) • Enhanced competitiveness (Kazan et al., 2018)

	Soft governance • Granting awards (Foerderer et al., 2021) • Signalling: opportunity and endorsement signals (Hukal et al., 2020) • Designing ratings and reviews (Chan et al., 2022) • Implementing mechanisms that structure user relationships, e.g., likes or endorsements, and those that direct user attention, e.g., hashtags (Reuber and Fischer, 2022)	• Co-opetition (Niculescu et al., 2018) • Improved complements' quality (Foerderer et al., 2021) • Platform forking (Karhu et al., 2018) • Sales volume (Inoue, 2021) • Better complementor dedication (Hurni et al., 2021) • Novelty of complementary products (Miric et al., 2022) • Shared knowledge (Zhang et al., 2022) • A trade-off between product novelty and commercial success (Miric et al., 2022)
Antecedents of navigation process • Strength of network effects (Eisenmann et al., 2006, 2011) • Vertical and horizontal differentiation (Hossain et al., 2011; Hossain and Morgan, 2013) • Differences in technologies (Mantena and Saha, 2012) • Age and market share (Landsman and Stremersch, 2011) • Industry architecture (Tee and Gawer, 2009) • Switching costs (Eisenmann et al., 2011; Basaure et al., 2020) • Overlapping user bases (Eisenmann et al., 2011) • Cross-unit coordination (Eisenmann et al., 2011) • Adopted technologies (Mantena and Saha, 2012) • Geographic scope of network externalities	**NAVIGATION PROCESS** ***Competitive environment*** • Coping with the winner-take-all competition (Eisenmann et al., 2006; Cennamo and Santalo, 2013) • Mitigating the risk of multihoming (Doganoglu and Wright, 2006; Eisenmann et al., 2006; Armstrong and Wright, 2007; Doganoglu and Wright, 2010; Belleflamme and Peitz, 2019; Bakos and Halaburda, 2020; Jeitschko and Tremblay, 2020; Wiegand et al., 2022) • Responding to and/or initiating new market entries (Cozzolino et al., 2021; Karhu and Ritala, 2021; Wu and Chamnisampan, 2021) • Avoiding and/or executing platform envelopment (Eisenmann et al., 2006, 2011) • Executing internationalization strategies (Stallkamp and Schotter, 2021)	**Outcomes of navigation process** • Profit and market share (Y. Chen and Xie, 2007) • First-mover advantage or disadvantage (Y. Chen and Xie, 2007) • Sales volume (Landsman and Stremersch, 2011) • Winning strategy (Anderson et al., 2014) • Innovation (Sedera et al., 2016; Miric and Jeppesen, 2020) • Profitability (Mantena and Saha, 2012) • Performance of the platform (Cennamo and Santalo, 2013) • Winner does not take all (Huotari et al., 2017) • Welfare implications (Spinello, 2005; Van Cayseele and Vanormelingen, 2019; S. Wang et al., 2019; Basaure et al., 2020; Chellappa and Mukherjee, 2021; Nguyen

(Stallkamp and Schotter, 2021) • Information transparency (H. Li and Zhu, 2021) • User privacy concerns (Gal-Or et al., 2018) • Network interconnectivity (Zhu et al., 2021) • Language (Jeon et al., 2021) • Taste preferences (Chellappa and Mukherjee, 2021) • Economic regulations (Paelo and Roberts, 2022)	• *"Digital colonization"* (Ozalp et al., 2022: 78) • Responding to disruptive innovations (Ansari et al., 2016) ***Macro-environment*** • Adhering to policies and antitrust laws (McCalman, 2022; Spinello, 2005; H. Wang, 2022) • Aligning with technological trajectories (Tiwana et al., 2010) • Complying with governmental regulations (S. Wang et al., 2019) • Addressing the risk of cyberattacks (Sen et al., 2020) • Reducing the risk of piracy (Ishihara and Muller, 2020; Miric and Jeppesen, 2020)	and Kannan, 2021; Stähler and Stähler, 2022) • Brand equity and consumer loyalty (Gong et al., 2020) • Development goals (Bonina et al., 2021) • Subscription prices, circulation levels, and advertising rates (Parker et al., 2021) • Sustainable competitive advantage (F. Li, 2021) • Reduced outsourcing and limited software variety (Ishihara and Muller, 2020) • Cooperation (Zhu et al., 2021)
Antecedents of evolution process • Platform architecture (Baldwin and Woodard, 2009; Tiwana et al., 2010; Huber et al., 2017) • Modularity (Baldwin and Woodard, 2009) • Environmental dynamics (Tiwana et al., 2010) • Economies of innovation and complementarity (Thomas et al., 2014) • IS capabilities (Tan et al., 2015) • Economies of transaction and search (Thomas et al., 2014) • *"Innovative capabilities, environmental scanning and sensing capabilities, and integrative capabilities for ecosystem orchestration"* (Helfat and Raubitschek, 2018: 1391) • Information communication	**EVOLUTION PROCESS** ***Architecture-driven*** • Controlling the interfaces (Gawer and Cusumano, 2014) • Resourcing and securing, *"Self-resourcing, regulation-based securing, diversity resourcing, and sovereignty securing"* (Ghazawneh and Henfridsson, 2013: 173) • Executing architectural openness (Thomas et al., 2014) • Coevolution of governance, environmental dynamics, and architecture (Tiwana et al., 2010) ***Function-driven*** • Developing new business models (Gawer and Cusumano, 2014; Muzellec et al., 2015) • Changing leverage logics: (1) production, (2) innovation, and (3) transaction (Thomas et al., 2014)	**Outcomes of evolution process** • Platform leadership (Gawer and Cusumano, 2014; Leong et al., 2019) • Complex business model designs (Zhao and Chen, 2019) • Market leadership (Zhao and Chen, 2019) • Acquisition of fundamental resources and capabilities, and the establishment of legitimacy (Au et al., 2020) • A shift from reliance on business actors to leveraging ecosystem actors (Au et al., 2020) • Platform balance and business sustainability (Au et al., 2020) • Platform dominance (McIntyre et al., 2021)

technologies (Leong et al., 2019) • Data types, technological operations, and actor configurations (Alaimo et al., 2020) • Early governance decisions (Thomas et al., 2022) • Network attributes, platform attributes, and complementor attributes (McIntyre et al., 2021) • Synergies between internal and external resources (Zeng et al., 2022)	• Implementing development strategies: (1) encapsulating, (2) delegating, (3) meshing, (4) empowering (Tan et al., 2015) • Utilizing boundary management mechanisms (Leong et al., 2019) • Innovating and immitating business models (Zhao and Chen, 2019) • Progressively developing actors (Au et al., 2020)	

3.2. Antecedents of industry platform management

Researchers have identified various factors that stimulate the process of creating of industry platforms, including the existence of essential system and business problems (Gawer and Cusumano, 2008), the layered modular architecture (Gawer, 2014), IS capabilities (Tan et al., 2015), dynamic capabilities, such as the ability to sense the internal environment, capture value, orchestrate silos, and transform the boundaries of the organization (Pundziene et al., 2022), and other capabilities such as innovation leverage, market exploration, quality control, appropriation (Shi et al., 2021).

Additionally, scholars have explored various factors that may influence the integration process. According to Rochet and Tirole (2006), the presence of a two-sided market, with both sides on board, necessitates the existence of transaction costs among end-users, limitations on pricing between the buyer and seller, and fixed membership costs. Besides, cross-subsidization can be triggered by two main factors, network externalities, namely asymmetric ones (Caillaud and Jullien, 2003), and third-degree price discrimination or multi-product pricing (Caillaud and Jullien, 2001; Rochet and Tirole, 2003; Parker and Van Alstyne, 2005). Further, the non-pricing approach, such as the utilization of first-party content, is intertwined with the platform's optimal pricing approach, which is in turn influenced by external factors such as market-side expectations and the interplay between first and third-party content (Hagiu and Spulber, 2013). Also, legitimacy, along with trust, are crucial for crowdfunding platforms to attract users and resources (Ingram Bogusz et al., 2019); and piggybacking is defined by the non-competitive and exclusive access of external users (Dou and Wu, 2021).

Moreover, distinct studies have investigated various factors that may impact the orchestration process. Baldwin and Woodard (2009) argue that a platform architecture shows a unique sort of modularity. Besides, the entrant absorptive capacity and the strength of network effects have an influence on platform openness (Niculescu et al., 2018), where openness is a governance-related issue. Further, the app market conditions impact application programming interfaces, which are required for developing complementary innovations (Xue et al., 2019); and the sellers' network environment shapes their responses to design changes in platform governance (Koo and Eesley, 2021).

Also, the antecedents of the navigation process have been emphasized differently across various studies. The likelihood of the winner-take-all scenario is higher when multihoming costs are substantial, network effects are positive, and the desire for special features is minimal (Eisenmann et al., 2006). Additionally, envelopment attacks are more likely to occur if the attacker's users and target significantly overlap, the invader can benefit from price discrimination, or if there are significant economies of scope (Eisenmann et al., 2011). Besides, scholars have identified various antecedents that influence the navigation process, including, customer loyalty (Y. Chen and Xie, 2007), industry architecture (Tee and Gawer, 2009), age and market share (Landsman and Stremersch, 2011), and privacy concerns (Gal-Or et al., 2018).

Lastly, in the context of the evolution process, modularity emerges as a key antecedent. This is primarily due to the fact that platform architecture, which is closely linked to the evolution of platforms, showcases a unique form of modularity (Baldwin and Woodard, 2009). Besides, the information systems capabilities play a major role in the evolution of industry platforms; however, the antecedents and outcomes of these capabilities differ in the different stages of evolution (Tan et al., 2015). Further, upon introducing the different leverage logics, Thomas et al. (2014) identify various antecedents for the evolution process. They posit that production leverage relies on both economies of scale and scope; innovation leverage on economies of innovation and economies of complementarity; and transaction leverage on economies of transaction and economies of search (Thomas et al., 2014). Also, different studies have identified different antecedents for the industry platform evolution process, including, data types, technological operations, and actor configurations (Alaimo et al., 2020), complementor's attributes (McIntyre et al., 2021), and early governance decisions (Thomas et al., 2022).

3.3. Outcomes of industry platform management

Concerning the creation process, the establishment of industry platforms has the potential to address unfulfilled needs (Tan et al., 2015) and critical system and business challenges for diverse industry players (Gawer and Cusumano, 2008). They enable platform owners to coordinate innovative and competitive agents, exploit demand and/or supply economies of scope, and create value (Gawer, 2014). Consequently, firms can attain economies of scope not only in production but also in innovation (Gawer, 2014). For instance, industry platforms have been shown to enhance innovation in the healthcare sector (Cennamo et al., 2022). Further, creating an industry platform can transform a multiproduct firm's competitors into complementors (Hagiu et al., 2020) and align a brand's objectives with those of its customers (Wichmann et al., 2022).

The primary objective of the integration process is to attract and integrate different market actors, regardless of whether pricing or non-pricing approaches are being followed. Rochet and Tirole (2003) argue that the decomposition of the price affects transaction volume and platform profitability, while Parker and Van Alstyne (2005) propose that firms may invest in products they intend to offer for free, even in the absence of competition, where any market segment can be eligible for the complimentary good. They argue that coupling products can simultaneously increase consumer welfare and firm profitability. Moreover, under specific circumstances, non-pricing approaches can improve platform performance, extract surplus from different market participants, and enhance return on investments (Hagiu and Spulber, 2013). Additionally, Dou and Wu (2021) identify the piggybacking conditions that can either improve profits or result in a prisoner's dilemma. Besides, despite the fact that the freemium business model might be an optimal pricing approach for advertising platforms (Sato, 2019), it might lead to the aggressive charging of advertisers, which is not always advisable (R. Wang et al., 2018).

Furthermore, various studies have yielded diverse results regarding the orchestration process. Granting access leads to a significant increase in development speed compared to devolving control (Boudreau, 2010); resourcing can expand the range and variety of platforms while also introducing new complementary applications, whereas securing can provide the platform owner with greater control over their platform (Ghazawneh and Henfridsson, 2013); and third-party complementors' participation is crucial for enabling a platform to cater diverse customer needs, as the platform alone may not be capable of doing so (Wareham et al., 2014). Besides, Karhu et al. (2018) posit that excessively broad openness can lead to platform forking. Additionally, various studies have yielded different results from the orchestration process, such as increased revenues but destabilization of the

platform's ecosystem (Wessel et al., 2017); improved competitiveness (Kazan et al., 2018); enhanced reputation or uptick in the ecosystem's free-riders (Cennamo and Santalo, 2013); and different levels of knowledge sharing among complementors (Zhang et al., 2022).

Similarly, the navigation process has yielded varying outcomes across different studies. Asymmetric customer loyalty can result in a profit disadvantage, while a new entrant lacking customer loyalty may surpass an incumbent platform in terms of market share and profit; consequently, customer loyalty can either stimulate first-mover advantage or first-mover disadvantage (Y. Chen and Xie, 2007). Also, as multihoming on the seller side increases, it negatively impacts the platform's sales, but as the platform grows and gains more market share, these negative effects disappear (Landsman and Stremersch, 2011). Moreover, different studies have identified diverse outcomes associated with the navigation process, including, enhancing profitability (Mantena and Saha, 2012), improving brand equity and fostering consumer loyalty (Gong et al., 2020), and achieving sustainable competitive advantage (F. Li, 2021).

Lastly, regarding the evolution process, diverse studies have demonstrated varied results. Baldwin and Woodard (2009) posit that platform architecture enables variety in the short term and evolvability in the long term. However, platform owners often encounter a dyadic governance tension arising from the trade-off between the co-created value and governance costs (Huber et al., 2017). Additionally, Au et al. (2020) observed various outcomes resulting from the different stages of evolution, including the acquisition of fundamental resources and capabilities while establishing legitimacy, building a strong complementors' (lender) base to reduce reliance on business partners, and achieving platform balance and long-term business sustainability.

3.4. The interplay between the different processes

Some studies have explored the dynamics within individual processes, while others have examined the interplay among the diverse processes. For instance, within the integration process and upon introducing piggybacking as a non-pricing instrument to attract various actors to the platform, Dou and Wu (2021) investigated the interplay between pricing and non-pricing. Particularly, they explored the optimal conditions for implementing piggybacking, how it affects the platform's subsidization strategy, and ultimately, its profits. In a similar vein, and in response to McIntyre and Srinivasan (2017), Dushnitsky et al. (2022) investigated the effects of the strategic mix of six different choices, including three distinct pricing and three non-pricing dimensions, on the platform's performance.

Further, the integration process was analyzed in conjunction with the orchestration process, specifically examining the interplay between platform architecture and governance approaches and their impact on the integration of third-party complementors (Saadatmand et al., 2019). An exemplification of this complexity lies in the challenge faced by platform owners in making investment decisions related to integration tools (Tan et al., 2020), e.g., application programming interfaces, which are an example of boundary resources (Ghazawneh and Henfridsson, 2013). Yet, these decisions are intertwined with pricing approaches (Tan et al., 2020). Therefore, the conventional notion of lowering prices for one market segment while increasing them for another does not hold true when integration tool investments are involved. For that reason, it is crucial to ensure that such investment decisions are aligned with pricing decisions (Tan et al., 2020). Further, in their investigation of the role of boundary resources in attracting and integrating external complementors, Engert et al. (2022) identified various forms of complementor engagement and subsequently determined the distinct types of boundary resources associated with each form. Similarly, the integration process was examined alongside the navigation process. Although early literature, such as Armstrong (2006) and Rochet and Tirole (2006), assumed that multihoming is more relevant on one side of the market, recent research by Bakos and Halaburda (2020) suggests that multihoming can occur on the seller and buyer sides of the platform simultaneously. In such a scenario, subsidizing the more elastic side may have limited or no benefit (Bakos and Halaburda, 2020).

Besides, the examination of the orchestration process was conducted in correlation with the navigation process. Ruutu et al. (2017) identified a connection between the openness in platform interfaces and the reduced likelihood of winner-takes-all threat. Further, an overly open approach may lead to platform forking, wherein instead of designing a mutually beneficial relationship with complementors, the platform owner is forced to manage a former complementor who has turned into a rival due to the excessive level of openness (Karhu et al., 2018). Consequently, boundary resources, which are part of the orchestration process, play a crucial role in maintaining a competitive advantage for platform owners (Karhu et al., 2018). Moreover, Chen et al. (2022) noted a correlation between the level of openness and multihoming, suggesting that a greater degree of openness results in a more complex ecosystem, ultimately leading to reduced levels of multihoming. Also, the platform's architecture can either facilitate or hinder multihoming, as complementors must decide whether to commit to one platform's complex architecture, sacrificing the ability to multihoming to another platform, or to design the complement using the *"lowest common denominator"* (Cennamo, 2018: 462) approach across all platforms, resulting in suboptimal performance on the most complex platform (Cennamo, 2018). Therefore, the architecture of the platform plays a significant role in the context of multihoming. In addition, Loh and Kretschmer (2022) linked the

competitive position of the platform owner to the complementors' behavior, especially in scenarios where the platform has limited control over the complementors' actions, as in crowdsourcing platforms. They argue that a stronger competitive position not only fosters better coordination with complementors but also correlates with higher levels of complementors' productivity (Loh and Kretschmer, 2022).

3.5 The dynamics of industry platform management

Building on the previous discussion, namely Section 3.4, we argue that these processes are not sequential but operate simultaneously and are continuously revisited, reflecting the dynamic nature of industry platforms (McIntyre et al., 2021). At the core of managing industry platforms is the creation process, entailing the establishment of a new platform (Gawer and Cusumano, 2008). Simultaneously, the integration process focuses on attracting and integrating diverse actors into the platform ecosystem (Rochet and Tirole, 2003; Armstrong, 2006; Eisenmann et al., 2006; Rysman, 2009), while the orchestration process centers on influencing their behavior and interactions (Baldwin and Woodard, 2009; Tiwana et al., 2010; Constantinides et al., 2018) to achieve desired outcomes and optimize ecosystem performance. Additionally, the navigation process involves strategically maneuvering the dynamics of the competitive and macro-environments (Eisenmann et al., 2006), extending beyond the platform ecosystem. Lastly, the evolution process drives the adaptation and transformation of the entire platform and its ecosystem over time (Helfat and Raubitschek, 2018; Modol and Eaton, 2021; Thomas et al., 2022). Indeed, initial governance decisions play a vital role in shaping the evolution of the platform and its associated ecosystems (Thomas et al., 2022); however, equally noteworthy is the recognition that the evolutionary trajectory of industry platforms and their ecosystems is influenced not only by governance decisions but also by other decisions and activities that are relevant to the various processes of industry platform management (Helfat and Raubitschek, 2018).

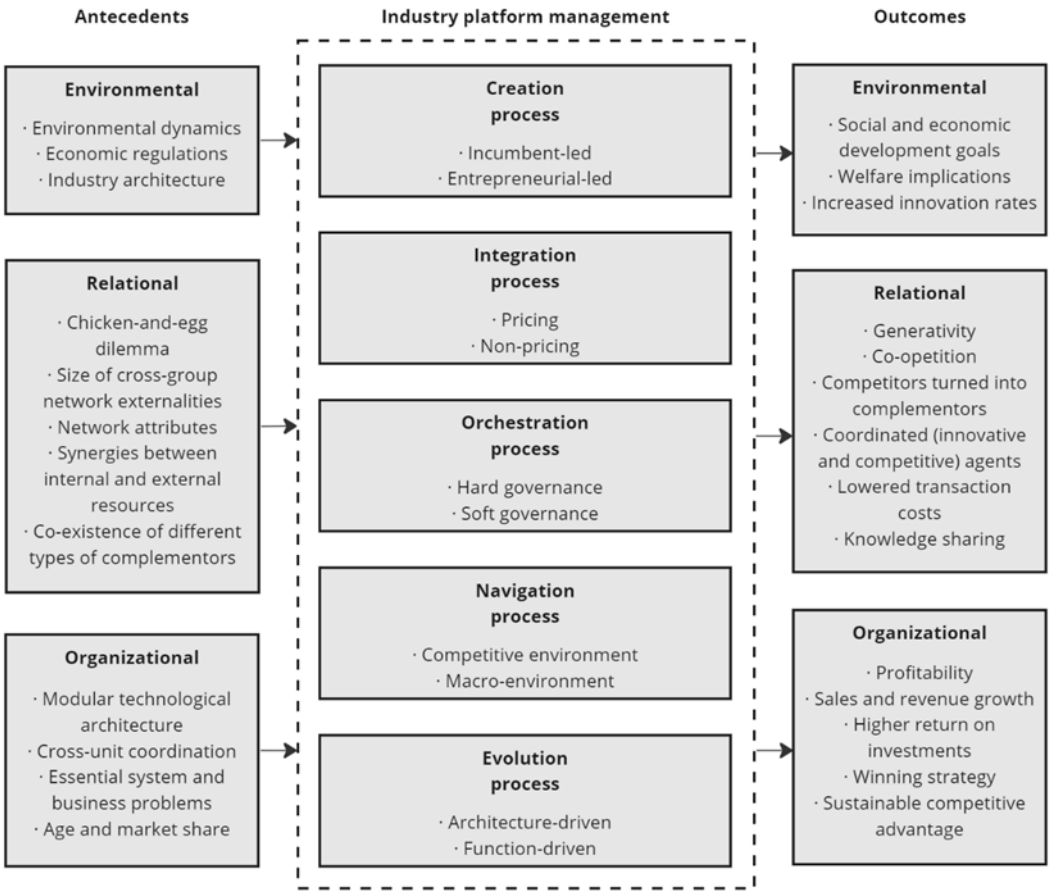

Figure 3: The dynamics of industry platform management

Accordingly, the interplay between these processes forms the foundation of managing industry platforms. Against this background, we argue that the management of industry platforms encompasses interrelated and iterative processes of creation, integration, orchestration, navigation, and evolution that operate simultaneously, reflecting the dynamic nature of industry platforms. Figure 3 provides a concise overview of the antecedents, processes, and outcomes associated with industry platform management, expanding upon the data presented in Table 2. While Figure 3 maintains exactly the same approach in presenting the processes as Table 2, it diverges in its representation of the antecedents and outcomes. In Table 2, we delineated the corresponding antecedents and outcomes for each of the five processes. However, in Figure 3, we aggregated the antecedents and outcomes of industry platform management across three distinct levels: environmental (macro level), relational (meso level), and organizational (micro level).

4. Future research agenda

As mentioned earlier, it is evident that the creation process has received limited attention in the industry platform literature. Similarly, the evolution process has primarily been explored in connection with the orchestration process, with a specific emphasis on architecture-driven evolution. Thus, the integration, orchestration, and navigation processes have been extensively addressed, though with a narrow focus on specific aspects within each, namely, pricing in the integration process (Rochet and Tirole, 2003), hard governance in the orchestration process (Ghazawneh and Henfridsson, 2013), and the competitive environment in the navigation process (Cennamo and Santalo, 2013). Consequently, it is crucial to shift the focus towards the unexplored aspects, namely, non-pricing in the integration process (Eisenmann and Hagiu, 2007), soft governance in the orchestration process (Foerderer et al., 2021), and the macro-environment in the navigation process (Sen et al., 2020). In brief, there is a clear need for a more comprehensive examination of the creation and evolution processes, alongside a broader investigation into the various facets within the other processes.

Transitioning from the broad overview in the preceding part, we suggest various research questions that can be explored within each of the five processes, as depicted in Figure 4. As for the creation process, in certain industries, the absence of the appropriate hardware infrastructure poses a considerable barrier for companies seeking to create an industry platform. Thus, it is essential to examine methods through which firms can identify and develop the optimal infrastructure required for successful platform creation. Further, by integrating the resource-based view with that of dynamic capabilities, scholars can explore the critical resources and capabilities required for incumbents, or entrepreneurs, to initiate the creation process. Other topics that can be examined within this process are the strategies that incumbent firms employ to effectively manage organizational change during their transition to a platform business model, or even the strategies that entrepreneurs or startups utilize to navigate and overcome the liabilities of newness and smallness within their specific industry. Besides, with regard to the integration process, scholars may explore the extent to which the incorporation of behavioral economics and psychological insights can enhance the effectiveness of both pricing and non-pricing approaches in attracting diverse actors to the platform. Furthermore, it is vital to identify the methods and metrics that can be employed to assess the effectiveness of the pricing and non-pricing approaches. Moreover, several platforms employ a combination of pricing and non-pricing approaches to attract various actors to their ecosystem; nevertheless, there remains a gap in understanding the ideal balance between pricing and non-pricing, as well as the means to measure this balance. The integration and orchestration processes share some research questions that revolve

around similar conceptual themes, though customized for each respective process. These questions include topics such as the interactions and complementarity among the diverse approaches, the optimal balance of these various approaches, methods for their measurement, and the applicability of the approaches across various platform types. Further, some questions dedicated to the orchestration process revolve around the development of novel governance approaches aimed at achieving a balance between user data protection and the effective orchestration of the platform. Moreover, existing research on orchestration has predominantly emphasized the interaction between the platform owner and external complementors, overlooking the crucial aspect of effectively managing relationships with other actors in the ecosystem. Therefore, research should address the relationship between the platform owner and the other actors within the ecosystem. Also, with the widespread adoption of artificial intelligence, it is imperative to investigate how advanced AI-driven governance approaches may reshape the orchestration process through providing real-time data-driven insights that enhance decision-making for platform owners. In a similar vein, AI-driven technologies can be explored to understand how they can be utilized for anticipating and responding to changes in the competitive or macro-environment within the navigation process. Additional areas for future research in the navigation process include examining the strategies that platform owners can implement to foster adaptability and resilience within their organizations, which would enable them to respond effectively to external dynamics. Furthermore, research can focus on understanding how changes in the macro-environment impact the competitive dynamics of platform owners. Besides, the evolution process can be further examined to gain insights into the evolutionary journey of industry platforms. This examination could help determine the common phases of the evolution journey, as well as the effective strategies for managing each stage. However, the diverse terminologies and classifications of platforms might pose a challenge in identifying the distinct stages of platform evolution. For instance, while some scholars have examined the development of a two-sided platform into a multi-sided platform (Zhao and Chen, 2019), others have examined the evolution of a hub-and-spoke multi-sided platform into a networked one and ultimately to a symbiotic multi-sided platform (Tan et al., 2015), to mention a few. Therefore, as scholars persist in using various terminologies and classifications for industry platforms, research on platform evolution is more likely to remain fragmented. Furthermore, when tackling the topic of evolution, much of the emphasis typically centers around the platform owner as the key decision-maker. Nevertheless, it is essential to acknowledge the presence of other actors within this ecosystem (Van Alstyne et al., 2016). Therefore, it is vital to understand the roles played by these diverse actors in shaping the evolution of industry platforms.

Upon completing the systematic review and categorizing the processes, we noted the existence of interdisciplinary studies that encompass more than one process simultaneously, that is Section 3.4. Thus, the purpose of the research agenda is not only to outline the future research questions within each of the processes but also to highlight the potential for generating novel research questions stemming from the interplay between these distinct processes. Therefore, gaining a thorough grasp of Section 3.4, combined with a careful analysis of Figure 2 and Table 2, aims to inspire researchers in crafting novel research inquiries that arise from the interconnected nature of the various processes. For instance, spanning the orchestration process and the navigation process may lead to questions such as: How can platform owners effectively fine-tune their orchestration approaches while navigating the ever-changing external environment? Or exploring further, how can signaling aid platform owners in navigating the challenges of digital piracy? Or even deeper and narrower, how can signaling aid in preventing intellectual property theft within the context of innovation platforms? Thus, the previously mentioned resources, namely Section 3.4, Figure 2, and Table 2, can serve as a valuable toolkit for researchers, offering inspiration for innovative research questions that connect diverse processes and, consequently, pave the way for new avenues of knowledge within the field of industry platforms.

