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Responding to platform owner moves: A 14-year qualitative study of four enterprise software complementors

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Abstract

Integrating the competition and the cooperation perspectives on value co-creation in platform ecosystems, this study explores complementor responses to platform owner moves that adversely affect the complementor's positioning. Our primary focus is to discern dynamic patterns of complementor responses and to understand their role in the process of re-stabilising the complementor's positioning. To this end, we conducted a 14-year longitudinal study, analysing 21 move-response instances across four platform partnerships. Our findings reveal three distinct complementor response archetypes: insist, pivot, and detach. Over time, complementors combine these archetypes into three unique response patterns. Through progressive diverging, complementors sidestep platform owner moves by diversifying their offer beyond the focal ecosystem. Although this can entail substantial multi-homing costs, it reduces dependence on the platform owner and bolsters resilience against future moves. Through adaptive oscillating, complementors use platform owner moves as opportunities to gradually diversify their offer within the focal ecosystem. This stepwise market expansion makes them resilient against future moves, while mitigating costs and efforts

related to multi-homing. Through persistent insisting, complementors can re-establish their previous positioning, but at the cost of increased dependence on the platform owner, leaving the complementor vulnerable to future moves. We synthesise these findings in our process model of complementor positioning. Emphasising the importance of complementor responses in fostering resilient software ecosystems, this model bears important implications for research on platform governance and platform-dependent entrepreneurship.

KEYWORDS
complementor perspective, longitudinal case study, platform ecosystems, platform evolution, platform owner entry, value co-creation

1 | INTRODUCTION

Software platform ecosystems, wherein a large number of small complementors partner with a platform owner to co-create digital innovation, have become the dominant organisational arrangement through which software is developed and distributed (Cennamo & Santalo, 2013; de Reuver et al., 2018). The rise of platforms has spurred a thriving, generative app economy (Deloitte, 2020; Fürstenau et al., 2023), in which complementors extend the software platform with applications and services that cater to a variety of customer needs. However, recent discussions spotlight the "dark sides" of platform partnerships, particularly from the vantage point of complementors (Cutolo & Kenney, 2021; McIntyre & Srinivasan, 2017; Rietveld & Schilling, 2021). Although there are undeniable success stories associated with platform partnerships (Sarker et al., 2012), the large majority of complementors grapple with the challenges of distinguishing themselves and their applications from competing app developers and creating a sustainable business (Cutolo & Kenney, 2021).

Given the large number of third-party applications, platform owners naturally prioritise the overall health of the ecosystem, thereby often sidelining the interests of individual complementors (Hurni et al., 2021; Kude et al., 2008; Wen & Zhu, 2019). Consistent with this ecosystem orientation (Hurni et al., 2022), prior research has shown that platform owners frequently set platform strategies and governance mechanisms without consulting their ecosystem, let alone individual complementors (Sahaym et al., 2023; Wareham et al., 2014). These unilateral *moves* can manifest in various ways. Platform owners may, for instance, encroach on markets previously occupied by complementors, if such a move aligns with their wider technological and strategic objectives (Eisenmann et al., 2011). They may also restrict access to vital resources, for example by severing crucial interpersonal relationships (Huber et al., 2017; Hurni et al., 2022). While platform owner moves are usually not specifically targeted at any particular complementor, some complementors can become the "collateral damage" of these actions. For instance, when a platform owner decides to retire certain APIs, some complementors' products may stop functioning if they relied on these APIs (Hurni et al., 2021; Kude et al., 2012).

Although complementors may have limited influence over the platform owner's decisions, they are independent and self-determined organisations, and thus have agency to architect their own fate (Sandberg et al., 2020; Tiwana, 2015). In particular, complementors can attempt to cushion adverse effects of platform owner moves by engaging in specific *responses* (Huber et al., 2017; Hurni et al., 2022). For instance, existing studies found that complementors often explore untapped market niches (Wen & Zhu, 2019), advocate for preferential access to the

platform owner's resource (Foerderer et al., 2018; Huber et al., 2017, Hurni et al. 2022; Wareham et al., 2014), or seek new partnerships with alternative platform owners, that is, engage in multi-homing (Cennamo et al., 2018; Hyrynsalmi et al., 2016). Building on this established but scattered knowledge about complementor responses, we further explore the intricate dynamics of platform owner moves, the way complementors respond to these moves over time, and the implications for complementors' positioning, in terms of a complementor's attributes that define the space and role it assumes in one or several platform ecosystems (Wessel et al., 2017).

Adequately tackling these questions requires careful consideration of extended timeframes and potential path dependencies. As platform owner moves often represent changes in strategic direction or platform governance, they occur infrequently (Foerderer et al., 2018; Schreieck et al., 2022). Furthermore, not all of these moves unsettle every complementor (Hurni et al., 2022), making such destabilising moves even rarer from the perspective of individual complementors. Moreover, complementor responses may not be immediate, take time to prepare and carry out, and some of their consequences may only become apparent at a later stage. Consequently, it is pivotal to analyse platform owner moves and complementor responses across elongated time spans. This need is underscored by prior work that has pointed to path dependencies in the positioning of complementors toward platform owners (Huber et al., 2017; Sarker et al., 2012). For instance, while complementors have the capability to evolve their positioning—for example, from a more transactional approach to more synergistic co-creation (Huber et al., 2017; Sarker et al., 2012)—they cannot reorient immediately because such reorientations hinge on conditions that are difficult to meet and accrue in complex historic processes (Huber et al., 2017; Sarker et al., 2012). Therefore, this study pursues two goals. First, we aim to conceptualise and empirically explore how complementors respond to platform owner moves that destabilise their positioning. Second, our aim is to discern dynamic patterns of responses and understand their contributions to the evolution of the complementors' positioning over time.

To achieve these goals, we conducted a longitudinal case study of four platform partnerships over a total period of 14 years (from 2007 to 2021). In this period, all four complementors repeatedly faced the challenge of having to respond to platform owner moves. Our findings show that complementors engaged in different responses to these moves, which form three dynamic response patterns. Through these response patterns, which we term progressive diverging, adaptive oscillating, and persistent insisting, complementors can re-stabilise their positioning, with implications for their resilience to future platform owner moves. Our process model of complementor positioning has important theoretical implications for the literature on platform governance and platform-dependent entrepreneurship.

2 | BACKGROUND

Research on ecosystems has thrived in recent years leading to a wealth of studies that looked at platform phenomena from different angles—including engineering (e.g., Spagnoletti et al., 2015), economics (e.g., Tan et al., 2015), and organisational (e.g., de Reuver et al., 2018) perspectives. Our study is in the organisational tradition. Accordingly, we view digital platforms as the centre of ecosystems where a large number of relatively small complementors partner with a platform owner to co-create digital innovation (Cennamo & Santalo, 2013; de Reuver et al., 2018). This perspective emphasises that the process of co-creating digital innovation is considerably more complex than the idea of modularity and the associated notion of "plug-and-play" extensibility would suggest. Work in this tradition highlights that co-creation in platform ecosystems goes beyond the mere provision of a modular platform with standardised interfaces. Rather, the complementors and the platform owner have to enact co-innovation practices and they have to coordinate and organise joint activities (e.g., Cennamo & Santalo, 2013; Ghazawneh & Henfridsson, 2013; Sarker et al., 2012; Wareham et al., 2014).

Within the organisational tradition of platform ecosystems, there are two separate thematic foci—cooperation and competition. Research focusing on cooperation foregrounds the importance of fusing and synergistically combining the resources possessed and controlled by the platform owner with those of the complementors. Research

focusing on competition foregrounds that platform owners and complementors compete for customers, threatening complementors' market position. We discuss both perspectives next.

2.1 | Cooperation perspective: Governing resource access

The cooperation perspective on platform ecosystems is in the tradition of research on cooperative inter-organisational arrangements such as joint ventures and strategic partnerships (Ring & van de Ven, 1992). It points to the importance of fusing and synergistically combining complementary resources possessed and controlled by independent but cooperating organisations (Sarker et al., 2012). Accordingly, research taking the cooperation perspective has had a strong interest in the different types of resources and capabilities that platform owner and complementors contribute to their partnership (Kude et al., 2012). Platform owners have been shown to provide a variety of different technical resources, most importantly the platform itself (Eaton et al., 2015; Ghazawneh & Henfridsson, 2013; Kude et al., 2012). Other important technical resources include the interfaces to connect complements to the platform, development and testing environments, as well as technical support (Eaton et al., 2015; Ghazawneh & Henfridsson, 2013). Platform owners also provide a range of commercial resources including app stores, market research insights, and standardised marketing material (Huber et al., 2017; Hurni et al., 2021), knowledge resources such as information portals and personal trainings (Foerderer et al., 2019), and reputational resources such as the permission to use the platform owner's logo (Kude et al., 2012). These resources have also been shown to vary systematically with regard to scalability and value (Foerderer et al., 2019; Huber et al., 2017). For example, a market study can be easily used and reused by every member of the ecosystem—it is thus highly scalable—but the fact that it is accessible to everyone also reduces its potential to use it as a source of differentiation, thus, limiting its value for complementors. By contrast, accessing the advanced technical knowledge of the platform owner's technical support team may require intense interpersonal interaction, it is thus a less scalable resource, but its scarcity makes it also more valuable.

The reason why platform owners provide these resources in the first place is the promise of generativity, that is, the prospect that complementors will use the resources to create a wide range of unforeseen innovation in terms of third-party solutions that serve customer needs not directly addressed by the platform (Boudreau, 2010). Such surprising outside innovation is possible because platform partnerships are looser than more traditional inter-organisational partnerships such as joint ventures (Gawer, 2014). Although complementors sign a developer agreement when they enter a platform partnership (Huber et al., 2017; Sarker et al., 2012), they are not contracted to develop a particular app (Gawer, 2014; Tiwana et al., 2010). They are free to use the resources offered by the platform owner as they see fit (Ghazawneh & Henfridsson, 2013; Hurni et al., 2021). Because resources vary regarding scalability and scarcity, an important task of the platform owner is to effectively govern resource access, that is, to purposefully constrain or enable the complementors' access to ecosystem resources (Huber et al., 2017; Hurni et al., 2021). Some openness is needed so that platforms foster generativity. Uncontrolled access to resources, however, may be problematic as it may make it difficult to build a coherent and scalable platform (Parker & Van Alstyne, 2018). Moreover, when governing access to resources, platform owners have to find the right balance between nurturing dyadic-level co-created value by pinpointing complementors to just the right resources on the one hand, and the additional costs that such targeted one-to-one governance entails on the other hand (Huber et al., 2017).

The primary mechanism to balance these competing demands are partner programs (Wareham et al., 2014)—especially in the context of enterprise software platforms (Huber et al., 2017; Hurni et al., 2022; Sarker et al., 2012). Partner programs usually define several formal partner levels where partners on higher levels get access to more valuable resources, but also have to accept additional obligations. For example, the partner programs of large enterprise software companies such as SAP, Oracle, or IBM usually have an entry level that is open to virtually any software company, but the resources entry-level partners can access are also fairly standard. As partners move up the

pyramid toward first-tier partnerships, the resource access increases, often facilitated through one-to-one personal support that platform owners grant at their own discretion (Huber et al., 2017; Hurni et al., 2022). However, such an ascension also requires complementors to pass costly certification of products and skills or to surpass certain revenue thresholds.

