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Mohamed, Mahmoud; Ahokangas, Petri; Pikkarainen, Minna

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Introduction

Platforms have recently gained business prominence and are profoundly changing the dynamics of the digital economy landscape (Tiwana, Konsynski & Bush, 2010; Hein et al., 2020; Jia, Cusumano & Chen, 2019; Rietveld, Schilling & Bellavitis, 2019; Cusumano, Yoffie & Gawer, 2020). The multisided platform is an ecosystem that incorporates the platform hub "core infrastructure" and complementary applications (Tiwana, 2013; Gawer, 2014). The platform ecosystem uses complementary capabilities to incorporate new functionalities that reside behind the scope and scale of the central platform (Cusumano & Gawer, 2002). Furthermore, it grants the central platform the power to orchestrate value creation and capture for the entire platform ecosystem (Wen & Zhu, 2019; Isckia, De Reuver & Lescop, 2020; Tiwana, Konsynski & Bush, 2010). Given the standardised structure of the multisided platform ecosystem, three main key stakeholder roles influence the ecosystem dynamics: Platform leader, complementors and end users (Tiwana, 2013). The platform leader is the owner of the platform core infrastructure, who orchestrates the dynamics of the platform ecosystem and grants the access rights to the complementors (Cusumano & Gawer, 2002; Williamson & De Meyer, 2012; Teece, 2018; Rietveld, Schilling & Bellavitis, 2019). Complementors are the stakeholders who provide the complementary offering and expand the scope of the platform (Tiwana, 2013). Depending on the platform leader's governance roles that defines who does what (Williamson & De Meyer, 2012), complementors have heterogeneous incentives to join the platform ecosystem that affect their ability to contribute to the platform ecosystem (Boudreau & Jeppesen, 2015). Nevertheless, the complementor's value creation activities are the key indicator of platform success (Cusumano & Gawer, 2002; Tiwana, 2013).

Coopetition – the strategic alignment of parallel competition and collaborative dynamics – is the building block for aggregating platforms into the multiplatform ecosystems (MPEs). Nevertheless, tensions often arise when platform leaders manage value creation activities and coordinate the

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inter-platform relations between complementors in the platform ecosystem (Zhang et al., 2022). The extant research has found that tensions may arise because complementors have heterogeneous motivations in joining the platform ecosystem (Boudreau & Jeppesen, 2015) that influence their decisions and activities within the ecosystem (McIntyre & Srinivasan, 2017), because there are no roles to control the relationship between platform leaders and complementors, and complementors are not under the platform leader's direct control in designing a knowledge-sharing framework (Zhang et al., 2020). It becomes challenging for the platform leader to manage these tensions, especially when developing a cooperative value creation framework including a wide range of platform complementors (Tura, Kutvonen & Ritaa, 2018; Zhang et al., 2022).

The extant strategic management research has examined these tensions from three perspectives: (I) Strict governance roles imposed by the platform leader on complementors (Tiwana, 2013; O'Mahony & Karp, 2022; Zhang et al., 2020); (II) the competition between platform owner and complementors (Wen and Zhu, 2019); and (III) the competition between complementors in the platform ecosystem (Hein et al., 2020; Zhang et al., 2020). Yet platform ecosystems today are evolving as meta-organisations (Gulati, Puranam & Tushman, 2012; Kretschmer et al., 2022), enabling the architectural design to incorporate a diverse set of platforms to work together where each platform may share part of the main infrastructure with others (Cusumano, Yoffie & Gawer, 2020; Kretschmer et al., 2022; Zhang & Williamson, 2021). The platform leader decides on the openness of the overall ecosystem by easing the restriction of joining the platform and developing complementary offerings (Eisenmann, Parker & Van Alstyne, 2009).

Strategic management research has addressed tensions when developing an inter-platform cooperative framework for the single multisided platform (e.g., gatekeeping tensions between platform leader and complementors) but has yet to address the inter-platform tensions in MPEs (Zhang et al., 2020; Zhang & Williamson, 2021). However, there is some knowledge related to integration stages into MPEs (Kretschmer et al., 2022), complementarity, governance and leadership roles between platforms (Tura, Kutvonen & Ritala, 2018; O'Mahony & Karp, 2022). As well as the contextual factors that influence the inter-platform competition (Kretschmer et al., 2022) and platforms' decision to integrate into MPEs (Gawer & Henderson, 2007; Miller & Toh, 2022). However, there is still a lack of research about the knowledge sharing between complementors and gatekeeping, affecting their ability to share knowledge in the MPEs.

This study addresses the gap by focusing on the coopetition and inter-platform tensions that arise when integrating into MPEs. Therefore, we aim to explore the coopetition-related tensions when complementing entrant and incumbent platforms integrate into MPEs. To approach this, we implemented qualitative case study research (Yin, 2003) backed with the platform ecosystem (Isckia, De Reuver & Lescop, 2020), coopetition dynamics

(Khanna, Gulati & Nohria, 1998; Tsai, 2002; Tiwana, 2013; Zhu & Iansiti, 2012; Ritala, 2019; Zhang et al., 2020) and knowledge-sharing literature alongside competition and governance from the multisided platform context (Zhu & Liu, 2018; Kretschmer et al., 2022; O'Mahony & Karp, 2022; Zhang et al., 2020).

The rest of the chapter is structured as follows. The next part discusses the inter-platform tensions and constructs the study's theoretical background. We then explain the empirical study setting and the study's findings. This chapter is concluded with the theoretical and managerial implications of the study and recommendations for future research.

Related Literature

Strategic management scholars have addressed tensions of inter-platform complementarity in the multisided platform ecosystems stemming from the unbalanced dynamics of coopetition and competition between complementors and platform leaders. On the one hand, coopetition originates from the alignment of common benefits between all complementors, regardless of their heterogeneous incentives and the private benefits of joining the platform (Zhang et al., 2020). Building a coopetition framework therefore requires all complementors to emphasise collaborative ties with other complementors over competitive ones (Ritala, 2019; Tsai, 2002). On the other hand, competition arises either through platform leader pressure on complementors via vertical integration (Zhu & Liu, 2018; Wen & Zhu, 2019) or between complementors in the platform ecosystem (Boudreau & Jeppesen, 2015; McIntyre & Srinivasan, 2017; Zhang et al., 2020; Zhang & Williamson, 2021). The unbalanced dynamics of cooperative and competitive powers create tensions between platform leaders and complementors that affect the value creation and capture of the overall platform ecosystem. The extant strategic management literature has addressed these tensions from the platform leader-to-complementor relations perspective. However, the tensions that are likely to arise while integrating into a complex MPEs ecosystem are relatively scant (Zhang & Williamson, 2021). With the current technological advances in which ecosystems built around platforms expand to include multiple platforms working together, this paradox is becoming a significant challenge when transitioning to MPEs as a multi-layered coopetition-based ecosystem.

Platform leaders may establish competitive pressure on complementors through vertical integration when they enter the complementor's product space and compete against them (Zhu & Liu, 2018). Scholars investigated vertical integration as a platform leader's approach to handling product areas in which complementors are underperforming (Wen & Zhu, 2019) and improving customer satisfaction with the overall platform ecosystem (Cusumano & Gawer, 2002). Furthermore, vertical integration is likely to occur when the platform leader decides to enter areas where complementors

perform well, because complementors lack the resources to form strict governance mechanisms to prevent platform leaders from undertaking vertical integration (Zhu & Iansiti, 2012). Vertical integration may affect the platform's overall performance and survival (Leiblein & Miller, 2003; Iansiti & Levien, 2004). Meanwhile, inter-platform competition arises from prioritising the complementor's heterogenous private benefits over the commonly shared benefits (Boudreau & Jeppesen, 2015; Ritala, 2018) that influence platform governance roles (Tiwana, 2013; O'Mahony & Karp, 2022) and knowledge-sharing incentives between complementors (Tsai, 2002; Zhang et al., 2020).