Creation process

· In industries lacking a suitable hardware infrastructure, how can firms identify the optimal infrastructure for platform creation (coring)?
· Can the principles of biomimicry be integrated into the creation process, leading to the development of self-optimizing, resilient, and highly adaptable platform ecosystems?
· What strategies can incumbent firms employ to manage the organizational change when transitioning to a platform business model?
· How can entrepreneurial-led platforms overcome the liabilities of newness and smallness?
· What are the fundamental resources and capabilities needed for incumbents, or entrepreneurs, to initiate the creation journey?

Integration process

· To what extent can behavioral economics and psychological insights be integrated into pricing and non-pricing approaches, enhancing their effectiveness in attracting diverse actors into the platform?
· What methods or metrics can be employed to evaluate the effectiveness of both pricing and non-pricing approaches?
· How do pricing and non-pricing approaches interact and complement each other to attract and integrate diverse actors to the platform?
· What is the optimal balance between pricing and non-pricing, and how can we measure this balance?
· How do (non-) pricing approaches vary across distinct platform types, and how can they be tailored to fit each platform's unique characteristics and objectives?

Orchestration process

· What novel governance approaches can be developed to strike a balance between user data protection and effective platform orchestration?
· How might advanced AI-driven governance approaches transform the orchestration process by providing real-time, data-driven insights that enhance decision-making for platform owners?
· How does the orchestration process effectively address the complexities posed by incomplete contracts?
· Do strategic complementors exist within the realm of industry platforms, akin to the strategic suppliers found in conventional businesses?
· How do hard and soft governance approaches interact and complement each other ?
· What is the optimal balance between soft and hard governance approaches?

Navigation process

· How can predictive analytics and AI-driven technologies be utilized to anticipate and respond to changes in the competitive and macro environments, enabling platforms to stay ahead of emerging challenges?
· What strategies can platform owners employ to cultivate adaptability and resilience within their organizations, allowing them to respond adeptly to external dynamics?
· How do changes in the macro environment impact the competitive dynamics of platform owners?
· How can platform owners successfully balance their strategies to manage both the macro-environmental factors and the competitive challenges, showcasing ambidexterity?
· What are the specific resources and capabilities essential for platform owners to effectively navigate the competitive and macro environments?

Evolution process

· What are the common phases in the evolution journey of platforms, and what approaches are effective for managing each stage?
· What role do different ecosystem actors play in influencing the evolution of platforms?
· How can a platform seamlessly transition from one type, such as a transactional platform, to another type, like an innovation platform, and potentially evolve into a hybrid platform model?
· How do platform owners navigate the challenges inherent in shifting from one platform type to another?
· How do architecture- and function-driven processes interact and contribute to the evolution of platforms?
· What are the essential resources and capabilities required for driving the evolution of the platform?

Figure 4: Future Research Agenda

As for the context where these platforms have received the majority of attention, most studies within the realm of industry platforms have predominantly examined B2C and C2C contexts, resulting in a substantial gap in our comprehension of B2B industry platforms, with the exception of Loux et al. (2020) and Shree et al. (2021), to mention a few. This lack of research has resulted in limited knowledge about B2B industry platforms and the processes involved. Furthermore, the conventional assumptions about industry platforms operating in B2C and C2C contexts may not be applicable to those operating in the B2B context (Loux et al., 2020). Therefore, scholars should examine the realm of B2B platforms, given the increasing prominence and accessibility of industry platforms within such contexts. Additionally, it would be optimal to conduct a systematic literature review on B2B platforms, akin to the approach outlined in this study, which can effectively unveil the unique characteristics and dynamics of B2B industry platforms. Furthermore, while most literature has focused on industry platforms in digitalized B2C contexts, recent studies have highlighted that certain industries are subject to higher levels of regulation, e.g., healthcare and education (Cennamo et al., 2022; Ozalp et al., 2022; Teece et al., 2022; Zhou and Wan, 2022), or are embedded with physical assets that play a major role in the value proposition, e.g., electric vehicle industry (Anderson et al., 2022). Consequently, this sets them apart from other industries that were initially examined in discussions of industry platforms, such as payment cards and game consoles (Rochet and Tirole, 2003; Armstrong, 2006; Rysman, 2009). Given these differences, it would be insightful to explore how the processes that industry platform owners undergo vary between those industries that have recently gained attention and the more typical industries commonly discussed in the literature. Besides, certain processes have predominantly concentrated on a specific type of industry platforms while overlooking others. For instance, the themes of architecture and governance have primarily been explored in the context of innovation platforms (Ghazawneh and Henfridsson, 2013; Eaton et al., 2015; Fink et al., 2020), neglecting the significance of these aspects in transaction platforms. Hence, when examining specific topics, it is crucial to assess whether the findings are applicable across all types of platforms or are specific to certain platform categories. Furthermore, Zhou and Wan (2022) argue that incumbent and late-entrant platforms employ different strategies to generate network effects. Consequently, it is possible that the approaches of platform owners to the processes we have examined vary between incumbents and late entrants. Lastly, it is important to highlight again that this review focused solely on the perspective of the platform owner, who is only a single actor within the platform ecosystem (Van Alstyne et al., 2016). Thus, for the sake of gaining a more comprehensive understanding of industry platforms, it is essential to conduct similar studies from the perspectives of the various actors within the ecosystem. In light of this, when examining industry platforms, it is vital for researchers to identify various factors: (1) the context where the platform operates, mainly B2C or B2B setting, (2)

the type of platform being examined, a transaction, innovation, or hybrid platform (Cusumano et al.'s, 2019), (3) the phase of the platform's lifecycle, launch or maturity phase (Gawer, 2021), and (4) the perspective of the study, which is based on the four different actors present in the platform ecosystem (Van Alstyne et al., 2016). Besides, the majority of work on industry platforms is conducted through conceptual and stylized analytic models (Sriram et al., 2015); however, there is a pressing need for more empirical research, particularly longitudinal studies, to deepen our understanding of the different processes.

5. Conclusion

Since the emergence of the literature on industry platforms, scholarly investigations into the management of these platforms have been characterized by fragmentation, with different groups of scholars narrowly focusing on specific processes and often overlooking others. Our research aimed to synthesize diverse studies, providing a holistic examination of the underlying processes integral to the management of industry platforms. By identifying the diverse processes, their antecedents and outcomes, and emphasizing their interplay, our research contributes significantly to both theoretical and practical realms.

Our study offers theoretical advancements by addressing the existing fragmentation in industry platform literature. Scholars can harness this comprehensive review to expand their perspectives, either through exploring the dynamics of individual processes or through examining the interplay between the diverse processes, particularly those commonly discussed within specific scholarly groups and those that may have been overlooked or addressed by separate groups. Notably, the research agenda we have presented, namely Figure 4, provides a foundation for further exploration, paving the way for novel research topics and elevating the literature on industry platforms to unprecedented levels. Further, the practical implications of our study are substantial for entrepreneurs, incumbents, and startups alike. Our research provides a thorough comprehension of industry platform management by examining the complexities of its diverse processes. It emphasizes the interconnected nature of these processes, emphasizing that they operate concurrently and iteratively rather than in isolation. This dynamic perspective provides not only academics but also practitioners with a nuanced understanding of how industry platforms are managed and how they evolve over time. Moreover, while our primary goal with the presented research agenda is to guide future research, it is noteworthy that the majority of the proposed questions carry practical implications. Thus, practitioners can leverage this research agenda as a strategic guide, navigating uncharted territories and addressing overlooked aspects of industry platform

management. Embracing this proactive approach holds the potential to significantly influence the advancement of their industry platforms.

Although our study makes a substantial contribution to the comprehension of industry platform management, particularly from the platform owner's perspective, it is important to acknowledge certain limitations. Future studies could enrich the literature by exploring management issues from the perspectives of various actors within the platform ecosystem, recognizing the collaborative nature of value creation in industry platforms (Ceccagnoli et al., 2012). Additionally, we acknowledge that our reliance solely on Scopus to compile the final list of articles may present limitations. Thus, subsequent studies could broaden their scope by incorporating different databases to conduct similar literature reviews.

In essence, the management of industry platforms differs from the conventional approaches applied in value chain businesses. The focus has shifted from controlling resources to integrating and coordinating them, from managing internal processes to orchestrating interactions within the platform ecosystem, and from emphasizing customer value to emphasizing ecosystem value (Van Alstyne et al., 2016). Consequently, our review establishes a robust foundation for comprehending the processes undertaken by platform owners in managing their industry platforms.

References

Adam, M., Croitor, E., Werner, D., Benlian, A., and Wiener, M. (2022). Input control and its signalling effects for complementors' intention to join digital platforms. *Information Systems Journal*. https://doi.org/10.1111/isj.12408

Adner, R. (2017). Ecosystem as Structure: An Actionable Construct for Strategy. *Journal of Management*, *43*(1), 39–58. https://doi.org/10.1177/0149206316678451

Alaimo, C., Kallinikos, J., and Valderrama, E. (2020). Platforms as service ecosystems: Lessons from social media. *Journal of Information Technology*, *35*(1), 25–48. https://doi.org/10.1177/0268396219881462

Ambrus, A., and Argenziano, R. (2009). Asymmetric Networks in Two-Sided Markets. *American Economic Journal: Microeconomics*, *1*(1), 17–52. https://doi.org/10.1257/mic.1.1.17

Amelio, A., and Jullien, B. (2012). Tying and freebies in two-sided markets. *International Journal of Industrial Organization*, *30*(5), 436–446. https://doi.org/10.1016/j.ijindorg.2012.03.002

Anderson, E. G., Bhargava, H. K., Boehm, J., and Parker, G. (2022). Electric Vehicles Are a Platform Business: What Firms Need to Know. *California Management Review*, *64*(4), 135–154. https://doi.org/10.1177/00081256221107420

Anderson, E. G., Parker, G. G., and Tan, B. (2014). Platform Performance Investment in the Presence of Network Externalities. *Information Systems Research*, *25*(1), 152–172. https://doi.org/10.1287/isre.2013.0505

Ansari, S. S., Garud, R., and Kumaraswamy, A. (2016). The disruptor's dilemma: TiVo and the U.S. television ecosystem. *Strategic Management Journal*, *37*(9), 1829–1853. https://doi.org/10.1002/smj.2442

Armstrong, M. (2006). Competition in two-sided markets. *The RAND Journal of Economics*, *37*(3), 668–691. https://doi.org/10.1111/j.1756-2171.2006.tb00037.x

Armstrong, M., and Wright, J. (2007). Two-sided Markets, Competitive Bottlenecks and Exclusive Contracts. *Economic Theory*, *32*(2), 353–380. https://doi.org/10.1007/s00199-006-0114-6

Au, C. H., Tan, B., and Sun, Y. (2020). Developing a P2P lending platform: Stages, strategies and platform configurations. *Internet Research*, *30*(4), 1229–1249. https://doi.org/10.1108/INTR-03-2019-0099

Bakos, Y., and Halaburda, H. (2020). Platform Competition with Multihoming on Both Sides: Subsidize or Not? *Management Science*, *66*(12), 5599–5607.

Baldwin, C. Y., and Woodard, C. J. (2009). The Architecture of Platforms: A Unified View. In A. Gawer, *Platforms, Markets, and Innovation*. Edward Elgar Publishing Limited. http://www.ssrn.com/abstract=1265155

Barile, S., Simone, C., Iandolo, F., and Laudando, A. (2022). Platform-based innovation ecosystems: Entering new markets through holographic strategies. *Industrial Marketing Management*, *105*, 467–477. https://doi.org/10.1016/j.indmarman.2022.07.003

Basaure, A., Vesselkov, A., and Töyli, J. (2020). Internet of things (IoT) platform competition: Consumer switching versus provider multihoming. *Technovation*, *90–91*, 102101. https://doi.org/10.1016/j.technovation.2019.102101

Belleflamme, P., and Peitz, M. (2019). Platform competition: Who benefits from multihoming? *International Journal of Industrial Organization*, *64*, 1–26. https://doi.org/10.1016/j.ijindorg.2018.03.014

Bolt, W., and Tieman, A. F. (2008). Heavily skewed pricing in two-sided markets. *International Journal of Industrial Organization*, *26*(5), 1250–1255. https://doi.org/10.1016/j.ijindorg.2007.11.003

Bonina, C., Koskinen, K., Eaton, B., and Gawer, A. (2021). Digital platforms for development: Foundations and research agenda. *Information Systems Journal*, *31*(6), 869–902. https://doi.org/10.1111/isj.12326

Boudreau, K. (2010). Open Platform Strategies and Innovation: Granting Access vs. Devolving Control. *Management Science*, *56*(10), 1849–1872. https://doi.org/10.1287/mnsc.1100.1215

Caillaud, B., and Jullien, B. (2001). Competing cybermediaries. *European Economic Review*, *45*(4–6), 797–808. https://doi.org/10.1016/S0014-2921(01)00123-4

Caillaud, B., and Jullien, B. (2003). Chicken and Egg: Competition among Intermediation Service Providers. *The RAND Journal of Economics*, *34*(2), 309–328. https://doi.org/10.2307/1593720

Ceccagnoli, M., Forman, C., Huang, P., and Wu, D. J. (2012). Cocreation of Value in a Platform Ecosystem: The Case of Enterprise Software. *MIS Quarterly*, *36*(1), 263–290. https://doi.org/10.2307/41410417

Cennamo, C. (2018). Building the Value of Next-Generation Platforms: The Paradox of Diminishing Returns. *Journal of Management*, *44*(8), 3038–3069. https://doi.org/10.1177/0149206316658350

Cennamo, C., Oliveira, P., and Zejnilovic, L. (2022). Unlocking Innovation in Healthcare: The Case of the Patient Innovation Platform. *California Management Review*, *64*(4), 47–77. https://doi.org/10.1177/00081256221101657

Cennamo, C., and Santalo, J. (2013). Platform competition: Strategic trade-offs in platform markets: Platform Competition. *Strategic Management Journal*, *34*(11), 1331–1350. https://doi.org/10.1002/smj.2066

Chan, H., Yang, M. X., and Zeng, K. J. (2022). Bolstering ratings and reviews systems on multi-sided platforms: A co-creation perspective. *Journal of Business Research*, *139*, 208–217. https://doi.org/10.1016/j.jbusres.2021.09.052

Chellappa, R. K., and Mukherjee, R. (2021). Platform Preannouncement Strategies: The Strategic Role of Information in Two-Sided Markets Competition. *Management Science*, *67*(3), 1527–1545. https://doi.org/10.1287/mnsc.2020.3606

Chen, L., Yi, J., Li, S., and Tong, T. W. (2022). Platform Governance Design in Platform Ecosystems: Implications for Complementors' Multihoming Decision. *Journal of Management*, *48*(3), 630–656. https://doi.org/10.1177/0149206320988337

Chen, Y., and Xie, J. (2007). Cross-Market Network Effect with Asymmetric Customer Loyalty: Implications for Competitive Advantage. *Marketing Science*, *26*(1), 52–66. https://doi.org/10.1287/mksc.1060.0238

Choi, J. P., and Jeon, D.-S. (2021). A Leverage Theory of Tying in Two-Sided Markets with Nonnegative Price Constraints. *American Economic Journal: Microeconomics*, *13*(1), 283–337. https://doi.org/10.1257/mic.20180234

Cong, L. W., Li, Y., and Wang, N. (2021). Tokenomics: Dynamic Adoption and Valuation. *The Review of Financial Studies*, *34*(3), 1105–1155. https://doi.org/10.1093/rfs/hhaa089

Constantinides, P., Henfridsson, O., and Parker, G. G. (2018). Platforms and Infrastructures in the Digital Age. *Information Systems Research*, *29*(2), 381–400. https://doi.org/10.1287/isre.2018.0794

Cozzolino, A., Corbo, L., and Aversa, P. (2021). Digital platform-based ecosystems: The evolution of collaboration and competition between incumbent producers and entrant platforms. *Journal of Business Research*, *126*, 385–400. https://doi.org/10.1016/j.jbusres.2020.12.058

Cusumano, M. A., Gawer, A., and Yoffie, D. B. (2019). The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power. Harper Business.

de Reuver, M., Sørensen, C., and Basole, R. C. (2018). The Digital Platform: A Research Agenda. *Journal of Information Technology*, *33*(2), 124–135. https://doi.org/10.1057/s41265-016-0033-3

Doganoglu, T., and Wright, J. (2006). Multihoming and compatibility. *International Journal of Industrial Organization*, *24*(1), 45–67. https://doi.org/10.1016/j.ijindorg.2005.07.004

Doganoglu, T., and Wright, J. (2010). Exclusive dealing with network effects. *International Journal of Industrial Organization*, *28*(2), 145–154. https://doi.org/10.1016/j.ijindorg.2009.07.006

Dou, Y., and Wu, D. J. (2021). Platform Competition Under Network Effects: Piggybacking and Optimal Subsidization. *Information Systems Research*, *32*(3), 820–835. https://doi.org/10.1287/isre.2021.1017

Dushnitsky, G., Piva, E., and Rossi-Lamastra, C. (2022). Investigating the mix of strategic choices and performance of transaction platforms: Evidence from the crowdfunding setting. *Strategic Management Journal*, *43*(3), 563–598. https://doi.org/10.1002/smj.3163

Eaton, B., Elaluf-Calderwood, S., Sørensen, C., and Yoo, Y. (2015). Distributed Tuning of Boundary Resources: The Case of Apple's iOS Service System. *MIS Quarterly*, *39*(1), 217–243. https://doi.org/10.25300/MISQ/2015/39.1.10

Economides, N., and Katsamakas, E. (2006). Two-Sided Competition of Proprietary vs. Open Source Technology Platforms and the Implications for the Software Industry. *Management Science*, *52*(7), 1057–1071. https://doi.org/10.1287/mnsc.1060.0549

Eisenmann, T., and Hagiu, A. (2007). Staging Two-Sided Platforms. Harvard Business School Background Note 808-004, July 2007 (Revised March 2008).

Eisenmann, T., Parker, G. G., and Van Alstyne, M. (2006). Strategies for Two-Sided Markets. *Harvard Business Review*, *84*(10).

Eisenmann, T., Parker, G. G., and Van Alstyne, M. (2011). Platform envelopment. *Strategic Management Journal*, *32*(12), 1270–1285. https://doi.org/10.1002/smj.935

Engert, M., Evers, J., Hein, A., and Krcmar, H. (2022). The Engagement of Complementors and the Role of Platform Boundary Resources in e-Commerce Platform Ecosystems. *Information Systems Frontiers*, *24*(1), 1–19. https://doi.org/10.1007/s10796-021-10236-3

Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., and Pappas, G. (2008). Comparison of PubMed, Scopus, Web of Science, and Google Scholar: Strengths and weaknesses. *The FASEB Journal*, *22*(2), 338–342. https://doi.org/10.1096/fj.07-9492LSF

Fang, T. P., Wu, A., and Clough, D. R. (2021). Platform diffusion at temporary gatherings: Social coordination and ecosystem emergence. *Strategic Management Journal*, *42*(2), 233–272. https://doi.org/10.1002/smj.3230

Fink, L., Shao, J., Lichtenstein, Y., and Haefliger, S. (2020). The ownership of digital infrastructure: Exploring the deployment of software libraries in a digital innovation cluster. *Journal of Information Technology*, *35*(3), 251–269. https://doi.org/10.1177/0268396220936705

Foerderer, J., Kude, T., Mithas, S., and Heinzl, A. (2018). Does Platform Owner's Entry Crowd Out Innovation? Evidence from Google Photos. *Information Systems Research*, *29*(2), 444–460. https://doi.org/10.1287/isre.2018.0787

Foerderer, J., Kude, T., Schuetz, S. W., and Heinzl, A. (2019). Knowledge boundaries in enterprise software platform development: Antecedents and consequences for platform governance. *Information Systems Journal*, *29*(1), 119–144. https://doi.org/10.1111/isj.12186

Foerderer, J., Lueker, N., and Heinzl, A. (2021). And the Winner Is …? The Desirable and Undesirable Effects of Platform Awards. *Information Systems Research*, *32*(4), 1155–1172. https://doi.org/10.1287/isre.2021.1019

Frishammar, J., Cenamor, J., Cavalli-Björkman, H., Hernell, E., and Carlsson, J. (2018). Digital strategies for two-sided markets: A case study of shopping malls. *Decision Support Systems*, *108*, 34–44. https://doi.org/10.1016/j.dss.2018.02.003

Gal-Or, E., Gal-Or, R., and Penmetsa, N. (2018). The Role of User Privacy Concerns in Shaping Competition Among Platforms. *Information Systems Research*, *29*(3), 698–722. https://doi.org/10.1287/isre.2017.0730

Gawer, A. (2014). Bridging differing perspectives on technological platforms: Toward an integrative framework. *Research Policy*, *43*(7), 1239–1249. https://doi.org/10.1016/j.respol.2014.03.006

Gawer, A. (2021). Digital platforms' boundaries: The interplay of firm scope, platform sides, and digital interfaces. *Long Range Planning*, *54*(5), 102045. https://doi.org/10.1016/j.lrp.2020.102045

Gawer, A., and Cusumano, M. A. (2008). How companies become platform leaders. *MIT Sloan Management Review*, *49*(2), 28–35.

Gawer, A., and Cusumano, M. A. (2014). Industry Platforms and Ecosystem Innovation: Platforms and Innovation. *Journal of Product Innovation Management*, *31*(3), 417–433. https://doi.org/10.1111/jpim.12105

Ghazawneh, A., and Henfridsson, O. (2013). Balancing platform control and external contribution in third-party development: The boundary resources model: Control

and contribution in third-party development. *Information Systems Journal*, *23*(2), 173–192. https://doi.org/10.1111/j.1365-2575.2012.00406.x

Gong, X., Cheung, C. M. K., Zhang, K. Z. K., Chen, C., and Lee, M. K. O. (2020). Cross-Side Network Effects, Brand Equity, and Consumer Loyalty: Evidence from Mobile Payment Market. *International Journal of Electronic Commerce*, *24*(3), 279–304. https://doi.org/10.1080/10864415.2020.1767427

Hagiu, A., Jullien, B., and Wright, J. (2020). Creating Platforms by Hosting Rivals. *Management Science*, *66*(7), 3234–3248. https://doi.org/10.1287/mnsc.2019.3356

Hagiu, A., and Spulber, D. (2013). First-Party Content, Commitment and Coordination in Two-Sided Markets. *Management Science*, *59*(4), 933–949.

Hanseth, O., and Lyytinen, K. (2010). Design Theory for Dynamic Complexity in Information Infrastructures: The Case of Building Internet. *Journal of Information Technology*, *25*, 1–19. https://doi.org/10.1007/978-3-319-29272-4_4

Helfat, C. E., and Raubitschek, R. S. (2018). Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems. *Research Policy*, *47*(8), 1391–1399. https://doi.org/10.1016/j.respol.2018.01.019

Hossain, T., Minor, D., and Morgan, J. (2011). Competing Matchmakers: An Experimental Analysis. *Management Science*, *57*(11), 1913–1925. https://doi.org/10.1287/mnsc.1110.1407

Hossain, T., and Morgan, J. (2013). When Do Markets Tip? A Cognitive Hierarchy Approach. *Marketing Science*, *32*(3), 431–453. https://doi.org/10.1287/mksc.1120.0770

Huber, T. L., Kude, T., and Dibbern, J. (2017). Governance Practices in Platform Ecosystems: Navigating Tensions Between Cocreated Value and Governance Costs. *Information Systems Research*, *28*(3), 563–584. https://doi.org/10.1287/isre.2017.0701

Hukal, P., Henfridsson, O., Shaikh, M., and Parker, G. G. (2020). Platform Signaling for Generating Platform Content. *MIS Quarterly*, *44*(3), 1177–1205. https://doi.org/10.25300/MISQ/2020/15190/

Huotari, P., Järvi, K., Kortelainen, S., and Huhtamäki, J. (2017). Winner does not take all: Selective attention and local bias in platform-based markets. *Technological Forecasting and Social Change*, *114*, 313–326. https://doi.org/10.1016/j.techfore.2016.08.028

Hurni, T., Huber, T. L., Dibbern, J., and Krancher, O. (2021). Complementor dedication in platform ecosystems: Rule adequacy and the moderating role of flexible and benevolent practices. *European Journal of Information Systems*, *30*(3), 237–260. https://doi.org/10.1080/0960085X.2020.1779621

Ingram Bogusz, C., Teigland, R., and Vaast, E. (2019). Designed entrepreneurial legitimacy: The case of a Swedish crowdfunding platform. *European Journal of*

Information Systems, *28*(3), 318–335.
https://doi.org/10.1080/0960085X.2018.1534039

Inoue, Y. (2021). Indirect innovation management by platform ecosystem governance and positioning: Toward collective ambidexterity in the ecosystems. *Technological Forecasting and Social Change*, *166*, 120652.
https://doi.org/10.1016/j.techfore.2021.120652

Ishihara, M., and Muller, E. (2020). Software piracy and outsourcing in two-sided markets. *Quantitative Marketing and Economics*, *18*(1), 61–124.
https://doi.org/10.1007/s11129-019-09221-7

Jacobides, M. G., Cennamo, C., and Gawer, A. (2018). Towards a theory of ecosystems. *Strategic Management Journal*, *39*(8), 2255–2276.
https://doi.org/10.1002/smj.2904

Jeitschko, T. D., and Tremblay, M. J. (2020). Platform Competition with Endogeneous Homing. *International Economic Review*, *61*(3), 1281–1305.
https://doi.org/10.1111/iere.12457

Jeon, D.-S., Jullien, B., and Klimenko, M. (2021). Language, internet and platform competition. *Journal of International Economics*, *131*, 103439.
https://doi.org/10.1016/j.jinteco.2021.103439

Jingyao, M., Gang, Z., and Ling, Z. (2022). Governance mechanisms implementation in the evolution of digital platforms: A case study of the Internet of Things platform. *RandD Management*, *52*(3), 498–516. https://doi.org/10.1111/radm.12494

Kaiser, U., and Wright, J. (2006). Price structure in two-sided markets: Evidence from the magazine industry. *International Journal of Industrial Organization*, *24*(1), 1–28.
https://doi.org/10.1016/j.ijindorg.2005.06.002

Kapoor, K., Ziaee Bigdeli, A., Dwivedi, Y. K., Schroeder, A., Beltagui, A., and Baines, T. (2021). A socio-technical view of platform ecosystems: Systematic review and research agenda. *Journal of Business Research*, *128*, 94–108.
https://doi.org/10.1016/j.jbusres.2021.01.060

Karhu, K., Gustafsson, R., and Lyytinen, K. (2018). Exploiting and Defending Open Digital Platforms with Boundary Resources: Android's Five Platform Forks. *Information Systems Research*, *29*(2), 479–497.
https://doi.org/10.1287/isre.2018.0786

Karhu, K., and Ritala, P. (2021). Slicing the cake without baking it: Opportunistic platform entry strategies in digital markets. *Long Range Planning*, *54*(5), 101988.
https://doi.org/10.1016/j.lrp.2020.101988

Katz, M. L., and Shapiro, C. (1994). Systems Competition and Network Effects. *Journal of Economic Perspectives*, *8*(2), 93–115. https://doi.org/10.1257/jep.8.2.93

Kazan, E., Tan, C.-W., Lim, E. T. K., Sørensen, C., and Damsgaard, J. (2018). Disentangling Digital Platform Competition: The Case of UK Mobile Payment

Platforms. *Journal of Management Information Systems*, *35*(1), 180–219. https://doi.org/10.1080/07421222.2018.1440772

Kohtamäki, M., Rabetino, R., and Möller, K. (2018). Alliance capabilities: A systematic review and future research directions. *Industrial Marketing Management*, *68*, 188–201. https://doi.org/10.1016/j.indmarman.2017.10.014

Koo, W. W., and Eesley, C. E. (2021). Platform governance and the rural–urban divide: Sellers' responses to design change. *Strategic Management Journal*, *42*(5), 941–967. https://doi.org/10.1002/smj.3259

Landsman, V., and Stremersch, S. (2011). Multihoming in Two-Sided Markets: An Empirical Inquiry in the Video Game Console Industry. *Journal of Marketing*, *75*, 39–54.