2.2 | Competition perspective: Platform owners enter complementor territory

The competition perspective is interested in questions around the boundaries of the platform itself. This view relaxes the assumption of platforms as a stable core and instead acknowledges that the feature set and functionality of a platform can expand over time (Hein et al., 2020; Sandberg et al., 2020). As platforms evolve, they can encroach upon market spaces previously held by their complementors (Foerderer et al., 2018). Thus, changes in the boundaries of the platform are important because they can lead to or intensify overlap with complementor territory, thereby increasing dyadic competition.

Questions around platform boundaries and platform owner entry have been discussed in the economics and IS literature under the term platform envelopment (Eisenmann et al., 2011; Hermes et al., 2020). While originally developed in the context of inter-platform competition, the envelopment concept has more recently been linked to competition between the platform owner and its complementors (Hermes et al., 2020; Zhu & Liu, 2018). A platform owner's entry into complementary markets can have different consequences for complementors. For example, if a platform owner evolves its platform by integrating new core functionality, this functionality can on the one hand act as a basis for complementary innovation (Foerderer et al., 2018). On the other, it may pose a risk to the complementor's existing business model (Hurni et al., 2022). Work in the context of enterprise software platforms has shown that platform envelopment may even "render the spoke's solution obsolete" (Kude et al., 2012, p. 262).

3 | CONCEPTUAL DEVELOPMENT: COMPLEMENTOR RESPONSES TO PLATFORM OWNER MOVES

Prior work on platform ecosystems predominantly subscribed to either the cooperation or the competition perspective. We integrate these two research traditions into a *move-response* framework, which provides the conceptual foundation for our empirical exploration. This framework is depicted in Figure 1 and its key components are introduced next.

Drawing from the cooperation perspective, which emphasises resource access, and the competition perspective, which centres on platform expansion, we distinguish between two types of *platform owner moves*: (1) moves that *restrict resource access* for complementors (Huber et al., 2017; Hurni et al., 2022; Sarker et al., 2012; Wareham et al., 2014) and (2) moves that *increase competitive overlap* between the platform owner and the complementor (Foerderer et al., 2018; Hermes et al., 2020). Notably, some platform owner moves may solely impair resource access or intensify competition, while others might do both.

Consistent with the objectives of our study, we focus on platform owner moves that adversely affect complementor positioning. A complementors' positioning is the distinctive space and role a complementor assumes in the platform ecosystem and relative to the platform owner (Wessel et al., 2017). It is rooted in the complementors' attributes, such as the resources and capabilities they utilise, their product and service offering, and their cost structure—and is also shaped by their relationship with external entities, such as the focal platform owner and outside actors. Specific platform owner moves can destabilise complementor positioning in different ways. For example, if a platform owner withdraws access to a vital resource, then complementors can no longer use this resource in their value co-creation, potentially leading to disruptions in their product and service offerings. Conversely, if a platform owner move increases competitive overlap, a complementor's solution may become redundant or even obsolete, placing the complementor at risk of customer attrition.
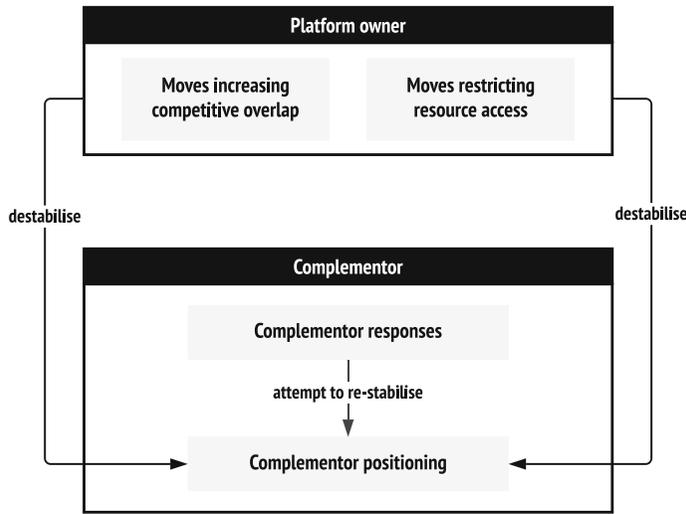
FIGURE 1   Move-response framework.

Given the destabilising impacts that platform owner moves exert on complementor positioning, it appears plausible to infer that complementors will counter moves with *responses* in an attempt to re-establish value co-creation. This is in line with the metaphor of biological ecosystems. Although this metaphor has frequently informed research on digital platforms, its specific facet of responses to destabilising events has remained underexplored. In biological ecosystems, the responses of organisms cushion perturbations and therefore play a critical role in bolstering ecosystem resilience (Willis et al., 2018). Translating this idea to platform ecosystems, complementors will likely attempt to mitigate the unsettling impacts of platform owner moves on their positioning by engaging in a response. Thus, just like platform owner moves, complementor responses influence positioning.

Being self-directed, often entrepreneurial, actors (Huber et al., 2017; Hurni et al., 2022; Sarker et al., 2012), complementors will make autonomous decisions about the nature and direction of their response. Similar to platform owner moves, complementor responses may be geared toward competition, in terms of finding new markets for existing products and services or exploring an evolution of product or service offerings. Responses may also target resource access, in terms of establishing alternative access channels to required resources in order to maintain value co-creation or exploring ways to mitigate the need for these specific resources.

Overall, the move-response framework, illustrated in Figure 1, implies that platform owner moves can destabilise the positioning of complementors, prompting complementor responses that attempt to re-stabilise positioning. Although complementor responses are reactions to platform owner moves, they are not fully determined by them. Instead, self-directed complementors decide how they respond based on both the external challenges presented by the platform owner moves and internal factors like their resource endowment and their existing offerings. In what follows, the framework will guide our empirical exploration of move-response instances and sets the groundwork for understanding long-term response patterns and consequences for complementor positioning.

4 | METHOD

4.1 | Longitudinal research design and case context

Studying how complementors respond to major platform owner moves requires a long observation period for two reasons. First, these moves occur infrequently and whether a particular complementor is affected by it depends on the specific positioning of that complementor. Thus, platform owner moves and complementor responses occur

infrequently over long periods of time. Second, complementor responses will often take time to be put in place and show effects. Therefore, move-response patterns cannot be comprehensively captured by an observation period of a few months or even a few years but instead call for an unusually long observation period. Accordingly, our goal was to ensure that we would be able to follow cases over multiple years and several rounds of data collection.

For this purpose, we approached complementor organisations that were members of the software ecosystem of one of the largest enterprise software firms worldwide, which we refer to as ALPHA. ALPHA offers a large set of software solutions, some of them traditionally catered toward specific industries, such as healthcare, automotive, or media. Founded in the 1970s, the organisation quickly became a leader in the enterprise software market, mainly due to the success of its enterprise resource planning (ERP) system. Since its earlier days, partner firms have played a central role for ALPHA. They have long been critical in the sales process and for implementation projects. Neither the global sales nor implementation projects could be provided by ALPHA alone—despite its growing sales and consulting divisions. Moreover, partner firms began to offer some of these add-on features as standard software solutions building on ALPHA's enterprise software system. Although partnerships played an important role early on, the partnership network was formally implemented around 2005 when ALPHA started to market its systems explicitly as software platforms.

The governance of these partnerships has tremendously changed in the last decades. In particular, the platform ecosystem around ALPHA is on a trajectory toward more standardisation. There are two major reasons for this change. On the one hand, ALPHA evolved from a relatively regional organisation to a global player with clients all over the world, thus calling for a more scalable governance approach for their growing network of complementors. For example, over the years, ALPHA has gradually introduced formal partnership programs with a partner management organisation. The partnership managers working for this organisation were initially located at ALPHA's headquarters and offered access to a considerable personal network within ALPHA. Over time, the official partnership management organisation, especially for lower-level partnerships, has increasingly been shifted to call centres in remote locations.

On the other hand, technological trends have made the system more modular and there seems to be a general tendency to a reduced need for informal, personal coordination. Most notably, whereas clients used to install enterprise software on their servers on premises, customer firms are increasingly relying on standardised cloud solutions, which run on remote servers and are offered and used over the Internet (see also Schreieck et al., 2022). Therefore, ALPHA increasingly offers its solutions as a web-based software service. Although the shift has opened new opportunities for third-party applications, it has also reduced the general amount of informal, personal coordination when developing add-on functionality.

In selecting cases from ALPHA's ecosystem, one risk was that complementors would drop out from our sample before platform owner moves and responses could be observed, for example, by going out of business. This was avoided by selecting complementor companies that were somewhat established in their respective niche and had partnered with ALPHA for several years. We selected four complementor companies, which we refer to as MACHINE, ARCHIVE, PIM, and MEDIA. Over the course of the study period, all four complementors were adversely affected by and responded to several platform owner moves. Overall, we were able to study the responses of ARCHIVE, PIM, and MEDIA over a period of 14 years (i.e., 2007–2021) and the responses of MACHINE over a period of six years[1] (2007–2013). Table 1 briefly summarises key information about the four complementors.

4.2 | Data collection

Consistent with our interest in complementor responses, our data collection focused on the perspective of complementors. Accordingly, in-depth interviews with key informants from the four complementors represent our main data source. In line with our focus on major responses to important platform owner moves, our goal was to select high-level executives with a

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[1]MACHINE abandoned ALPHA's ecosystem after six years (see Section 5 for details).

long tenure and birds-eye view on key developments as our interviewees. Accordingly, from each complementor we interviewed the key executive in charge of developing responses to moves of the platform owner. This included CEOs, founders, and division heads. To get a full picture of the organisations, we also interviewed additional interview partners in two of the four complementor organisations (see Table 1). All interviews, except for the last round, were conducted in person and included visits to the company sites. The last round of interviews in 2021 was conducted via video calls.

To be able to capture move-response dynamics that stretch over long periods and to minimise recall bias, we interviewed these key informants at several points in time. For ARCHIVE, PIM, and MEDIA, we conducted interviews at five different points in time, summing up to six interviews for ARCHIVE and PIM and eight interviews for MEDIA.[2] For MACHINE—the complementor that terminated the formal partnership with ALPHA—we conducted four interviews at three different times. In total, we conducted 24 interviews between 2007 and 2021 as shown in Table 2.[3] Interviews were recorded and transcribed,[4] lasted between 45 and 90 min, and followed an interview guideline covering questions related to the types of platform owner moves that had occurred in the past or since the last interview, how the complementors had reacted to them, and information on how moves and responses affected the positioning of complementors.

Even though this study is first and foremost interested in the perspective of complementors, we also collected internal documents from ALPHA (e.g., ecosystem-wide documents such as the partnership charter, code of conduct, standard partner contract, and information provided through online partner portals) as well as publicly available doc-

TABLE 1 Overview of complementors and interviewees.

Complementor	(Initial) core business	Key informant	Additional interviewees	Observation period
MACHINE	Integration between ALPHA's system and various machines (e.g., vending machines)	CEO	n.a	2007–2013
ARCHIVE	Extension of ALPHA's system through functionality related to data archiving	Partnership and international sales manager	n.a.	2007–2021
PIM	Product information management systems for cross-media publishing	Founder and CEO	Sales director	2007–2021
MEDIA	Extension of ALPHA's systems through functionality and services related to the newspaper publishing industry	Head of product development	Head of industry solutions, head of marketing, head of media solutions	2007–2021

TABLE 2 Number and time of interviews.

Complementor	2007/2008	2009	2013	2016	2021	Sum
MACHINE	2	1	1			4
ARCHIVE	2	1	1	1	1	6
PIM	2	1	1	1	1	6
MEDIA	3	1	1	2	1	8
						24

[2]Some interviews at MEDIA were held in joint sessions with multiple interview partners.