Extant research has found that complementors become more willing to cooperate with other complementors when they are less impacted by competitive pressure (Ritala et al., 2018; O'Mahony & Karp, 2022; Zhang et al., 2020). Inter-platform collaborative relations contribute to extensive knowledge-sharing mechanisms and leveraging the platform's overall quality (Tsai, 2002; Gnyawali & Park, 2011). Scholars argue that value creation is unlikely to happen unless complementors build an interconnected win-win relationship with other complementors and platform leaders (Ritala, 2018; Zhu & Liu, 2018). Nevertheless, inter-platform competition is associated with platform leaders' willingness to orchestrate the ecosystem and foster the platform's competitiveness (Kretschmer et al., 2022). Depending on the degree of knowledge sharing and openness, the platform ecosystem expands to include multiple complementors, who aim to increase their opportunities in the ecosystem (Isckia, De Reuver & Lescop, 2020; Zhang & Williamson, 2021). However, openness gives the platform ecosystem a considerable competitive advantage over its rivals. Yet it raises competitive tensions between complementors concerning future collaborations that may influence some complementors' future strategies (Zhu & Iansiti, 2012). For this, competition originates between platforms through direct or indirect network effects when they compete to control the competitive landscape of specific markets (Economides & Katsamakas, 2006; Tiwana, Konsynski & Bush, 2010).

Coopetition between complementors alters the excessive competition dynamics between platforms in the platform ecosystem (Zhang et al., 2020). Coopetition is the strategic approach of building collaborative linkages with competitors to efficiently utilise resources, achieve market growth, create new market opportunities and enhance the overall competitive dynamics in the platform ecosystem (Lepak, Smith & Taylor, 2007; Ritala, 2019). The balance of coopetition dynamics at the platform ecosystem level is the wheel for managing the value creation between all platforms in MPEs (Gnyawali et al., 2016). However, previous research has highlighted coopetition from building a collaborative framework in the single organisation platform, which included building a knowledge-sharing framework between all complementors within the platform ecosystem (Ritala & Hurmelinna-Laukkanen, 2019; Ritala, 2019;

Zhang et al., 2020). Coopetition establishes routine knowledge when information is repeatedly shared among all stakeholders in the platform ecosystem (Wong, 2004). For this, control of the platform ecosystem is granted to the central technological hub to facilitate the complementarity between stakeholders in the platform ecosystem, especially when platforms enter new markets and attempt to convince complementors to join under a degree of uncertainty (Tiwana, Konsynski & Bush, 2010; Valkokari, 2015). The hierarchy and establishment of the incumbent firms can create huge obstacles to the platform entering specific markets unless the platform leader grants complementors the flexibility and autonomy to design their offerings (Kretschmer et al., 2022; Zhang et al., 2020). Strategic management scholars have investigated the tensions of platform complementarity to arise from platform leaders' own resources, which gives platform leaders the authority to grant access to the external complementors (Gawer & Cusumano, 2002; Eisenmann, Parker & Van Alstyne, 2006; Gawer, 2014).

The dynamics of complementarity in MPEs can exist between platforms operating in different markets rather than interacting on different sides of a single market (Zhang & Williamson, 2021). The extant research has examined modularity as a platform strategy to manage complexity, boost innovation and scale the platform's business scope (Baldwin & Clark, 2002; Kretschmer et al., 2022; Yrjölä, Ahokangas & Matinmikko-Blue, 2021). In this study, we follow Tiwana's (2013) definition of the stakeholder roles in the platform ecosystem. The stakeholder roles define individual platforms' tendency to integrate into MPEs, whether they expand their business scope or build new cooperative relations and allow other complementors, because the end user of one platform could be the same end user of multiple other platforms. Likewise, the complementor of one platform could be the complementor of other platforms included in the same ecosystem. It becomes complex to either build a coopetition framework between multiple platforms in the same ecosystem or coordinate their heterogenous private benefits to serve the overall common platform goal. The empirical evidence that coopetition can drive platform-to-platform openness and collective governance is lacking (O'Mahony & Karp, 2022), especially in the context of MPEs, where the coopetition dynamics can be multi-layered and complex, which may lead to tensions rather than collective governance (Ritala & Hurmelinna-Laukkanen, 2019; Zhang & Williamson, 2021).

By combining the coopetition and knowledge-sharing framework and the platform-to-platform openness literature, we aim to deepen our understanding of the tensions in managing coopetition while integrating into MPEs. The extant platform literature focuses on the dynamics between the platform leader and complementors in regard to platform openness with its complementors. However, we seek to contribute to the theoretical discussion of MPEs through the digital care ecosystem as a study context for two reasons. First, the extant literature refers to the digital care ecosystem as connected health platforms that act as a pre-existing ecosystem on which

platforms integrate (Niemelä et al., 2019). Second, all the case companies participating in this study aimed to develop platforms and integrate them with other solutions into Stroke-Data MPEs. To that end, coopetition and competition dynamics define individual platform integration strategies into MPEs.

Methodology

Research Design

This study opts for a qualitative research approach through a case study setting aligned with an open-ended research question (Eisenhardt, 1989; Yin, 2003). The existing platform theories are developed around the complementarity and competition between platform leaders and complementors in the intra-platform setting. Nevertheless, the empirical evidence on inter-platform complementarity and coopetition dynamics is limited, with multiple demand and multiple supply sides existing around the focal platform (Kretschmer et al., 2022; Zhang & Williamson, 2021). Due to the scant evidence of the inter-platform complementarity dynamics (Kretschmer et al., 2022; Zhang et al., 2020), we chose an exploratory case study approach to analyse our case (Patton, 2002; Yin, 2003). We started by formulating the theoretical background to gain a comprehensive understanding of the existing theories and formulate a pre-understanding of the research phenomenon (Miller & Toh, 2022; Yin, 2003).

We then followed the purposeful sampling approach in selecting case companies integrating into MPEs (Patton, 2002). In general, purposeful sampling justifies the selection of participant case companies that meet the study's aim and purpose (Collingridge & Gantt, 2008). In doing so, the case companies included in this study are Finnish High-Tech companies operating in the healthcare domain. All the case companies are part of the Stroke-Data consortium, part of Business Finland's Smart Life programme, which facilitates innovation and technology deployment for health tech companies. The programme aimed to co-create a decision-support system for stroke prevention and diagnosis. Each company had their own platform to integrate into the overall Stroke-Data MPEs or technology patent to complement the other case companies' platforms integrating into the Stroke-Data MPEs. Table 9.1 summarises the case companies and their offering in MPEs.

Research Context

The digital stroke care pathway is the contextual framework for this study that comprises multiple multisided platforms working together. The digital care ecosystem requires platforms to have an overall integration into a parenting platform to unify the user interface for the end user. The necessity for platforms to build on each other and intersect at one or more

Table 9.1 Summary of the case companies and interview rounds

Case	*Case company's background*	*Interview rounds and duration in minutes*			*Number of interviewees*
		First	*Second*	*Third*	
A	Medical technology provider. The company has two platform roles in the Stroke-Data platform: (I) Building a platform for a preventive solution to be used by patients and healthcare experts; and (II) a regulatory expert role for making the developed solutions certifiable for medical use. The company aims for Stroke-Data MPEs to help carry out initial R&D projects related to new software prototypes as medical devices for patients at risk of a stroke. Furthermore, conducting R&D for a new solution for remote patient examination supports clinical decision-making.	85	80	100	4
B	Rehabilitation service provider. The company is developing a big data platform to integrate sleep and rest period data. The platform will be integrated into all points across the Stroke-Data platform.	168	–	–	3
C	Cloud service and data analytics provider. It is a small and medium-sized enterprise (SME) company, with its core business around a platform specialising in business intelligence and data reporting and warehousing, reporting, planning and budgeting sub-domains.	61	–	–	1
D	IT and service-oriented software provider. The company has an empathic building solution to visualise the building of all data collection points and analyses them together. Through visualisation, the information gets to be accessible through the data, which can be used to develop preventive solutions on the Stroke-Data platform. The company aims for new international business opportunities from the Stroke-Data platform.	66	–	–	2