Leong, C., Pan, S. L., University of New South Wales, Australia, Leidner, D. E., Baylor University, Huang, J.-S., and "Beihang University, China." (2019). Platform Leadership: Managing Boundaries for the Network Growth of Digital Platforms. *Journal of the Association for Information Systems*, *20*(10), 1531–1565. https://doi.org/10.17705/1jais.00577

Li, F. (2021). Sustainable Competitive Advantages via Temporary Advantages: Insights from the Competition between American and Chinese Digital Platforms in China. *British Journal of Management*, *33*(4), 1–24. https://doi.org/10.1111/1467-8551.12558

Li, H., and Zhu, F. (2021). Information Transparency, Multihoming, and Platform Competition: A Natural Experiment in the Daily Deals Market. *Management Science*, *67*(7), 4384–4407. https://doi.org/10.1287/mnsc.2020.3718

Lin, F., Tian, H., Zhao, J., and Chi, M. (2022). Reward or punish: Investigating output controls and content generation in the multi-sided platform context. *Internet Research*. https://doi.org/10.1108/INTR-05-2021-0292

Loh, J., and Kretschmer, T. (2022). Online communities on competing platforms: Evidence from game wikis. *Strategic Management Journal*, *44*(7). https://doi.org/10.1002/smj.3442

Loux, P., Aubry, M., Tran, S., and Baudoin, E. (2020). Multi-sided platforms in B2B contexts: The role of affiliation costs and interdependencies in adoption decisions. *Industrial Marketing Management*, *84*, 212–223. https://doi.org/10.1016/j.indmarman.2019.07.001

Mantena, R., and Saha, R. L. (2012). Co-opetition Between Differentiated Platforms in Two-Sided Markets. *Journal of Management Information Systems*, *29*(2), 109–140. https://doi.org/10.2753/MIS0742-1222290205

McCalman, P. (2022). Trade policy with FANG's (aka trade policy and multi-sided platforms). *Journal of International Economics*, *138*, 103655. https://doi.org/10.1016/j.jinteco.2022.103655

McIntyre, D. P., and Srinivasan, A. (2017). Networks, platforms, and strategy: Emerging views and next steps: Networks, Platforms, and Strategy. *Strategic Management Journal*, *38*(1), 141–160. https://doi.org/10.1002/smj.2596

McIntyre, D. P., Srinivasan, A., and Chintakananda, A. (2021). The persistence of platforms: The role of network, platform, and complementor attributes. *Long Range Planning*, *54*(5), 101987. https://doi.org/10.1016/j.lrp.2020.101987

McIntyre, D. P., and Subramaniam, M. (2009). Strategy in Network Industries: A Review and Research Agenda. *Journal of Management*, *35*(6), 1494–1517. https://doi.org/10.1177/0149206309346734

Miric, M., and Jeppesen, L. B. (2020). Does piracy lead to product abandonment or stimulate new product development?: Evidence from mobile platform-based developer firms. *Strategic Management Journal*, *41*(12), 2155–2184. https://doi.org/10.1002/smj.3208

Miric, M., Ozalp, H., and Yilmaz, E. D. (2022). Trade-offs to using standardized tools: Innovation enablers or creativity constraints? *Strategic Management Journal*. https://doi.org/10.1002/smj.3457

Modol, J. R., and Eaton, B. (2021). Digital infrastructure evolution as generative entrenchment: The formation of a core–periphery structure. *Journal of Information Technology*, *36*(4), 342–364. https://doi.org/10.1177/02683962211013362

Muzellec, L., Ronteau, S., and Lambkin, M. (2015). Two-sided Internet platforms: A business model lifecycle perspective. *Industrial Marketing Management*, *45*, 139–150. https://doi.org/10.1016/j.indmarman.2015.02.012

Nag, R., Hambrick, D. C., and Chen, M.-J. (2007). What is strategic management, really? Inductive derivation of a consensus definition of the field. *Strategic Management Journal*, *28*(9), 935–955. https://doi.org/10.1002/smj.615

Newbert, S. L. (2007). Empirical research on the resource-based view of the firm: An assessment and suggestions for future research. *Strategic Management Journal*, *28*(2), 121–146. https://doi.org/10.1002/smj.573

Nguyen, T., and Kannan, K. (2021). Welfare Implications in Intermediary Networks. *Information Systems Research*, *32*(2), 378–393. https://doi.org/10.1287/isre.2020.0970

Niculescu, M. F., Wu, D. J., and Xu, L. (2018). Strategic Intellectual Property Sharing: Competition on an Open Technology Platform Under Network Effects. *Information Systems Research*, *29*(2), 498–519. https://doi.org/10.1287/isre.2017.0756

Ozalp, H., Ozcan, P., Dinckol, D., Zachariadis, M., and Gawer, A. (2022). "Digital Colonization" of Highly Regulated Industries: An Analysis of Big Tech Platforms' Entry into Health Care and Education. *California Management Review*, *64*(4), 78–107. https://doi.org/10.1177/00081256221094307

Paelo, A., and Roberts, S. (2022). Competition and Regulation of Mobile Money Platforms in Africa: A Comparative Analysis of Kenya and Uganda. *Review of Industrial Organization*, *60*(3), 463–489. https://doi.org/10.1007/s11151-022-09858-x

Pagani, M. (2013). Digital Business Strategy and Value Creation: Framing the Dynamic Cycle of Control Points. *MIS Quarterly*, *37*(2), 617–632. https://doi.org/10.25300/MISQ/2013/37.2.13

Parker, G. G., Petropoulos, G., and Van Alstyne, M. (2021). Platform mergers and antitrust. *Industrial and Corporate Change*, *30*(5), 1307–1336. https://doi.org/10.1093/icc/dtab048

Parker, G. G., and Van Alstyne, M. (2005). Two-Sided Network Effects: A Theory of Information Product Design. *Management Science*, *51*(10), 1494–1504. https://doi.org/10.1287/mnsc.1050.0400

Parker, G. G., and Van Alstyne, M. (2018). Innovation, Openness, and Platform Control. *Management Science*, *64*(7), 3015–3032. https://doi.org/10.1287/mnsc.2017.2757

Preble, J. F. (1997). Integrating the Crisis Management Perspective into the Strategic Management Process. *Journal of Management Studies*, *34*(5), 769–791. https://doi.org/10.1111/1467-6486.00071

Pundziene, A., Gutmann, T., Schlichtner, M., and Teece, D. J. (2022). Value Impedance and Dynamic Capabilities: The Case of MedTech Incumbent-Born Digital Healthcare Platforms. *California Management Review*, *64*(4), 108–134. https://doi.org/10.1177/00081256221099326

Reinartz, W., Krafft, M., and Hoyer, W. D. (2004). The Customer Relationship Management Process: Its Measurement and Impact on Performance. *JOURNAL OF MARKETING RESEARCH*.

Reuber, A. R., and Fischer, E. (2022). Relying on the engagement of others: A review of the governance choices facing social media platform start-ups. *International Small Business Journal: Researching Entrepreneurship*, *40*(1), 3–22. https://doi.org/10.1177/02662426211050509

Rietveld, J., and Schilling, M. A. (2020). *Platform Competition: A Systematic and Interdisciplinary Review of the Literature*. *47*(6), 1528–1563.

Rochet, J.-C., and Tirole, J. (2003). Platform Competition in Two-Sided Markets. *Journal of the European Economic Association*, *1*(4), 990–1029. https://doi.org/10.1162/154247603322493212

Rochet, J.-C., and Tirole, J. (2006). Two-sided markets: A progress report. *The RAND Journal of Economics*, *37*(3), 645–667. https://doi.org/10.1111/j.1756-2171.2006.tb00036.x

Roson, R. (2005). Two-Sided Markets: A Tentative Survey. *Review of Network Economics*, *4*(2). https://doi.org/10.2202/1446-9022.1070

Ruutu, S., Casey, T., and Kotovirta, V. (2017). Development and competition of digital service platforms: A system dynamics approach. *Technological Forecasting and Social Change*, *117*, 119–130. https://doi.org/10.1016/j.techfore.2016.12.011

Rysman, M. (2009). The Economics of Two-Sided Markets. *Journal of Economic Perspectives*, *23*(3), 125–143. https://doi.org/10.1257/jep.23.3.125

Saadatmand, F., Lindgren, R., and Schultze, U. (2019). Configurations of platform organizations: Implications for complementor engagement. *Research Policy*, *48*(8), 103770. https://doi.org/10.1016/j.respol.2019.03.015

Sato, S. (2019). Freemium as optimal menu pricing. *International Journal of Industrial Organization*, *63*, 480–510. https://doi.org/10.1016/j.ijindorg.2018.12.006

Sedera, D., Lokuge, S., Grover, V., Sarker, S., and Sarker, S. (2016). Innovating with enterprise systems and digital platforms: A contingent resource-based theory view. *Information and Management*, *53*(3), 366–379. https://doi.org/10.1016/j.im.2016.01.001

Sen, R., Verma, A., and Heim, G. R. (2020). Impact of Cyberattacks by Malicious Hackers on the Competition in Software Markets. *Journal of Management Information Systems*, *37*(1), 191–216. https://doi.org/10.1080/07421222.2019.1705511

Shi, X., Li, F., and Chumnumpan, P. (2021). Platform Development: Emerging Insights From a Nascent Industry. *Journal of Management*, *47*(8), 2037–2073. https://doi.org/10.1177/0149206320929428

Shree, D., Kumar Singh, R., Paul, J., Hao, A., and Xu, S. (2021). Digital platforms for business-to-business markets: A systematic review and future research agenda. *Journal of Business Research*, *137*, 354–365. https://doi.org/10.1016/j.jbusres.2021.08.031

Shujahat, M., Sousa, M. J., Hussain, S., Nawaz, F., Wang, M., and Umer, M. (2019). Translating the impact of knowledge management processes into knowledge-based innovation: The neglected and mediating role of knowledge-worker productivity. *Journal of Business Research*, *94*, 442–450. https://doi.org/10.1016/j.jbusres.2017.11.001

Spanuth, A., and Urbano, D. (2023). Exploring social enterprise legitimacy within ecosystems from an institutional approach: A systematic literature review and research agenda. *International Journal of Management Reviews*, ijmr.12349. https://doi.org/10.1111/ijmr.12349

Spinello, R. A. (2005). Competing Fairly in the New Economy: Lessons from the Browser Wars. *Journal of Business Ethics*, *57*(4), 343–361. https://doi.org/10.1007/s10551-005-1832-6

Sridhar, S., Mantrala, M. K., Naik, P. A., and Thorson, E. (2011). Dynamic Marketing Budgeting for Platform Firms: Theory, Evidence, and Application. *Journal of Marketing Research*, *48*(6), 929–943. https://doi.org/10.1509/jmr.10.0035

Sriram, S., Manchanda, P., Bravo, M. E., Chu, J., Ma, L., Song, M., Shriver, S., and Subramanian, U. (2015). Platforms: A multiplicity of research opportunities. *Marketing Letters*, *26*(2), 141–152. https://doi.org/10.1007/s11002-014-9314-1

Stähler, F., and Stähler, L. (2022). Copyright Protection in the Digital Single Market: Potential Consequences for Content Platform Competition. *Review of Industrial Organization*, *61*(1), 1–22. https://doi.org/10.1007/s11151-022-09866-x

Stallkamp, M., and Schotter, A. P. J. (2021). Platforms without borders? The international strategies of digital platform firms. *Global Strategy Journal*, *11*(1), 58–80. https://doi.org/10.1002/gsj.1336

Tan, B., Anderson, E. G., and Parker, G. G. (2020). Platform Pricing and Investment to Drive Third-Party Value Creation in Two-Sided Networks. *Information Systems Research*, *31*(1), 217–239. https://doi.org/10.1287/isre.2019.0882

Tan, B., Pan, S., University of New South Wales, Lu, X., Fudan University, Huang, L., and Fudan University. (2015). The Role of IS Capabilities in the Development of Multi-Sided Platforms: The Digital Ecosystem Strategy of Alibaba.com. *Journal of the Association for Information Systems*, *16*(4), 248–280. https://doi.org/10.17705/1jais.00393

Tee, R., and Gawer, A. (2009). Industry architecture as a determinant of successful platform strategies: A case study of the i-mode mobile Internet service. *European Management Review*, *6*(4), 217–232. https://doi.org/10.1057/emr.2009.22

Teece, D. J., Pundziene, A., Heaton, S., and Vadi, M. (2022). Managing Multi-Sided Platforms: Platform Origins and Go-to-Market Strategy. *California Management Review*, *64*(4), 5–19. https://doi.org/10.1177/00081256221109961

Thomas, L. D. W., Autio, E., and Gann, D. M. (2014). Architectural Leverage: Putting Platforms in Context. *Academy of Management Perspectives*, *28*(2), 198–219. https://doi.org/10.5465/amp.2011.0105

Thomas, L. D. W., Autio, E., and Gann, D. M. (2022). Processes of ecosystem emergence. *Technovation*, *115*, 102441. https://doi.org/10.1016/j.technovation.2021.102441

Tilson, D., Lyytinen, K., and Sørensen, C. (2010). Digital Infrastructures: The Missing IS Research Agenda. *Information Systems Research*, *21*(4), 748–759. https://doi.org/10.1287/isre.1100.0318

Tiwana, A. (2015). Evolutionary Competition in Platform Ecosystems. *Information Systems Research*, *26*(2), 266–281. https://doi.org/10.1287/isre.2015.0573

Tiwana, A., Konsynski, B., and Bush, A. A. (2010). Platform Evolution: Coevolution of Platform Architecture, Governance, and Environmental Dynamics. *Information Systems Research*, *21*(4), 675–687. https://doi.org/10.1287/isre.1100.0323

Trabucchi, D., and Buganza, T. (2022). Entrepreneurial dynamics in two-sided platforms: The influence of sides in the case of Friendz. *International Journal of*

Entrepreneurial Behavior and Research, *28*(5), 1184–1205. https://doi.org/10.1108/IJEBR-01-2021-0076

Tranfield, D., Denyer, D., and Smart, P. (2003). Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. *British Journal of Management*, *14*(3), 207–222. https://doi.org/10.1111/1467-8551.00375

Van Alstyne, M., Parker, G. G., and Choudary, S. P. (2016). Pipelines, Platforms, and the New Rules of Strategy. *Harvard Business Review*, *94*(4), 54–62.

Van Cayseele, P., and Vanormelingen, S. (2019). Merger Analysis in Two-Sided Markets: The Belgian Newspaper Industry. *Review of Industrial Organization*, *54*(3), 509–541. https://doi.org/10.1007/s11151-018-9650-z

Wang, H. (2022). Platform antitrust in China. *China Economic Journal*, *15*(2), 171–186. https://doi.org/10.1080/17538963.2022.2067688

Wang, J., Lai, J.-Y., and Chang, C.-H. (2016). Modeling and analysis for mobile application services: The perspective of mobile network operators. *Technological Forecasting and Social Change*, *111*, 146–163. https://doi.org/10.1016/j.techfore.2016.06.020

Wang, R., Gou, Q., Choi, T.-M., and Liang, L. (2018). Advertising Strategies for Mobile Platforms With "Apps." *IEEE Transactions on Systems, Man, and Cybernetics: Systems*, *48*(5), 767–778. https://doi.org/10.1109/TSMC.2016.2616369

Wang, S., Chen, H., and Wu, D. (2019). Regulating platform competition in two-sided markets under the O2O era. *International Journal of Production Economics*, *215*, 131–143. https://doi.org/10.1016/j.ijpe.2017.10.031

Wareham, J. D., Fox, P. B., and Cano Giner, J. L. (2014). Technology Ecosystem Governance. *Organization Science*, *25*(4), 1195–1215. https://doi.org/10.2139/ssrn.2201688

Wessel, M., Thies, F., and Benlian, A. (2017). Opening the Floodgates: The Implications of Increasing Platform Openness in Crowdfunding. *Journal of Information Technology*, *32*(4), 344–360. https://doi.org/10.1057/s41265-017-0040-z

Wichmann, J. R. K., Wiegand, N., and Reinartz, W. J. (2022). The Platformization of Brands. *Journal of Marketing*, *86*(1), 109–131. https://doi.org/10.1177/00222429211054073

Wiegand, N., Peers, Y., and Bleier, A. (2022). Software multihoming to distal markets: Evidence of cannibalization and complementarity in the video game console industry. *Journal of the Academy of Marketing Science*. https://doi.org/10.1007/s11747-022-00893-4

Wu, C.-H., and Chamnisampan, N. (2021). Platform entry and homing as competitive strategies under cross-sided network effects. *Decision Support Systems*, *140*, 113428. https://doi.org/10.1016/j.dss.2020.113428

Xue, L., Song, P., Rai, A., Zhang, C., and Zhao, X. (2019). Implications of Application Programming Interfaces for Third-Party New App Development and Copycatting. *Production and Operations Management*, *28*(8), 1887–1902. https://doi.org/10.1111/poms.13021

Yoo, Y., Henfridsson, O., and Lyytinen, K. (2010). The New Organizing Logic of Digital Innovation: An Agenda for Information Systems Research. *Information Systems Research*, *21*(4), 724–735. https://doi.org/10.1287/isre.1100.0322

Young Kang, H., and Suarez, F. F. (2022). Platform Owner Entry Into Complementor Spaces Under Different Governance Modes. *Journal of Management*, 1–35. https://doi.org/10.1177/01492063221094759

Zeng, J., Yang, Y., and Lee, S. H. (2022). Resource Orchestration and Scaling-up of Platform-Based Entrepreneurial Firms: The Logic of Dialectic Tuning. *Journal of Management Studies*. https://doi.org/10.1111/joms.12854

Zhang, Y., Li, J., and Tong, T. W. (2022). Platform governance matters: How platform gatekeeping affects knowledge sharing among complementors. *Strategic Management Journal*, *43*(3), 599–626. https://doi.org/10.1002/smj.3191

Zhao, D., and Chen, M. (2019). Ex-ante versus ex-post destination information model for on-demand service ride-sharing platform. *Annals of Operations Research*, *279*(1–2), 301–341. https://doi.org/10.1007/s10479-019-03316-w

Zhou, J., and Wan, X. (2022). How to Build Network Effects on Online Platforms for Mental Health. *California Management Review*, *64*(4), 20–46. https://doi.org/10.1177/00081256221107421

Zhu, F., Li, X., Valavi, E., and Iansiti, M. (2021). Network Interconnectivity and Entry into Platform Markets. *Information Systems Research*, *32*(3), 1009–1024. https://doi.org/10.1287/isre.2021.1010

The Dynamics of Organizational Boundaries in Creating a B2B Industry Platform: Interplay and Repositioning Practices

Abstract

The industry platform business model has attracted significant attention in recent years, mainly because a substantial portion of the most valuable businesses operate as platforms. As a result, many companies started exploring the possibility of transitioning towards an industry platform logic. Although the topic of industry platforms has been extensively researched in the academic field, there has been relatively limited attention given to the issue of establishing industry platforms and how a firm's organizational boundaries shift during this transition, particularly within the Business-to-Business (B2B) context. In line with this, we conducted an in-depth case study to closely examine how the organizational boundaries of a B2B firm shift: initially transitioning from a consulting firm to evolving into a software enterprise and subsequently transitioning from a software enterprise to ultimately becoming an industry platform. Therefore, we examine the firm's identity, power, competence, and efficiency changes throughout these two significant transitions. Further, we explore the interplay among the various boundary lenses during each transition and the evolution of the organizational boundaries across both transitions, thereby revealing a novel approach to creating a B2B industry platform through the accumulation of overlapping customer networks, facilitated by initially attracting the most influential side to the platform ecosystem. We conclude our study by presenting a framework elucidating the dynamics of creating an industry platform. This framework involves utilizing a stand-alone product as a transitional stage, with the stand-alone product being offered to the more influential party.

1. Introduction

Empirical evidence provides many examples of successful companies established by adopting the platform business model, such as the iconic cases of Uber and Airbnb, to mention a couple (Wortmann, Jung, and Gassmann 2024). Also, several companies, such as Microsoft (Hagiu and Wright 2015), have evolved from conventional pipeline models (Van Alstyne, Parker, and Choudary 2016) to industry platforms (Gawer and Cusumano 2014), a model associated with the strong presence of network effects. While many failed due to complexities, successful adopters have grown significantly in size and scale, becoming among the most valuable companies in market capitalization. Apple, Microsoft, Alphabet, Amazon, and Meta are just a few examples

(Parker and Van Alstyne 2018; Gawer 2021; Jacobides and Lianos 2021; Ozalp et al. 2022). Industry platforms are "products, services, or technologies developed by one or more firms, and which serve as foundations upon which a larger number of firms can build further complementary innovations and potentially generate network effects" (Gawer and Cusumano 2014, 420).

Gawer and Cusumano (2008) argue that any firm can create an industry platform by following two strategic processes, coring and tipping, each comprising different business and technological actions. Further, by increasing openness, even an internal platform, also known as a company or product platform, can transition into a supply-chain platform and ultimately into an industry platform (Gawer 2014). Yet, platform openness is not the sole means to transition from an internal platform to an industry platform. Thomas et al. (2014) argue that leverage logic, whether transaction, innovation, or production, plays a vital role in this transition and goes hand in hand with platform openness. Other scholars have examined various strategies for creating industry platforms. For example, Hagiu et al. (2020) explore the possibility of creating industry platforms by hosting rivals; Pagani (2013) emphasizes the significance of incremental and disruptive innovation in creating industry platforms; and Eisenmann and Hagiu (2007) proposed the vendor to two-sided platform strategy as a cost-effective approach to establishing an industry platform. In this strategy, the firm initially sells products to sellers, ensuring their affiliation (Hagiu and Wright 2015); once the first side is successfully onboarded, it becomes easier to shift attention to the other side of the market (Eisenmann and Hagiu 2007).

While some studies have touched upon the topic of creating industry platforms (Gawer and Cusumano 2008), it remains relatively under-examined in the platform literature (Gawer 2014; Tan et al. 2015; de Reuver, Sørensen, and Basole 2018; Shi, Li, and Chumnumpan 2021). Another evident gap concerns the research context since studies have primarily focused on the B2C or C2C contexts (Hagiu, Jullien, and Wright 2020; Cennamo, Oliveira, and Zejnilovic 2022; Teece et al. 2022; Trabucchi and Buganza 2022a), leaving the exploration of the B2B context somewhat overlooked (Loux et al. 2020). More importantly, the platform literature gives limited attention to organizational boundaries (Gawer 2021). The latter is a significant gap as many established companies that want to apply this blockbuster model and become an industry platform must transition from selling stand-alone products or using a pipeline model to the platform model.

During the hitherto underexamined transition, organizational boundaries (Santos and Eisenhardt 2005) will evolve, often dramatically, revealing several complexities as part of an intricate metamorphosis. For instance, firms will experience a shift in organizational identity (Eisenmann, 2008; Evans and Schmalensee, 2008; Gawer,

2014, 2021) and changes in power dynamics with its stakeholders (Rochet and Tirole 2003; Eisenmann, Parker, and Van Alstyne 2006; Lin et al. 2022; Zhang, Li, and Tong 2022). Also, while different competencies are necessary for transition (Van Alstyne, Parker, and Choudary 2016; Teece 2017; Helfat and Raubitschek 2018; Schreieck, Wiesche, and Krcmar 2021), only a few studies have addressed this topic (Tan et al. 2015; Teece 2017; Helfat and Raubitschek 2018). Similarly, the dynamics involved in deciding between in-house development and outsourcing (Van Alstyne, Parker, and Choudary 2016; Boudreau 2017; Hagiu and Wright 2018; Ishihara and Muller 2020) remain understudied.

The convergence of the above gaps intersects at a single point, giving rise to a central research question: How do a firm's organizational boundaries evolve during the transition towards adopting a B2B industry platform? We rely on an in-depth analysis of a single case study to examine the shifts in organizational boundaries during the transition towards adopting a B2B industry platform. Building upon the various organizational boundary lenses (Santos and Eisenhardt 2005), the contribution of this study is threefold: (1) examine how the organizational boundaries of a B2B firm change as it transitions from being a consulting firm to becoming a software enterprise and ultimately an industry platform, through the lenses of identity, power, competence, and efficiency; (2) explore the interplay among the boundary lenses during each transition and the resulting evolution of the organizational boundaries across both transitions, ultimately uncovering a novel approach for transitioning towards a B2B industry platform; and (3) present a managerial framework designed to elucidate the dynamics of organizational boundaries during the transition towards an industry platform.

2. Conceptual framework

2.1. Industry platform

Industry platforms (Gawer and Cusumano, 2014), digital platforms (de Reuver, Sørensen, and Basole 2018), two-sided platforms (Rochet and Tirole 2006; Belleflamme and Peitz 2019), multi-sided platforms (Hagiu and Wright 2015), innovation platforms (Baldwin and von Hippel 2011; Gawer 2021), and others, are used interchangeably to refer to the same phenomenon, that is "technologies, products or services that create value primarily by enabling direct interactions between two or more customer or participant groups" (Hagiu 2014, 71). Accordingly, various scholars use different terminologies to refer to industry platforms. Further, reflecting this diversity in terminology, different scholars present diverse

classifications for industry platforms (Eisenmann 2008; Boudreau and Lakhani 2009). Therefore, for simplicity and consistency throughout this paper, we adhere to Gawer and Cusumano's (2014, 420) definition and Cusumano, Gawer, and Yoffie's (2019) classification, which we consider the clearest and most straightforward in the literature. While the industry platforms' definition was previously presented in the introduction, regarding the classification, Cusumano, Gawer, and Yoffie (2019) argue that there are two main types of industry platforms: (1) transaction platforms, which facilitate transactions between different sides, such as Amazon facilitating transactions between sellers and buyers, and (2) innovation platforms, which provide an extensible codebase allowing third-party software developers to develop complementary applications on top of the platform, such as Sony PlayStation facilitating the development of games on top of its consoles. Additionally, (3) hybrid platforms fall between the previously mentioned types and share their functions. For example, Apple allows external developers to create complementary applications on top of its operating system, iOS, while simultaneously offering an App Store where they facilitate transactions between software developers and iPhone users.