[3]The interviewee had left ARCHIVE before the last interview, but could still respond to questions about moves, responses, and consequences at ARCHIVE in the previous years.

[4]We conducted and transcribed the interviews in the local language. The quotes used in the results section were translated to English by the authors.

uments that reported about ALPHA's moves (trade press articles, press releases, etc.). This data provided us with a rich and differentiated understanding of platform owner moves and was used to triangulate information gleaned from our interviews. In addition, we systematically recorded key financial (i.e., revenue, growth, profits) and organisational metrics (i.e., number of employees and acquisitions) on ALPHA for each year from 2006 to 2021 to get a general idea of how the platform owner's market position evolved over time. One author attended a one-day event at the occasion of ARCHIVE's 25th company anniversary, where key executives from ARCHIVE gave insights into milestones in ARCHIVE's history as an organisation and partner of ALPHA.

4.3 | Data analysis

4.3.1 | Establishing reliability and validity

Throughout the analysis, we applied several strategies to increase richness, reliability, and validity of the analysis. First, to eliminate misunderstandings and increase external validity, interviewees checked and confirmed the content of the initial set of transcribed interviews (Miles & Huberman, 1994). Second, to validate and enrich our understanding of platform owner moves, we triangulated data gleaned from interviews with information from documents (Yin, 2013). Third, the two researchers met regularly in in-person workshops and phone calls to cross-validate interpretations and refine emerging concepts and categories (Boyatzis, 1998; Miles & Huberman, 1994).

4.3.2 | Units of analysis

Each of the four investigated partner dyads contained multiple move-response instances that serve as embedded units of analysis for this study (Yin, 2013). Already during data collection, we used the broad distinction between platform owner moves and complementor responses to record major dynamics taking place in each dyad. As our data became more complete and our analysis more sophisticated, we were able to identify 21 move-response instances spread over the four partner dyads giving us the opportunity for systematic comparisons across cases and over time. This research design also enabled the analysis of "natural experiments" (Lee, 1989) that is, situations in which different complementors responded to similar platform owner moves (e.g., moves related to ALPHA's efforts to increasingly standardise platform governance) but in different ways and with different consequences.

4.3.3 | Coding and category refinement

We followed an iterative approach that moved back and forth between existing literature, data analysis, and theory-building through multiple, interdependent steps of concept and category development (Boyatzis, 1998; Yin, 2013). We started our analysis by recording all relevant data into timelines enabling a structured historical reconstruction of each case's key events, history, and evolution (Langley, 1999). For this purpose, we applied descriptive codes to our source material and immersed ourselves in the data by reading and re-reading the source material. During this analysis step, we converged on key events, when they took place, and how they affected the four dyadic partnerships, resulting in a case write-up that remained close to the data (Miles & Huberman, 1994). With these detailed timelines established, we then proceeded to a formal data coding phase.

In our first round of coding, we used the concepts of platform owner moves, complementor responses, and complementor positioning as sensitising devices. Derived from the cooperation and the competition perspectives (see sections 2.1. and 2.2.), these three concepts served as literature-informed up-front codes (Boyatzis, 1998). Given our study's objective of unpacking the intricate relationships between platform owner moves, complementor responses,

and complementor positioning, we approached our data corpus with the goal of developing a more nuanced coding scheme tailored to the unique characteristics of our cases but also informed by existing literature (Boyatzis, 1998). Through this abductive concept refinement process (Boyatzis, 1998), we delineated two categories of platform owner moves (restricting access to platform resources and increasing competitive overlap) and complementor responses (re-adjusting competitive overlap and re-gaining resource access).

For platform owner moves, the two categories restricting access to platform resources and increasing competitive overlap largely align with our literature-based understanding of cooperation and competition between platform owners and complementors. For complementor responses, a more nuanced coding scheme emerged from our empirical analysis. We found complementors to venture into new markets either within the focal ecosystem or beyond. Those choosing to remain within the focal ecosystem refine their offerings to better cater to their existing clientele, tap into different customer segments, or expand into new geographic regions (Sandberg et al., 2020; Tiwana, 2015). On the other hand, complementors diversify beyond their "home" ecosystem by adapting their solutions to cater to users of various platforms (Cennamo et al., 2018; Hyrynsalmi et al., 2016). Furthermore, complementors restore resource access by establishing alternative, and occasionally unofficial, channels, effectively bypassing imposed restrictions (Foerderer et al., 2019; Huber et al., 2017; Hurni et al., 2022). Complementors also develop access to a different set of resources (Huber et al., 2017; Hurni et al., 2022). For example, we found complementors to elevate their partnership tier within the primary ecosystem (Sarker et al., 2012; Wareham et al., 2014) or turn to resources provided by another platform owner (Cennamo et al., 2018; Hyrynsalmi et al., 2016).

As we scrutinised the consequences of moves and responses for the positioning of complementors, we noticed differing timescales of impact. Platform owner moves had immediate effects in that they destabilised the current complementor positioning, that is, complementors experienced restrictions in their ability to co-create value based on current platform-related resources and their existing product/service offering (Huber et al., 2017). Related responses led to immediate extra costs for creating workarounds and initiating changes to their positioning (Huber et al., 2017). For example, a platform owner move can limit the added value of a complementor's solution and a complementor may respond by beginning to develop new markets, for example, a geographic region where the platform owner is less active, leading to extra costs.

Conversely, some impacts emerged or accrued over longer durations and were tied to long-term patterns of complementor responses rather than isolated move-response pairs. These long-term impacts altered the complementor positioning, in terms of changing the complementor's cost structure, product and service offering, dependence on platform owner, and platform-related resources. For example, over several years, certain complementors became increasingly dependent on the platform owner, while others diversified their product and service offerings to explore adjacent markets, thereby becoming less dependent. This observation led to our differentiation between direct, destabilising effects on complementor positioning and protracted consequences for complementor positioning. Table 3 offers definitions and codes for the categories of platform owner moves, complementor responses, and consequences for complementor positioning.

4.3.4 | Exploring response archetypes and dynamic patterns

The final step of our data analysis focused on discerning empirical regularities linking platform owner moves, complementor responses, and complementor positioning (Boyatzis, 1998). For this purpose, we engaged in comparative analysis techniques leveraging tables and visual displays for systematic comparisons across cases and over time (Miles & Huberman, 1994). Our intent was twofold. First, we aimed to synthesise the empirically identified complementor responses into a collection of archetypes. This process resulted in three response archetypes, which we term *insist*, *pivot*, and *detach*. Second, we aimed at distilling relationships between moves, response archetypes, and complementor positioning. During this analysis, it became evident that there was no strict one-to-one correspondence between platform owner move and response archetype. However, discernible relationships between the

TABLE 3 Concepts, definitions, and codes.

Concept	Definitions	Codes
Platform owner move	*Increasing competitive overlap*, that is, the platform owner enters the territory of complementors and/or intensifies dyadic-level competition between platform owner and complementor (based on Foerderer et al., 2018; Hermes et al., 2020)	• Platform owner enters the horizontal or vertical niche of the complementor • Platform owner acquires a competitor of the complementor • Platform owner attempts to conduct a specific customer project with own development and implementation workforce rather than leaving the project to a complementor
	Restricting resource access, that is, the platform owner reduces the number and/or scope of resources that a complementor can access and dispose of (based on Huber et al., 2017; Hurni et al., 2022; Sarker et al., 2012; Wareham et al., 2014)	• Platform owner reduces or suppresses formal access to resources • Platform owner reduces or suppresses access to informal network • Platform owner reduces or suppresses access to product interfaces or foundational functionality
Complementor response	*Re-adjusting competitive overlap*, that is, complementor activities to change their field of activity in reaction to a platform owner move (Sandberg et al., 2020; Tiwana, 2015)	• Complementor compensates in the same market through product evolution or intensified sales activities • Complementor focuses on another market within the same ecosystem through re-adjusting the geographical focus/target clients or through developing new/entirely re-designed products • Complementor shifts to a different ecosystem by focusing on clients of another platform owner with a similar similar/different product or within a similar/different geographical market
	Re-gaining resource access, that is, complementor activities to restore access to resources or replace current access channels with new ones in reaction to a platform owner move (Foerderer et al., 2018; Huber et al., 2017; Hurni et al., 2022)	• Complementor obtains formal access to other resources in another ecosystem or different partner program/level • Complementor informally obtains access to same/other resources within the focal ecosystem or to other resource outside the focal ecosystem • Complementor shifts to another platform as foundation of its solutions
Complementor positioning	*Direct, destabilising effects on complementor positioning* denote the immediate impacts of a platform owner move on a complementor's ability to co-create value based on its platform-related resources and existing product/service offering and the incurring costs for ad-hoc measures as well as for initiating the re-stabilisation of the complementor positioning (Huber et al., 2017).	• Inability to co-create value because of lost access to ecosystem resources • Customers abandon complementor product/service • Costs related to formation and evolution of the formal partnership • Costs related to formation of personal network ties • Costs related to knowledge accumulation • Costs related to product evolution or development

(Continues)

TABLE 3 (Continued)

Concept	Definitions	Codes
	Protracted consequences for complementor positioning refer to the emerging or accruing implications that are tied to long-term response patterns, altering the complementor's positioning in terms of its cost structure, product and service offering, dependence on platform owner, and platform-related resources (Wessel et al., 2017).	Cost structure • Costs for maintenance of interpersonal relationships • Costs related to formal partner program Product and service offering • Products/service offering is increasingly specific to a niche • Product/service offering diversified within focal ecosystem • Product/service offering diversified beyond focal ecosystem Dependence on platform owner • Growing one-sided dependence on focal platform owner or other platform owners • Decreasing one-sided dependence on focal platform owner or other platform owners Platform-related resources • Platform-related resources are increasingly narrow/focused/specific to a niche (e.g., deep expertise about particular niche) • Platform-related resources are portable (e.g., from one platform to the other) • Platform-related resources are broadening within or beyond focal ecosystems (e.g., expertise about new customer groups or geographies)

moves, complementor responses, and complementor positioning became apparent when examining sequences of interconnected responses spanning extended periods of time. Thus, our final phase of theoretical development focused on unpacking these long-term response patterns and elucidating their theoretical role (Langley, 1999). This resulted in the classification of three dynamic patterns, which we term *progressive diverging*, *adaptive oscillating*, and *persistent insisting*. Our analysis further reveals how these intricate response patterns influence shifts in complementor positioning and help build resilience against future platform owner moves. We synthesise these insights in our process model of complementor positioning in platform ecosystems.

5 | RESULTS

5.1 | Platform owner moves and complementor responses at PIM and MACHINE

In what follows, we present detailed insights into two of the four cases, that is, PIM and MACHINE. In the case of PIM, despite major challenges, the partnership and also PIM itself were successful and PIM generally followed the trajectory of ALPHA to standardise and scale the network. Whereas PIM's success largely depended on its strong personal ties with ALPHA at the outset, toward the end PIM seemed less dependent on ALPHA, but still provided valuable add-on functionality for ALPHA's customers. By contrast, the partnership with MACHINE did not adapt to the evolving nature of the platform ecosystem. Although MACHINE was innovative and was working together with ALPHA on cutting-edge topics, its strong position at the beginning did not carry over as ALPHA standardised and scaled its partner network. MACHINE terminated the partnership in the process of our data collection.