(*Continued*)

Table 9.1 (Continued)

Case	*Case company's background*	*Interview rounds and duration in minutes*			*Number of interviewees*
		First	*Second*	*Third*	
E	AI solution provider which used to develop the rehabilitation platform for stroke patients to be used in the rehabilitation homes or hospitals. The rehabilitation solution will be integrated within the Stroke-Data platform.	56	80	101	2
F	Healthcare technology provider. The company is providing sensors for other platforms involved in the Stroke-Data platform. The sensors can be used in the rehabilitation part of the co-developed solution.	99	–	–	1
G	The case company has a Brain status sensor that measures the ECG. The aim is to make use of the sensor as a data source for the Stroke-Data platform. The developed platform will be used in intensive care units and ambulances to deliver real-time data of the patient status. In addition, the company intends to come up with a physician decision support system linked to their platform solution. The company aims to study how to bring AI-driven analytics to Stroke diagnostics and decision-making.	–	–	113	4
H	Fundus cameras and software solution provider. The company plans to integrate their cameras in the Stroke-Data platform to prevent cardiovascular diseases related to stroke detection, treatment and rehabilitation.	–	–	18	1

Source: The authors.

points in the ecosystem therefore existed alongside this study. In this study, each case company had its platform infrastructure "focal incumbent platform" or technology patent "complementing platform". All the participating platforms joined the Stroke-Data consortium to leverage their capabilities, integrate their platforms and jointly co-develop a solution for stroke prevention, diagnostics and rehabilitation. Every platform planned to integrate its solution into the planned Stroke-Data MPEs (Figure 9.1).

Stroke-Data MPE is the target solution to build from this study (Figure 9.1). In addition, the case companies "platform stakeholders" were conceptualised as individual multisided platforms that complemented each other in MPEs. Figure 9.1 depicts the Stroke-Data MPEs. The Stroke-Data MPEs consist of four intersecting platforms. Depending on the degree of complementarity and data ownership, each platform has a certain degree of platform-to-platform openness, where part of an individual company's platform infrastructure or technology patent is shared with another company's platform. The four intersecting platforms are (I) a back-end solution platform; (II) an expert solution platform; (III) a patient solution platform; and (IV) a patient's family care-related solution platform that focuses on updating the patient's family about the patient's status during and after stroke treatment.

Data Collection and Case Companies' Background

Based on the exploratory nature of this study (Eisenhardt, 1989), we conducted three data collection rounds between the spring of 2020 and the autumn of 2021 to understand how the process unfolded and achieve the study's aim. The semi-structured interviews were the primary source of data collection (Dearnley, 2005). As the data collection proceeded to the third round, we reached data saturation, where no significant insights could develop from collecting further data (Morse, 1995; Guest, Bunce & Johnson, 2006). We interviewed managerial-level and decision-making experts from eight case companies integrating their platforms into Stroke-Data MPEs. The fundamental role of the interviewees selected for this study was that they directly affected their case company's strategic choice. We conducted 14 interviews for this study in three rounds based on the integration phase in the Stroke-Data MPEs. We did not reveal interviewees' names or case companies' names for data anonymisation purposes (Table 9.1). General interview themes and questions were sent in advance if the interviewees asked for them. We provided some illustrations during the interviews to clarify the theme if required or to guide the conversation towards the business context rather than the engineering focus.

Data Analysis

This study started by formulating what we know about coopetition and competition in the single multisided platform, then progressed to what we

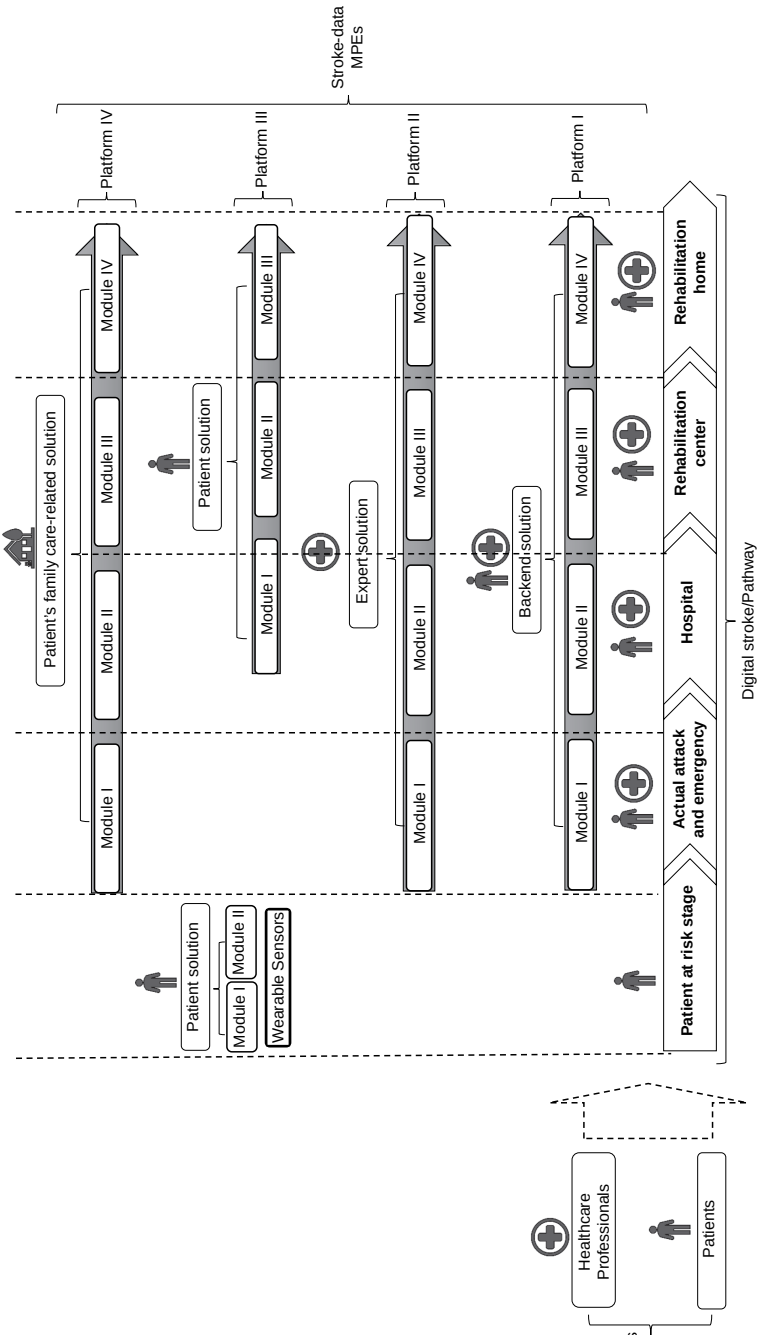

Figure 9.1 The planned integrations into the digital care pathway.

Source: The authors.

know and do not about MPEs. The study aimed to identify the tensions of coopetition that arise when platforms integrate into MPEs. In doing so, we recorded all the interviews after obtaining all the participants' approval, then transcribed interviews immediately after conducting them. During the interviews, we took some sidenotes to highlight interesting themes emerging from the discussion and guide through further data collection rounds (Miles & Huberman, 1994; Eriksson & Kovalainen, 2008). We followed the thematic analysis approach to analyse our data (Braun & Clarke, 2006). We started analysing the data through in-depth reading of interview transcripts for each case company. We then started the coding using the NVIVO software in three coding rounds. The open coding round (Corley & Gioia, 2004) gives the study a purpose and direction for conducting in-depth qualitative analysis (Yin, 2003). We started by assigning codes emerging from the literature background corresponding to this study's main themes to categorise the enormous amount of data into sub-categories and ease and guide the process for further analysis (Miles & Huberman, 1994). As the study progressed, new data were collected, and multiple codes emerging from the data and corresponding quotes were added to the initial coding list (Corley & Gioia, 2004). Accordingly, more new themes have emerged in the study than expected during the initial planning for the early data collection rounds (Miles & Huberman, 1994). For example, the platform's opportunistic behaviour and dropouts from MPEs arose in the study, which was not planned in the original study setting. Similar codes from the open coding rounds were then merged into sub-groups in the second axial coding round. The main themes for the study were then categorised in the final coding round (Strauss & Corbin, 1997; Corley & Gioia, 2004).