Throughout this paper, when mentioning the term "platform", we specifically refer to "industry platforms" (Gawer and Cusumano 2014, 417), which are associated with network effects. Network effects (Katz and Shapiro 1985), namely indirect network effects or cross-side network effects (Gawer and Cusumano 2014), where the value for one side increases as the number of users on the other side grows, are the primary distinguishing factor between an industry platform and different types of platforms (Gawer and Cusumano 2014). Furthermore, in addition to network effects and regarding Hagiu and Wright (2015, 163), industry platforms have two main features beyond other requirements: (1) "they enable direct interactions between two or more distinct sides", and (2) "each side is affiliated with the platform". Thus, when examining the case firm's transition towards an industry platform, or a transaction platform to be more specific, we verify that it embodies all three factors mentioned earlier, meeting the criteria for classification as an industry platform.

2.2. Organizational boundaries in the context of digital platforms

The theory of the firm examines the delineation of organizational boundaries to understand how companies define and redefine them, as well as the activities involved in boundary-shaping processes. This occurs, for instance, when companies shift strategic trajectories or due to innovations in business models. Such strategic repositioning impacts firm boundaries, necessitating a thorough examination through multiple analytical lenses. Accordingly, insights from diverse management theories are essential to consider various strategic adjustments in organizational

boundaries. A set of firm boundary theories exist to address these boundaries delineation, including complementary lenses (Schilling and Steensma 2002; Santos and Eisenhardt 2005; Yang, Lin, and Lin 2010) such as organizational identity (Albert and Whetten 1985), power dynamics (Pfeffer and Salancik 1978; Porter 1980), competence (Barney 1991; Peteraf 1993), and transaction cost economics (Williamson 1975; Williamson 1985). Each theory approaches boundary decisions focusing on achieving desired outcomes, including organizational coherence, industry power, growth, capability acquisition, and efficiency (Santos and Eisenhardt 2005; Huikkola et al. 2020).

2.2.1. Identity change in industry platform creation

Organizational identity is defined as how organizational members answer questions such as "Who are we as an organization?" and "What kind of organization is this?" (Albert and Whetten 1985; Gioia and Thomas 1996). While organizational identity is jointly constructed via collective sensemaking within organizations, it is reflected in the organizational strategy and materialized through the firm's boundaries (Kogut 2000). Consequently, significant organizational changes are often associated with a firm's strategic identity (Clark et al. 2010) and signify the organizational transition from one business logic to another. For instance, transitioning to an industry platform logic, whether from a pipelines business (Van Alstyne, Parker, and Choudary 2016), internal platform, or supply-chain platform (Gawer 2014), involves significant organizational changes and forces companies to redefine their identity while reconsidering processes for value creation, delivery, and capture (Cusumano, Gawer, and Yoffie 2019). Thus, the transition triggers a set of boundary choices (Tripsas 2009), as "organizational boundaries should be set to achieve coherence between the identity of the organization and its activities" (Santos and Eisenhardt 2005, 500).

Transitioning from a stand-alone (single-side) product firm to a platform has proven successful in B2C and B2B contexts (Wortmann, Jung, and Gassmann 2024). It involves a profound shift in organizational identity, where the identity of the resulting industry platform is influenced by "the strategic decisions that platform owners make when they design their business, design their value proposition for each side, and choose their platform sides" (Gawer 2021, 7). According to previous studies, industry platforms share two main factors in common: (1) enabling interactions between different ecosystem actors and (2) facilitating the creation of complementary innovations (Eisenmann, Parker, and Van Alstyne 2006; Gawer and Cusumano 2014; Hagiu 2014; de Reuver, Sørensen, and Basole 2018). These two factors align with Cusumano, Gawer, and Yoffie's (2019) classification of industry platforms, categorizing them as either transaction or innovation platforms. The primary identity of a transaction platform lies in facilitating transactions or interactions between the different sides of the platform, which is how transaction platforms create value

(Gawer 2021). Instead, the identity of an innovation platform lies in serving as a technological foundation where third-party software developers create novel complementary applications, which is how innovation platforms create value (Gawer 2021).

2.2.2. Power dynamics in industry platform creation

Organizational boundaries "determine the sphere of organizational influence, including its degree of industry control and its power over the external forces" (Santos and Eisenhardt 2005, 491). As success is often related to the degree of control that a firm exercises over different stakeholders, firms aim to dominate the industry "bottleneck" where critical decisions are made (Pil and Holweg 2006), gain bargaining power (Porter 1980), and increase their control over strategic relationships, knowledge and resources (Pfeffer and Salancik 1978; Garud and Kumaraswamy 1993). Industry power dynamics determine power distribution (McGahan 2000), market governance (Adams and Brock 1982; Gereffi, Humphrey, and Sturgeon 2005), division of labor (Gereffi 1994), and the processes of value creation and capture (Ivarsson and Alvstam 2010). Embracing industry platforms involves transforming power dynamics between the platform owner and various stakeholders, particularly the diverse actors in the platform ecosystem (Van Alstyne, Parker, and Choudary 2016).

On the one hand, the platform owner must incentivize potential actors and influence their decision to join the platform ecosystem (Eisenmann, Parker, and Van Alstyne 2006). This can be achieved either through pricing mechanisms (Rochet and Tirole 2003; Economides and Katsamakas 2006; Rochet and Tirole 2006; Bolt and Tieman 2008), such as cross-subsidization strategies (Caillaud and Jullien 2001) and designing the appropriate pricing structure (Kaiser and Wright 2006), or through non-pricing mechanisms (Eisenmann and Hagiu, 2007), such as executing marketing investments (Sridhar et al. 2011) and utilizing first-party content (Hagiu and Spulber 2013). On the other hand, the platform owner has to orchestrate the platform ecosystem by influencing the behaviors of the ecosystem actors (Baldwin and Woodard, 2009; Constantinides et al., 2018; Tiwana et al., 2010). This can be achieved either through resource provision and control exertion (Foerderer, Lueker, and Heinzl 2021), such as utilizing boundary resources (Ghazawneh and Henfridsson 2013; Eaton et al. 2015) and entry into complementor's market (Foerderer et al. 2018; Young Kang and Suarez 2022), or through non-monetary and non-control means (Foerderer, Lueker, and Heinzl 2021), such as designing ratings and reviews (Chan, Yang, and Zeng 2022) and executing mechanisms that guide user attention, e.g., hashtags (Reuber and Fischer 2022).

2.2.3. Competence changes in industry platform creation

Organizational boundaries are "dynamically determined by matching organizational resources with environmental opportunities" (Santos and Eisenhardt 2005, 497). However, the transition from a traditional value-chain business to an industry platform represents a significant change in the perception of resources (Van Alstyne, Parker, and Choudary 2016). In traditional value-chain businesses, competitive advantage stems from owning valuable, rare, inimitable, and non-substitutable resources (Barney, 1986; Barney, 1991; Dierickx, 1989). However, in the realm of industry platforms, the primary asset owned by the company is its community (Sun and Tse 2009; Eisenmann, Parker, and Van Alstyne 2011), or in other words, the platform ecosystem that consists of various actors that "interact in order for a focal value proposition to materialize" (Adner 2017, 55). Thus, the platform ecosystem stands as the primary resource of an industry platform, as "cross-group network effects can turn network participants, who are customers of a two-sided network, into critical resources that bring sustained competitive advantages to the network" (Sun and Tse 2009, 47). Further, moving towards industry platforms calls for reconfiguring existing resources and developing new resources and capabilities, which companies may achieve by using a range of initiatives, including internalization, partnering, and outsourcing.

The capabilities that are required to create an industry platform have, to some extent, received limited attention in the platform literature (Teece 2017; de Reuver, Sørensen, and Basole 2018; Fehrer and Nenonen 2020; Shi, Li, and Chumnumpan 2021), with a few exceptions such as Tan et al. (2015), Teece (2017), and Shi et al. (2021). Perhaps this might be because creating industry platforms has generally received limited attention in the literature (Gawer 2014; Tan et al. 2015; de Reuver, Sørensen, and Basole 2018; Shi, Li, and Chumnumpan 2021). Tan et al. (2015) argue that Information Systems (IS) capabilities play an evolutionary role in developing industry platforms. Further, Teece (2017) identified various dynamic capabilities associated with different stages of the platform lifecycle, from birth to self-renewal, particularly emphasizing the importance of generative sensing, asset orchestration, and business model selection during the platform's birth stage. Other scholars have identified different capabilities, including both business- and technology-related ones (Gawer and Cusumano 2008), that are essential for platform owners, such as platform envelopment (Eisenmann, Parker, and Van Alstyne 2011) and sensing the internal environment, value-capturing through connectedness, orchestrating silos, and transforming organizational boundaries (Pundziene et al. 2022).

2.2.4. Efficiency dynamics in industry platform creation

The efficiency approach draws on the conceptual underpinning of transaction-cost economics (TCE) to maximize long-term savings and minimize transaction costs through balancing flexibility and behavioral uncertainty. This is achieved by finding optimal coordination mechanisms that emerge from considering the trade-off between alternative structures, e.g., markets, hierarchies, and collaborative mechanisms (Williamson 1985). This approach calls for efficient platform interaction organization, considering production and transaction costs. In the context of industry platforms, when addressing the question of whether the platform owner should conduct a specific activity within the platform firm or outsource it from other firms in the market, the discussions mainly revolve around opening the platform to third-party software developers versus maintaining control over the platform and its ecosystem (Parker and Van Alstyne 2009; Boudreau 2017; Parker and Van Alstyne 2018). To simplify, the make-versus-buy decision in pipeline businesses is discussed as the control-versus-enable decision in the context of industry platforms (Hagiu and Wright 2018). This is primarily because industry platforms are not structured according to the traditional value chain (Boudreau 2017); instead, they orchestrate interactions among different actors in the ecosystem (Ghazawneh and Henfridsson 2013; Gawer and Cusumano 2014), thereby co-creating value with them (Ceccagnoli et al. 2012). Accordingly, platform owners leverage ideas they may not have considered and from third parties they may not even be aware of (Van Alstyne, Parker, and Choudary 2016).

These discussions are primarily relevant to innovation platforms (Cusumano, Gawer, and Yoffie 2019), which allow third-party software developers to develop complementary applications on top of the platform (de Reuver, Sørensen, and Basole 2018); consider the large number of developed applications on the Apple App Store for instance (Parker, Van Alstyne, and Jiang 2016). In contrast, these discussions are less relevant in transaction platforms, where the platform owner primarily facilitates interactions or transactions between the different actors in the platform ecosystem (Gawer 2021); consider matchmaking platforms, for instance (Wu, Zhang, and Padmanabhan 2018). Thus, efficiency is primarily discussed within innovation platforms rather than transactional ones. Perhaps this oversight may be attributed to the evolution of outsourcing beyond its traditional boundaries observed in pipeline businesses (Van Alstyne, Parker, and Choudary 2016), particularly as third-party complementors not only complement but also replace activities once conducted internally (Van Alstyne, Parker, and Choudary 2016), thereby attracting significant attention. Further, this might also be attributed to the relatively limited attention given to transaction costs in the platform literature (Helfat and Raubitschek 2018), particularly within transaction platforms.

3. Methodology

3.1. Research Strategy

This research follows a qualitative strategy drawing on an in-depth single case study as its primary method. Case studies are an appropriate choice when exploring questions that have not been studied exhaustively (Leonard-Barton 1990), and they are justified when exploring in further detail complex phenomena's driving forces under exceptional and difficult-to-replicate circumstances (Eisenhardt 1989; Eisenhardt and Graebner 2007). Notably, in-depth single unique case studies are appropriate and robust when seeking to understand the specifics of a phenomenon and generate rich (although context-specific) holistic accounts for theory-building and theory-testing based on compelling examples in exceptional circumstances (Dyer and Wilkins 1991; Siggelkow 2007).

3.2 Case selection and description

Case selection is challenging in qualitative research, particularly in single case studies, as the quality of the outcomes is determined by the case quality and adequacy (Dubois and Araujo 2007; Eisenhardt and Graebner 2007). This study uses a purposeful, straightforward sampling approach (Patton 1990). As primary criteria, we looked for a B2B company that has been in the market for a few years and provides the opportunity to access rich information for examining boundary decisions and changes resulting from business development activities.

The selected case is a Finnish firm formally established in 2012 by five co-founders as a software enterprise facilitating customer-supplier collaboration, enabling manufacturers to connect seamlessly with their own network of suppliers. Before 2012, the five co-founders operated a consulting firm specializing in examining B2B relationships, where they encountered challenges in finding a suitable (digital) tool to meet customer needs. Accordingly, they decided to establish a software enterprise to connect manufacturers with their network of suppliers. The company's primary operations revolve around offering a stand-alone product, the software, that connects manufacturers with their network of suppliers, ultimately enhancing the overall productivity of the firm's value chain. Thus, the company focuses on four main modules for manufacturers: purchasing and sourcing, supplier quality, engineering and development, and supplier master data. Concerning the suppliers, the company has recently begun redirecting attention towards them, placing them at the center of development by focusing on five main areas: providing scalable integration of electronic data interchange, enabling the use of the platform with multiple suppliers,

and automating specific tasks within the platform to achieve cost savings, fostering a more transparent and collaborative relationship with manufacturers, eliminating the hassle of software installations, and modifying the interface to be more user-friendly for both manufacturers and suppliers.

Over the past few years, with more than 3,500 businesses utilizing their software, indirect network effects have emerged, sparking the case firm's interest in adopting an industry platform business model. In simpler terms, the company, which currently has 20 employees, foresees an opportunity to shift its primary focus from selling software to manufacturers to facilitating interactions between the various actors in the ecosystem. Essentially, the case firm aims to match potential manufacturers with potential suppliers, allowing manufacturers to connect with any supplier using the software. This case is compelling because it will enable us not to explore a single transition but to examine two significant shifts: (1) from a consulting firm to a software enterprise and (2) from a software enterprise to an industry platform. These transitions were characterized by the active implementation of growth strategies, impacting organizational structure and boundaries.

Accordingly, the company represents an ideal case for answering our research question and examining how a B2B firm shifts towards creating an industry platform. In this context, our purposeful sampling combines intensity, opportunism, and convenience strategies (Patton 1990). The company is a "talking pig" (Siggelkow 2007, 20), a unique case that provides an appropriate context for illustrating and conceptualizing the phenomenon under consideration and helps to evaluate and question both novel and traditional conceptual connections (Dyer and Wilkins 1991; Siggelkow 2007). Moreover, the firm has a long collaboration history with the present study's authors, offering a clear opportunity for unusual research access (Yin 1994; Eisenhardt and Graebner 2007).

3.3 Data collection and analysis.

The data collection process lasted from June 2023 to December 2023. As a first step, it included a thorough analysis of the case firm's website and public documents (including blogs), which allowed us to understand its evolution and key milestones and provided insights concerning potential boundary shifts to explore. Next, we developed a semi-structured questionnaire and conducted 13 interviews (Table 1) via Microsoft Teams with people in various organizational positions from September to November 2023 (lasting between 27 and 67 minutes). Interviewees were chosen based on the following criteria to ensure a comprehensive understanding of the case firm: either they had worked for the company for the period of our case analysis (including the founders and former customers later joining the company), or they

held positions in the hierarchy directly influencing business development decisions affecting firm boundaries. The interviews were recorded with permission from the interviewees and automatically transcribed verbatim using Microsoft Teams functionality. We ended the interview process when the additional evidence added by new interviews approached irrelevance, reaching then saturation (Yin 1994).

Table 1: Primary data summary

Interview	Interviewee's position	Duration (minutes)	Pages
1	Chief Creative Officer, Co-founder	67	48
2	Chief Operating Officer	34	37
3	Senior software architect	54	61
4	Sales Executive (Fin, Eng)	55	51
5	Chief Business Design Officer, Co-founder	61	52
6	Account Executive	47	48
7	Customer Success Manager	51	56
8	Chief Executive Officer, Co-founder	63	51
9	Chief Creative Officer, Co-founder	57	53
10	Chairman of the Board	57	46
11	Chief Creative Officer, Co-founder	27	31
12	Board Member, Co-founder, Professor	61	47
13	Board Member, Co-founder, Professor	47	45
Total		**690**	**626**

Following the fieldwork, descriptive strategy, content, and thematic analyses were applied from the first interview when examining the data (Yin 1994; Braun and Clarke 2006). In doing so, we combined induction and deduction, and therefore, we can describe the process as abductive reasoning (Dubois and Gadde, 2002). Thus, the interviews were coded using Nvivo 14, and the codes were continuously reviewed as the discovery process progressed, comparing the emerging findings with the assumptions from the conceptual framework. One co-author implemented the coding and recoding to ensure consistency, but the coder was assisted by ongoing discussions with the co-authors during the process. Once the coding process was completed, we generated the data structure (Corley and Gioia 2004; Gioia, Corley, and Hamilton 2013), which includes the first-order concepts describing respondents' language that merged into second-order themes and aggregate dimensions through the abstraction process (Figure 1).

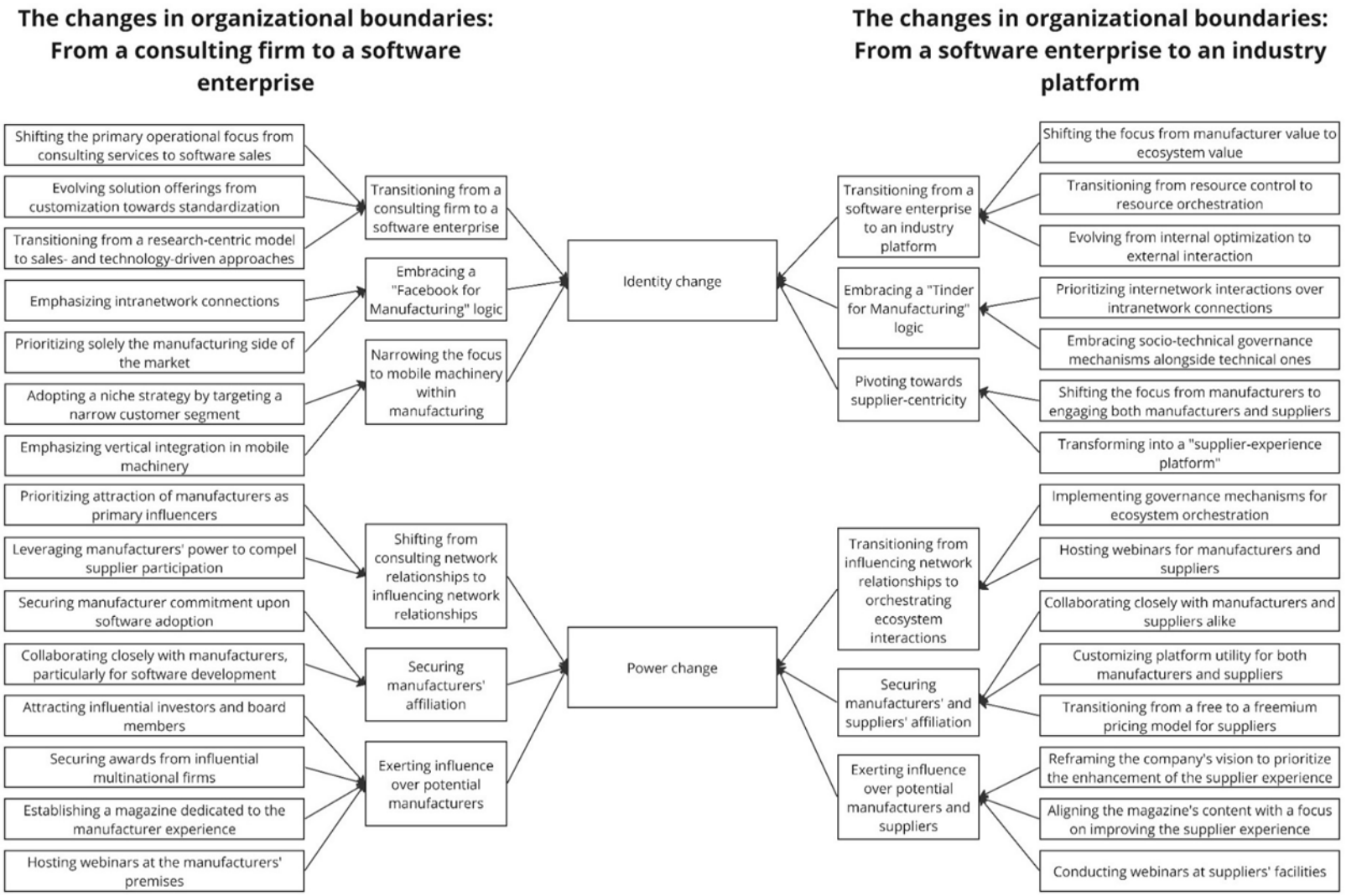

Figure 1: Data structure

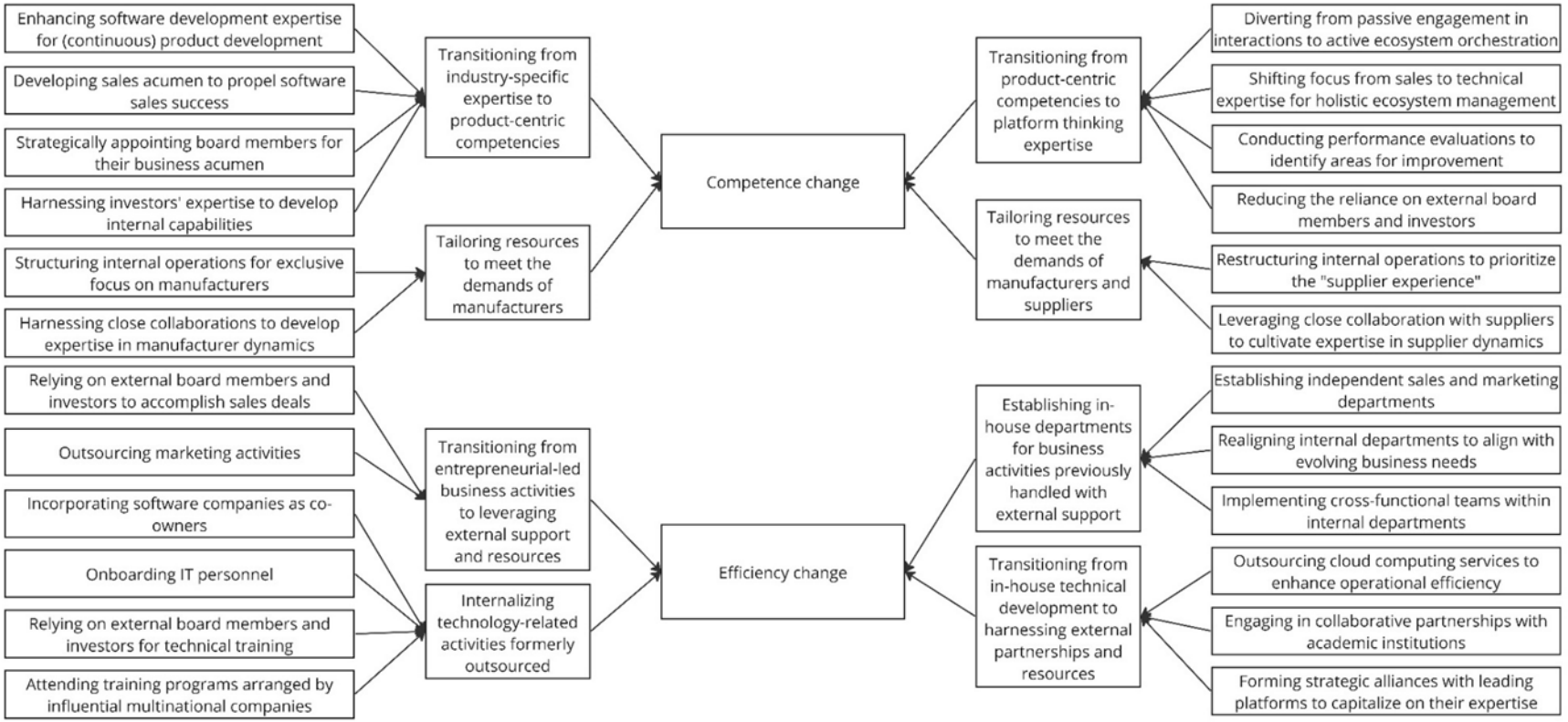

Figure 1: Data structure (continued)

3.4. Research quality and trustworthiness

In designing and implementing the research process, we applied different strategies to ensure the quality and trustworthiness of the outcomes. First, we employed a detailed data collection protocol and engaged multiple respondents to capture diverse perceptions and meanings inherent in a complex business development process and organizational boundary transformation (Dubois and Araujo, 2007), thus ensuring case reliability (Yin, 1994). Moreover, we contacted the participants again several times to clarify inconclusive topics or develop insightful ideas, and the informants also reviewed a draft version of the manuscript, reinforcing the study's validity (Yin 1994; Gibbert, Ruigrok, and Wicki 2008; Gibbert and Ruigrok 2010). The triangulation of different active and passive data sources was also applied to ensure data accuracy and complement the information and evidence gathered from interviews, thereby enhancing the validity and reliability of our study (Yin 1994; Beverland and Lindgreen 2010). Further, the company has served several years as a live case in different courses in which the authors were involved. Accordingly, these strategies jointly allowed us to identify and examine various aspects of the examined phenomenon (Dubois and Gadde 2002), including a few nested firm boundary changes (Gibbert, Ruigrok, and Wicki 2008).

4. The realignment of organizational boundaries in the transition towards adopting an industry platform

Next, we discuss the three phases that encapsulate the transitions that led to creating an industry platform. When presenting the findings, we provide power quotes in a table and proof quotes as supplementary materials if requested (Pratt 2008; Pratt 2009). The case firm initially functioned as a consulting firm, transitioned into a software enterprise, and is evolving into an industry platform. The consulting firm operated under a distinct name from the software enterprise, whereas the software enterprise and the industry platform share the same name.

The consulting firm's primary operations focused on examining B2B business relationships, particularly those between businesses and their suppliers, using an analytical tool initially developed as part of a university project. The developed tool was not intended for sale to manufacturers or suppliers but was fundamental to driving the firm's consulting operations. Subsequently, in response to a market need sensed during consulting operations, where businesses demanded a (digital) tool to connect them with their network of suppliers, the consulting firm transitioned its main operational focus from consulting to software development, ultimately

establishing a software enterprise. This transition marked a shift from the consulting firm's customized consultancy services to the development of four standard modules within the newly developed software. These modules were deliberately designed to serve a specific niche, the manufacturing industry, with a particular focus on manufacturers of mobile machinery. Accordingly, the company focused on attracting manufacturers to the platform, who then brought along their suppliers, as the primary goal of the software is to facilitate connections between manufacturers and their networks of suppliers. After directly attracting approximately 40 manufacturers and indirectly drawing in 3,500 suppliers, cross-group network effects (Katz and Shapiro 1985; Parker and Van Alstyne 2005; Gawer and Cusumano 2014) began to catalyze within the established ecosystem. This sparked an opportunity to facilitate interactions between manufacturers and suppliers in the ecosystem, explicitly matching potential manufacturers with potential suppliers (Wu, Zhang, and Padmanabhan 2018). Accordingly, this implies a shift in focus towards the suppliers to ensure their affiliation with the platform (Eisenmann and Hagiu, 2007), ultimately facilitating interactions between the different actors in the platform ecosystem.