We selected the cases of PIM and MACHINE because their contrast serves to illustrate key differences with regard to the response patterns analysed in our data. In this section, we use rich case narratives to unpack the full spectrum and complex dynamics (Langley, 1999) of platform owner moves and complementor responses from these two cases. In the cross-case analysis, we present summary evidence on all 21 move-response instances from our four cases.

5.1.1 | PIM

PIM was founded in 1999 and quickly established itself as an important player in the emerging field of product information management software. The original focus of PIM's solution was to create an integrated data base with product data and use it for cross-media publishing in various outlets. Initially, the focus was on the creation of catalogues and leaflets, but increasingly shifted to online channels on company websites. PIM was linked to ALPHA from early on. On the one hand, the main private investor of PIM used to have a leading role at ALPHA. On the other hand, PIM's headquarters were geographically close to ALPHA. ALPHA's managing director (MD) noted:

> "Being located in close proximity to ALPHA is, of course, important for us. I believe you can't underestimate these aspects, because communicative need for coordination, that's huge. That's why for us it's relatively easy to handle."

The personal links helped PIM to establish the formal partnership with ALPHA relatively quickly and receive the respective certifications. However, the MD stressed that the formal partnership and certification and even potential future steps like being on ALPHA's price list "don't help much if there is no demand for your topic." This was particularly challenging for PIM because the product category—product information management solutions—was not yet clearly established.

> "A key problem is the lack of clarity in the market, and the resulting sales costs" (MD).

This is where the partnership with ALPHA helped PIM immensely. On the one hand, the partnership with ALPHA was valuable for PIM because of ALPHA's reputation, which was particularly important for a young and small software company like PIM. On the other hand, there was a natural complementarity between PIM and some subunits of ALPHA. Most notably, the product and sales teams in the domains of product life cycle management and master data management had a strong interest to work with PIM as PIM's software filled a gap in ALPHA's portfolio and the ability to offer PIM's solution as a complement helped ALPHA's teams in customer situations.

Despite these strong ties between PIM and ALPHA and the initial successes, a move by ALPHA dramatically changed the situation early in the partnership. ALPHA acquired another company that had a solution in the context of product information management. Even though this solution was not the reason why ALPHA acquired the company, it still turned ALPHA and PIM into competitors with overlapping offerings.

> "That makes for a very unpleasant situation. The market does not fully understand what's going on, because in part we are in competition with ALPHA, and in part we are collaborating with ALPHA" (MD).

Interestingly, PIM's MD saw this move by ALPHA less as a competitive threat, because he was convinced that the product management information solution that ALPHA obtained through the acquisition was not comparable to PIM's solution. Still, he acknowledged that "unfortunately, this company also covers our niche, and ALPHA now has a solution available, even though a small one, and they cannot simply throw this away." The main consequence for PIM was that it "makes it very, very difficult to build a real strategic partnership where you approach the market

together." Most notably, given that ALPHA's units were supposed to rely on ALPHA's own solutions, the acquisition was basically a "showstopper" (MD) for joint initiatives.

PIM responded to this move by trying to recoup the anticipated losses. Specifically, PIM personnel approached and tried to convince other subunits within ALPHA's organisation of the superiority of PIM's solution. In particular, whereas PIM experienced some roadblocks in ALPHA's headquarters, the MD explained that PIM intensified interactions with ALPHA's units internationally:

> "What we do to keep this going is that we are very active internationally. Recently, I had visits to individuals responsible for this topic [within ALPHA] in the USA, in Japan, [in China and neighboring markets], and in Singapore for the entire Asian region, in order to promote our solutions within the ALPHA network. And to see what their view is, whether they should rely on a proven solution and collaboration for the topics product information management and cross-media publishing, or to push forward their own solution. The goal was to do promotion for us" (MD).

The MD explained that ALPHA periodically engages in a...

> "...white spot analysis, where the business teams have to decide whether the topic is a white spot or whether ALPHA does have a solution. This white spot analysis is currently not favorable for us, because they bought something. And now we have to work on this and tell them: 'Guys, this is only theoretically a product. That's not ready to be used in practice. There may be three to four references, but these don't really exist, forget about it.' This is the line of reasoning we are currently working on."

Both the MD and the sales director were aware of PIM's dependency on ALPHA:

> "If you have really dedicated your products specifically to one large partner, you become dependent. And once this stops working, it quickly turns into an existential threat" (MD).

The activities to build ties with other subunits of ALPHA were successful to some extent, and PIM was able to continue to co-create some value despite the new competitive situation. However, this came at substantial costs:

> "It's a lot of persuasion effort... It really takes perseverance. This can take several years, and you have to stay on the ball to get to something." (MD)

Yet, the MD considered these activities as very important because "if you don't have the sales teams on your side, if you are only listed somewhere, nothing happens. If the salesperson rather sells another 100 consulting days to code something instead of recommending your solution."

After some time, it became clear that ALPHA's acquired solution in the area of product information management could not be turned into a successful offering:

> "This company was not acquired because of its product information management solution. And during the last two years, it became clear that ALPHA has not managed to push this side topic into the markets and that there are technical difficulties. This led again to intensify the exchanges with us."

The initial idea was to create a close sales partnership where ALPHA's sales force would sell PIM's solution. Whereas ALPHA's product development teams wanted to push for an internal solution, the sales teams had an urgent need to offer to ALPHA's clients a high-quality solution for product information management—an area which was of increasing importance. Based on increasing sales pressure, ALPHA decided to formalise a sales partnership and even pondered the idea of a takeover:

> "However, then things turned out differently once more. The sales forecasts of ALPHA's sales organization for this solution were so high that ALPHA changed the strategy again and decided that it's necessary to consider an acquisition and not just a collaboration."

Despite serious considerations, the process came to a halt at some point for two main reasons. On the one hand, ALPHA realised "that the entire area product information management/cross-media publishing is not cleanly structured within ALPHA" (MD). On the other hand, according to PIM's MD, the financial crisis weighed heavily, and ALPHA's leadership decided that radical cost cutting was needed. As a result of this move to stop the contemplated acquisition of PIM, collaboration was reduced to a minimum. ALPHA engaged in re-organising its internal units concerned with product information management and also replaced the respective leadership teams.

PIM responded to this new situation by again pivoting regarding the subunits within ALPHA with which they could interact and co-create value. PIM was open to explore new opportunities, and it quickly turned out that the e-business/e-commerce unit within ALPHA was a good fit:

> "With them we work together very well. As opposed to this other segment [master data management] they don't have a strategy discussion right now, they can just collaborate with us. They don't have their own product that would be in competition with us. ALPHA has one, but this area doesn't. That's an important difference. They are interested in our products, our solution is cheaper than ALPHA's... So this is going well, we have done several projects with several customers together" (MD).

PIM also continued to collaborate with the master data management unit—that is, the unit whose restructuring had been partly responsible for stopping the acquisition talks—albeit at a smaller scale.

> "We now also work well with the original MDM [master data management] unit on a small scale. They are currently not that interested in these topics—cross-media publishing/product information management [due to the ongoing organisational restructuring]—and they generously pass over leads. Through all the interaction that has happened last year [when an acquisition was considered] this is well established, the individuals know each other very well on a personal level [individuals at the operational level who are still there]."

Around the same time, another change for the partnership dynamics was the induction of ALPHA's new CEO, who had a critical stance toward close collaboration with smaller partners. This had important implications for PIM.

> "I am still somewhat skeptical because ALPHA has a new CEO, who is much more EBIT-focused and more stringent and puts emphasis on attending to rules. A product partner, if it is supposed to be a closer partnership, now has to be present globally. It must have sales and consulting subsidiaries in the most important markets worldwide. ALPHA is not really interested anymore in local partners. In this regard, PIM is too small" (MD).

PIM was careful not to raise new concerns, so they responded by trying to evade ALPHA's move. On the one hand, PIM started to venture beyond ALPHA's platform:

> "I am not sure if we had this already when we talked last time, but we are now also supporting [ALPHA competitor]'s platform...That was really necessary because [ALPHA competitor] is gaining ground in the enterprise context" (MD).

On the other hand, the MD explained that PIM decided to "deliberately keep this [their partnership with ALPHA] low profile. We deliberately don't want to bring this to attention at higher levels. We do have the contacts, but we

don't do it. Because we don't want the discussions to start again. Because we don't want this internal product information management/cross-media publishing solution to interfere" (MD).

By doing this, PIM was able to keep costs related to the partnership with ALPHA and co-created value at reasonable levels for some time. However, a few years later, the collaboration based on the e-business and e-commerce solution slowed down. PIM's MD explained that the solution was simply not that good anymore:

> "It [ALPHA's e-commerce solution] is somewhat cumbersome and visually not appealing. So, it is generally not that salable. That's why the integration with our solution is not that helpful, it's even a burden for our salespeople."

Soon after, ALPHA fixed its weakness in the e-commerce space by acquiring a larger provider of e-commerce software. This, again, challenged the partnership with PIM. On the one hand, the question of acquiring PIM re-surfaced. The acquired e-commerce company "was interested in the immediate, rapid acquisition of PIM right after the company was acquired. The founder and CEO [of the acquired company] contacted us: 'One question: How much do you want?'" In the end, an acquisition was not considered further "due to the same topics and political conflicts [that had undermined PIM's acquisition earlier]" (MD). Still, the acquisition of this new e-commerce company created quite some turmoil. On the one hand, even though offerings of the newly acquired company had some overlap with the features offered by PIM, there was a clear communication that ALPHA would not consider the topic of product information management further:

> "Also toward our current customers, who, for example, have both components [PIM's and the newly acquired company's] and wanted to know how they should react. If they [ALPHA] would replace PIM and put everything into [the newly acquired company's system] or what they have planned. In an untypical way for ALPHA, they said relatively clearly: 'The product information management topic, forget about it! We do e-commerce.'"

On the other hand, the experiences from the acquisition ALPHA had done a few years earlier still weighed heavily.

> "This can change when it comes to the details, we know them long enough now. At the management level, this is the focus, like it was communicated originally [for the earlier acquisition]… But of course, on the street [i.e., in the field], there may be people that run in a different direction. A company has been bought, that company has a sales organization that has been active in that direction for several years—they are not going to stop everything from one day to the next."

PIM's response to this new turmoil was relatively calm and serene.

> "I think one has to say that we have developed a somewhat detached position. We have learned that an acquisition by ALPHA doesn't necessarily mean much. First, there is a lot of buzz, but over time, in such a big corporation, these things fizzle out" (MD).

Generally, PIM took a wait-and-see position toward ALPHA:

> "Of course, it is about staying on good terms and keeping options open. Nobody knows what's going to happen in the future… For example, something like [new ALPHA technology] or a gap in the context of [newly acquired company] or something else, and someone is going to jump at that. And before someone else jumps at that, we have to be there. That's what it's always about, but right now there is nothing."

Moreover, PIM began to further detach itself from the clear focus on ALPHA to reduce dependence. On the one hand, there was still a clear focus on ALPHA:

> "The thing is: 70% of our home market is ALPHA and the IT departments are very ALPHA-driven. They just want to see: Does this solution work with ALPHA? And we have this story on the personal side, with [person with former leading role at ALPHA] as part of our investors and because we personally know all the people."

On the other hand, PIM was very open to work based on other enterprise software platforms and also did so successfully:

> "That's going very well, yes. We have many mixed scenarios, that doesn't matter at all. We have the interfaces to the other systems and it really doesn't make a difference... In fact, there is no technical advantage. Technically, we could offer [ALPHA competitor] systems. [Other ALPHA competitor] systems are just as good as ALPHA systems" (MD).