Findings

In the analysis of the Stroke-Data MPEs (Figure 9.2), we considered the scarcity of literature related to the platform-to-platform openness and integration into MPEs. This helped us expand our scope beyond the integration stages and identify the causes of inter-platform tensions in MPEs.

Building on the three interview rounds, we defined the targeted integration into Stroke-Data MPEs, the integration requirements for joining the ecosystem and the tensions that arose during the integration. Despite all the benefits driven by coopetition and platform-to-platform openness in MPEs, the existence of multiple leading platforms, "incumbent platforms" and multiple complementing "entrant platforms" triggers tensions in managing the overall coopetition dynamics between stakeholders in MPEs, regarding who does what, and who dominates a particular part/function of the overall ecosystem offering or even dominates a specific market entry. In the Stroke-Data MPEs, the tensions between ecosystem stakeholders arise

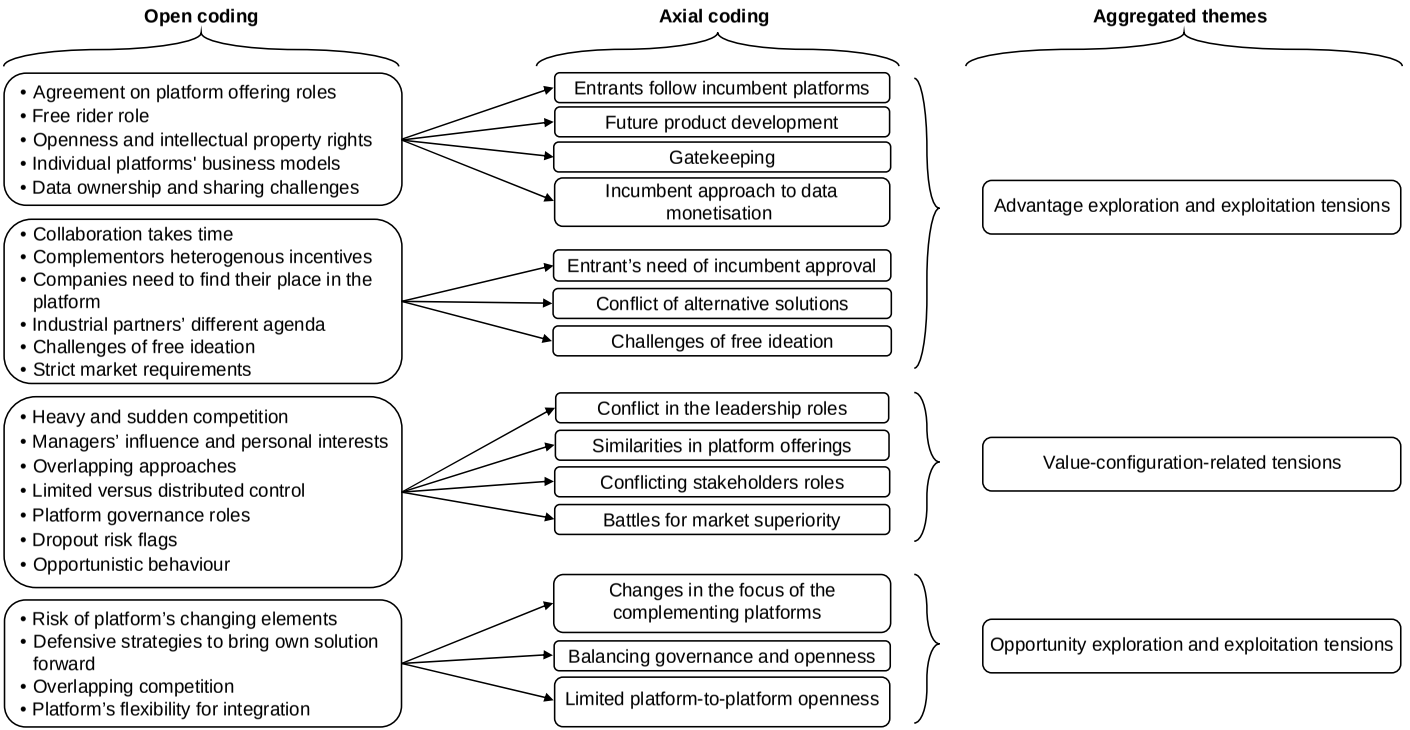

Figure 9.2 Data structure.

Source: The authors.

from an imbalance between (I) platform gatekeeping versus knowledge sharing, (II) competition for market superiority versus coopetition and (III) governance versus platform-to-platform openness.

Platform Gatekeeping Versus Knowledge Sharing

While integrating into Stroke-Data MPEs, the lack of monetised data required to develop further AI algorithms was the primary key element to stimulate tensions between platforms. All the cases involved in the integration into Stroke-Data MPEs appeared to have data-sharing limitations. They lacked an extensive knowledge-sharing framework with other platforms involved in MPEs. Due to the nature of the Stroke-Data MPEs operating in the healthcare domain, hospitals come first as the processor of the anonymised patients' data. We conceptualised hospitals as the central data hub that complements all the platforms involved in Stroke-Data MPEs. Hospitals refuse to monetise anonymised patients' data with entrant platforms involved in platform development unless they are associated with a trustworthy incumbent. In some cases, they managed to obtain an anonymised patient's data. However, the extensive anonymisation of data prevented the development of further algorithms in the later stages, limiting the platforms' capacity for further development.

All the interviewees argued that they would benefit from the coopetition if hospitals "as the primary data source in the stroke-data MPEs" tried not to strategically manoeuvre companies' trials in developing new services by limiting/or prohibiting access to anonymised patient data. Case G is an incumbent platform that participates in the Stroke-Data platform's patient and expert solutions. Interviewee 3 questioned the data owner's attitude towards sharing and enabling companies to do the research and development work because any development work for their platform depended on hospitals' views of data access. Interviewee 2 commented:

> *Hospitals believe that companies would not be doing research work if they shared monetised patient data. They will be doing product development work and utilising the fruits they already have [referring to the anonymised patient's data], and I disagree.*

Interviewee 3 also disagreed with the hospital's view of data access by explaining,

> *We are in many cases conducting similar research cases to those universities are doing in algorithm development and various sources. There may be room for improvement in the hospital's attitude as the data owner. Of course, companies will do a product development if there is a market opportunity, but yes, we currently have a big R and a small D for future product development.*

Interviewee 1 from case E commented on the same discussion, explaining that it takes 5–6 years to get the technology to the market.

> *"We conduct extensive research before the development, but hospitals delay the process"*, Interviewee 1 concluded.

As a response to the requirements related to data-sharing mechanisms hospitals place on the entrants, entrant platforms may initiate gate-keeping when an incumbent platform starts developing a broader product portfolio using the monetised data from the entrant platform's side. We found that platforms were willing to collectively establish a knowledge-sharing framework unless it was not used to expand the product umbrella of the complementing platform. Interviewee 1 from case E commented:

> *Once platforms start working on the data sharing, they need to be/or positively forced to be trustworthy every second when you are sourcing sensitive data, then analysing and sharing these data afterwards.*

The new entrant platforms in the Stroke-Data MPEs were extensively developing platform solutions, while incumbent platforms were negotiating higher terms of data sharing. Interviewee 1 continued:

> *We are [referring to case E] currently in the process of developing our company and solution, so we're not yet at the stage where we could share the data and negotiate more terms.*

Meanwhile, interviewee 1 from case A believed that "personal relations and trust between platform managers" were the basic elements for building a successful knowledge-sharing framework. Interviewee 3 from case G argued that

> *initiating data-sharing partnerships between stakeholders in Stroke-Data are crucial for the success of the whole ecosystem.*

The business reality is that every platform wants to retain its dominance in the market and negotiate higher terms from the complementing platforms.