4.1. The two main transitions

In the journey towards establishing an industry platform, two main transitions unfold: first, from being a consulting firm to becoming a software enterprise, and second, from being a software enterprise to ultimately becoming an industry platform. The changes in organizational boundaries during each transition are depicted in the data structure presented in Figure 1. The left side illustrates the shifts in organizational boundaries as the company evolved from a consultancy firm to a software enterprise, while the right side shows the changes as the company transitioned from a software enterprise to an industry platform. Table 2 also shows accumulated power quotes from interviewees corresponding to each transition across the four examined organizational boundaries.

4.1.1. The first transition: From a consulting firm to a software-enterprise

This shift entailed the development of a stand-alone product, that is, the software, specifically tailored to meet the needs of manufacturers. Accordingly, the main focus during this shift was solely on the manufacturers, who would later represent just one side of the platform (Eisenmann and Hagiu 2007). When evaluating changes in organizational boundaries during this transition, we examine shifts in four key boundary conceptions: identity, power, competence, and efficiency (Santos and Eisenhardt 2005).

As for the identity, the company redirected its primary focus from offering consultancy services to providing a stand-alone product, which is the software. Further, the company viewed itself as the "Facebook for manufacturers". Despite Facebook being a multi-sided platform (Bakos and Katsamakas 2008; Tan et al. 2015), when using the term "Facebook", interviewees referred to the potential for manufacturers to connect with their network of suppliers. Additionally, its targeted end customer further shaped the company's identity. Although the company provided software for supply-chain relationships, the solutions embedded within it are customized explicitly for manufacturers, particularly those engaged in producing machinery with wheels underneath, in other words, manufacturers of mobile machinery. Besides, regarding the power dynamics, transitioning from operating a consulting firm to establishing a software enterprise marked a shift from merely evaluating B2B business relationships to actively influencing them. The company extended its power by deliberately attracting manufacturers to adopt the software (Eisenmann and Hagiu 2007), capitalizing on their influential position within their networks of suppliers, who would undoubtedly follow. As a result, the company secured manufacturers' affiliations by customizing the software to suit their specific needs. Additionally, the company employed various strategies to influence potential manufacturers. This included relying on external advisors and board members with influence over manufacturing companies and establishing a magazine focusing on the manufacturing experience.

Regarding the changes in competences, shifting towards offering a stand-alone product required two critical skills: software development and software sales, which the founders completely lacked. Regarding software development, the founders already possessed extensive industry and supply chain expertise but lacked technological skills. Conversely, due to its consulting heritage, the company lacked a sales-oriented culture regarding software sales. Therefore, they had to integrate these skills into the firm and tailor their resources to meet the needs of manufacturers. Besides, the firm encountered several efficiency trade-offs during this transition. Regarding software sales, the company relied on external advisors and board members to accomplish sales deals rather than establishing their own sales department. Further, a similar approach was taken with software development, as it was deemed more efficient to outsource technology-related activities in the initial stages. However, the initial versions of the software fell short of fulfilling the co-founders' vision. Thus, the company aimed to establish its technology department to oversee the creation and development of the software, a move that proved to be more effective.

Table 2: Interviewees' power quotes on the two main transitions

	Transition 1	**Transition 2**
Identity	We made this kind of pivot when we decided that we are an enterprise software. We need to focus on enterprise sales and concentrate on business-critical processes, such as purchase orders (Chief Creative Officer, Co-founder) We are the Facebook for a manufacturing company (Chief Creative Officer, Co-founder)	We call ourselves the supplier experience platform because we think that our job is to deliver the kind of place where customers can serve their suppliers perfectly and smoothly (Chief Creative Officer, Co-founder) We are developing and planning how to make this kind of Tinder application. If you start using (the name of the platform), you can search for suppliers and establish relationships there, just as you can do individually on LinkedIn or Facebook. We couldn't do it before because there were not enough suppliers. With them inside and the platform expanding, it's possible to create features that help you find new suppliers (Chief Creative Officer, Co-founder).
Power	Suppliers do not have the power in a network to dictate to their customers what system to use. So, the key to marketing and selling (the name of the platform) still lies with those bigger customers who have started using (the name of the platform) in their network management (Board Member, Co-founder, Professor) We were listening closely to our potential and existing customers, conducting workshops, and through this process, we managed to find visionary customers who wanted to start using (the name of the platform) (Chief Creative Officer, Co-founder)	We need to develop (the name of the platform) in a way that suppliers also want to use (the name of the platform), ensuring that it not only serves customers but also meets the needs of suppliers. We need to understand what suppliers want and identify the pain points they currently face when using (the name of the platform). Additionally, we should offer various ways they can utilize the platform with their customers, whether manually or through integration or something in between. There can be many different technical solutions on how to use (the name of the platform), and we need to find the best one for the supplier (Customer Success Manager) We have now built quite a good network of companies or an ecosystem using (the name of the platform). Now, we can see that some of our customers have heard about (the name of the platform) from their suppliers. Their suppliers tell them, "Hey, we are using this system with our other customers. You should also look into this because it will bring you this and this value" (Chairman of the Board).
Competence	We had the idea and concept, but we lacked coding knowledge. We are a software company, and our latest acquired capability was in software	From a technical standpoint, the Tinder logic might not be a walk in the park; it could take some serious development. We do not know what each supplier is selling, so we don't have a way to connect

	Transition 1	**Transition 2**
	development (Chief Creative Officer, Co-founder) We were lost with sales then because we had no background there. We did not have a CSO profile type in our founding team, so we used external advisers (Chief Business Design Officer, Co-founder)	the right suppliers from other networks to one customer. I think that's quite a big challenge, but if we knew what the supplier is supplying, then it might be easier (Chief Operating Officer)
Efficiency	We tried to create the product with outsourced software development services. So, we were buying development work from a third-party company. However, it was really expensive, and the result was not what we hoped for (Chief Executive Officer, Co-founder) Our product is in good shape. It has been developed rapidly, with a dedicated team of around ten people consistently working on product development (Chief Business Design Officer, Co-founder) Those board members have been opening doors for some publicly listed companies, making introductions, and even accompanying us in early meetings (Chief Business Design Officer, Co-founder)	It has evolved a lot, and since we started to hire people in sales and marketing, we used to handle it just with me and the other founders. But now we have four full-time people dedicated to sales, including one marketing person (Chief Business Design Officer, Co-founder) We changed the platform to (the name of a cloud computing service provider). We knew that (the cloud computing service provider) is this kind of major player in this market. So, every manufacturing company has (the cloud computing service provider) product in it. It was also this kind of credibility thing. We relied on them as we were confident about them. And because when you are running a business-critical process, it needs to be up and running all the time, around the clock (Chief Creative Officer, Co-founder)

4.1.2. The second transition: From a software enterprise to a B2B industry platform

In the second phase of transitioning towards an industry platform, the company's main focus shifted from emphasizing the stand-alone product and the inherent value of manufacturers to emphasizing the intrinsic value of suppliers and, ultimately, the ecosystem value (Ceccagnoli et al. 2012; Van Alstyne, Parker, and Choudary 2016; Cennamo and Santaló 2019; Schreieck, Wiesche, and Krcmar 2021), which comprises both manufacturers and suppliers (Eisenmann and Hagiu 2007). Mirroring the initial transition, when assessing changes in organizational boundaries during this second phase, we examine shifts in the four essential boundary conceptions: identity, power, competence, and efficiency (Santos and Eisenhardt 2005).

The company's identity was shaped by the transition from a one-sided platform logic, which involved offering a stand-alone product to manufacturers, to embracing an

industry platform logic (Caillaud and Jullien 2001; Caillaud and Jullien 2003; Rochet and Tirole 2003; Rochet and Tirole 2006). This transition involved shifting from valuing individual manufacturers to valuing both manufacturers and suppliers, or in other words, valuing the ecosystem (Gawer and Cusumano 2014; Adner 2017; Jacobides, Cennamo, and Gawer 2018). In line with this transformation, there was a shift from the "Facebook" logic to the "Tinder" logic, referring to a platform that enables manufacturers to connect with any supplier within the ecosystem (Cusumano and Gawer 2002; Gawer and Henderson 2007; Gawer and Cusumano 2014). The company's identity undergoes further shaping as it transitions entirely from having manufacturers at the heart of the software enterprise to having suppliers at the platform's core (Eisenmann and Hagiu, 2007), where the entire platform is now labeled as the "supplier-experience platform". Further, in the previous transition, the company acquired power indirectly through the manufacturers, who influenced the decisions of suppliers joining the platform. However, after successfully onboarding enough manufacturers and suppliers, the company no longer relies solely on the manufacturers' leverage. Instead, their primary strength lies in orchestrating interactions between manufacturers and suppliers (Wareham, Fox, and Cano Giner 2014; Eaton et al. 2015; Hagiu and Wright 2015; Zhang, Li, and Tong 2022). This is mainly achieved by shifting the focus from securing manufacturers' affiliation to securing both manufacturers' and suppliers' affiliation (Hagiu and Wright, 2015; Eisenmann and Hagiu, 2007). Besides, the strategies adopted to influence potential manufacturers have also changed, as the focus now extends to potential manufacturers and suppliers. For example, the primary content of the magazine has transitioned from highlighting manufacturers' experiences to highlighting suppliers' experiences.

When shifting towards an industry platform, the owner must address business and technological competencies again (Gawer and Cusumano 2008). While software development and software sales remain essential for attracting more manufacturers to the platform (Sridhar et al. 2011; Hagiu and Spulber 2013; Wang, Lai, and Chang 2016; Adam et al. 2022), they are no longer the primary focus. With the shift towards an industry platform, the company must reconfigure its business and technological competences to embrace the platform-thinking approach (Gawer and Cusumano 2014; Trabucchi and Buganza 2022b). This reconfiguration is vital to fulfill the needs of the suppliers, establish the foundation for connecting potential manufacturers and suppliers, and ultimately establish the necessary governance mechanisms to orchestrate the ecosystem actors (Ghazawneh and Henfridsson 2013; Eaton et al. 2015; Ghazawneh and Henfridsson 2015). Thus, as the primary focus in an industry platform revolves around orchestrating ecosystem actors (Boudreau 2010; Tiwana, Konsynski, and Bush 2010; Boudreau 2012), technological competences have taken precedence, to a certain extent diminishing the importance of business-related ones,

namely sales and marketing. Further, internalizing business-related activities is deemed more efficient than relying on external resources to fulfill these activities. Conversely, technology-related activities internalized in the previous period have again begun to shift externally, as it's more efficient to outsource specific activities and leverage external partnerships and alliances to develop others. For example, collaborating with universities on short to medium-term projects to design appropriate governance mechanisms (Hukal et al. 2020; Chan, Yang, and Zeng 2022; Reuber and Fischer 2022) is more efficient than hiring IT individuals with previous experience in industry platforms, even though hiring IT individuals with prior experience in an industry platform is more effective (Ge, Huang, and Kankanhalli 2020).

4.2. The interplay among the diverse boundary lenses

The shift towards becoming an industry platform cannot be fully understood from the lens of each organizational boundary alone. Instead, the interplay among the boundary lenses should be examined to fully capture the transition dynamics (Santos and Eisenhardt 2005). Figure 2 summarizes the interplay between the various organizational boundaries in each transition.

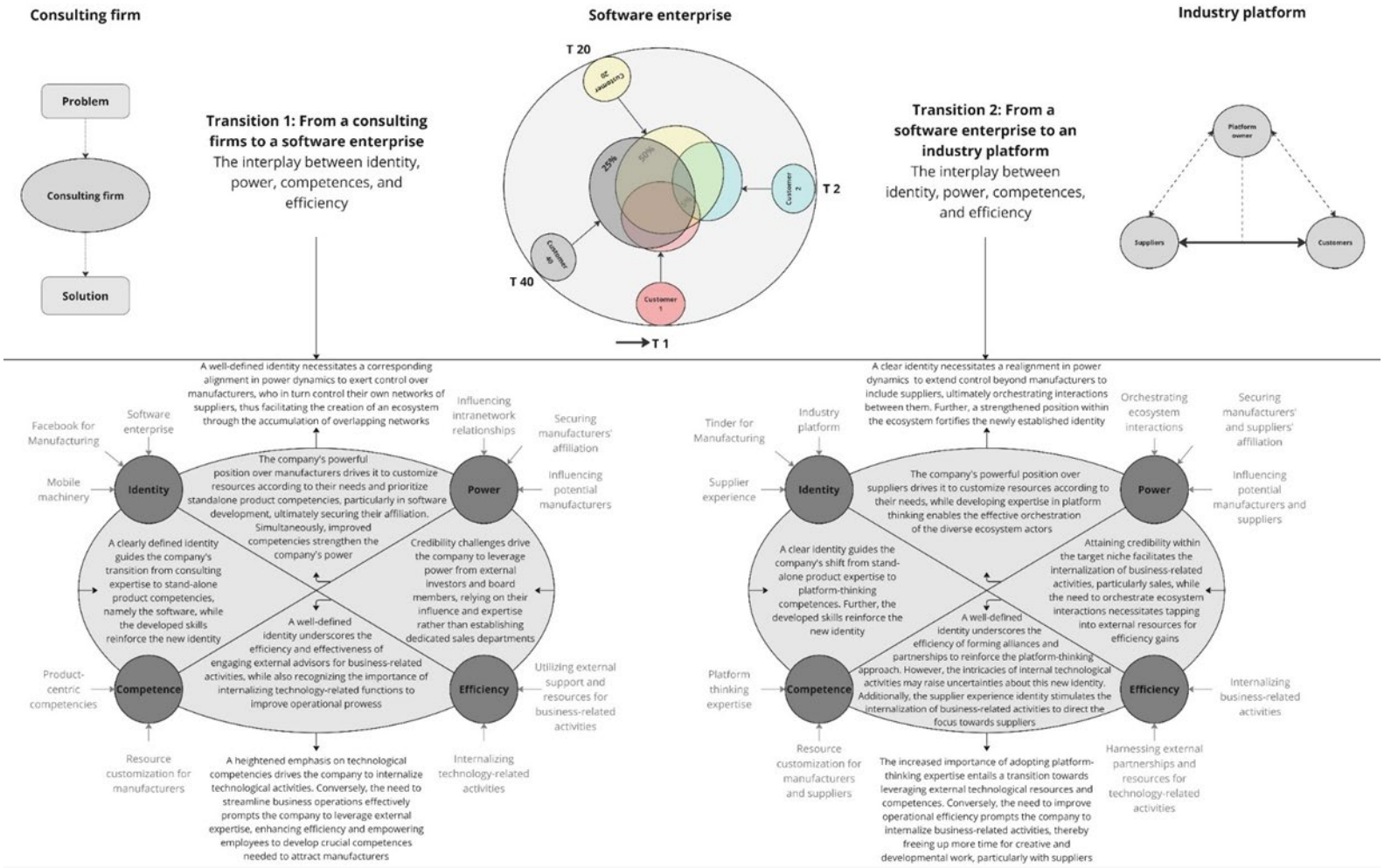

Figure 2: The interplay among the diverse boundary lenses

4.2.1. From a consulting firm to a software enterprise: The interplay between identity, power, competence, and efficiency

During the initial transition phase, the interplay between identity, power, competencies, and efficiency plays a pivotal role in shaping the emergence of a bounded ecosystem. This is achieved primarily by directing attention towards manufacturers, leading to the accumulation of overlapping manufacturer networks.

A clear identity shift towards offering a stand-alone product, exemplified by the transition to a software enterprise acting as the "Facebook" for mobile machinery manufacturers, necessitates a corresponding realignment in power dynamics between the firm and its stakeholders. This shift involves moving from a position of influence to one of direct control. The firm aims to achieve this control by enticing its target audience, manufacturers, to adopt the newly developed software, thereby solidifying their commitment to the software and ensuring their affiliation (Hagiu and Wright 2015). Further, given the influential position held by manufacturers over their suppliers, the case firm extends its power from manufacturers to exert indirect influence over the suppliers. Concurrently, in alignment with the new identity and the evolving power dynamics, various technological and business competencies become prominent, particularly software development and sales in the case firm under examination. Although the ideal scenario avoids transaction costs, several factors may necessitate relying on external expertise for technological and business-related processes.

This strategic decision is influenced by various factors, such as the lack of credibility intensified by the inherent challenges of being a small, new entrant in the market, as observed in the case firm. Thus, rather than establishing its own sales department to attract the target audience directly, that is, the manufacturers, the firm leverages external resources to draw them in. This entails harnessing the power of external sources, such as collaborating with external advisors and board members. Under certain circumstances, this approach may prove more efficient and more effective in influencing the target side's decisions than relying only on the firm's internal competencies, as illustrated by the case firm.

The firm's ability to influence the target audience extends beyond attracting them; it also involves the inherent value proposition of the stand-alone product, which is a critical factor in ensuring the manufacturer's affiliation with the software enterprise. Therefore, technological competencies emerge as a critical factor in alignment with the new identity. Yet, acknowledging the constraints associated with outsourcing technological activities, the firm tends to internalize these functions, enhancing its software-centric competencies. This strategic shift not only strengthens the firm's

organizational identity as a software enterprise but also enables it to customize the software to cater to the specific needs of the targeted party through close collaboration. This, in turn, reinforces their commitment to the stand-alone product, thereby enhancing the firm's power over its target audience. Consequently, the knowledge gained from this collaborative endeavor proves to be a valuable resource for the company.

Leveraging external resources, such as board members, not only aids in accomplishing business-related activities, such as software sales, and enhancing the firm's power position but also facilitates the internal development of business- and technology-related competencies. For instance, the case firm intentionally aligned the selection of board members with the firm's new identity, specifically choosing individuals with expertise in sales, technology, or both. As a result, they integrated a sales-oriented mindset within the founder's team and enhanced the newly established IT department's competencies by organizing regular training sessions with the board members.

As a result of the interplay among these organizational boundaries, the case firm successfully established a bounded ecosystem by focusing on one side, the manufacturers. This was achieved through the accumulation of overlapping manufacturer networks. For example, as illustrated in Figure 3, at T1, the initial manufacturer joined, bringing along its network of suppliers. Subsequently, at T2, the second manufacturer joined, bringing 95% of its suppliers, with 5% already utilizing the software as suppliers of the first manufacturer. This trend is reinforced by the company's adoption of a niche strategy, focusing solely on mobile machinery manufacturers. By T40, when the 40th manufacturer adopts the software, it only needs to onboard 25% of its suppliers, as the remaining 75% are already utilizing the software as suppliers to the preceding 39 manufacturers. Accordingly, as the number of manufacturers adopting the software grows, so does the volume of suppliers leveraging it, streamlining the process for the software enterprise to attract additional manufacturers. This is attributed to the reduced onboarding burden for new manufacturers, as many of their suppliers already utilize the software. The case firm overcomes the chicken-and-egg dilemma by initially attracting the more influential side to the platform.

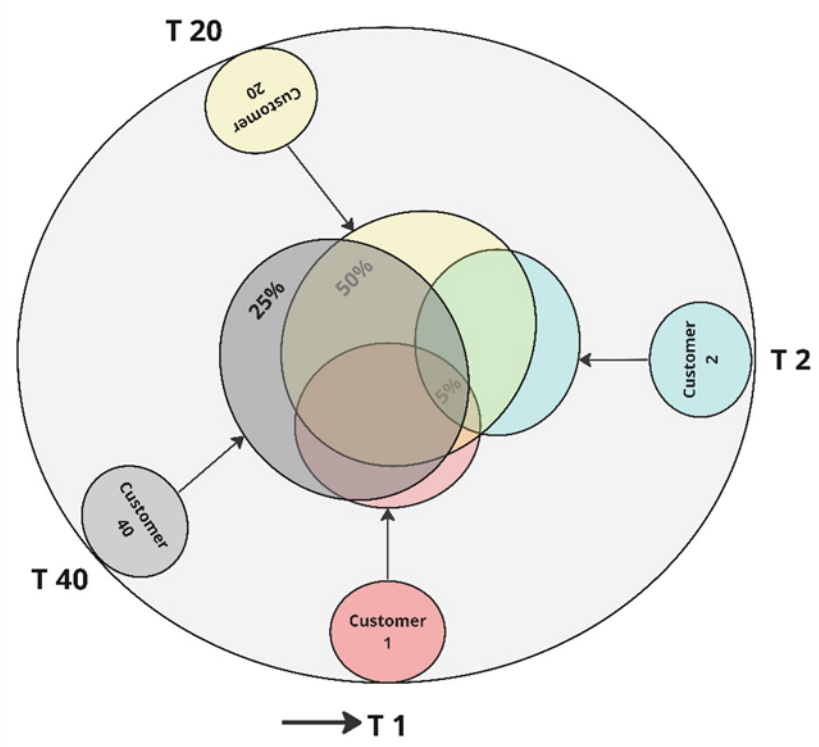

Figure 3: The accumulation of overlapping customer networks

4.2.2. From a software enterprise to an industry platform: The interplay between identity, power, competence, and efficiency

In the second phase of transition, the interplay between identity, power, competencies, and efficiency plays a pivotal role in shaping the dynamics of the previously established bounded ecosystem. This is primarily achieved by shifting focus from sole manufacturers to encompass manufacturers and suppliers, ultimately orchestrating the interactions between the two sides. This was mainly facilitated by the cross-group network effects emerging within the previously established bounded ecosystem (Gawer and Cusumano 2014).

A clear identity shift towards creating an industry platform, illustrated by the transition to a transaction platform acting as the "Tinder" for mobile machinery manufacturers, requires further realignment in power dynamics between the platform owner and its stakeholders. This transition entails shifting from exerting indirect influence over the other side, the suppliers, to exerting direct control while maintaining the previously established direct control over the initially targeted side, the manufacturers. The firm seeks to establish this control by incentivizing suppliers to fully utilize the platform's benefits, securing their commitment, and ensuring their affiliation (Hagiu and Wright 2015). However, achieving such commitment necessitates close collaboration with the suppliers, mirroring the collaborative

efforts undertaken with the manufacturers in the previous transition. Consequently, in line with the evolving identity and power dynamics, new technological and business competencies emerge, emphasizing platform-thinking competencies. This shift diminishes the significance of previously prominent competences, namely software development and sales. While these competencies remain crucial for attracting additional customers to the platform, they alone are insufficient to meet the demands of the new identity and power dynamics.

The firm shifts its primary focus from customizing resources to meet the needs of the initially attracted side, the manufacturers, to customizing resources to meet the needs of the other side, the suppliers. This entails gaining deeper insights into the dynamics of suppliers, thereby establishing the foundation for connecting the different sides. Therefore, the knowledge gained from this close collaboration is a valuable resource for the platform owners. Subsequently, the firm needs to shift the primary focus of its technology-related activities from solely software development to encompassing platform orchestration (Baldwin and Woodard, 2009; Constantinides et al., 2018; Tiwana et al., 2010). This involves developing the appropriate soft and hard governance mechanisms to orchestrate the interactions within the platform ecosystem (Foerderer, Lueker, and Heinzl 2021). Therefore, in line with the new identity and the necessity to instill a platform thinking mindset for orchestrating interactions across different platform sides, relying on external partnerships and alliances for developing technological competences, particularly orchestration, proves to be more efficient than hiring new individuals, somehow mirroring the approach taken with software sales in the previous phase. Simultaneously, as the company's power position strengthens and its credibility increases, attracting additional manufacturers to the platform ecosystem becomes less challenging. Consequently, this enables the internalization of previously outsourced business-related activities, such as software sales in the case firm, facilitating the establishment of a dedicated sales department within the firm.

Accordingly, the growing significance of platform-thinking competencies requires a shift towards leveraging external technological resources and competencies for increased efficiency. Simultaneously, improving the efficiency of business-related activities, that is, internalizing them, provides more time for creative and developmental work. This is particularly crucial for understanding the foundation that will be used to connect the different sides and ultimately orchestrate their interactions.

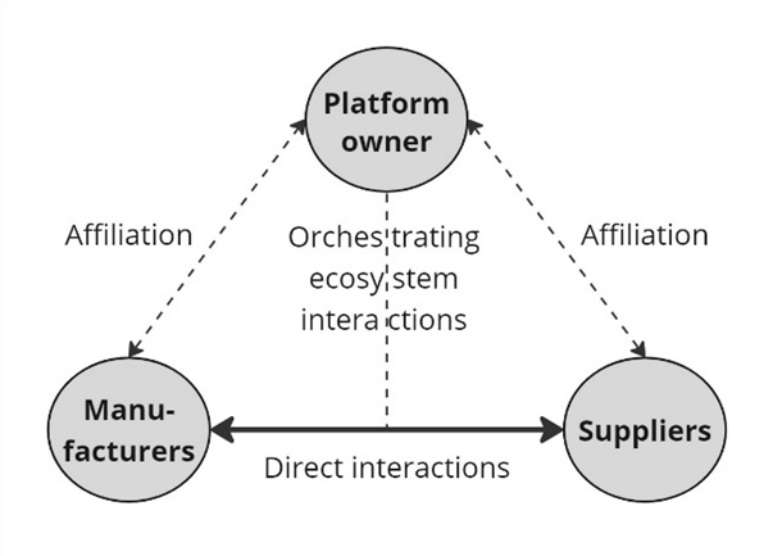

Figure 4: Illustration of the established B2B industry platform

In summary, as illustrated in Figure 4, the platform owner ensures manufacturers' affiliation, following the close collaboration during the first transition (Eisenmann and Hagiu 2007), and suppliers' affiliation, following the close collaboration in this second transition (Hagiu and Wright 2015). Therefore, these transitions lay the groundwork for facilitating interactions between manufacturers and suppliers across the previously established overlapping networks (Gawer and Cusumano 2014; Hagiu and Wright 2015), ultimately orchestrating their interactions while matching potential manufacturers with potential suppliers.

4.3. The evolution of organizational boundaries in the transition towards an industry platform

In establishing a B2B industry platform, the firm experiences two significant transitions across the four organizational boundaries, as illustrated in Figure 5. The first transition involves shifting towards offering a stand-alone product, while the second involves evolving to facilitate ecosystem interactions.

The firm's identity first shifts towards becoming a stand-alone product firm, where it creates value for its customers through the product and/or service it offers, such as the software the case firm provides to the manufacturers. Subsequently, the firm shifts its identity towards becoming an industry platform (Gawer and Cusumano 2014), thereby creating value for the different sides by facilitating the interactions between them (Rochet and Tirole 2006; Gawer and Cusumano 2014; Wu, Zhang, and Padmanabhan 2018). For example, the platform allows manufacturers to find specific suppliers in the ecosystem that are not currently serving them. Further, mirroring the

identity shift, the firm's power initially shifts towards controlling the first side, that is the manufacturers in the case firm, while indirectly influencing the other side, the suppliers. To be more specific, the decision of whom to attract first can be determined by assessing the power position of the different sides. In simpler terms, the firm prioritizes attracting the more influential side to adopt the stand-alone product first. However, as the initially targeted side holds power over the other side, they can draw them into the potential platform ecosystem, thereby enabling the potential platform owner to exert indirect influence over them. However, merely (indirectly) influencing the other side is insufficient for a transition towards an industry platform; thus, the potential platform owner shifts towards directly controlling the different sides, ultimately orchestrating their interactions.

In alignment with the newly established identity and the evolving power dynamics, the firm initially focuses on developing stand-alone product-related competencies, such as software development and sales, as observed in the current case study. Additionally, this transition entails tailoring the firm's resources to meet the specific requirements of the initially targeted side. However, as the firm progresses towards establishing an industry platform, it modifies its resources to address the other side's needs and develops platform-thinking competencies. Accordingly, this shift necessitates reconfiguring the previously established competencies, given the different nature of business- and technology-related activities in this phase, with particular emphasis on ecosystem orchestration. However, various internal and external factors significantly determine whether to pursue in-house development or outsourcing. In our case firm, transitioning towards a stand-alone product highlights the efficiency of internalizing technology-related activities while outsourcing business-related ones. Conversely, shifting towards an industry platform proves more efficient in handling business-related activities internally and relying on external partnerships and alliances to develop technology-related ones.