This approach seemed successful for ALPHA as the company was growing, both nationally and internationally, and had established itself as one of the leading players in the field of product information management systems.

5.1.2 | MACHINE

MACHINE has been a partner of ALPHA since 2005, soon after the company was founded. Although there was substantial fluctuation among the employees, the number of employees was around 15–25 along the six years during which we followed MACHINE (2007–2013). During the studied time period, MACHINE could be characterised as a highly innovative software company in the sense that it was on several occasions working on topics before they became mainstream. For example, the company's focus at the outset was to connect machines, such as vending machines or wind turbines, with ALPHA's key system. In other words, Internet of Things and big data were discussed at MACHINE before they received widespread attention. The CEO noted that early on, "ensuring the transfer of large amounts of data was the biggest challenge from a technical perspective." Later on, again rather early, MACHINE turned to topics such as the use of mobile technology and smart phones at the workplace and electromobility.

From MACHINE's establishment on, the ties with ALPHA were very strong. MACHINE's main office was in a university town not far from ALPHA's headquarters, where ALPHA's research unit was located. MACHINE had a technical advisory council which featured two prominent individuals, the former long-term head of ALPHA's research unit and a prominent professor of computer science who was known for having a strong industry network, including ALPHA and many of its clients. MACHINE's CEO explained that although the information portals offered by ALPHA to its partners "are very good and comprehensive," he highlighted the great importance of personal contacts:

> "We obtain the useful knowledge through personal contacts. ALPHA's employees and ours know each other and if there is a problem, our people call their peers at ALPHA and say: We have a problem, could you please help us?"

Most notably, he stressed that "we have very good personal contacts to the research division. If we have a technological problem, we ask ALPHA's people if they can help us. It's as if you ask a colleague within MACHINE." Based

on these networks, MACHINE and ALPHA were successfully co-creating value, for example, through collaborating in joint software development or sales initiatives.

While the partnership seemed on a good trajectory and bound to grow further in the early years, ALPHA made a move to substantially slow down the growing value co-creation with MACHINE. While MACHINE was willing to and indeed did invest more into the partnership with ALPHA—most notably in terms of acquiring know-how specific to ALPHA and its enterprise platforms—these increasing investments were not reciprocated by ALPHA. Specifically, despite MACHINE's strong personal links to ALPHA, the CEO increasingly felt that getting specific information in advance, such as about new products at ALPHA, was difficult:

> "Nobody is going to tell you these things, because that would be complicated, as there are so many ALPHA partners, so they cannot serve these things to one partner on a plate. The other partners wouldn't find that very funny."

Still the CEO expressed that "more marketing support [from ALPHA] would be desirable." One specific wish that the CEO had noted was to be officially listed on ALPHA's price list, which would have meant that ALPHA's sales force would have been able to directly offer MACHINE's solutions to clients. But again, the CEO realised that this is a very distant possibility, as all partners ask the same questions:

> "Is our product going to be on your price list next week? When is your sales force going to sell our product? And can you tell us when ALPHA is going to acquire us? Especially the last one with a bit of irony, but you can imagine that if 2,000 partners are asking these questions, it's not a serious option for ALPHA."

MACHINE's CEO stated that ALPHA lacked the necessary interest in the domain to provide more specific support and engage in more intensive value co-creation:

> "Vending [machines] is not the right area for that. The number and volume of projects are not big enough. It's going to be difficult to go higher [in terms of partner level]."

As a result of ALPHA's move to restrict access to more resources, MACHINE tried to diversify and reduce the dependence on ALPHA to sell its adapters. This was done in two main ways. First, MACHINE entered a new, at the time innovative, domain—mobile applications. In particular, MACHINE developed solutions for car-sharing and for time keeping in organisations. Importantly, while some of these new mobile applications, such as car-sharing, were relatively far away from ALPHA's solutions, MACHINE's goal at this stage was not to move away from ALPHA:

> "For us this is not about car-sharing solutions, but about the technology that is in between. We have called it the mediation layer. Once we have this mediation layer, we can develop solutions for iPhone, Google, or Symbian, and can connect these to different applications [from ALPHA] by just linking the services to the mediation layer."

Second, MACHINE was looking for new sources of funding and more predictability. This was done through applying for publicly funded projects in the context of green mobility and mobility for the elderly. While ALPHA's research unit was involved in these publicly funded projects at the beginning, the goal now was also to "establish partnerships with other firms" (CEO).

As a result of ALPHA's move to restrict additional resource access and MACHINE's response to diversify, the co-created value between ALPHA and MACHINE stagnated. At the same time, costs for product development and knowledge accumulation remained high. While scalability and efficiency increased through ALPHA's introduction of

an online store for third-party software, this online store did not help MACHINE reduce costs. According to the CEO, the main reason for this was the following:

> "Our vending adapter is never sold by itself, but always as part of a larger project with other components. This is why it cannot be handled, managed, sold through the [online store]... For us, this is purely a marketing instrument. People find information [about MACHINE] if they look for it" (CEO).

The partnership was shaken up again at a later stage through a move by ALPHA that substantially increased direct competition with MACHINE. As mobile applications became more mainstream, this field became increasingly interesting for ALPHA and the platform owner started to offer own mobile solutions. After its shift from adapters connecting ALPHA's systems to machines toward mobile applications, MACHINE was among the first to develop mobile solutions based on ALPHA's systems.

> "For example, we developed a time management system based on ALPHA's platform for the iPhone. The idea was to enable consultants to do their project billing based on that. It was integrated with ALPHA's HR management module, and it worked perfectly fine. And we had several conversations with ALPHA to bring this solution to clients" (CEO).

However, even before ALPHA introduced its own solutions, ALPHA took steps to dramatically reduce access to its resources—in this case in terms of sales support:

> "We had clear agreements. And then they said: 'That's not possible right now, we cannot approach this customer right now, let us go to that one. No, that's not possible either, let us try in two weeks, or let us try in two months. And now we have this event, we have to wait for that.' And then came the news: ALPHA has its own [mobile] time management system. And I thought to myself: Ok, that must have been the reason. This is a type of behavior where I thought that's simply not ok!" (CEO).

In response to ALPHA's entry into the mobile space, MACHINE tried to leverage its good relationship with ALPHA to find a solution.

> "The market would have been large enough, there are so many consulting firms... We could have easily shared this market. We could have done this in a more collaborative way" (CEO).

However, finding such a collaborative solution was difficult for MACHINE because their counterparts were not dedicated personal contacts:

> "The contacts were responsible for the whole mobile area [at ALPHA] at the time. We were directed to the sales organization by them, and then we had these sales contacts. I had meetings with them where we discussed how we proceed, when we make appointments [with potential clients], what we do" (CEO).

Generally, it was difficult for MACHINE to establish personal networks in the mobile space, because "after two or three meetings we had a personal relationship, and the next time they said: 'I am not responsible for this anymore, you have to ask this or that person'" (CEO). Thus, MACHINE's response to ALPHA's move to enter into the mobile space was to try to re-establish and leverage personal networks, which led to substantial costs for MACHINE.

One particular reason why MACHINE had to re-build a new personal network was that around the same time, ALPHA restructured its research division, which dramatically decreased MACHINE's access to important contacts and resources:

> "In the meantime, the research division has more or less vanished into thin air. It only exists in bits and pieces, in part it has been restructured, in part it still exists, and in part nobody really knows" (CEO).

Over the course of the partnership the negative moves added up: First, MACHINE's discontinuation of its original adapter solution, then the competitive move and non-collaborative behaviour with regard to the mobile applications, and then the restructuring and partial dissolvement of the research division—where MACHINE had its most important personal contacts and collaboration partners within ALPHA. After this barrage of destabilising moves, MACHINE decided to terminate the partnership with ALPHA:

> "The current status is that roughly one year ago, we have officially ended the partnership with ALPHA, in the sense that we are not a certified partner of ALPHA anymore… We have decided to not prolongate the official partnership anymore. The term ended anyway, and we send a letter of cancellation informing ALPHA. Nothing came back, and that's how it was. We stopped paying and we were deleted from the official partner website" (CEO).

Since the termination of the partnership, MACHINE focused on two main activities. On the one hand, MACHINE started to develop mobile apps for various clients. On the other hand, MACHINE continued to work on publicly funded projects, mostly on electromobility and technology support for the elderly in the context of urban mobility.

5.2 | Cross-case analysis

In this section, we systematically compare move-response instances across our four cases in four interconnected steps. First, we summarise the 21 move-response instances that we encountered over the observation period across our four cases. Second, we compare the 21 move-response instances for similarities and differences to develop archetypical complementor responses. Third, we seek for dynamic patterns in terms of longer-term regularities in how complementors respond to moves. Fourth, we use these response patterns as a basis for developing our process theory.

5.2.1 | Move-response instances across cases

Our two case illustrations provided rich insights into eight move-response instances selected from the PIM and the MACHINE cases. Table 4 provides a summary of evidence for all 21 move-response instances found across all four cases. In the table, we describe and summarise these instances in detail using our upfront concepts and categories. Accordingly, Table 4 captures how platform owner moves destabilise the positioning of complementors and how complementors respond to these moves in various ways with varying consequences. We synthesise the distinct characteristics of these move-response instances by describing them along the a priori concepts and categories, that is, we chronicle platform owner moves (in terms of increasing competitive overlap and restricting resource access), complementor responses (in terms of re-adjusting competitive overlap and re-gaining resource access), and direct, destabilising effects on complementor positioning.

TABLE 4 Move-response instances across four cases.

#	Comple-mentor	Platform owner move		Complementor response		Direct destabilising effects on complementor positioning
		Increasing competitive overlap	Restricting resource access	Re-adjusting competitive overlap	Re-gaining resource access	
1	PIM	ALPHA acquires a company that has some solution overlap with PIM, even though this is not the motivation for the acquisition and the solution is not considered as mature as PIM's	• Uncertainty about what solution to promote reduces willingness of ALPHA to give sales support for PIM's solution	• PIM addresses ALPHA clients in other geographical markets • Starts connecting the solution to other enterprise software systems	• PIM develops informal network within ALPHA, but also turns to different units, especially on an international scale • Initiates formal partnerships with other platform owners	• Substantial additional costs for starting to build informal network to sales units within ALPHA in other regions • Moderate additional knowledge accumulation and product development costs for making the solution compatible with other platforms • Decreased value co-creation inside ecosystem
2	PIM	n.a.	• ALPHA seriously considers acquiring PIM, but once this acquisition does not materialise, collaboration goes to a minimum, also triggered by changes in key personnel	• Diversifies addressed customer needs by offering the solution also as an extension to ALPHA's e-business suite	• Develops informal network within ALPHA in different units, benefits from good contacts at operational level	• Moderate extra costs for nurturing informal network, PIM leverages existing contacts • Moderate extra costs for accumulating knowledge about e-business context • Challenged co-created value with ALPHA, but kept stable also because ALPHA contacts pass over leads to PIM that they cannot serve
3	PIM	n.a.	• ALPHA changes leadership, new CEO with new strategic direction, resulting in less promotion of partners through sales initiatives	• PIM focuses on diversifying addressed customer needs outside ALPHA by offering solutions that are compatible with other	• Develops formal partnerships and informal resource access outside ALPHA's ecosystem	• Moderate extra costs for initiating partnerships outside ALPHA • Moderate additional knowledge accumulation and product development

(Continues)

TABLE 4 (Continued)