Another tension arises when two or more platforms build their knowledge-sharing framework as a sub-set of the central one in MPEs. Cases A and E have built their knowledge-sharing framework to develop the rehabilitation platform in the Stroke-Data MPEs. During one joint interview discussion with the two companies, Interviewee 1 from case E explained that both companies shared many of society and business values. Furthermore, from the rehabilitation part of the Stroke-Data MPEs, both companies shared the same interest in developing our solution to create interaction between patients

and healthcare professionals. Interviewee 1 from case A specifically described their coopetition dynamics with case E, saying:

> *We're not working as a whole [referring to Stroke-Data stakeholders] – we're working as a sub-set. But if we reach mutual agreements, we will have a communication relationship with the rest.*

Market Superiority Versus Coopetition

Incumbent platforms tend to establish a coopetition framework with entrant platforms if the dynamics of coopetition guarantee their market dominance will be maintained. For this, Interviewee 3 from case A highlights the necessity of defining each platform's role and then proceeding with the market agreements for all the ecosystem's stakeholders. Interviewee 3 noted:

> *It is not very clear which consortium members are supposed to do what – at the end of the day, this is something we need to have.*

Stakeholders in MPEs need to clarify and agree the market leadership roles to make coopetition happen. To reach these agreements, Interviewee 1 highlights "*the conflict of platform leadership roles that arise*", because the only way to keep incumbent platforms dominant in their area is to negotiate higher terms from entrant platforms to fully/or partly open their platform to the entrant platforms. As discussed in the previous chapter, entrant platforms in complex domains (e.g., the healthcare domain) seek the approval of incumbent platforms to get recognised in those domains where the requirement for innovation is rather complex. This becomes the bargaining power for the incumbent platforms when discussing the perks of competition for each stakeholder involved in MPEs, because case E wanted approval for their new technology in the healthcare domain. Interviewee 1 from case D said:

> *We want Stroke-Data to help us open the doors and discuss with other stakeholders, but we will have several safety issues that we have to go through.*

Interviewee 1 from case A highlighted "*personal relations between managers*" to come first while building a coopetition framework. Additionally, Interviewee 1 from case C disappointedly pointed out that coopetition with the incumbent platform was time-consuming for growth companies with high aims to expand in the market. He mentioned:

> *It takes time to build the collaboration and reach the kind of coopetition we're aiming for.*

Regardless of the stakeholder's position in MPEs, platform-to-platform openness is associated with the fear of sudden competition from

opportunistic stakeholders. Interviewee 3 from case A justifies the incumbent platform approach in creating their defensive mechanism before initiating any coopetition framework with other stakeholders in MPEs as the burden of protecting their competitive advantage and market dominance. Interviewee 3 from case A does not see it as a bargaining advantage from the incumbents' perspective over the new entrants:

> *It is important to discuss the competitive advantage of companies with new stakeholders; like decide what is the right process to admit new stakeholders …, that we are not just suddenly bringing some competitor in there without discussing and agreeing together about it somehow.*

The role of designing and evaluating coopetition dynamics and aligning who is going to do what is privileged to the incumbent platforms, as Interviewee 4 explained:

> *If a big competitor suddenly appeared sort of wanting to do the same things, then, there could be some kind of conflict.*

Designing a coopetition agreement that specifies each stakeholder's role in MPEs thus prevents the rise of overlapping/conflicting interests. Interviewee 3 highlights the *"consortium agreement proposal from each stakeholder"* as the way to cover any significant risks that may arise on the establishment of the coopetition framework. To overcome the threat of sudden competition from stakeholders with different agendas, Interviewee 3 highlighted that the coopetition agreement must specify the conditions that governed each stakeholder's competitive advantage developed in MPEs.

Incumbent platforms tend to create a defensive mechanism before initiating any coopetition framework with other platforms in MPEs. Interviewee 3 from case A specifically mentioned "*the free-rider role*" as the condition to consider before granting other incumbents or new entrant platforms access to the focal platform's infrastructure; Interviewee 3 concluded:

> *We don't want to end up specifying the whole requirement domain for the whole solution, so we cannot do like … work for them, or we cannot do … work for them, and that is part of our share of responsibility in this discussion as well.*

Respectively, incumbent platforms negotiate higher authority in the decision-making related to further product development or research activities. Then, if the new entrant platform has no opportunity to get a large enough share of the coopetition framework pie, they drop out of MPEs. In the case of Stroke-Data, the negotiation of coopetition dynamics between an incumbent platform and entrant platform led one new entrant platform to drop out of the Stroke-Data MPEs. The dropout occurred during the

early stages of formulating the proposal for a coopetition agreement between all stakeholders participating in the Stroke-Data MPEs.

Interviewee 3 from case A believed that "*similarities in the platform offerings*" caused tensions between stakeholders in MPEs. The case A proposal for their participatory role in the data analysis part was similar to the case D proposal for the Stroke-Data platform. As case company A successfully had built a similar system in the Swedish hospitals, they planned to develop it in the Stroke-Data. Meanwhile, case D already specialised in data analytics; the company planned to build a big data platform to aggregate data from all possible data collection points across the whole digital care stroke treatment and rehabilitation ecosystem. As Interviewee 3 from case A noted:

> *We need to reach an agreement about who is supposed to do what.*

A special agreement was needed between cases A and D to plan what they were doing and prevent the overlapping conflicts of interest to avoid the "*overlapping competition*", Interviewee 1 from case A highlighted. The proposal for coopetition discussion between cases A and D opened the way to a collaboration between cases A and G, because case G can use the data from case A servers to develop the brain status solution.

Similarly, case company C provides a video solution for case company D to be used on the big data platform. Interviewee 1 from case C explained that they had to study the big data of case D first, then explore how to align their big data concept capabilities to proceed with the implementation and pilot cases. However, there was an overlapping similarity between case C and F platforms, especially if case F felt that case C was their competitor on the Stroke-Data platform. Interviewee 1 from case C said:

> *We need to discuss and agree with them [referring to case F], because they have their platform, and I don't know if they feel we are their competitor.*

The overlapping/or similarity of platform offerings between stakeholders in MPEs creates the challenge of coopetition versus competition. If stakeholders do not reach a fair agreement for the coopetition framework, it can lead to MPE dropouts. Interviewee 2 from case E highlighted that "*stakeholders' heterogenous incentives to join the platform ecosystem*" might create a conflict between stakeholders in MPEs. Interviewee 1 described their fears when they decided to join the Stroke-Data platform:

> *At first, it seemed we might have some minor conflict with case A once they started developing a clear solution. However, we needed to be quiet with all parties and sharp in our area to protect and support others.*

Some stakeholders tend to build partnership agreements if there is an overlapping approach between stakeholders in MPEs. From the partnership

perspective, two or more stakeholders decide to co-develop their platform. Case E is building the rehabilitation solution on the Stroke-Data platform. However, they partnered with case A to build the patient solution platform by monetising the data from the case E platform, because case A needed the patient/end-user data to develop the patient solution platform. Interviewee 1 from case E explained:

> *The cooperation with case A is built on the basis that we provide data for their solution and on having the kind of set-up in which we support them and vice versa.*

Interviewee 2 mentioned that if stakeholders did not reach partnership agreements when platform solution overlapped, incumbent platforms might try to acquire the new entrants "*to avoid the conflict of overlapping solutions that will become competition in the future*".