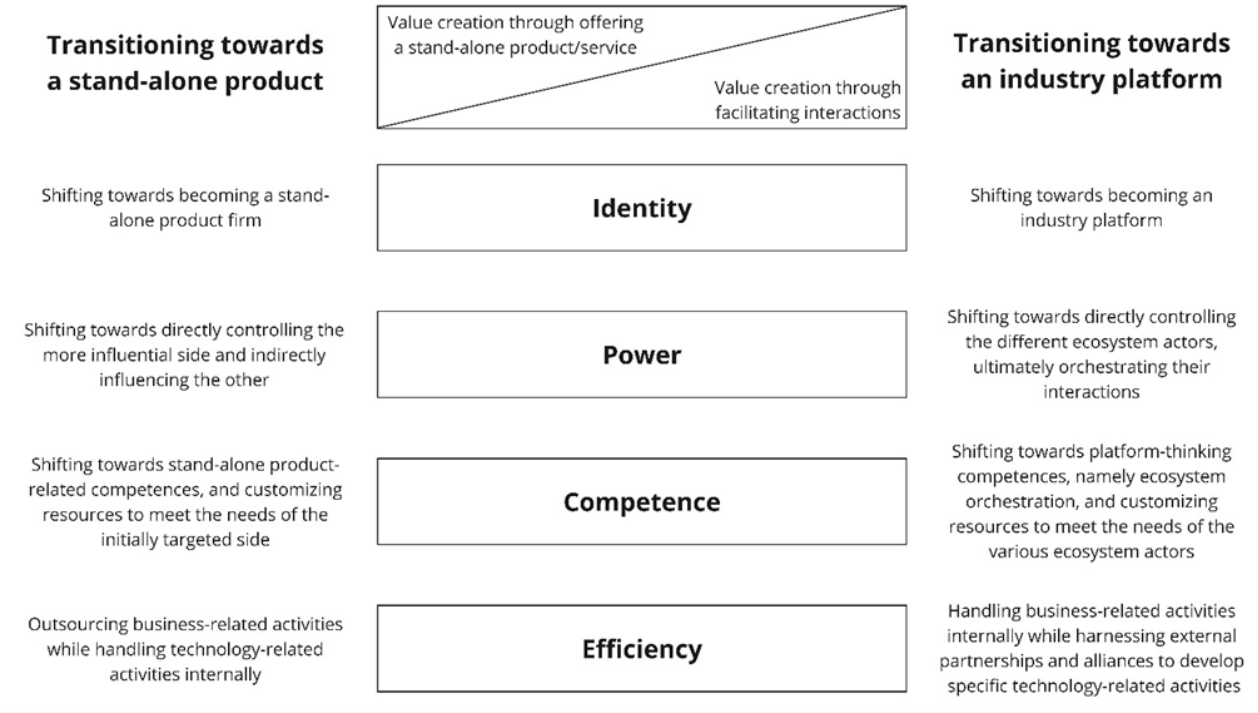

Figure 5: The evolution of organizational boundaries across the two main transitions

5. Conclusion

Transitioning towards an industry platform logic has received limited attention within the broader platform literature (Gawer 2014; Tan et al. 2015; de Reuver, Sørensen, and Basole 2018; Shi, Li, and Chumnumpan 2021). Most studies exploring the topic of creating industry platforms have primarily focused on B2C and C2C contexts, e.g., Tan et al. (2015) and Trabucchi and Buganza (2022a), leaving the B2B domain relatively unexplored (Loux et al. 2020). More importantly, exploring the shift in organizational boundaries during the transition towards industry platforms remains unexplored in the platform literature (Gawer 2021). Thus, our main objective is to examine the dynamics of organizational boundaries during the transition towards a B2B industry platform by conducting a comprehensive empirical case study. In doing so, we contribute to the understudied topic of creating and exploring B2B industry platforms and the underexplored topic of organizational boundaries in the broader platform literature. While examining the diverse organizational boundaries in the two distinct phases of the transition towards an industry platform has provided valuable insights, the primary contribution of the paper lies in examining the interplay between the boundary lenses within each transition phase, as well as the evolution of the organizational boundaries across the two transitions. Accordingly, we uncover a novel approach for creating a B2B

industry platform, ultimately presenting a managerial framework that elucidates the dynamics of organizational boundaries when adopting an industry platform logic.

5.1. Theoretical contribution

Various strategies have been examined for creating industry platforms (Gawer 2014; Thomas, Autio, and Gann 2014; Hagiu, Jullien, and Wright 2020). However, the approach uncovered through this study stands out distinctively from the rest. Eisenmann and Hagiu's (2007) strategy might seem the closest, especially in its emphasis on initially targeting one side of the market before shifting the focus to another. However, our research uncovers a strategy that goes beyond this sequential approach. Notably, we unveil a novel approach to establishing a B2B industry platform characterized by the staged accumulation of overlapping networks through (1) providing a stand-alone product and (2) strategically leveraging power dynamics within the platform ecosystem, particularly by offering the stand-alone product to the most influential party.

In simple terms, during the first stage, the firm's identity shifts towards becoming a stand-alone product firm, with software being the primary offering of the case firm. In alignment with the newly established identity, the potential platform owner aims to exert direct control over one side and indirect influence over the other by leveraging power dynamics between the different sides. Accordingly, the platform owner develops business and technological competencies (Gawer and Cusumano 2008) to serve the initially targeted side effectively and ensure their affiliation with the stand-alone product (Hagiu and Wright 2015). This, in turn, allows the potential platform owner to fulfill their new identity and achieve the desired power dynamics. Simultaneously, the changes in the previously mentioned organizational boundaries significantly influence decisions regarding internalizing or outsourcing business- and technology-related activities to attain higher efficiency. Therefore, the potential platform owner accumulates overlapping networks, creating a bounded ecosystem where interactions are only possible within each network.

In the second stage, as cross-group network effects begin to emerge within the bounded platform ecosystem (Gawer and Cusumano 2014), the platform's identity evolves towards becoming an industry platform, characterized by the creation of value through facilitating interactions between the different sides (Gawer and Cusumano 2014; Cusumano, Gawer, and Yoffie 2019). Consequently, the platform owner aims to secure the affiliation of the other side (Hagiu and Wright 2015), which requires further adjustments to the power dynamics between the platform owner and its stakeholders. Thus, the power dynamics transition from directly controlling one side and indirectly influencing the other to directly controlling both sides. This

involves further reconfiguring the firm's business and technological competencies to closely engage with the different sides, cater to their needs, ensure their affiliation, and ultimately establish direct control over them. In doing so, the platform owner can lay the foundation for connecting the different sides, ultimately orchestrating their interactions. However, the additional changes to identity, power, and competences significantly influence decisions regarding internalizing or outsourcing business- and technology-related activities to attain higher efficiency.

In line with this novel approach to transitioning towards an industry platform, we argue that deciding which side the potential B2B platform owner should attract first rests upon the most influential side. Simply put, the platform owner aims to attract the most influential side first, recognizing their ability to influence the other side's decision, ultimately facilitating the accumulation of overlapping networks. Therefore, prioritizing the attraction of influential parties to the platform might be an approach to overcoming the chicken-and-egg dilemma in B2B industry platforms.

5.2. Managerial contribution

The shifts in organizational boundaries are crucial for managers when adopting an industry platform. These shifts cannot be overlooked, nor can they be approached independently. Shifting towards an industry platform is not solely a decision related to "Who we are?" and the company's identity but also the power dynamics between the firm and its stakeholders, particularly those who will join the platform ecosystem later. Simultaneously, the shifts in identity and the need to realign power dynamics compel the organization to reconfigure its business and technological competencies (Gawer and Cusumano 2008), ultimately influencing decisions regarding in-house production and outsourcing from the market. Consequently, these decisions are not addressed in isolation. Instead, managers should consider the interplay between these decisions when transitioning towards an industry platform.

Section 4.3 introduces a framework that presents possible practices for the gradual transition towards adopting an industry platform, utilizing a stand-alone product as an intermediary stage. Managers can optimize the organization's resources by prioritizing the attraction of the more influential side first, then shifting focus to the other side (Eisenmann and Hagiu, 2007). However, shifting the focus to the other side does not imply attracting them, as they are already part of the platform ecosystem due to the accumulation of overlapping networks. Instead, shifting the focus involves working closely with the other side to ensure their affiliation and establish the foundation for connecting the different sides (Gawer 2021), ultimately orchestrating their interactions (Baldwin and Woodard, 2009; Constantinides et al., 2018; Tiwana et al., 2010).

5.3. Limitations and suggestions for future research

The research draws upon an exploratory, in-depth analysis of a single case study transitioning towards embracing an industry platform. While offering broad generalizations proves challenging due to several limitations, the approach does not aim for statistical generalization but serves as a methodological apparatus for abstraction and analytical/conceptual generalization (Yin 1994). Although we believe most findings will be valid in other cases transitioning from stand-alone product firms to B2B platform models, which is not an uncommon path as recently discussed by Wortmann, Jung, and Gassmann (2024), we aim to highlight some additional considerations. First, it is crucial to emphasize that the platform owner had only two sides: manufacturers and suppliers (Rochet and Tirole 2003). However, things would have been more complicated if more sides were involved (Hagiu and Wright 2015). Therefore, the initial focus on the most influential side warrants further examination in B2B industry platforms where more than two sides interact within the ecosystem. Besides, as mentioned earlier, the case firm under examination transitioned to an industry platform, specifically, a transaction platform (Cusumano, Gawer, and Yoffie 2019). Therefore, the uncovered approach for creating an industry platform may be applicable in the context of transaction platforms but not innovation platforms.

Examining the creation of a B2B industry platform from the perspective of organizational boundaries has brought to light several limitations in the platform literature. First, although we managed to correlate the identity of industry platforms with the diverse terminologies, definitions, and classifications used to characterize them, the literature lacks a comprehensive examination of the identity of platforms associated with network effects. Further, regarding power dynamics, when addressing the process of attracting different sides to the platform (Hagiu and Spulber 2013), significant emphasis has been placed on pricing (Rochet and Tirole 2003; Rochet and Tirole 2006; Rysman 2009). However, in the case of B2B platforms, pricing does not seem to play an essential role in attracting different sides; instead, customized efforts are necessary to attract the various sides to the platform, as observed in the case firm. Therefore, this raises questions about the role of pricing in B2B industry platforms, especially considering that one of the main pillars of the industry platform literature is the economics perspective (Gawer 2014), which predominantly focuses on pricing and platform competition (Rochet and Tirole 2003; Rochet and Tirole 2006; Rysman 2009).

We lack a clear understanding of the competencies that are essential for creating various industry platforms. For example, in the case firm, which is a B2B transaction platform, sales competences emerge as crucial for attracting different actors to the

platform ecosystem. However, it is impossible to generalize and equate sales with the role pricing plays in B2C and C2C platforms (Rochet and Tirole 2003; Rochet and Tirole 2006; Rysman 2009). Additionally, concerning efficiency in industry platforms, the trade-off of whether the platform owner should depend on internal capabilities or rely on external resources is inherently connected to the ecosystem actors (Hagiu and Wright 2018; Helfat and Raubitschek 2018). While it is undoubtedly valuable to examine the control-versus-enable trade-off (Hagiu and Wright 2018), other efficiency-related decisions also warrant further examination, particularly those indirectly linked to the ecosystem actors, e.g., sales, as observed in the case firm.

References

Adam, M., E. Croitor, D. Werner, A. Benlian, and M. Wiener. 2022. Input control and its signalling effects for complementors' intention to join digital platforms. *Information Systems Journal*.

Adams, W., and J. W. Brock. 1982. Integrated monopoly and market power: System selling, compatibility standards, and market control. *The Quarterly Review of Economics and Business* 22 (4): 29–42.

Adner, R. 2017. Ecosystem as Structure: An Actionable Construct for Strategy. *Journal of Management* 43 (1): 39–58.

Albert, S., and D. A. Whetten. 1985. Organizational identity. In *L. L. Cummings, & B. M. Staw (Eds.), Research in organizational behavior*, 263–95. Greenwich, CT: JAI Press.

Bakos, Y., and E. Katsamakas. 2008. Design and Ownership of Two-Sided Networks: Implications for Internet Platforms. *Journal of Management Information Systems* 25 (2): 171–202.

Baldwin, C., and E. von Hippel. 2011. Modeling a Paradigm Shift: From Producer Innovation to User and Open Collaborative Innovation. *Organization Science* 22 (6): 1399–417.

Baldwin, C. Y., and C. J. Woodard. 2009. The Architecture of Platforms: A Unified View. In *Platforms, Markets, and Innovation*, A. Gawer. Cheltenham, UK: Edward Elgar Publishing Limited.

Barney, J. 1986. Organizational Culture: Can It Be a Source of Sustained Competitive Advantage? *The Academy of Management Review* 11 (3): 656–65.

Barney, J. B. 1991. Firm resources and sustained competitive advantage. *Journal of Management* 17 (1): 99–120.

Belleflamme, P., and M. Peitz. 2019. Price disclosure by two-sided platforms. *International Journal of Industrial Organization* 67: 102529.

Beverland, M., and A. Lindgreen. 2010. What makes a good case study? A positivist review of qualitative case research published in Industrial Marketing Management, 1971–2006. *Industrial Marketing Management* 39 (1): 56–63.

Bolt, W., and A. F. Tieman. 2008. Heavily skewed pricing in two-sided markets. *International Journal of Industrial Organization* 26 (5): 1250–5.

Boudreau, K. 2010. Open Platform Strategies and Innovation: Granting Access vs. Devolving Control. *Management Science* 56 (10): 1849–72.

Boudreau, K. 2012. Let a Thousand Flowers Bloom? An Early Look at Large Numbers of Software App Developers and Patterns of Innovation. *Organization Science* 23 (5): 1409–27.

Boudreau, K. 2017. Platform-Based Organization and Boundary Choices: "Opening-Up" While Still Coordinating and Orchestrating. *SSRN Electronic Journal*.

Boudreau, K., and K. R. Lakhani. 2009. How to Manage Outside Innovation. *MIT Sloan Management Review* 50 (4): 68–76.

Braun, V., and V. Clarke. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology* 3 (2): 77–101.

Caillaud, B., and B. Jullien. 2001. Competing cybermediaries. *European Economic Review* 45 (4–6): 797–808.

Caillaud, B., and B. Jullien. 2003. Chicken & Egg: Competition among Intermediation Service Providers. *The RAND Journal of Economics* 34 (2): 309–28.

Ceccagnoli, M., C. Forman, P. Huang, and D. J. Wu. 2012. Cocreation of Value in a Platform Ecosystem: The Case of Enterprise Software. *MIS Quarterly* 36 (1): 263–90.

Cennamo, C., and J. Santaló. 2019. Generativity Tension and Value Creation in Platform Ecosystems. *Organization Science* 30 (3): 617–41.

Cennamo, C., P. Oliveira, and L. Zejnilovic. 2022. Unlocking Innovation in Healthcare: The Case of the Patient Innovation Platform. *California Management Review* 64 (4): 47–77.

Chan, H., M. X. Yang, and K. J. Zeng. 2022. Bolstering ratings and reviews systems on multi-sided platforms: A co-creation perspective. *Journal of Business Research* 139: 208–17.

Clark, S. M., D. A. Gioia, D. Jr. Ketchen, and J. B. Thomas. 2010. Transitional Identity as a Facilitator of Organizational Identity Change during a Merger. *Administrative Science Quarterly* 55 (3): 397–438.

Constantinides, P., O. Henfridsson, and G. G. Parker. 2018. Platforms and Infrastructures in the Digital Age. *Information Systems Research* 29 (2): 381–400.

Corley, K. G., and D. A. Gioia. 2004. Identity ambiguity and change in the wake of a corporate spin-off. *Administrative Science Quarterly* 49 (2): 173–208.

Cusumano, M., A. Gawer, and D. Yoffie. 2019. *The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power*. Harper Business.

Cusumano, M. A., and A. Gawer. 2002. The elements of platform leadership. *MIT Sloan Management Review* 43 (3): 51–8.

Dierickx, I. 1989. Asset Stock Accumulation and Sustainability of Competitive Advantage. *Management Science* 35 (12): 1504–11.

Dubois, A., and L. Araujo. 2007. Case research in purchasing and supply management: Opportunities and challenges. *Journal of Purchasing and Supply Management* 13 (3): 170–81.

Dubois, A., and L.-E. Gadde. 2002. Systematic combining: an abductive approach to case research. *Journal of Business Research* 55 (7): 553–60.

Dyer, W. G., and A. L. Wilkins. 1991. Better stories, not better constructs, to generate better theory: A rejoinder To Eisenhardt. *Academy of Management Review* 16 (3): 613–9.

Eaton, B., S. Elaluf-Calderwood, C. Sørensen, and Y. Yoo. 2015. Distributed Tuning of Boundary Resources: The Case of Apple's iOS Service System. *MIS Quarterly* 39 (1): 217–43.

Economides, N., and E. Katsamakas. 2006. Two-Sided Competition of Proprietary vs. Open Source Technology Platforms and the Implications for the Software Industry. *Management Science* 52 (7): 1057–71.

Eisenhardt, K. M. 1989. Building theories from case study research. *The Academy of Management Review* 14 (3): 532–50.

Eisenhardt, K. M., and M. E. Graebner. 2007. Theory Building From Cases: Opportunities and Challenges. *Academy of Management Journal* 50 (1): 25–32.

Eisenmann, T. 2008. Managing Proprietary and Shared Platforms. *California Management Review* 50 (4): 31–53.

Eisenmann, T., and A. Hagiu. Staging Two-Sided Platforms. *Harvard Business School Background Note* 808-004, July 2007. (Revised March 2008)

Eisenmann, T., G. G. Parker, and M. Van Alstyne. 2006. Strategies for Two-Sided Markets. *Harvard Business Review* 84 (10): 92-101+149.

Eisenmann, T., G. G. Parker, and M. Van Alstyne. 2011. Platform envelopment. *Strategic Management Journal* 32 (12): 1270–85.

Evans, D. S., and R. Schmalensee. 2008. Markets with Two-Sided Platforms. *Competition Law and Policy* 1 (28): 667–93.

Fehrer, J. A., and S. Nenonen. 2020. Crowdfunding networks: Structure, dynamics and critical capabilities. *Industrial Marketing Management* 88: 449–64.

Foerderer, J., T. Kude, S. Mithas, and A. Heinzl. 2018. Does Platform Owner's Entry Crowd Out Innovation? Evidence from Google Photos. *Information Systems Research* 29 (2): 444–60.

Foerderer, J., N. Lueker, and A. Heinzl. 2021. And the Winner Is …? The Desirable and Undesirable Effects of Platform Awards. *Information Systems Research* 32 (4): 1155–72.

Garud, R., and A. Kumaraswamy. 1993. Changing competitive dynamics in network industries : An exploration of Sun Microsystems' open systems strategy. *Strategic Management Journal* 14 (July): 351–69.

Gawer, A. 2014. Bridging differing perspectives on technological platforms: Toward an integrative framework. *Research Policy* 43 (7): 1239–49.

Gawer, A. 2021. Digital platforms' boundaries: The interplay of firm scope, platform sides, and digital interfaces. *Long Range Planning* 54 (5): 102045.

Gawer, A., and M. A. Cusumano. 2008. How companies become platform leaders. *MIT Sloan Management Review* 49 (2): 28–35.

Gawer, A., and M. A. Cusumano. 2014. Industry Platforms and Ecosystem Innovation: Platforms and Innovation. *Journal of Product Innovation Management* 31 (3): 417–33.

Gawer, A., and R. Henderson. 2007. Platform Owner Entry and Innovation in Complementary Markets: Evidence from Intel. *Journal of Economics & Management Strategy* 16 (1): 1–34.

Ge, C., K.-W. Huang, and A. Kankanhalli. 2020. Platform skills and the value of new hires in the software industry. *Research Policy* 49 (1): 103864.

Gereffi, G. 1994. The organization of buyer-driven global commodity chains: how United States retailers shape overseas production networks. In *Commodity Chains and Global Capitalism*, ed. G. Gereffi and M. Korzeniewicz, 95–122. Westport, CT, Praeger.

Gereffi, G., J. Humphrey, and T. Sturgeon. 2005. The governance of global value chains. *Review of International Political Economy* 12 (1): 78–104.

Ghazawneh, A., and O. Henfridsson. 2013. Balancing platform control and external contribution in third-party development: the boundary resources model: Control and contribution in third-party development. *Information Systems Journal* 23 (2): 173–92.

Ghazawneh, A., and O. Henfridsson. 2015. A Paradigmatic Analysis of Digital Application Marketplaces. *Journal of Information Technology* 30 (3): 198–208.

Gibbert, M., and W. Ruigrok. 2010. The "What" and "How" of Case Study Rigor: Three Strategies Based on Published Work. *Organizational Research Methods* 13 (4): 710–37.

Gibbert, M., W. Ruigrok, and B. Wicki. 2008. What passes as a rigourous case study? *Strategic Management Journal* 29: 1465–74.

Gioia, D. A., and J. B. Thomas. 1996. Identity, Image and Issue Interpretation: Sensemaking during Strategic Change in Academia. *Administrative Science Quarterly* 41 (3): 370–403.

Gioia, D. A., K. G. Corley, and A. L. Hamilton. 2013. Seeking qualitative rigor in inductive research. *Organizational Research Methods* 16 (1): 15–31.

Hagiu, A. 2014. Strategic Decisions for Multisided Platforms. *MIT Sloan Management Review* 55 (2): 92–3.

Hagiu, A., and D. Spulber. 2013. First-Party Content, Commitment and Coordination in Two-Sided Markets. *Management Science* 59 (4): 933–49.

Hagiu, A., and J. Wright. 2015. Multi-sided platforms. *International Journal of Industrial Organization* 43: 162–74.

Hagiu, A., and J. Wright. 2018. Controlling versus enabling. *Management Science* 65 (2): 577–95.

Hagiu, A., B. Jullien, and J. Wright. 2020. Creating Platforms by Hosting Rivals. *Management Science* 66 (7): 3234–48.

Helfat, C. E., and R. S. Raubitschek. 2018. Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems. *Research Policy* 47 (8): 1391–9.

Huikkola, T., R. Rabetino, M. Kohtamäki, and H. Gebauer. 2020. Firm boundaries in servitization: Interplay and repositioning practices. *Industrial Marketing Management* 90 (October): 90–105.

Hukal, P., O. Henfridsson, M. Shaikh, and G. G. Parker. 2020. Platform Signaling for Generating Platform Content. *MIS Quarterly* 44 (3): 1177–205.

Ishihara, M., and E. Muller. 2020. Software piracy and outsourcing in two-sided markets. *Quantitative Marketing and Economics* 18 (1): 61–124.

Ivarsson, I., and C. G. Alvstam. 2010. Upstream Control and Downstream Liberty of Action?: Interdependence Patterns in Global Value Chains, with examples from Producer-driven and Buyer-driven Industries. *Review of Market Integration* 2 (1): 43–60.

Jacobides, M. G., and I. Lianos. 2021. Regulating platforms and ecosystems: an introduction. *Industrial and Corporate Change* 30 (5): 1131–42.

Jacobides, M. G., C. Cennamo, and A. Gawer. 2018. Towards a theory of ecosystems. *Strategic Management Journal* 39 (8): 2255–76.

Kaiser, U., and J. Wright. 2006. Price structure in two-sided markets: Evidence from the magazine industry. *International Journal of Industrial Organization* 24 (1): 1–28.

Katz, M. L., and C. Shapiro. 1985. Network Externalities,Competition, and Compatibility. *The American Economic Review* 75 (3): 424–40.

Kogut, B. 2000. The network as knowledge: generative rules and the emergence of structure. *Strategic Management Journal* 21 (3): 405–25.

Leonard-Barton, D. 1990. A Dual Methodology for Case Studies: Synergistic Use of a Longitudinal Single Site with Replicated Multiple Sites. *Organization Science* 1 (3): 248–66.

Lin, F., H. Tian, J. Zhao, and M. Chi. 2022. Reward or punish: investigating output controls and content generation in the multi-sided platform context. *Internet Research*.

Loux, P., M. Aubry, S. Tran, and E. Baudoin. 2020. Multi-sided platforms in B2B contexts: The role of affiliation costs and interdependencies in adoption decisions. *Industrial Marketing Management* 84: 212–23.

McGahan, A. M. 2000. How Industries Evolve. *Business Strategy Review* 11 (3): 1–16.

Ozalp, H., P. Ozcan, D. Dinckol, M. Zachariadis, and A. Gawer. 2022. "Digital Colonization" of Highly Regulated Industries: An Analysis of Big Tech Platforms' Entry into Health Care and Education. *California Management Review* 64 (4): 78–107.

Pagani, M. 2013. Digital Business Strategy and Value Creation: Framing the Dynamic Cycle of Control Points. *MIS Quarterly* 37 (2): 617–32.

Parker, G. G., and M. Van Alstyne. 2005. Two-Sided Network Effects: A Theory of Information Product Design. *Management Science* 51 (10): 1494–504.

Parker, G. G., and M. Van Alstyne. 2009. Six Challenges in Platform Licensing and Open Innovation. *Communications & Strategies* (74): 17–36.

Parker, G. G., and M. Van Alstyne. 2018. Innovation, Openness, and Platform Control. *Management Science* 64 (7): 3015–32.

Parker, G. G., M. Van Alstyne, and X. Jiang. 2016. Platform Ecosystems: How Developers Invert the Firm. *MIS Quarterly* 41 (1): 255–66.

Patton, M. Q. 1990. Purposeful sampling. In *Qualitative evaluation and research methods*, 169–86. Beverly Hills, CA: Sage.

Peteraf, M. 1993. The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal* 14 (3): 179–91.

Pfeffer, J., and G. Salancik. 1978. *The External Control of Organizations: A Resource Dependence Perspective*. New York: Harper & Row Publishers.

Pil, F. K., and M. Holweg. 2006. Evolving From Value Chain to Value Grid. *MIT Sloan Management Review* 47 (4): 72–80.

Porter, M. E. 1980. *Competitive Strategy. Techniques for analyzing industries and competitors*. The Free Press.

Pratt, M. G. 2008. Fitting oval pegs into round holes. *Organizational Research Methods* 11 (3): 481–509.

Pratt, M. G. 2009. For the lack of a boilerplate: Tips on writing up (and rewriting) qualitative research. *Academy of Management Journal* 52 (5): 856–62.

Pundziene, A., T. Gutmann, M. Schlichtner, and D. J. Teece. 2022. Value Impedance and Dynamic Capabilities: The Case of MedTech Incumbent-Born Digital Healthcare Platforms. *California Management Review* 64 (4): 108–34.

Reuber, A. R., and E. Fischer. 2022. Relying on the engagement of others: A review of the governance choices facing social media platform start-ups. *International Small Business Journal: Researching Entrepreneurship* 40 (1): 3–22.

de Reuver, M., C. Sørensen, and R. C. Basole. 2018. The Digital Platform: A Research Agenda. *Journal of Information Technology* 33 (2): 124–35.