#	Comple-mentor	Platform owner move — Increasing competitive overlap	Restricting resource access	Complementor response — Re-adjusting competitive overlap	Re-gaining resource access	Direct destabilising effects on complementor positioning
				enterprise software systems to which PIM's solutions can be connected		costs, as system becomes increasingly standardised and can plug into different enterprise software solutions
4	PIM	ALPHA acquires large e-business player	• Clear focus within ALPHA to promote own solution	• Continues to focus on addressing diverse customer needs across ecosystems in terms of making solution compatible with different platforms	• Engaging in additional platform ecosystems by building sales networks, primacy of ALPHA keeps disappearing	• High extra costs for initiating formal partnerships and nurturing informal ties outside ALPHA • Moderate additional knowledge accumulation and product development costs for standardising product and increasing compatibility across foundational systems
5	MACHINE	n.a.	• ALPHA limits access to additional resources, such as marketing support, thus not reciprocating MACHINE's steps to intensify partnership	• MACHINE develops mobile solutions for ALPHA's platform, in terms of a mobile HR tool that builds on and connects to ALPHA's enterprise software, in addition to solutions for connecting machines • Activities in new areas, such as e-mobility solutions, that are more independent from ALPHA	• MACHINE tries to build a new network with ALPHA's development and sales units in the contexts of mobile and HR • Aims at getting access to resources outside ALPHA, for example, through publicly funded projects with the help of ties to local university	• High additional costs for attempts to re-build informal network within ALPHA • High additional knowledge accumulation and product development costs outside ALPHA for developing new solutions • Decreased co-created value with ALPHA in the original field of activities (machine connectors)

TABLE 4 (Continued)

#	Comple-mentor	Platform owner move		Complementor response		Direct destabilising effects on complementor positioning
		Increasing competitive overlap	Restricting resource access	Re-adjusting competitive overlap	Re-gaining resource access	
6	MACHINE	n.a.	• ALPHA dramatically reduces resource access in terms of sales support, at the time not clear why, but later entered into direct competition by offering own mobile solutions	• Keeps addressing same clients in the current niches	• Focuses on re-establishing collaboration with ALPHA and with the same unit by trying to leverage personal, informal networks. Not successful despite good network into ALPHA. • Tries to maintain the partnership even though ALPHA is increasingly blocking attempts to collaborate	• Substantial extra costs for efforts to leverage sales network • Further decreasing co-created value with ALPHA
7	MACHINE	ALPHA enters direct competition by offering own mobile solutions	• Complete halt of marketing and sales support	• Aims to continue addressing current niche market	• Tries to re-establish its position and reduce competition by drawing on personal contacts to find collaborative approach, for example, ways to share the market. Not successful despite good network into ALPHA	• Substantial additional costs for continuing efforts to leverage sales network • Further decreasing co-created value with ALPHA
8	MACHINE	n.a.	• ALPHA closes its research division	• MACHINE aims to address new customer needs by providing app development for clients and continues to address client needs around e-mobility	• MACHINE unilaterally ends partnership and focuses on products and services independent of ALPHA, including the continuing reliance on publicly funded projects	• Substantial additional market development costs outside ALPHA • No more value co-creation with ALPHA

(Continues)

TABLE 4 (Continued)

#	Comple-mentor	Platform owner move		Complementor response		Direct destabilising effects on complementor positioning
		Increasing competitive overlap	Restricting resource access	Re-adjusting competitive overlap	Re-gaining resource access	
9	MEDIA	n.a.	ALPHA slows down media activities in MEDIA's home market, turning to foreign market because home market is relatively satisfied	• MEDIA continues to address current market, trying to achieve joint market address with ALPHA despite ALPHA's decreasing activity and interest in MEDIA's home market	• Revives informal network ties within same unit of ALPHA • Formalises partnership with ALPHA by becoming a certified partner	• High extra costs for formalising partnership through partnership contract • Moderate additional costs for nurturing informal network • Value co-creation exacerbated due to issues related to high licence costs and low usability of ALPHA solution
10	MEDIA	ALPHA decides to develop an editor for newspaper ads as this is required for one large project (large newspaper in a different geographical market)	n.a.	• Stops development of its own component to focus on add-on functionality, becomes even more specific, in terms of a niche within the niche, ALPHA move seen as an opportunity • Participates in conceptualization of new editor but its offers to co-develop are rejected by ALPHA	• Continues to focus on formal partnership and informal networks with same solution and team within ALPHA	• Moderate additional development costs for new add-ons
11	MEDIA	n.a.	• ALPHA reduces budget for advancing the editor for newspaper ads	• MEDIA decides not to renew certifications for some add-on features • Focus on other services and products in the ALPHA context, for example, implementation	• Focuses still on formal and informal relationship with ALPHA	• Decreasing value co-creation with ALPHA given the lack of further development of foundational software

TABLE 4 (Continued)

#	Comple-mentor	Platform owner move		Complementor response		Direct destabilising effects on complementor positioning
		Increasing competitive overlap	Restricting resource access	Re-adjusting competitive overlap	Re-gaining resource access	
				services or the integration of an external solution that provides a digital folder for all documents related to ad orders into ALPHA's systems via an adapter tool		
12	MEDIA	n.a.	• ALPHA substantially increases licence fees for clients	• Considers entirely moving away from focus on ALPHA • Licence fees as the trigger for MEDIA to consider alternatives to ALPHA, the general unhappiness with the partnership and the technological advances have been looming and play a central role	• MEDIA considers relying on another platform instead of ALPHA, or even self-develop entire media solution instead of complementing another one	• Substantial additional knowledge accumulation costs for scanning market for alternatives • Switch not implemented, but substantial additional knowledge accumulation and product development costs in store if switch to other platform or self-development had been implemented • Co-created value with ALPHA further decreasing
13	MEDIA	n.a.	• ALPHA dramatically cuts budgets for developing media-related features. As a result, clients would not use ALPHA's solution but look for other ways to include required functionality (e.g., self-develop, rely on other providers)	• MEDIA tries to diversify addressed customer needs, looking at customer needs that are not exclusively focused on ALPHA's platform ecosystem • Starts to build additional adapters to other, non-ALPHA systems	• Builds on other enterprise software and CRM solutions as the basis for own add-ons	• High additional knowledge accumulation and product development costs for developing new connectors to outside systems • Moderate extra costs for creating new formal and informal networks as market is small and

(Continues)

TABLE 4 (Continued)

#	Comple-mentor	Platform owner move		Complementor response		Direct destabilising effects on complementor positioning
		Increasing competitive overlap	Restricting resource access	Re-adjusting competitive overlap	Re-gaining resource access	
						• MEDIA is well-known in the industry • Co-created value within ALPHA's platform ecosystem further decreasing
14	MEDIA	n.a.	• ALPHA downsizes media capabilities both in consulting and in development	• Changes focus by not only providing software but also consulting services related to media industry	• Focus still on ALPHA but more independent from formal and informal partnerships	• High additional knowledge accumulation costs for initiating the development of new field of activity and capabilities
15	MEDIA	n.a.	• ALPHA's new enterprise software systems do not include industry solutions, such as the one for media organisations, anymore	• MEDIA envisions to considerably extend its offer in terms of services and add-ons, shifting its identity from a provider of add-ons and consulting services related to ALPHA to building middleware to integrate solutions from various vendors, including ALPHA, in best-of-breed fashion	• Focus on various platforms and systems as the foundation for own add-ons, middleware, and services	• Approach would involve high additional knowledge accumulation and product development costs for middleware platform (somewhat compensated by lower product development costs for connecting solutions due to increasing standardisation) • Decreasing value co-creation with ALPHA
16	ARCHIVE	ALPHA adds new features related to data archiving as a response to increasing pressure from clients (e.g., data retention management)	n.a.	• ARCHIVE maintains focus on its larger domain of data archiving • Develops new, advanced functionality to keep convincing customers of	• Continues to focus on same organisational units and systems within ALPHA	• High extra costs to keep obtaining insights into future developments by relying on informal networks

TABLE 4 (Continued)

#	Comple-mentor	Platform owner move		Complementor response		Direct destabilising effects on complementor positioning
		Increasing competitive overlap	Restricting resource access	Re-adjusting competitive overlap	Re-gaining resource access	
				the need for ARCHIVE's add-on solution		• Moderate additional knowledge accumulation and product development costs to develop new features
17	ARCHIVE	n.a.	• ALPHA cancels certification agreements and asks for re-certification	• ARCHIVE is somewhat disgruntled about cancellation of certifications but re-certifies as this is needed for marketing purposes • Maintains the focus on its specific domain of data archiving	• Continues to focus on same organisational units and systems within ALPHA	• High knowledge accumulation and product development costs for re-certification
18	ARCHIVE	n.a.	• ALPHA introduces new partner program relying on individuals in remote locations, which is considered less helpful by ARCHIVE	• Maintains the addressed customer needs in its specific domain of data archiving	• Reinforces local contacts with persons in charge for data archiving at ALPHA • Continues to focus on same organisational units and systems within ALPHA	• High knowledge accumulation and product development costs for membership in new partner program • High extra costs for nurturing personal network locally despite increasing hurdles
19	ARCHIVE	ALPHA introduces column-oriented databases, also based on the acquisition of a company in the context of data storage that ARCHIVE has provided an adapter for since several years	n.a.	• Although ARCHIVE's and acquired company's solutions are somewhat overlapping, ARCHIVE develops new niche solutions building on its head start with new technology; goal to	• Continues to focus on same organisational units and systems within ALPHA (close collaboration as ALPHA even approached ARCHIVE early on to bring in its expertise)	• Moderate additional product development and knowledge accumulation costs (ARCHIVE has already worked with the technology for several years)

(Continues)

TABLE 4 (Continued)

#	Comple-mentor	Platform owner move		Complementor response		Direct destabilising effects on complementor positioning
		Increasing competitive overlap	Restricting resource access	Re-adjusting competitive overlap	Re-gaining resource access	
20	ARCHIVE	n.a.	• Within ALPHA, ARCHIVE's main contact person moves to a different area. There was a very strong personal relationship with this person and even though the coordination with the new individuals is functional, it is not the same degree of access to specific knowledge	become key partner of ALPHA for this technology • Continues to focus on offering solutions in the same area of the new technology	• Continues to focus on same organisational units and systems within ALPHA • Tries to nurture personal network even without the strong personal relationship and the access to specific knowledge	• High extra costs for developing informal contacts to keep information flow at a level comparable as before • Decreasing co-created value because of lack of key advocate in combination with the new competitive situation
21	ARCHIVE	n.a.	• ALPHA changes leadership and culture, much more sales-driven, need to generate numbers, less attuned to the needs of small complementors	• ARCHIVE tries to diversify addressed customer needs to some extent • Create broader solution portfolio within ALPHA's ecosystem (e.g., focus on GDPR or analytics in the context of various modules)	• Continues to focus on same organisational units and systems within ALPHA but also broadens reach within ALPHA in line with extension of solution portfolio	• Moderate additional knowledge accumulation and product development costs for gradually extending solution portfolio and networks

5.2.2 | Archetypical complementor responses

By systematically comparing move-response instances, we identified three archetypical complementor responses, which we refer to as *insist*, *pivot*, and *detach* (Table 5).

First, complementors can respond to platform owner moves by *insisting* on the current positioning and focusing on the same niche. By insisting, complementors aim to re-establish or create access to critical resources, while continuing to build on the same software platform and even on the same module of that platform. If a complementor insists in response to a platform owner move that mainly increases competitive overlap, it means that it works toward adjusting its offering to be even more focused within the same niche, for example, by enhancing or developing new features that would complement the new solution offered by the platform owner. For example, instead of shying away from the competition when ALPHA developed a specific component (an ads editor) with functionality that was previously provided by MEDIA (move-response instance #10 in Table 4), MEDIA insisted and focused on an even more specific niche. Despite the associated product development costs, MEDIA began to develop new add-on functionality based on ALPHA's editor.