Meanwhile, to keep the dynamics of coopetition working, the new entrant platform must face "*the risk of changing elements*", Interviewee 1 concluded. As much as opportunity, coopetition put new entrants under continuous pressure to change the context of their platform/complementary offering. As Interviewee 1 said:

> *We have to leave space for the additional actors we need in the project to be able to deliver those things.*

New entrants therefore needed to have flexible configuration models to meet the integration requirements of the incumbent platforms. Interviewee 1 viewed their transition to the Stroke-Data platform as an opportunity that introduced future uncertainties to their current model. Interviewee 1 continued:

> *We do not know patient needs yet, and all the stakeholders involved at the moment know it. They know that actor X or potential competitor X needs to be involved in reaching the project's target. For example, now we're talking about getting involved in Sweden. Everybody [referring to Stroke-Data stakeholders] would say yes, we want to expand to Sweden and have Swedish partners, but we're doing this with our resources. However, it's nice to get involved there, but they do not need to touch our current model.*

Balancing Governance and Platform Openness

The challenge of balancing between governance and platform openness driven by the fear of the product imitation or development of further innovations by other platforms. The tensions of governance activities may constrain any further integrations into MPEs. Despite having a knowledge-sharing framework, we found that platforms tended to anonymise data to share it extensively with other platforms. For example, in the Stroke-Data MPEs, the

knowledge-sharing framework had anonymised data that constrained the development of any further AI algorithms. We found that the development of long-term visions for the governance practices between platforms was a huge challenge. Platforms often tended to avoid open discussions of their intended data-sharing policies. It was also challenging to discuss individually planned governance mechanisms between all the platforms.

In the Stroke-Data MPEs the incumbent platforms were ready to engage in coopetition with new entrants if it would guarantee their market dominance (e.g., dominance in data analytics and visualisation). Our finding indicates that incumbents tend to negotiate bigger terms from small businesses/new entrants integrating into MPEs, because they cannot do it alone due to their limited financial resources and the market's maturity level (e.g., healthcare domain). Interviewee 1 from case D argued:

> *If you give something to us, we will also give something to you. We research and collaborate on this because that is our intention as well. But in Stroke-Data, we'd like to organise more discussion with [mentioning company name] to find out to build up this collaboration.*

To that end, platforms tend to engage in the coopetition framework if it does not affect their position in the market. They tend to negotiate bigger terms from other complementing/small platforms. The variations and contradictions of individual goals of each platform create a considerable challenge that leads to some MPE dropouts.

From this, case G, as an incumbent platform, focused on their brain status solution and did not wish to initiate competition with new entrant platforms. However, they wanted the data for their server to build further algorithms and integrate their solution across the whole care pathway. This was challenging without reaching an agreement for platform-to-platform openness with the hospitals and other platforms involved in Stroke-Data MPEs. Platform-to-platform openness was challenging in this situation. If case G started developing further algorithms generated through platform-to-platform openness, this would drive direct competition with case E. To prevent direct competition with case E, case G tried to implement limited platform-to-platform openness to keep the coopetition dynamics and avoid direct competition with their complementor.

Another coopetition tension occurred between case G as an incumbent platform and case D, because case D had its big data platform to integrate into the hospital and home environment within Stroke-Data MPEs. There was an opportunity for case G to integrate its brain status platform into the big data platform, generating further data for the case E platform. However, case G argued that their solution was intended for hospital use and was not targeted at use in the home environment (referring to rehabilitation homes). Participant 1 from case G noted:

> *We saw the trust among business ecosystem members related to the technical data integration and quality, which still needs initial investment in data linking, depending on hospitals and service providers. But if the ecosystem didn't work out well this time, it may be a key learning opportunity for other business modelling ideas.*

Case G did not want to expand their business scope to home environments through coopetition and a high level of data sharing with case D. Their current solution targeted the hospital and ambulance environments. Expanding to home environments would intensify competition with case E. This would also change the platform's current focus:

> *"We aren't planning to go in that direction at all",* Interviewee 3 concluded.

Another similar tension happened between case D and cases E and A, which hindered Norway's global reach. As per the Norwegian system, the big data platform developed by case D required comprehensive integration with the rehabilitation platform jointly developed by cases E and A. If the integration had happened, it would have been implemented in Norway if all the stakeholders in the Stroke-Data MPEs approved the use of the case D big data platform. However, cases D, E and A did not reach a coopetition agreement with all the stakeholders in the Stroke-Data MPEs. Accordingly, the big data platform within the rehabilitation part of the Stroke-Data platform did not meet the Norwegian hospitals' requirements.

Discussion

This study explores how coopetition-related tensions emerge when platforms integrate into MPEs, and how platforms deal with these tensions. Each case company in the studied MPES has its own platform that contributes to the MPE either as a focal "incumbent platform" to integrate other platforms into/or as a complementary platform for the focal platforms. We focused on the coopetition between entrants and incumbent platforms rather than the contextual factors for platforms' integration into MPEs. Our findings indicate that tensions of coopetition emerge in MPEs because of the ecosystem requirement for higher levels of integration and knowledge sharing between all platforms. Incumbent platforms implement full integrations into the new entrant platforms to overcome the threat of competition from new entrant platforms. This is the opposite of competition dynamics in the multisided platform setting, in which new entrant platforms come with radical innovations to disrupt market dynamics for incumbent platforms. We categorised the coopetition-related tensions into three main phases (Figure 9.3). In the following sub-chapters, we discuss

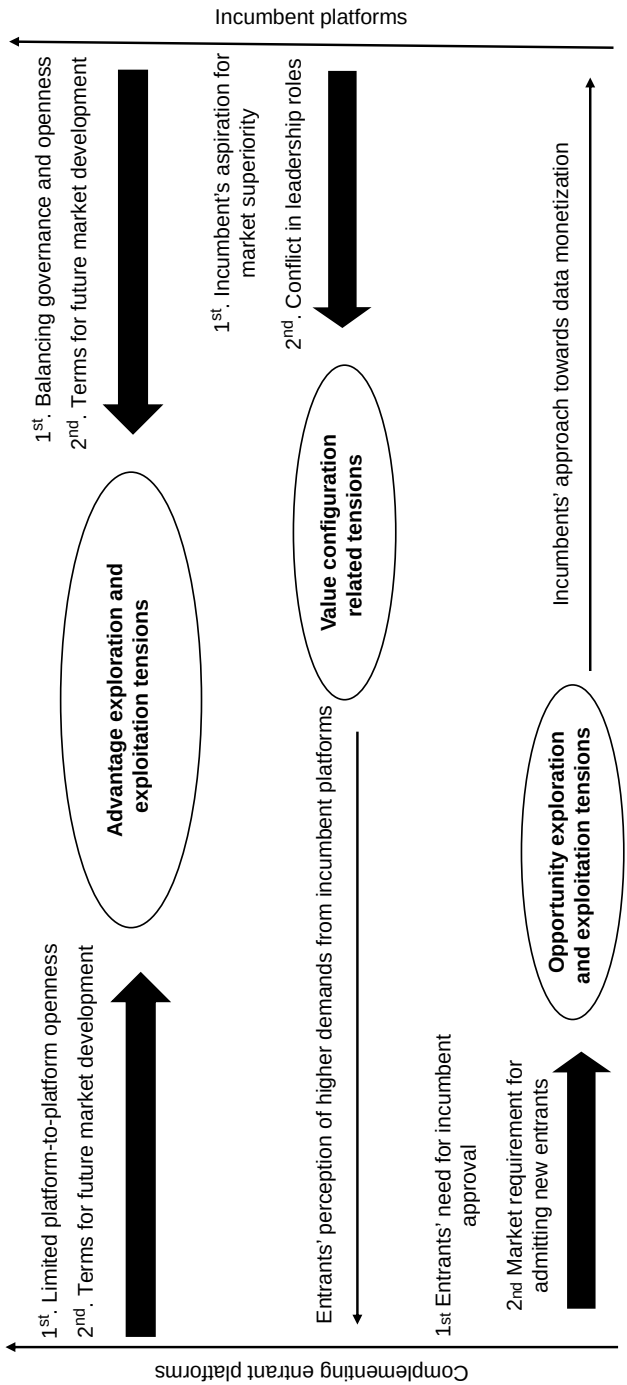

Figure 9.3 Coopetition-related tensions in MPEs.