Rochet, J.-C., and J. Tirole. 2003. Platform Competition in Two-Sided Markets. *Journal of the European Economic Association* 1 (4): 990–1029.

Rochet, J.-C., and J. Tirole. 2006. Two-sided markets: a progress report. *The RAND Journal of Economics* 37 (3): 645–67.

Rysman, M. 2009. The Economics of Two-Sided Markets. *Journal of Economic Perspectives* 23 (3): 125–43.

Santos, F. M., and K. M. Eisenhardt. 2005. Organizational Boundaries and Theories of Organization. *Organization Science* 16 (5): 491–508.

Schilling, M. A., and H. K. Steensma. 2002. Disentangling the Theories of Firm Boundaries: A Path Model and Empirical Test. *Organization Science* 13 (4): 387–401.

Schreieck, M., M. Wiesche, and H. Krcmar. 2021. Capabilities for value co-creation and value capture in emergent platform ecosystems: A longitudinal case study of SAP's cloud platform. *Journal of Information Technology* 36 (4): 365–90.

Shi, X., F. Li, and P. Chumnumpan. 2021. Platform Development: Emerging Insights From a Nascent Industry. *Journal of Management* 47 (8): 2037–73.

Siggelkow, N. 2007. Persuasion with case studies. *Academy of Management Journal* 50 (1): 20–4.

Sridhar, S., M. K. Mantrala, P. A. Naik, and E. Thorson. 2011. Dynamic Marketing Budgeting for Platform Firms: Theory, Evidence, and Application. *Journal of Marketing Research* 48 (6): 929–43.

Sun, M., and E. Tse. 2009. The Resource-Based View of Competitive Advantage in Two-Sided Markets. *Journal of Management Studies* 46 (1): 45–64.

Tan, B., S. Pan, University of New South Wales, X. Lu, Fudan University, L. Huang, and Fudan University. 2015. The Role of IS Capabilities in the Development of Multi-Sided Platforms: The Digital Ecosystem Strategy of Alibaba.com. *Journal of the Association for Information Systems* 16 (4): 248–80.

Teece, D. J. 2017. Dynamic Capabilities and (Digital) Platform Lifecycles. In *Advances in Strategic Management*, ed. J. Furman, A. Gawer, B. S. Silverman, and S. Stern, 37:211–25. Emerald Publishing Limited.

Teece, D. J., A. Pundziene, S. Heaton, and M. Vadi. 2022. Managing Multi-Sided Platforms: Platform Origins and Go-to-Market Strategy. *California Management Review* 64 (4): 5–19.

Thomas, L. D. W., E. Autio, and D. M. Gann. 2014. Architectural Leverage: Putting Platforms in Context. *Academy of Management Perspectives* 28 (2): 198–219.

Tiwana, A., B. Konsynski, and A. A. Bush. 2010. Platform Evolution: Coevolution of Platform Architecture, Governance, and Environmental Dynamics. *Information Systems Research* 21 (4): 675–87.

Trabucchi, D., and T. Buganza. 2022a. Entrepreneurial dynamics in two-sided platforms: the influence of sides in the case of Friendz. *International Journal of Entrepreneurial Behavior & Research* 28 (5): 1184–205.

Trabucchi, D., and T. Buganza. 2022b. Landlords with no lands: a systematic literature review on hybrid multi-sided platforms and platform thinking. *European Journal of Innovation Management* 25 (6): 64–96.

Tripsas, M. 2009. Technology, Identity, and Inertia Through the Lens of "The Digital Photography Company." *Organization Science* 20 (2): 441–60.

Van Alstyne, M., G. G. Parker, and S. P. Choudary. 2016. Pipelines, Platforms, and the New Rules of Strategy. *Harvard Business Review* 94 (4): 54–62.

Wang, J., J.-Y. Lai, and C.-H. Chang. 2016. Modeling and analysis for mobile application services: The perspective of mobile network operators. *Technological Forecasting and Social Change* 111: 146–63.

Wareham, J. D., P. B. Fox, and J. L. Cano Giner. 2014. Technology Ecosystem Governance. *Organization Science* 25 (4): 1195–215.

Williamson, O. E. 1975. *Markets and Hierarchies: Analysis and Antitrust Implications*. New York: Free Press.

Williamson, O. E. 1985. *The Economic Institutions of Capitalism*. New York: Free Press.

Wortmann, F., S. Jung, and O. Gassmann. 2024. *The Platform Business Navigator. The strategies behind the most successful platform companies*. FT Publishing.

Wu, Y., K. Zhang, and V. Padmanabhan. 2018. Matchmaker Competition and Technology Provision. *Journal of Marketing Research* 55 (3): 396–413.

Yang, H., Z. Lin, and Y. Lin. 2010. A multilevel framework of firm boundaries: Firm characteristics, dyadic differences, and network attributes. *Strategic Management Journal* 31: 237–61.

Yin, R. K. 1994. *Case study research: Design and Methods*. Newbury Park, CA: Sage.

Young Kang, H., and F. F. Suarez. 2022. Platform Owner Entry Into Complementor Spaces Under Different Governance Modes. *Journal of Management*: 1–35.

Zhang, Y., J. Li, and T. W. Tong. 2022. Platform governance matters: How platform gatekeeping affects knowledge sharing among complementors. *Strategic Management Journal* 43 (3): 599–626.

The New Space Ecosystem: Insights from the Architecture of Digital Platforms

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1 Introduction

The fascination with space-related activities has roots dating back to at least the beginning of the Cold War (Jora et al., 2023). However, for many years, these activities remained beyond the reach of private companies and certainly out of reach for end customers (Vidmar, 2020). While people are familiar with significant events like the Soviet Union's launch of the first satellite into space or the American moon landing (Gupta et al., 2022), these occurrences were distant news read in the media rather than firsthand experiences for people. The dominance of powerful governments played a central role in keeping the space ecosystem a realm

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A. Ojala and W. W. Baber (eds.), *Space Business*,
https://doi.org/10.1007/978-981-97-3430-6_3

exclusive to a handful of nations (Gupta et al., 2022), leaving the rest of the world as mere spectators. Over the last two decades, a notable shift occurred with the private sector making significant inroads into the space ecosystem (Bousedra, 2023; Vidmar, 2020; Weinzierl, 2018), challenging established standards and beliefs that previously considered such endeavors as the exclusive domain of governmental entities. This evolution enabled the private sector not only to be part of the space ecosystem but also to directly deliver space-related applications to end customers, paving the way for a new era often denoted as New Space (Di Tullio et al., 2023; Madan & Halkias, 2020; Parrella et al., 2022; Robinson & Mazzucato, 2019).

The integration of digitalization into the space ecosystem has not only transformed the configuration of the ecosystem but has given rise to entirely new paradigms within the New Space Ecosystem (Bousedra, 2023; Vidmar, 2020). However, this transformation might not be solely attributable to digitalization; it extends to the underlying mindset steering this technological shift (Jora et al., 2023). The incursion of the American capitalist mindset, personified by influential figures like Elon Musk, Jeff Bezos, and Richard Branson (Bousedra, 2023; Vidmar, 2020; Weinzierl et al., 2022), has been a defining factor in reshaping the space ecosystem. Accordingly, the integration of these various factors into the dynamics of the New Space introduced new value chains that surpass the traditional distinction between upstream and downstream. The upstream segment, while retaining its fundamental player categories, has undergone substantial advancements with the entry of the private sector (Borroz & Korber, 2023). This is particularly evident in terms of satellite miniaturization and the cost reduction of launch activities (Parrella et al., 2022; Vidmar, 2020). As a result, the upstream advancements have cascaded downstream (Lamine et al., 2021), giving rise to a diverse array of endeavors, particularly applications developed by third-party developers through utilizing the space-related data (Onwudiwe & Newton, 2021). Accordingly, these initiatives have actively played a role in restructuring the downstream segment of the value system. Nevertheless, our understanding of the New Space Ecosystem's architecture remains incomplete.

Our primary objective is to conduct a systematic review to unveil the architectural configuration of the New Space Ecosystem. Accordingly, we aimed to curate a diverse selection of articles that explore distinct value chains, both upstream and downstream, within the overall value system of the New Space. Upon analyzing the selected articles, we

observed striking parallels between the architecture of the digital platform ecosystem and that of the New Space. Therefore, following the presentation of the methodology in Sect. 2 and the discussion on the evolution of the space ecosystem in Sect. 3, we uncovered the architecture of the New Space Ecosystem in Sect. 4. Further, in Sect. 5, we proceeded to present the architecture of the digital platform ecosystem, drawing parallels between its structure and that of the New Space Ecosystem. We posit that the literature on digital platforms serves as a valuable starting point to comprehend the intricacies across different layers within the New Space Ecosystem. Accordingly, this study centers around three main contributions. First, we identify the key dynamics that have shaped the architecture of the New Space Ecosystem, namely, the incursion of the private sector, the miniaturization of satellites, and the surge in space data applications. Furthermore, we delineate the distinct layers composing the New Space Ecosystem, which emerges as a layered structure consisting of three primary layers: the infrastructure layer, the data layer, and the application layer. Lastly, we propose a prospective research agenda derived from the parallels drawn with the digital platform ecosystem, mainly centered around the dynamics of network effects within the New Space Ecosystem, the orchestration of the ecosystem, and the applicability of the platform business model within and across the different layers of the New Space Ecosystem.

2 Methodology

To achieve the objective of uncovering the architecture of the New Space Ecosystem, conducting a systematic review emerged as the optimal approach. Accordingly, it was crucial to curate a diverse array of articles that could provide valuable insights into this realm. The initial step entailed the identification of relevant search terms, followed by the establishment of selection criteria, as outlined by Tranfield et al.'s (2003). We required that the selected articles have at least one of the following keywords in their titles: "new space" OR "space econom*" OR "space industr*" OR "space sector*" OR "space ecosystem*" OR "ecosystem of space" OR "space firm*" OR "space business*" OR "space activit*" OR "space innovation*" OR "space technolog*". We utilized Elsevier's Scopus, which is recognized as one of the most effective tools for literature searches (Falagas et al., 2008). Concerning the selection criteria, as depicted in Fig. 1, our emphasis was on the domains of business and

management. Specifically, we targeted peer-reviewed journal articles and book chapters published after the year 1999. This timeframe aligns with the private sector's significant involvement in the space ecosystem, as highlighted by Gupta et al. (2022).

The initial search yielded 137 articles; however, three of them were duplicates, resulting in a final count of 134. Furthermore, after an initial screening of titles and/or keywords, we excluded 24 articles that did not specifically focus on New Space. For instance, some focused on "new space" as a physical space, particularly within architectural and real estate contexts. Besides, upon thorough examination of the abstracts and/or the

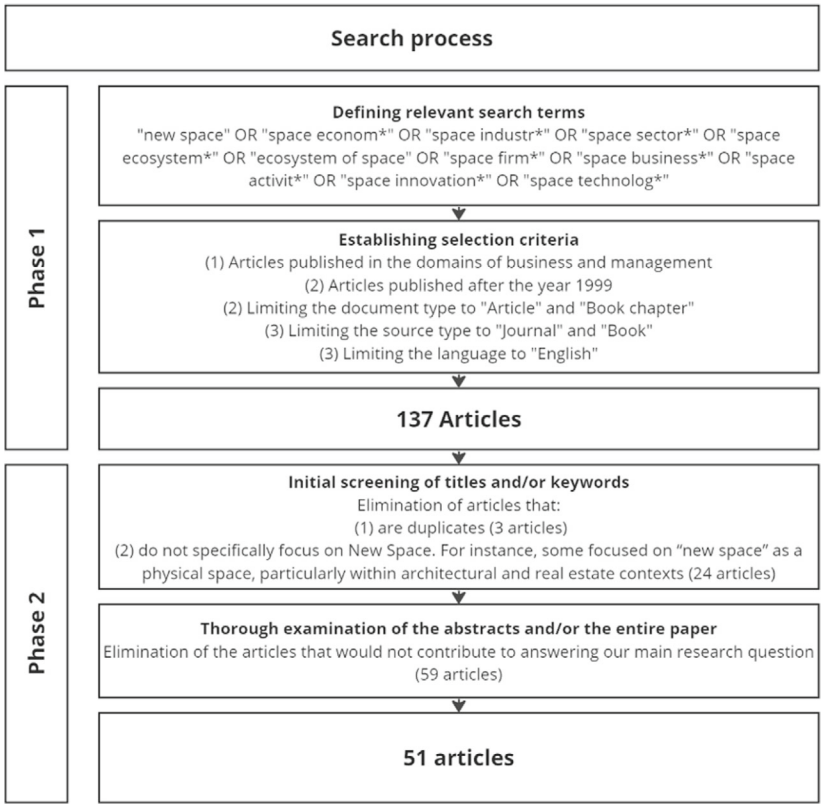


Fig. 1 Search process

entire remaining articles, we excluded 59 articles, as it became apparent that they would not contribute to answering our main research question. Thus, we were left with 51 articles to uncover the architecture of the New Space Ecosystem.

Furthermore, the systematic approach of the review extends beyond the search process to encompass the analysis phase (Spanuth & Urbano, 2023). This entailed a comprehensive analysis of the 51 articles, initially categorizing each as either upstream or downstream, based on the definitions provided by Lamine et al. (2021), OECD (2022), and Onwudiwe and Newton (2021). However, during the categorization process, it became evident that certain articles did not align with either the upstream or downstream segments. Consequently, this approach allowed us to systematically identify the distinct layers constituting the New Space Ecosystem, as illustrated in Sect. 4.

3 From Old Space to New Space: The Evolution of the Space Ecosystem

The economic interest in space began to gain momentum during the Cold War, where the space ecosystem was predominantly monopolized by two major countries, the United States and the Soviet Union (Lee et al., 2021). The Soviet Union launched the world's first satellite, Sputnik, in 1957, followed by the first human to orbit Earth in 1961. On the American side, the Apollo Moon missions involved more complex missions. These missions ultimately lead to the historic moon landing by humans in 1969 (Gupta et al., 2022). Alongside Russia and the US, other participants such as France, Japan, and the United Kingdom entered the scene. However, all of these activities conducted in the first few decades were dominated by state-funded initiatives, commonly referred to as traditional space or old space (Gupta et al., 2022). The primary objective of such early space initiatives was exploration and scientific pursuits (Bousedra, 2023). Nevertheless, in contemporary times, there has been a shift away from the traditional goals of exploration and science toward socio-economic objectives, with a particular focus on innovation and economic performance (Bousedra, 2023). Additionally, during the past few years, the space ecosystem has shifted from being dominated by a handful of leading space nations, mainly through the public sector, to now involving more than 60 countries. These countries, along with their

private commercial entities, are actively engaged in the space ecosystem (Robinson & Mazzucato, 2019).

3.1 Unfolding the Evolution: Three Key Phases

Various scholars have categorized the evolution of the space ecosystem into distinct eras or phases. The majority of these classifications typically revolved around three or four different space eras. Robinson and Mazzucato (2019) categorized space waves into four: Space 1.0, encompassing astronomy; Space 2.0, focusing on the space race and the Apollo era; Space 3.0, involving the International Space Station era and integrated international initiatives; and Space 4.0, featuring more nations, diverse types of space players, spin-off, spin-in, and spillover, indicating closer ties to consumers and society. Other scholars, such as Jora et al. (2023), have classified the evolution of the space ecosystem into three distinct time frames. In their classification, the first stage commenced at the beginning of the twentieth century, emphasizing scientists' theoretical research on the potential uses of space. The second stage, spanning from 1950 to 1970, marked the initiation of practical exploration projects, military considerations, and initial economic contemplations related to the cosmos. The third stage, post the 1970s, witnessed a shift toward collaboration between the governmental and commercial sectors in space endeavors (Jora et al., 2023). In a similar vein, Vidmar (2020) outlined three distinct eras: the first phase, spanning the 1960s and 1970s, characterized by the dominance of a few nations, notably the US and the Soviet Union; the second phase, spanning the 1980s and 1990s, marked the commencement of commercialization by large multinational corporations; and the final phase, post the 2000s, represents the democratization of space activities driven by innovation and entrepreneurship. Regardless of the various categorizations offered by different scholars, they can all be distilled into three key phases. The first encompassed the theoretical phase of space activities, preceding the Cold War era. The second phase entailed space activities monopolized by a few nations and distanced from private businesses, consumers, and society, primarily during the Cold War era. And the final phase, predominantly observed in the past two to three decades, witnessed the private sector's increasing involvement in space-related activities. This involvement has reshaped our perceptions of space and the benefits derived from such endeavors. Academically, this last phase is commonly denoted as the New Space era.

3.2 *Defining the Dynamics of the New Space Ecosystem*

In contrast to the old, or traditional, space era, which predominantly originated with the beginning of the Cold War, the New Space era lacks a specific date or event marking its commencement (Gupta et al., 2022). Nevertheless, various events occurring around the 2000s collectively signified the initiation of the New Space era, notably the entry of the private sector into the space ecosystem (Gupta et al., 2022). As a result, space-related activities witnessed a transition from the (dominated) government sector to the private sector, particularly with the advent of the capitalist mindset into the space ecosystem (Jora et al., 2023). Besides, in discussions regarding New Space, SpaceX consistently emerges as a focal point. The company indeed has achieved remarkable milestones in the space ecosystem, notably being the first private company capable of returning a space vehicle from low Earth Orbit. Also, it holds the distinction of being the first private company to successfully deliver a shipment to the International Space Station (Yazici & Darici, 2019). However, the emergence of New Space cannot be solely attributed to the advent of SpaceX and its groundbreaking launch capabilities. Therefore, the New Space Ecosystem has been influenced by various factors, let alone the transformative impact of digitalization (Bousedra, 2023; Vidmar, 2020).

While a universally agreed-upon definition of New Space may currently be lacking, we posit that the emergence of New Space Ecosystem was influenced by at least three major dynamics: (1) the growing interest in the commercial tendering of government practices and the involvement of the private sector in the space ecosystem (Bousedra, 2023; Vidmar, 2020), (2) the miniaturization of satellites (Parrella et al., 2022; Vidmar, 2020), that is, the reduction in both size and weight of the satellite (Bousedra, 2023; Gupta et al., 2022; Vidmar, 2020), and (3) the surge in space data applications propelled by the impact of digitalization (Vidmar, 2020). Besides, when referring to ecosystems, we adhere to Adner's (2017, p. 40) definition, where an ecosystem is described as "*the alignment structure of the multilateral set of partners that need to interact for a focal value proposition to materialize*".

4 The Architecture of the New Space Ecosystem

Researchers commonly classify the space ecosystem into upstream and downstream, e.g., Lamine et al. (2021) and Onwudiwe and Newton (2021). On the one hand, the upstream segment represents the "*scientific and technological foundations of space programmes (e.g., science, R&D, manufacturing and launch)*" OECD (2022, p. 30). On the other hand, the downstream segment encompasses the products and services delivered through the utilization of space infrastructures and the data they provide (Lamine et al., 2021), or what is referred to as the "*Space-derived activities in other sectors*" in the OECD (2022, p. 31). Besides, it is noteworthy to emphasize that the OECD (2022, p. 30) defines the downstream segment as encompassing activities such as the "*Daily operations of space infrastructure and "down-to-earth" activities that directly rely on the provision of a space capacity*".

With the miniaturization of satellites and increase in launcher capacity, there has been a notable increase in the number of satellite launches into space. Consequently, a surge in data generation from these satellites has been observed (Harris & Baumann, 2015). Nevertheless, raw data alone does not yield any economic benefit, requiring substantial practical efforts to harness the economic potential inherent in this data (Harris & Baumann, 2015). For this reason, a data layer has begun to emerge between the upstream and downstream segments. The increased availability of data and enhanced computing power is paving the way for novel commercial opportunities, especially in the fields of data processing and analysis (Vidmar, 2020), as exemplified by entities like SkyWatch, Microsoft Azure, and Amazon Web Services. Accordingly, we propose that the architecture of the New Space Ecosystem can be illustrated as a layered structure, consisting of three primary layers: (1) the infrastructure layer, (2) the data layer, and (3) the application layer.

4.1 The Infrastructure Layer

The infrastructure layer encompasses a spectrum of activities related to the development, manufacturing, launch, and ongoing operations and management of space-bound infrastructure. To a certain extent, this layer is considered mature, subject to extensive regulation by the public sector (Lamine et al., 2021), and characterized by substantial intellectual property protection and a high level of secrecy (Vidmar, 2020). Until recently,

the private sector did not significantly influence or contribute substantial value to the various activities within this layer (Vidmar, 2020). However, over the past two decades, this layer has progressively opened up to the private sector, marked by the emergence of public–private partnerships between government entities and private companies like SpaceX led by Elon Musk and Blue Origin founded by Jeff Bezos (Onwudiwe & Newton, 2021). As a result, novel actors became actively engaged in this layer, playing a crucial role in paving the way for the emergence of the New Space phenomenon (Vidmar, 2020). One prominent example in this layer is SpaceX, which is an American company specializing in the design, manufacturing, and launch of advanced rockets and spacecraft.

4.2 The Data Layer

A key outcome of advancements in the infrastructure layer is the heightened flow of data (Vidmar, 2020). A space infrastructure, namely a satellite, has a restricted capacity for carrying data on its payload, which emerges from its instrumentation. Consequently, there is an ongoing necessity to relay the data to an external source (Ellipsis Drive, 2023). However, extracting and acquiring data from the infrastructure layer is anything but straightforward. Transmitting this data to Earth can be slow and costly due to limitations in frequency and bandwidth, as well as the demand for specific IT skills (Gupta et al., 2022). Alternatively, employing space-based cloud networks for data analysis can significantly enhance speed, efficiency, and cost-effectiveness, eliminating the need to download massive amounts of data back to Earth (Gupta et al., 2022). Regardless of the method employed to extract data, it is certain that novel value chains are emerging within the broader space ecosystem. Further, extracting data constitutes just one aspect within the data layer, as the mere provision of raw data does not inherently lead to substantial economic benefits (Bousedra, 2023; Harris & Baumann, 2015). Therefore, a considerable amount of work is essential to unlock the economic potential inherent in this data (Harris & Baumann, 2015). Alongside data extraction and processing, several companies have emerged offering processed data. This data is mainly provided in the form of Application Programming Interfaces (APIs), allowing external parties to develop complementary applications atop the extracted data from the infrastructure layer. Thus, the data layer encompasses all activities related to the space-related data derived from the infrastructure layer, including, but not

limited to, extraction, processing, and provision. SkyWatch Space Application exemplifies a company functioning within this layer. The company aggregates remote sensing data from the infrastructure layer, offering customers the tools necessary to maximize the benefits of such data. Simultaneously, SkyWatch provides the infrastructure layer with a remote sensing data distribution solution, facilitating the efficient delivery of data to the market.

4.3 The Application Layer

In contrast to the well-established and regulated nature of the infrastructure layer, the application layer emerges as a dynamic and less structured one (Lamine et al., 2021; Vidmar, 2020). An illustrative example within the application layer involves the first artificial satellite, Sputnik. Upon being launched into Earth's orbit, Sputnik transmitted a series of audible beeps accessible to anyone with a radio receiver. A few years later, with advancements in encryption technologies during the 70s and 80s, broadcasting and telecommunications emerged as the predominant offering in the application layer. This was mainly driven by the minimal processing requirements for the data (Vidmar, 2020). However, with the emergence of the New Space era, a diverse array of data types has emerged, opening up possibilities for the development of various applications built on top of the data layer. A notable example is the utilization of Earth Observation data, which offers a versatile portfolio of offerings spanning industries such as transportation, education, insurance, and banking (Lamine et al., 2021). Another example is the utilization of satellite navigation data, particularly when coupled with smartphones (Reid et al., 2020). Thus, space-based applications are gaining momentum, both in terms of volume and the diversity of offerings being developed (Bousedra, 2023). For instance, the identical dataset extracted from an Earth Observation satellite can be simultaneously employed by various players in the application layer. This allows them to develop diverse offerings across different industries, incurring low or even negligible costs for the firms in the data layer (Bousedra, 2023). Thus, the application layer encompasses a diverse array of offerings crafted for end customers, whether in a business-to-business (B2B) or business-to-consumer (B2C) context. These offerings are built upon space-related data originating from the infrastructure layer and extracted, processed, distributed, and transferred by the data layer. Within this layer, Orbital Insight exemplifies a company

that analyzes billions of geospatial data points, providing essential input for strategic business decisions. These decisions span a range of areas, such as cost reduction, time savings, revenue and margin enhancement, improved asset utilization, accelerated due diligence, and more.

4.4 The Layered Structure

The New Space Ecosystem, Fig. 2, emerges as a layered structure, consisting of three primary layers: (1) the infrastructure layer, (2) the data layer, and the (3) application layer. First, the infrastructure layer encompasses all activities related to the manufacturing, launching, and control of space infrastructure. Further, the data layer includes all activities associated with extracting, processing, distributing, and transferring data derived from the infrastructure layer. Lastly, the application layer involves the development of offerings, comprising both products and services, built on top of the data extracted from the infrastructure layer as well as processed and disseminated by the data layer. The infrastructure layer reflects the transformative journey from a government-centric space domain to one characterized by private sector participation, notably exemplified by companies like SpaceX and Blue Origin. The data layer, as a pivotal intermediary, highlights the increased availability of data and computing power, fostering novel opportunities in data processing and analysis. Meanwhile, the application layer embodies the innovative spirit of the New Space era, showcasing the diverse offerings developed by third-party complementors across various industries. Accordingly, this conceptual framework delineates the intricate interplay among the different layers that define the evolving dynamics within the New Space Ecosystem. Nevertheless, these layers are not entirely distinct. While we have provided examples of different players within specific layers, there are firms that extend across two or three layers. An illustrative case is the emergence of Starlink, which is a division of SpaceX. In this instance, the parent company expanded its activities to encompass the diverse layers, offering high-speed internet services to end customers almost anywhere.

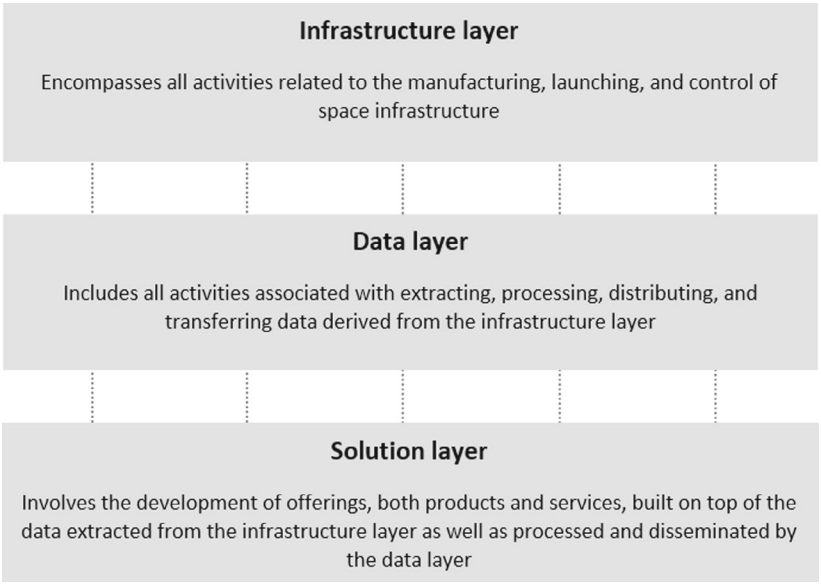


Fig. 2 The layered structure of the New Space Ecosystem

5 The Digital Platform Ecosystem and the New Space Ecosystem

When examining the architecture of the New Space Ecosystem, parallels can be drawn with another digital infrastructure-based ecosystem, namely, the digital platform ecosystem. In Sect. 5.1, we define digital platforms, while in Sect. 5.2, we explore the architecture of the digital platform ecosystem. Further, in Sect. 5.3, we briefly explore the digital threads within the New Space Ecosystem. Accordingly, in Sect. 5.4, we compare and contrast the architectures of the digital platform ecosystem and that of the New Space, elucidating the underlying similarities and differences between these two distinct ecosystems. Finally, in Sect. 5.5, we present certain areas of future research from the lens of the digital platform ecosystem, mainly drawn based on the parallels presented in the previous section, Sect. 5.4.