If a complementor insists in response to a platform owner move that reduces resource access, then this means that the complementor engages in activities to re-establish access to the same resources or find different channels to access the resources. This could involve aiming at strengthening the existing informal access to resources, for example, in terms of building new informal contacts, or formal access to resources, for example, in terms of advancing to a higher partner level or obtaining additional certifications. One example for insisting in response to a platform owner move that restricted resource access is MACHINE's response to when ALPHA entirely stopped marketing support for MACHINE once it offered its own mobile solutions (#7). Instead of walking away from the partnership or diversifying its activities (which it later did), MACHINE responded by trying to re-establish its positioning through drawing on personal contacts to find a collaborative approach to share the market.

Second, another archetypical way to respond to platform owner moves is to *pivot*, in terms of expanding product offerings and addressed markets as well as resource access within the focal platform ecosystem. Pivoting means that the complementor extends its product and service offering, but on the basis of the same platform owner's foundational system. Readjusting competitive overlap through pivoting often implies changes in terms of required resources. Thus, complementors that pivot within the focal ecosystem might aim at obtaining access to resources

TABLE 5 Archetypical complementor responses.

Response archetype	Re-adjusting competitive overlap	Re-gaining resource access
Insist	• Complementor focuses on the same niche • Gradual adjustment within the market niche through product evolution	• Complementor aims to strengthen informal access to resources within focal ecosystem • Complementor may obtain additional formal resource access by advancing in partner program (e.g., additional certifications, advance in partner level) • Complementor focuses on same product foundation
Pivot	• Complementor focuses on different niche within the same ecosystem • Complementor aims to adjust products to address different client segments or geographical markets	• Complementor attempts to obtain formal access to a different partner program and/or informal access to resources in a different organisational unit • Complementor shifts to another module of the focal platform owner's system
Detach	• Complementor extends to market outside focal ecosystem	• Complementor aims to obtain (initially mostly formal) access to resources outside focal ecosystem • Complementor solution evolves to connect to other platforms as foundational systems

through other formal and informal channels in the focal ecosystem. This could mean that complementors participate in a different partner program offered by the same platform owner or that complementors put effort into developing informal networks in a different organisational unit of the platform owner. Although complementors that pivot within the focal ecosystem will rely on the same platform owner's foundational system, the solution may connect to a different module of the platform.

Like insist, pivot can happen in response to moves that increase competitive overlap and those that restrict resource access—with similar outcomes. If responding to a move that increases competitive overlap by pivoting, complementors adjust their product and service offering, which will also affect what platform resources are needed to offer these products. If responding to a move that restricts resource access and the response is to resort to other resources within the focal ecosystems, complementors will likely also have to adjust product offerings or addressed clients so that these resources can be brought to bear. An example for pivoting within the focal ecosystem comes from ARCHIVE, that responded to ALPHA adding new features by pivoting within ALPHA's ecosystem (#16). Specifically, when ALPHA developed a new feature related to data retention management, ARCHIVE saw this as part of the natural lifecycle of its solution and pivoted by starting to develop other advanced functionality related to data archiving.

Third, complementors may *detach* in response to platform owner moves. In contrast to the pivot response, where the focus remains within the ecosystem, detach means that complementors respond to platform owner moves by extending beyond the boundaries of the focal ecosystem. A detach response implies a fundamental adjustment of product offerings and addressed markets outside the focal ecosystem. Complementors that engage in the detach response will also require new resources and new access channels. Naturally, in terms of the foundational system, a detach response outside the focal ecosystem means that complementors build their solution, at least partly, on a different software platform. Often, complementors will initially lack informal networks outside the focal ecosystem and therefore mostly rely on formal channels, such as the partner programs of other platform owners.

Complementors respond with the detach response to moves that increase competitive overlap or restrict resource access. In the former case, the impetus for extending beyond the focal ecosystem is to reduce competitive overlap, which ensues the need for different resources. In the latter case, the lack of resource access drives the response, but the outcome will be similar in terms of fundamentally adjusted product offerings and addressed markets as well as altered resource access. An example for detaching is PIM's response to ALPHA's move to acquire a large e-business player (#4), which had some overlap with the functionality offered by PIM, and the corresponding constraints for PIM to get access to ALPHA's resources, for example, in terms of sales support. PIM responded by detaching from ALPHA's ecosystem and making its solution compatible with other enterprise software system.

5.2.3 | Dynamic patterns of complementor responses

Figure 2 shows the long-term evolution of moves and archetypical responses exhibited by each case. The move-response dynamics varied across cases, but followed regularities over certain periods of time, which we next synthesise into dynamic patterns of complementor responses. We identified three such patterns which we refer to as *progressive diverging*, *adaptive oscillating*, and *persistent insisting* (see Figure 3).

One pattern we observed among complementors is to engage in *progressive diverging*, that is, complementors responded to ALPHA's moves by engaging in a sequence of pivot and detach responses. We observed this pattern in both the PIM and MEDIA (in later stages) cases (Figure 2). Through progressive diverging, PIM and MEDIA increasingly broadened their product and service offerings. For example, PIM first pivoted in terms of extending its offerings within ALPHA's platform (e.g., by engaging with ALPHA's sales teams in different geographical areas (#1) or by offering products based on different modules of ALPHA's platform (#2)). Over time, based on the broader offerings and the more generally applicable resources and knowledge, PIM was increasingly able to also offer products and services based on competing enterprise software platforms (#3, #4), that is, PIM evolved from pivoting to detaching.
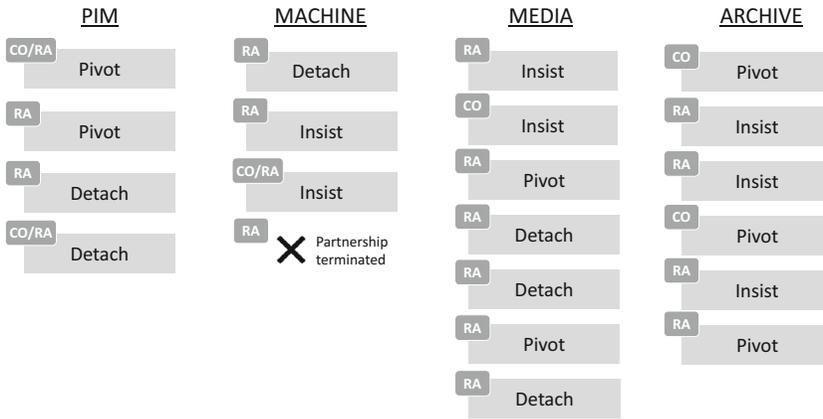
Notes: CO, platform owner move increasing competitive overlap; CO/RA, platform owner move increasing competitive overlap and restricting resource access; RA, platform owner move restricting resource access.

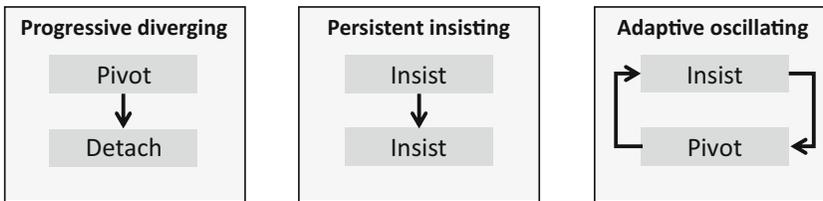**FIGURE 2**   Summary of cases as sequences of archetypical responses.

FIGURE 3   Dynamic patterns of complementor responses.

Another dynamic pattern we observed is *persistent insisting*, in terms of repeatedly engaging in insist responses. This pattern was applied in the MACHINE case as well as the earlier periods of MEDIA's partnership. As the platform owner kept constraining resource access or increased competitive overlap, these complementors did not move into adjacent market spaces or outside ecosystems but instead attempted to stay in their established niches or focus even more on that niche. To make up for the more constrained resource access, these complementors started to increasingly rely on informal channels such as close interpersonal ties with ALPHA employees. For example, MACHINE was putting substantial effort into strengthening personal ties once ALPHA refused sales support for one of MACHINE's products (#6).

Yet another pattern is to dynamically transition between pivot and insist responses. This pattern, which we refer to as *adaptive oscillating*, was applied by ARCHIVE. In light of ALPHA's repeated moves to constrain resource access and to include features also offered by ARCHIVE in its own offering, ARCHIVE shifted between insisting on resource access and market niche on the one hand and pivoting to adjacent, unoccupied market spaces on the other hand. As long as value co-creation was possible, ARCHIVE insisted, but the complementor was also not hesitating to move away from the current niche once competitive overlap increased or resource access ceased. Importantly, it was the specific resources in their current niche, in terms of personal networks and niche-specific knowledge that acted as an early-warning system for obsolescence and promising future fields of activity. In other words, while insisting, ARCHIVE already prepared their future pivoting. For example, when ALPHA acquired a software company focusing on column-oriented databases (#19), ARCHIVE could rely on its existing technological knowledge and personal networks that it had developed through its insisting responses (#17, #18) when refocusing their effort toward a different niche.

5.2.4 | A process model of complementor positioning in platform ecosystems

The insights from the preceding cross-case analysis are synthesised in our process model of complementor responses in platform ecosystems (see Figure 4). The model shows that platform owner moves repeatedly destabilise the positioning of complementors by increasing competitive overlap or restricting resource access for a particular complementor. Although they destabilise complementor positioning, these moves alone do not determine how the complementor responds, nor how the platform partnership evolves. Instead, patterns of complementor responses over extended periods of time drive the long-term trajectory of complementor positioning and with it the complementor's resilience to future platform owner moves. In what follows, we describe how patterns of complementor responses affect complementor positioning along its four dimensions.