Source: The authors.

our findings by emphasising the coopetition-related tensions that arise during integration into MPEs.

Opportunity Exploration and Exploitation Tensions

Our analysis reveals that higher complementarity levels may stimulate incumbent platforms' tendency to establish gatekeeping with new entrant platforms as a precaution against sudden competition or technology imitation. The market requirement establishes a strong drive for coopetition from the entrant platform's side, seeking their competitors' approval. In the Stroke-Data MPEs, healthcare as a complex domain constrains the entrant platform's ability to access the data unless they are part of the incumbents' offering. Furthermore, the accreditation and licensing requirements for admitting new technology are rather strict and are difficult to achieve with the entrant platform's resources. The integration requirements placed by the healthcare domain emerged as the bargaining power for incumbents to negotiate the terms of the coopetition agreement, which stimulates gatekeeping tensions between all the platforms integrating into MPEs. Gatekeeping may perform well as a platform strategy to shape the ecosystem's requirements built around platform sides (Boudreau & Jeppesen, 2015; Zhang et al., 2020). Incumbent platforms therefore try to maintain market dominance by applying centralised control models to safeguard their platform's technical core (Den Hartigh et al., 2016). In contrast, we find that gatekeeping in MPEs hinders the individual platform's motivation to share data with other platforms and innovate if they are threatened by technology imitation or admitting rival platforms to MPEs. We observed a bottleneck in the gatekeeping when all the platforms integrating into MPEs tended to utilise data to get a more significant market share, with each platform tending to constrain the others from winning the battle for significant market shares. Furthermore, incumbent platforms may initiate gatekeeping as a defensive mechanism when new entrant platforms threaten further product development.

The ecosystem built around MPEs evolves when new stakeholders decide to join the ecosystem. Nevertheless, the leadership and control in MPEs undergo multiple transitions between centralised and collective control deciding whom to admit to the ecosystem. Incumbent platforms prefer to keep their centralised control to maintain their market dominance and guarantee equal market opportunities for all platforms within MPEs (Gawer & Cusumano, 2002; Den Hartigh et al., 2016). Nevertheless, entrant platforms eager for opportunity exploration and exploitation drive integration into MPEs and collaborate with incumbents. We find that entrant platforms fail to integrate into MPEs if they lack a flexible platform design that meets the incumbent's integration requirements, because the platform flexibility refers to the ability to build sub-systems around the platform's technical core (Tiwana, Konsynski & Bush, 2010).

We argue that tensions arise with integrations into MPEs from coordinating coopetition dynamics between incumbent and new entrant platforms, especially when opportunistic behaviour tends to prioritise private benefits – i.e., the platform may realise greater value added outside MPE boundaries, then threaten/or decide to drop out instead of collaborating for greater collective benefits – and therefore triggers competition between stakeholders in MPEs – i.e., the gatekeeping effect arising between platforms limiting the amount of shared knowledge and thereby preventing other platforms from developing further dependent innovations.

Tensions Associated with Value Configuration

MPEs provide a mediating ecosystem to enable the multi-layered complementarity between multiple platforms to enrich the value proposition for the whole field/industry more than can be created by an individual multisided platform working independently. The complexity of the multi-layered ecosystem drives these layers to shape the ecosystem's overall goal (Teece, 2018). Our findings indicate that competition on the inter-platform level arises from individual platforms' tendency to add new complementary offerings to the existing ones to expand their market base and reach the global market. This may result in platforms' tendency to implement a transparent knowledge-sharing framework with other platforms in MPEs. We found that incumbent platforms joined MPEs as part of their battle for market dominance; cooperating with the new entrant platforms guaranteed their market dominance. For this, tensions happen during the transition to extensive knowledge-sharing mechanisms as a requirement for integration into MPEs.

In MPEs, the incumbent platforms' aspiration for market superiority justifies their control and leadership rights through their share of the research and development costs incurred during the risky stages of the battle for market dominance. Nevertheless, the incumbent platforms use it as a strategic manoeuvre for designing the governance roles for the whole ecosystem. This leads incumbents to anonymise data before sharing them with entrant platforms; the anonymisation is done to an extent that hinders further innovation. Tensions in agreeing governance roles may constrain the configuration of MPEs or hinder further innovations driven by the fear of losing market dominance.

Regardless of the ecosystem's enabling role in creating the network between multiple platforms to work together holistically, the ecosystem establishes a boundary role for all the stakeholders in the ecosystem. The ecosystem governance role places some boundaries that differ, depending on the stakeholder role in the platform. For example, the leading platforms consider knowledge sharing a limitation for their future market expansions. For this, platform leaders will get complementors to develop similar innovations that stimulate sudden competition in certain markets or technical

domains. Furthermore, each stakeholder in the platform of the platform's ecosystem aims for a winning market share role (Figure 9.3).

Advantage Exploration and Exploitation Tensions

Like the distributed platform leadership roles enabled by collective governance in a multisided platform setting (O'Mahony & Karp, 2022), we find that inter-platform coopetition in MPEs intensifies data sharing. However, it increases tensions when the platform's opportunistic behaviour becomes visible. We therefore claim that collective governance emerges between platforms in MPEs when they fully agree on the coopetition terms in response to the appearance of sudden competition in MPEs. The incumbent platforms retain their dominant leadership role in deciding whom to admit to MPEs and the conditions for granting access to new stakeholders. The entrant platforms' dependency on incumbents for entering complex domains like healthcare originates the unbalanced leadership roles in MPEs. For this, platforms integrating into MPEs need to be opportunistically aligned (O'Mahony & Karp, 2022); otherwise, opportunistic dropouts will occur if unbalanced leadership roles pressurise the new entrant platforms' autonomy to grant access to new possible partners/stakeholders. Complementary relationship and competition are closely intertwined and are needed to grow the MPEs. Despite competitive pressure through the unbalanced coopetition dynamics, it stimulates the R&D trials in each platform. We found that the balanced cooperative and competitive dynamics are the enablers of platform innovations that go beyond the scope of each platform and find new ways to retain their presence in the market.

Implications for Theory

This study makes three main contributions in exploring how coopetition-related tension arises when complementing entrant and incumbent platforms integrate into MPEs.

First, it addresses the gap in the platform coopetition literature by building a foundation for platform research when multiple platforms are integrated into MPEs. The extant coopetition literature highlights the need to address the role of coopetition in relation to the competitiveness and emergence of the ecosystem (Choi, Garcia & Friedrich, 2010; Ritala, Golnam & Wegmann, 2014; Ritala, 2019). In doing so, we analysed the integration of individual platforms into MPEs until the coopetition agreement between participating platforms is reached. Moreover, we tracked the platform-to-platform openness and governance roles and conditions. As much as the opportunity that coopetition between platforms in MPEs brings to the platforms, we argue that coopetition-related tensions may hinder the integration process by causing a dropout in the middle of

the integration process, especially when platforms attempt to grant or hinder access to its infrastructure in trade and the broader market share of new product development. This finding resonates with findings related to the platform's decision to choose the control mode, either by allowing the centralised or controlled control of the platform's technical core to maintain a certain degree of market dominance (Den Hartigh et al., 2016). Furthermore, our study highlights that the competition for market dominance in a particular field remains the constraint for developing the practical coopetition framework between multiple platforms in MPEs. The coopetition becomes a wise strategic choice for entrant platforms operating in complex domains that need huge initial investments to bring novel solutions to the market. This finding resonates with the collective value creation literature through coopetition (Gnyawali & Park, 2011; Ritala & Hurmelinna-Laukkanen, 2019; Zhang et al., 2020). The extant literature focuses on studying the platform leadership, governance strategies, and complementarity between platform owners and complementors who add value on the supply side of the platform during the battles for market dominance (Gawer & Cusumano, 2015; Den Hartigh et al., 2016). Furthermore, scholars have examined the competition situations between platform owners and complementors (Zhu & Liu, 2018), following the recommendations of Zhang et al. (2020) that the complementor's interaction in relation to knowledge sharing and platform openness should be explored. This study identifies the collective governance mechanism between complementing entrant and incumbent platforms. Especially when single platforms integrate into MPEs, each platform will revise its access and control role in accordance with the new platform setting. We argue that platforms integrate into MPEs to expand their business scope and create value by building a collaborative relationship with their competitors. Platform-to-platform openness is the key to integrating and establishing the coopetition dynamics.