5.1 *Defining Digital Platforms*

As we explore the parallels between the architecture of the two ecosystems, it is crucial to define our understanding of digital platforms. The term itself lacks a standardized definition in the literature, and various scholars offer distinct terminologies, definitions, and classifications for digital platforms. In broad terms, one of the clearest and most straightforward categorizations is presented by Cusumano et al. (2019). They have classified technological platforms associated with network effects into two primary categories. On the one hand, there are (1) transaction platforms, which facilitate transactions between different market sides, e.g., Apple App Store. On the other hand, there are (2) innovation platforms, which enable third-party complementors to create complementary innovations on top of the platform through utilizing the extensible codebase provided by the platform owner or the platform provider, e.g., Apple iOS. Furthermore, (3) hybrid platforms are situated between transaction and innovation platforms, blending functions from both types, e.g., Apple. Technological platforms associated with network effects are referred to as industry platforms and defined as "*products, services, or technologies developed by one or more firms, serving as foundations upon which a larger number of firms can build further complementary innovations, potentially generating network effects*" (Gawer & Cusumano, 2014, p. 420). Besides, what distinguishes an industry platform from other types, such as internal, company, product, or supply-chain platforms, is its ability to potentially generate network effects (Gawer & Cusumano, 2014). Network effects occur when the value of the platform increases for one side as the number of parties on the other side increases (Katz & Shapiro, 1985).

Thus, when drawing parallels from the digital platform ecosystem, we are specifically referring to the second type of industry platforms, known as innovation platforms according to the strategic management literature (Gawer, 2021, 2022). Alternatively, innovation platforms are known as digital platforms in the information systems literature and are defined as "*purely technical artifacts where the platform is an extensible codebase, and the ecosystem comprises third-party modules complementing this codebase*" (de Reuver et al., 2018, p. 126). Therefore, regardless of the terminology used, we are referring to technological platforms that: (1) are associated with network effects and (2) provide an extensible codebase.

This codebase enables third-party software developers to create complementary applications atop the platform, primarily facilitated through the provision of APIs (Ghazawneh & Henfridsson, 2013).

5.2 *The Architecture of the Digital Platform Ecosystem*

It is crucial to grasp the architecture of the digital platform ecosystem, akin to the depiction of the layered structure of the New Space Ecosystem. A digital platform ecosystem is typically illustrated as having a core-periphery structure (Modol & Eaton, 2021). The platform owner is situated at the core, surrounded by various actors within the ecosystem, such as producers and consumers. Modol and Eaton (2021) presented a comprehensive analysis spanning a 20-year period, detailing the evolution of the digital infrastructure concept, resulting in the architectural manifestation of a digital platform with a core-periphery structure. Furthermore, as outlined by Baldwin and Woodard (2009), the digital platform ecosystem comprises three distinct elements: (1) a stable core characterized by limited variety, (2) a variable periphery exhibiting high variety, and (3) interfaces in between, defined as "*specifications and design rules that describe how the platform and modules interact and exchange information*" (Tiwana et al., 2010, p. 676). Boundary resources, such as standardized development tools (Miric et al., 2022), software libraries (Fink et al., 2020), and Application Programming Interfaces (Ghazawneh & Henfridsson, 2013), exemplify some of these interfaces. Boundary resources are defined as "*the software tools and regulations that serve as the interface for the arm's-length relationship between the platform owner and the application developer*" (Ghazawneh & Henfridsson, 2013, p. 175). Thus, these boundary resources serve as interfaces between the platform core and its periphery. Further, within this core-periphery structure, or, in other words, within the digital platform ecosystem, four distinct layers exist: (1) the platform owner, who controls the platform and decides on participation eligibility and criteria, such as Google owning Android; (2) the platform provider, who manages the platform interfaces, exemplified by Samsung providing Android; (3) producers, who are software developers creating applications on top of the platform, for instance, applications available in the Samsung App Store, e.g., Angry Birds; and (4) consumers, who purchase or use the developed applications (Van Alstyne et al., 2016).

5.3 *Digital Threads in the New Space Ecosystem*

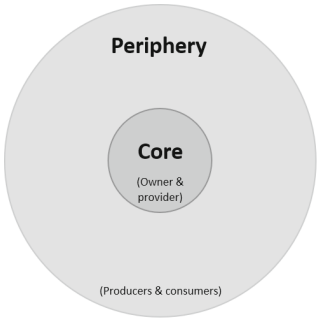
Bousedra (2023, p. 8) contends that "*the incursion of digital technologies into the space sector offers new market opportunities for space data*". The pervasive adoption of digital technologies has brought about significant disruptions across numerous industries. These disruptions include reducing entry barriers, intensifying business dynamics, introducing novel business models, or encompassing all of these aspects. However, digitalization is just one of the factors contributing to the evolution of space-related activities. Earlier, we discussed the penetration of the capitalist mindset into the space sector. To explore further, it is crucial to specify that it is the American capitalist mindset at play (Jora et al., 2023). More precisely, it is embodied by key figures associated with digital giants leading the ongoing space race. This is exemplified by individuals like Jeff Bezos, the founder of Amazon (Blue Origin), and Elon Musk, the founder of PayPal, Amazon, and Tesla (SpaceX) (Bousedra, 2023). These individuals are not only leveraging their economic fortunes but also drawing upon their previous experiences in the Information Technology (IT) sector. Their approach involves advancing innovation and disrupting the status quo (Madan & Halkias, 2020). Consequently, the initiatives led by these figures have primarily penetrated the infrastructure layer, where the upstream innovations have had a downstream ripple effect (Lamine et al., 2021), bringing space-related activities closer to end customers. This is mainly evident through the development of space-related applications. Therefore, whether through the widespread adoption of digital technologies or the initiatives of specific influential figures, such digital threads have actively contributed to reshaping the dynamics within the New Space Ecosystem.

5.4 *Architectural Parallels Between the Digital Platform Ecosystem and the New Space Ecosystem*

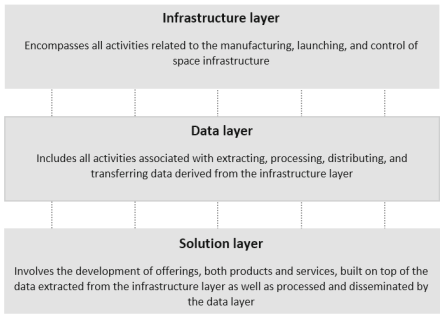
A platform is characterized by a core and a periphery, featuring a singular owner positioned at the center of the ecosystem, responsible for orchestrating the diverse ecosystem actors in the periphery (Zeng et al., 2022). Nevertheless, the core-periphery structure does not precisely capture the essence of the New Space Ecosystem, given the absence of a singular actor responsible for orchestrating the diverse actors within the ecosystem, as shown in Fig. 3. Within the infrastructure layer, neither the satellite

manufacturer, the satellite owner, nor the launcher bears the responsibility for this orchestration task. Similarly, in the data layer, neither the data extractor, the data processor, nor the provider of processed data shoulders the responsibility for orchestration. This principle is similarly applicable to the application layer. For that reason, the architecture of the New Space Ecosystem is more accurately depicted as a layered structure rather than a core-periphery one, given the absence of a single player responsible for orchestrating the entire ecosystem.

Revisiting the diverse layers within both architectures, parallels can be drawn based on the roles played within the different layers, as shown in Table 1. Whether it is the platform owner layer or the infrastructure layer, both are, in one way or another, responsible for the digital infrastructure that is at the heart of the ecosystem, be it the platform in the case of the digital platform ecosystem or the satellite in the case of the New Space Ecosystem. Thus, the platform owner's ownership of the digital infrastructure, the platform, aligns with the infrastructure layer, representing those players who are directly responsible for the infrastructure, the satellites. Correspondingly, the platform provider layer aligns with the data layer, given that both serve as providers of interfaces, mainly in the form of APIs. Similarly, the producers align with the application layer, analogous to the role of third-party developers creating complementary applications atop the APIs. These APIs are provided by the platform provider in the digital platform ecosystem and by the data layer in the



The core-periphery structure of the digital platform ecosystem



The layered structure of the New Space Ecosystem

Fig. 3 Architectural contrasts: Digital platform ecosystem versus New Space Ecosystem

Table 1 Comparison of roles across the diverse layers: Digital platform ecosystem versus New Space Ecosystem

Digital platform ecosystem		*New space ecosystem*	
Layer	*Role/s*	Layer	*Role/s*
Platform owner	Controls the platform and decides on participation eligibility and criteria, e.g., Google (owning Android)	*Infrastructure layer*	Encompasses all activities related to the manufacturing, launching, and control of space infrastructure, e.g., Space X
Platform provider	Manages the platform interfaces, or, in other words, responsible for the provision of the API's, e.g., Samsung (providing Android)	*Data layer*	Includes all activities associated with extracting, processing, distributing, and transferring data, e.g., API's, derived from the infrastructure layer, e.g., SkyWatch
Producers	Develop complementary applications on top of the API's provided by the platform provider, e.g., Angry Birds	*Application layer*	Develop complementary applications built on top of the data extracted from the infrastructure layer as well as processed and disseminated by the data layer, e.g., Orbital Insight
Consumers	Purchase or use the developed applications	*Consumers*	Purchase or use the developed applications

New Space Ecosystem. Finally, consumers, present in both digital platforms and the New Space, represent individuals or entities benefiting from the applications developed on top of these (digital) infrastructures. Accordingly, as we navigate into the diverse layers of the digital platform ecosystem, a growing convergence of similarities becomes evident when compared to the New Space Ecosystem.

5.5 Implications and Future Directions

Significant parallels emerge between the architectures of the digital platform ecosystem and the New Space Ecosystem, particularly in the distinct layers characterizing each. This observation leads us to assert that exploring the architecture of the digital platform ecosystem can serve as a crucial foundation for a more in-depth exploration of the New Space

Ecosystem, mainly in the reams of: (1) the dynamics of network effects within the ecosystem, (2) the orchestration of the layered New Space Ecosystem, and (3) the adoption of the platform business model within and across the different layers.

5.5.1 *The Dynamics of Network Effects Within the New Space Ecosystem*

As more satellites join the infrastructure layer, the data layer becomes richer and more diverse, thereby enhancing the overall value for diverse actors in the application layer. Exploring how the growth of the infrastructure layer contributes to positive, or potentially negative, network effects unveils the dynamics within the New Space Ecosystem. The impact of an expanding satellite network on the data and application layers, and consequently on the value proposition for end-users and stakeholders, provides valuable insights into the power of network effects within the New Space Ecosystem. Thus, the literature on digital platform ecosystems serves as a valuable starting point to understand the dynamics of network effects within the New Space Ecosystem, particularly due to the fact that network effects are the main distinguishing factor that sets digital platforms apart from all other types of platforms (Gawer & Cusumano, 2014).

5.5.2 *The Adoption of the Platform Business Model Within and Across the Different Layers of the New Space Ecosystem*

Throughout this study, our focus has been on the architecture of the digital platform ecosystem rather than on the applicability of the digital platform as a business model. However, when examined as a business model rather than merely an ecosystem, the digital platform business model can be effectively employed across the various layers of the New Space Ecosystem. While the infrastructure layer and the data layer are typically associated with B2B contexts due to their upstream positions, it is worth noting that digital platforms in B2B contexts are not entirely absent, even though the literature has predominantly focused on examining such platforms in B2C and C2C contexts (Abed Alghani et al., 2024; Loux et al., 2020). Moreover, while our focus in this paper has predominantly been on innovation platforms, it is worth noting that another type of industry platforms, namely transaction platforms (Cusumano et al., 2019), could also find application across various layers within the New Space Ecosystem. Thus, whether adopting an innovation

or a transaction platform business model, both possess the capability to introduce novel value creation, delivery, and capturing initiatives within the different layers of the New Space Ecosystem.

5.5.3 The Orchestration of the Layered New Space Ecosystem

An essential takeaway from the digital platform ecosystem is the understanding of governance mechanisms responsible for guiding and stimulating innovation within the ecosystem. In broad terms, there is a need to implement rules and regulations to strike a balance between controlling and fostering innovation (Boudreau, 2012; Hagiu & Wright, 2018). This is particularly crucial between the data and application layers, mirroring the governance mechanisms employed by platform owners or providers to orchestrate the behaviors of third-party developers in the digital platform ecosystem (Boudreau, 2017). Digital platforms providing an extensible codebase for external complementors underscore the importance of a regulatory framework that fosters innovation while maintaining an adequate level of control. For instance, through a detailed case study of Apple's iPhone platform, Ghazawneh and Henfridsson (2013) developed a theoretical model to characterize the design and use of boundary resources, centered on two main drivers: resourcing, "*the process by which the scope and diversity of a platform is enhanced*", and securing, "*the process by which the control of a platform and its related services is increased*" Ghazawneh and Henfridsson (2013, p. 176). Ghazawneh and Henfridsson (2013) linked the developed model to process theory, in which causation requires the sequential presence of essential conditions to achieve a specific outcome, and where causation is both contingent and bidirectional. Such insights could provide valuable contributions to the New Space Ecosystem, particularly in the interplay between the data layer and the application layer, by promoting regulatory environments that encourage innovation initiatives while maintaining essential control. Therefore, there is a wealth of knowledge to be acquired from the digital platform literature, covering insights into boundary resources (Eaton et al., 2015; Ghazawneh & Henfridsson, 2013), control mechanisms (Parker & Van Alstyne, 2018), gatekeeping strategies (Zhang et al., 2022), and even the softer governance mechanisms (Foerderer et al., 2021) employed by platform owners to orchestrate diverse actors within the digital platform ecosystem.

6 Conclusion

In brief, the primary objective of this chapter was to unveil the architecture of the New Space Ecosystem. To achieve this, we initially depicted the evolutionary trajectory from the Old Space to the New Space era, emphasizing the three key dynamics that defined the New Space Ecosystem. As we pursue our primary objective of uncovering the diverse layers, namely infrastructure, data, and application layers, we have identified significant parallels between the architectures of the digital platform ecosystem and that of the New Space. Consequently, our aim was to draw parallels between the two ecosystems, extracting insights from the literature on the digital platform ecosystem. Building on these findings, we presented a future research agenda, primarily driven by insights from the literature on digital platforms. We firmly believe that the presented research agenda establishes the groundwork for future research and in-depth investigations into the New Space Ecosystem.

An essential theoretical contribution of this chapter lies in the identification and elucidation of the core dynamics that have shaped the architecture of the New Space Ecosystem. These insights not only enrich our understanding of the New Space Ecosystem but also pave the way for a comprehensive and unified definition, not only for New Space but also for the broader New Space Ecosystem. Further, we explored the architectural intricacies of the New Space Ecosystem, revealing its layered structure. This exploration allowed us to map out the various layers constituting the ecosystem, shedding light on the nuanced relationships and interactions between them. Last but not least, we have laid the groundwork for future research by drawing parallels with the digital platform ecosystem. Accordingly, this has the potential to serve as a valuable starting point for a deeper exploration of the New Space Ecosystem.

On the practical side, this paper serves as a valuable resource for practitioners seeking to grasp the dynamics and architecture of the New Space Ecosystem. It enables them to evaluate whether their organizations can engage with this promising ecosystem, either within a single layer or across the diverse layers. Furthermore, shedding light on the absence of an orchestrator within the New Space Ecosystem, along with outlining its various layers, could serve as a valuable starting point, especially for policymakers. These insights might incentivize legislators to reexamine whether there should be a designated entity responsible for orchestrating this evolving ecosystem and, if so, who should assume the

role of the orchestrator. Besides, expanding upon the identified parallels, we proposed the potential application of the platform business model across diverse layers. Such insights offer practitioners a valuable foundation to innovate and develop novel business models within the dynamic landscape of New Space Ecosystem. Lastly, the identification of the application layer highlights that any industry has the opportunity not only to participate in the New Space Ecosystem but also to reap benefits from its involvement. Therefore, we firmly believe that "*Your Company Needs a Space Strategy. Now*" (Weinzierl et al., 2022).

References

Abed Alghani, K., Kohtamäki, M., & Kraus, S. (2024). Mapping the Landscape: Unveiling the Structural Dynamics of Industry Platforms. *European Journal of Innovation Management*. https://doi.org/10.1108/EJIM-09-2023-0748

Adner, R. (2017). Ecosystem as Structure: An Actionable Construct for Strategy. *Journal of Management, 43*(1), 39–58. https://doi.org/10.1177/0149206316678451

Baldwin, C., & Woodard, C. J. (2009). The Architecture of Platforms: A Unified View. In A. Gawer (Ed.), *Platforms, Markets and Innovation* (pp. 19–44). Edward Elgar Publishing.

Borroz, N., & Korber, S. (2023). To Infinity and Beyond: A Teaching Case on Rocket Lab and the Emergence of New Zealand's Space Ecosystem. *The International Journal of Entrepreneurship and Innovation*. https://doi.org/10.1177/14657503231165147

Boudreau, K. (2012). Let a Thousand Flowers Bloom? An Early Look at Large Numbers of Software App Developers and Patterns of Innovation. *Organization Science, 23*(5), 1409–1427. https://doi.org/10.1287/orsc.1110.0678

Boudreau, K. (2017). Platform-Based Organization and Boundary Choices: "Opening-Up" While Still Coordinating and Orchestrating. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2929725

Bousedra, K. (2023). Downstream Space Activities in the New Space Era: Paradigm Shift and Evaluation Challenges. *Space Policy, 64*, 101553. https://doi.org/10.1016/j.spacepol.2023.101553

Cusumano, M. A., Gawer, A., & Yoffie, D. B. (2019). The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power. Harper Business.

de Reuver, M., Sørensen, C., & Basole, R. C. (2018). The Digital Platform: A Research Agenda. *Journal of Information Technology, 33*(2), 124–135. https://doi.org/10.1057/s41265-016-0033-3

Di Tullio, P., La Torre, M., Rea, M. A., Guthrie, J., & Dumay, J. (2023). Beyond the Planetary Boundaries: Exploring Pluralistic Accountability in the New Space Age. *Accounting, Auditing & Accountability Journal*. https://doi.org/10.1108/AAAJ-08-2022-6003

Eaton, B., Elaluf-Calderwood, S., Sørensen, C., & Yoo, Y. (2015). Distributed Tuning of Boundary Resources: The Case of Apple's iOS Service System. *MIS Quarterly, 39*(1), 217–243. https://doi.org/10.25300/MISQ/2015/39.1.10

Ellipsis Drive. (2023). *New Space Ecosystem*. Space-as-a-Service. Ellipsis Drive. https://ellipsis-drive.com/blog/new-space-ecosystem-space-as-a-service/

Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., & Pappas, G. (2008). Comparison of PubMed, Scopus, Web of Science, and Google Scholar: Strengths and Weaknesses. *The FASEB Journal, 22*(2), 338–342. https://doi.org/10.1096/fj.07-9492LSF

Fink, L., Shao, J., Lichtenstein, Y., & Haefliger, S. (2020). The Ownership of Digital Infrastructure: Exploring the Deployment of Software Libraries in a Digital Innovation Cluster. *Journal of Information Technology, 35*(3), 251–269. https://doi.org/10.1177/0268396220936705

Foerderer, J., Lueker, N., & Heinzl, A. (2021). And the Winner Is …? The Desirable and Undesirable Effects of Platform Awards. *Information Systems Research, 32*(4), 1155–1172. https://doi.org/10.1287/isre.2021.1019

Gawer, A. (2021). Digital Platforms' Boundaries: The Interplay of Firm Scope, Platform Sides, and Digital Interfaces. *Long Range Planning, 54*(5). https://doi.org/10.1016/j.lrp.2020.102045

Gawer, A. (2022). Digital Platforms and Ecosystems: Remarks on the Dominant Organizational Forms of the Digital Age. *Innovation: Organization & Management, 24*(1), 1–15. https://doi.org/10.1080/14479338.2021.1965888

Gawer, A., & Cusumano, M. A. (2014). Industry Platforms and Ecosystem Innovation: Platforms and Innovation. *Journal of Product Innovation Management, 31*(3), 417–433. https://doi.org/10.1111/jpim.12105

Ghazawneh, A., & Henfridsson, O. (2013). Balancing Platform Control and External Contribution in Third-Party Development: The Boundary Resources Model: Control and Contribution in Third-Party Development. *Information Systems Journal, 23*(2), 173–192. https://doi.org/10.1111/j.1365-2575.2012.00406.x

Gupta, A., Sharma, N., & Maender, C. (2022). India's Launch into New Space: Leveraging the Constellation of Information Technology, Pharma, and Biotech. *New Space, 10*(1), 20–32. https://doi.org/10.1089/space.2021.0039

Hagiu, A., & Wright, J. (2018). Controlling Versus Enabling. *Management Science, 65*(2), 577–595. https://doi.org/10.1287/mnsc.2017.2956

Harris, R., & Baumann, I. (2015). Open Data Policies and Satellite Earth Observation. *Space Policy, 32*, 44–53. https://doi.org/10.1016/j.spacepol.2015.01.001

Jora, O.-D., Roşca, V. I., Iacob, M., Murea, M.-M., & Nedef, M.-Ş. (2023). Small and Medium Enterprises Shooting for the Stars: What Matters, Besides Size, in Outer Space Economy? *Management & Marketing, 18*(1), 20–35. https://doi.org/10.2478/mmcks-2023-0002

Katz, M. L., & Shapiro, C. (1985). Network Externalities, Competition, and Compatibility. *The American Economic Review, 75*(3), 424–440.

Lamine, W., Anderson, A., Jack, S. L., & Fayolle, A. (2021). Entrepreneurial Space and the Freedom for Entrepreneurship: Institutional Settings, Policy, and Action in the Space Industry. *Strategic Entrepreneurship Journal, 15*(2), 309–340. https://doi.org/10.1002/sej.1392

Lee, J., Kim, I., Kim, H., & Kang, J. (2021). SWOT-AHP Analysis of the Korean Satellite and Space Industry: Strategy Recommendations for Development. *Technological Forecasting and Social Change, 164*, 120515. https://doi.org/10.1016/j.techfore.2020.120515

Loux, P., Aubry, M., Tran, S., & Baudoin, E. (2020). Multi-Sided Platforms in B2B Contexts: The Role of Affiliation Costs and Interdependencies in Adoption Decisions. *Industrial Marketing Management, 84*, 212–223. https://doi.org/10.1016/j.indmarman.2019.07.001

Madan, B., & Halkias, D. (2020). Success Factors for European Commercial Activities in NewSpace: An Integrative Literature Review. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3802541

Miric, M., Ozalp, H., & Yilmaz, E. D. (2022). Trade-Offs to Using Standardized Tools: Innovation Enablers or Creativity Constraints? *Strategic Management Journal*. https://doi.org/10.1002/smj.3457

Modol, J. R., & Eaton, B. (2021). Digital Infrastructure Evolution as Generative Entrenchment: The Formation of a Core—Periphery Structure. *Journal of Information Technology, 36*(4), 342–364. https://doi.org/10.1177/02683962211013362

OECD. (2022). *OECD Handbook on Measuring the Space Economy* (2nd ed.). OECD Publishing. https://doi.org/10.1787/8bfef437-en

Onwudiwe, M., & Newton, K. (2021). Africa and the Artemis Accords: A Review of Space Regulations and Strategy for African Capacity Building in the New Space Economy. *New Space, 9*(1), 38–48. https://doi.org/10.1089/space.2020.0043

Parker, G. G., & Van Alstyne, M. (2018). Innovation, Openness, and Platform Control. *Management Science, 64*(7), 3015–3032. https://doi.org/10.1287/mnsc.2017.2757

Parrella, R. M., Spirito, G., Cirina, C., & Falvella, M. C. (2022). The New Space Economy and New Business Models. *New Space, 10*(4), 291–297. https://doi.org/10.1089/space.2021.0020

Reid, T. G. R., Chan, B., Goel, A., Gunning, K., Manning, B., Martin, J., Neish, A., Perkins, A., & Tarantino, P. (2020). "Satellite Navigation for the Age of Autonomy, " 2020 IEEE/ION Position, Location and Navigation Symposium (PLANS). *Portland, OR, USA, 2020*, 342–352. https://doi.org/10.1109/PLANS46316.2020.9109938

Robinson, D. K. R., & Mazzucato, M. (2019). The Evolution of Mission-Oriented Policies: Exploring Changing Market Creating Policies in the US and European Space Sector. *Research Policy, 48*(4), 936–948. https://doi.org/10.1016/j.respol.2018.10.005

Spanuth, A., & Urbano, D. (2023). Exploring Social Enterprise Legitimacy Within Ecosystems from an Institutional Approach: A Systematic Literature Review and Research Agenda. *International Journal of Management Reviews*. https://doi.org/10.1111/ijmr.12349

Tiwana, A., Konsynski, B., & Bush, A. A. (2010). Platform Evolution: Coevolution of Platform Architecture, Governance, and Environmental Dynamics. *Information Systems Research, 21*(4), 675–687. https://doi.org/10.1287/isre.1100.0323

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. *British Journal of Management, 14*(3), 207–222. https://doi.org/10.1111/1467-8551.00375

Van Alstyne, M., Parker, G. G., & Choudary, S. P. (2016). Pipelines, Platforms, and the New Rules of Strategy. *Harvard Business Review, 94*(4), 54–62.

Vidmar, M. (2020). New Space and Innovation Policy: Scotland's Emerging "Space Glen." *New Space, 8*(1), 31–51. https://doi.org/10.1089/space.2019.0032

Weinzierl, M. (2018). Space, the Final Economic Frontier. *Journal of Economic Perspectives, 32*(2), 173–192. https://doi.org/10.1257/jep.32.2.173

Weinzierl, M., (Raj) Choudhury, P., Khanna, T., MacCormack, A., & Rosseay, B. (2022). *Your Company Needs a Space Strategy. Now*. Harvard Business Review. https://hbr.org/2022/11/your-company-needs-a-space-strategy-now

Yazici, A. M., & Darici, S. (2019). The New Opportunities in Space Economy. *İnsan ve Toplum Bilimleri Araştırmaları Dergisi, 8*(4), 3252–3271. https://doi.org/10.15869/itobiad.615134

Zeng, J., Yang, Y., & Lee, S. H. (2022). Resource Orchestration and Scaling-up of Platform-Based Entrepreneurial Firms: The Logic of Dialectic Tuning. *Journal of Management Studies*. https://doi.org/10.1111/joms.12854

Zhang, Y., Li, J., & Tong, T. W. (2022). Platform Governance Matters: How Platform Gatekeeping Affects Knowledge Sharing Among Complementors. *Strategic Management Journal, 43*(3), 599–626. https://doi.org/10.1002/smj.3191