Second, we conclude that the value proposition in MPE ecosystems depends on the degree of end-user centricity and dual knowledge sharing between complementors and platform leaders. However, when platforms integrate into MPEs, their old governance models initiate the tensions with the new collective value creation-based model. This enables the rivalry power between platforms to influence their ability to share information with other complementing platforms, which leads to fragmented innovations and inside-the-box untapped opportunities (Zhang et al., 2020). This view is consistent with Koo and Eesley's (2021) view of the platform owner's right to orchestrate the platform design rules to govern value creation dynamics between stakeholders. Our research suggests another consequence in MPEs: A knowledge-sharing framework to be integrated within the platform's architecture as a condition for the integration into MPEs. This intensifies the cooperative initiatives between all the stakeholders in the ecosystem and reduces the likelihood of gatekeeping initiated by the incumbents as a defensive strategy against technology imitation or hijacking.

Third, our study concludes that knowledge sharing at the ecosystem level is very important, because it influences the formation of the coopetition framework between platforms in MPEs. We argue that coopetition is likely to form when competing actors realise that the collective benefits driven by the cooperative strategy are greater than the individual actor's private benefits. Gatekeeping tensions hinder the achievement of collective governance agreements, challenging the expansion of collaborative dynamics between platforms integrating into MPEs. This finding complements the extant discussion around platform governance and complementary dynamics in the platform ecosystem (Iansiti & Levien, 2004; Gawer & Cusumano, 2015; Zhang et al., 2020; Broekhuizen et al., 2021). Since platform governance remains the most critical feature in the integration into MPEs, the power of control is based on the ownership of the platform's technical infrastructure (Rietveld, Schilling & Bellavitis, 2019; Kretschmer et al., 2022). Our study shows that platform leadership roles grant leading platforms the "owner of the technical core" right to define the goals of the entire ecosystem and guide the value creation and capture activities between all the platforms involved in MPEs. This is consistent with the view that grants incumbents "as platform leaders" the right to design the governance mechanisms for the platform ecosystem and establish the communication linkages between all complementors (Zhang et al., 2020). We also suggest another consequence: The gatekeeping of the complementing entrant platforms hinders knowledge sharing and the retraining of complementors' innovation when a platform's innovation becomes dependent on incumbent governance roles.

Based on this exploratory study, we found that creating multi-layered coopetition in MPEs is possible from the theoretical perspective. However, building the collaborative framework tends to be challenging when several platforms that integrate into the ecosystem appear to have competing market goals. The process of opening the platform infrastructure and establishing a knowledge-sharing framework with other platforms in the ecosystem embodies multiple challenges. Platforms tend to retrain the information if other platforms utilise it for further product development efforts outside the platform ecosystem.

Implications for Practice

Our study proposes several recommendations for platform managers and practitioners when platforms consider integrating into MPEs an opportunity to expand their business scope and market share. First, we encourage platform managers to consider the contextual factors for their platforms to integrate into MPEs in defining the goals of their integrations. The in-depth analysis of our case indicates that coopetition comes as a risky strategic decision for the incumbent platforms to undertake, especially when they collaborate with competing entrants who bring disruptive innovation

to the market. Incumbents risk collaborating with entrants associated with the fear of technology imitation and losing the aspiration for market superiority. Nonetheless, the integration into MPEs and collaboration with competing platforms enriches the individual platform's ability to conduct R&D projects on a larger scale beyond the individual platform's ability. By highlighting the coopetition-related tensions, we hope to encourage platform managers and decision-makers to define the coopetition framework in terms of the choice of leadership and governance roles, whether centralised or collective models. We propose that well-defined contextual factors for platforms' integration into MPS reduce the likelihood of tensions that cause dropouts in the advanced stages of integrations. The agreement of the coopetition framework that is made during the early stages of integration into MPEs can also influence the control of the tensions that may arise in later phases.

Second, we argue that high levels of platform-to-platform openness do not prevent the inter-complementarity tensions when some platforms realise significant opportunities outside the scope of MPEs. However, when platforms operate in complex domains like healthcare, a balanced coopetition dynamics between incumbent and new entrant platform works well in MPEs if it guarantees the incumbent platforms' dominance in the market and enables new entrant platforms to get their own share of the market. We conclude that collective governance models are needed to integrate new entrants and incumbent platforms into MPEs. Otherwise, tensions will arise from controlled governance; opportunistic behaviour then hinders the collective value creation between platforms. This study may encourage platform managers and decision-makers to achieve a collective governance model within their coopetition agreement.

Limitations and Directions for Future Research

Our study runs into several limitations that could be investigated by future research. First, this study holistically investigates coopetition-related tensions in MPEs. Furthermore, empirical evidence is needed to examine how the organisational structure of MPEs can coordinate coopetition tensions between complementors and facilitate knowledge sharing between competing platforms. Second, this study examines inter-platform complementarity as a tension rather than an intensifier of further innovations. Building on Cusumano and Gawer's (2002) study, we find that keeping complementors with similar goals in one management hub improves collaborative relations. Otherwise, the opportunistic behaviour disrupts inter- and intra-platform collaborative dynamics (Kretschmer et al., 2022). Additional studies are needed to validate the framework for managing the complementor's conflict of interest in MPEs when their complementary relationship threatens competition. Third, we use the digital care ecosystem as the contextual framework for our study, favouring the collaborative settings of MPEs. Studying

similar platform settings in other contexts, including a wide range of complementors, is needed to examine cross-industry complementary relationships between platforms and the contextual motives for joining the MPE ecosystem.

Our study's empirical setting did not allow a direct analysis of the stages of the complementors' disputes for two reasons. On the one hand, this study was conducted as part of the Stroke-Data project that aimed to integrate platforms into Stroke-Data MPEs. On the other hand, it was challenging to collect further data on the complementing platforms' response to the incumbents' demands, especially when we tried to navigate the platform's future market strategies and aims of the coopetition. We believe further longitudinal studies are needed to analyse the complementors' interactions during advanced stages, especially the post-integration stage, including knowledge sharing versus gatekeeping between platforms in MPEs. In addition, it will be beneficial to propose strategies for managing inter-platform tensions when complementors realise benefits outside ecosystem boundaries. Our current findings categorise that tension in the scope of the complementors' opportunistic behaviour, which leads to dropouts from the platforms.

Nevertheless, we suggest further research to investigate the strategic framework for managing these tensions. In addition, further research will be beneficial for investigating the technological versus institutional conditions, "*government legislation versus technological and market requirements*", which may affect MPEs' overall dynamics. Finally, our study is based on eight Finnish technology-oriented platforms operating in the healthcare domain. All the case companies had to meet the integration and hospital requirements to implement their technology. It is therefore challenging to generalise this study's findings for other domains/industries. Nevertheless, this study opens future research avenues for analysing coopetition-related tensions in other MPEs settings.

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