Complementors that engage in progressive diverging change their *product and service offering* such that it is more diversified—first within the ecosystem but increasingly across ecosystems. Such a portfolio approach comes with considerable *costs* for multi-homing, as the need to build up knowledge and cultivate *platform-related resources* across ecosystems entails considerable effort. The advantage of such an approach for complementors is that the *dependence* on the focal platform owner is considerably reduced, building resilience for future platform owner moves in the long-term. For example, through increasingly diversifying its offerings and its resources, PIM became more and more independent from ALPHA. While co-created value was shifted outside ALPHA's ecosystem, progressive diverging also made PIM resilient. For example, when ALPHA acquired PIM's direct competitor later in our observation period (#4), the impact on PIM was less severe and more easily managed than when a similar event occurred earlier (#1), despite the previously acquired solution being of notably lower quality. The reason for this is that the sequence of responses following the pattern of progressive diverging made PIM less dependent from ALPHA. Hence, through progressive diverging complementors build up a diversified range of offerings and multiple footholds—and while value co-creation might be more transactional with any single platform owner, they also become less vulnerable to future adversarial moves by the focal platform owner.
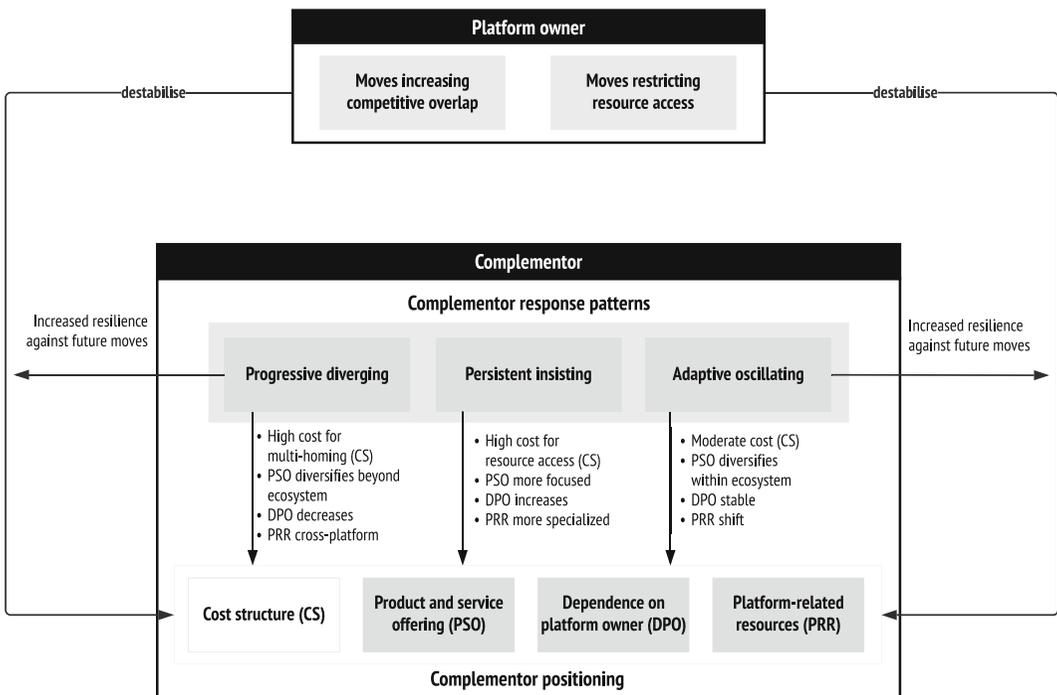

FIGURE 4 Process model of complementor responses in platform ecosystems.

For complementors that engage in the response pattern of adaptive oscillating, the *product and service offering* is constantly shifting within the focal platform ecosystem. Whenever an offering is threatened because the platform owner increases competitive overlap or restricts resource access, the complementor would pivot to another niche within the focal ecosystem, in terms of gradually altering the *product and service offering* and adjusting its *platform-related resources*. Given that this is done gradually and through re-using specific knowledge, the *costs* are moderate. Importantly, although *dependence* from the focal platform owner is not reduced, complementors engaging in adaptive oscillating use a specific approach to manage this dependence. In particular, these complementors use their platform-specific resources to engage in both, exploitation and exploration. They engage in exploitation by using their resources to co-create value in the current niche. They engage in exploration by using these resources to receive early signals about future offerings of the platform owner—to develop an understanding of promising future niches, and to have a head start in evolving their product and service offering and required resources. For example, by adaptively oscillating between insist and pivot, ARCHIVE leveraged synergies between successive responses: Using the knowledge acquired by insisting on preferential resource access, ARCHIVE could more carefully prepare and time its pivoting responses. Hence, by developing this ambidextrous routine, complementors that engage in adaptive oscillating do not reduce dependence but manage it effectively, thereby building resilience against future platform owner moves.

Whereas complementors that engage in progressive diverging and adaptive oscillating build resilience by reducing dependence or proactively managing it, complementors that engage in persistent insisting accept *dependence* by going "all in." These complementors have to bear the costs for continuously ensuring access to *platform-specific resources* and for building a focused *product and service offering*. Complementors that engage in persistent insisting do so in the hope of a future breakthrough in the partnership, and accept the threat of an increased vulnerability of complementors vis-a-vis platform owner moves. Thus, this strategy comes with considerable risk: To maintain their increasingly untenable market position, the complementors' core product and service offerings must rely on resources that the platform owner could restrict access to at any time. This risk is best exemplified by the MACHINE case, in which the partnership between platform owner and complementor was abruptly terminated after the platform owner closed its internal research unit that also served as MACHINE's entry point into valuable resources from ALPHA (#8).

6 | DISCUSSION

This study was motivated by two objectives: First, to conceptualise and empirically explore how complementors respond to platform owner moves that destabilise their positioning, and second, to discern dynamic patterns of responses and understand their consequences for complementors' positioning. To achieve these objectives, we have drawn on a 14-year longitudinal study, examining 21 move-response instances across four platform partnerships. To address the first objective, we developed three archetypical complementor responses (i.e., insist, pivot, and detach), which we characterised along two categories (i.e., re-adjusting competitive overlap and re-gaining resource access). Turning to our second objective, we observed that over time, complementors systematically combine these archetypes into three distinct long-term response patterns: progressive diverging, adaptive oscillating, and persistent insisting. We synthesised the insights from our longitudinal investigation into a process model of complementor positioning in platform ecosystems.

Our findings have important implications for research interested in the management of complexities and dynamics of co-opetition in platform-based co-creation, point to the importance of complementor responses for creating resilient software ecosystems, and inform the current discussion around platformisation of incumbent firms. We discuss this next.

6.1 | Theoretical implications

Research in the organisational tradition of platform ecosystems largely bifurcated into two isolated streams—the cooperation perspective interested in the combination and fusing of resources (e.g., Huber et al., 2017; Sarker

et al., 2012) and the competition perspective interested in platform owner entry into complementor territory (e.g., Eisenmann et al., 2011; Foerderer et al., 2018). Our conceptualisations of platform owner moves and complementor responses bridge these previously disconnected research streams. Interestingly, our findings show that there is no one-to-one correspondence between platform owner move and the complementor response: a competitive move does not invariably lead to a complementor response that reduces competitive overlap, and similarly, a restriction in resource access might not always result in a direct attempt to regain that access. Instead, our study unravels regularities in long-term response patterns showing how over extended periods of time cooperative and competitive activities of complementors do not merely take turns but feed into each other. This is perhaps best exemplified by the response pattern of adaptive oscillating, where complementors alternate between insist and pivot: When confronted with moves that increase competitive overlap, complementors do not hastily pivot to adjacent markets. Instead, they engage in responses that secure additional resources and in this process, they cultivate deep relationships with platform owner personnel and platform-specific expertise. Subsequently, complementors leverage these deepened relationships and expertise to accurately pinpoint attractive niches to pivot into.

Recent studies have underscored the acute risks complementors face when collaborating with platform owners (Hurni et al., 2022; e.g., Zhu & Liu, 2018), viewing complementors as platform-dependent entrepreneurs (Cutolo & Kenney, 2021; Rietveld & Schilling, 2021). This perspective portrays complementors as potential collateral damage in the wake of decisions platform owners take for their own benefit. At first glance, our findings are in support of this notion. Our study has documented numerous instances where platform owners encroach upon complementor territory and strip access to vital resources, thereby destabilising the positioning of complementors. However, while our findings recognise the criticality and impact of platform owner moves, our 14-year study of complementor responses shows that whether and to what extent these risks and challenges materialise is to a significant degree driven by the deliberate and self-determined response patterns of the complementors. Our process model of complementor positioning provides a nuanced understanding of the complexities and dynamics between moves, responses, and positioning. It shows that the longer-term positioning of complementors is not merely a product of individual platform owner moves but emerges from how complementors respond to these moves over extended periods of time. While platform owners do have the power to engage in moves that jeopardise the positioning of complementors, it is equally imperative to acknowledge the agency of complementors. Their capacity to not only select from a repertoire of responses but also to combine these responses in ways that foster resilience against future platform owner moves (as seen in adaptive oscillating and progressive diverging) shows that complementors are architects of their own fate. This insight adds to recent research that discusses the role of complementors as platform-dependent entrepreneurs whose destiny hinges on platform owners (Cutolo & Kenney, 2021; Rietveld & Schilling, 2021), by showing that complementors can take a proactive role, even in the face of adversarial platform owner moves.

Interestingly, these insights offer an intriguing parallel with biological ecosystems. Studies on biological ecosystems have emphasised the pivotal role individual members' responses play in fostering ecosystem-level resilience—i.e., an ecosystem's capacity to maintain stability amidst environmental shifts (Willis et al., 2018). Our research insinuates similar ecosystem-level effects in human-made ecosystems. Specifically, the response patterns unpacked through our findings enable complementors to recalibrate and achieve an equilibrium for the partnership through intentional shifts in complementor positioning. Cumulatively, such dyadic-level adaptations likely reinforce overall resilience of the ecosystem.

Our research not only helps reveal the long-term dynamics of platform partnerships but also offers insights for studies centered on the specific context of enterprise software platforms (see e.g., Huber et al., 2017; Hurni et al., 2021; Sahaym et al., 2023; Sarker et al., 2012; Schreieck et al., 2022). Enterprise software ecosystems are markedly different from other empirical contexts, such as mobile ecosystems (Foerderer et al., 2021) or crowdworking (Möhlmann et al., 2021). Our examination of 21 move-response instances enriches our understanding of ecosystem entrepreneurship and viable business models in this specific setting. A particular point of interest is the response archetype of pivoting. Although an integral part of the dynamic response patterns of both progressive diverging and adaptive oscillating, this micro-level response has not been as prominently explored as more familiar complementor responses such as multi-homing (e.g., Cennamo et al., 2018), which is embodied in the detach

archetype. Pivoting facilitates complementors to venture into neighbouring niches by repurposing platform owner-specific expertise and inter-personal connections. It enables them to diversify yet persistently reapply their platform-specific knowledge and capabilities, thereby gradually extending their scope without growing overly dependent on the platform owner. Pivoting might be particularly evident and play a central role in enterprise software ecosystems. Given the complexity of developing, marketing, and selling enterprise systems, the different organisational units of platform owners in this industry often have competing priorities (Schreieck et al., 2022), so that the particular ambitions of different departments, regions, or units do not necessarily coincide. Pivoting is a response archetype that capitalises on these discrepancies, suggesting it as a unique, context-specific contribution to research on enterprise software ecosystems (Hong et al., 2013).

Our study provides rare insights into the challenges of creating a platform ecosystem under "brownfield" conditions, that is, in situations in which a platform and its ecosystem are not built from scratch—the proverbial "greenfield"—but from an already established network of key partners. Enterprise software vendors have relied for decades—and long before app stores and platforms for smartphones even existed—on large networks of implementation partners and independent software vendors (Kude et al., 2012). Our cases have allowed us to trace how the transition toward a formal ecosystem model played out from its beginning in 2005 (when the partner ecosystem was formally established) to 2021 (when ALPHA was widely considered to be a leading enterprise software platform owner). The central focus of our investigation was how pre-existing partners were affected by the platformisation moves of the platform owner and how they responded to them over long periods of time. Thus, while there is ample research on the creation of platforms under greenfield conditions (Baldwin & Clark, 2000; Gulati et al., 2012; Parker & Van Alstyne, 2005), our research emphasises the challenges inherent in adopting a platform approach under brownfield conditions. In greenfield cases, the primary focus often rests on challenges like modular platform design, technical standards, and ecosystem governance (Baldwin & Clark, 2000; Gulati et al., 2012; Spagnoletti et al., 2015; Wareham et al., 2014). In contrast, our findings show that under brownfield conditions the platformisation process is not only technically but socially complex because the effects of platform owner moves are heavily influenced by the responses of the complementors, suggesting that a focus on technical design issues may fall short. Our study unpacks the trade-offs that platform owners must consider when attempting to shift legacy partnerships into the regime of platform governance: Certain modes of co-creation that are more synergistic and require closer interaction may potentially be destroyed (Sahaym et al., 2023; Sarker et al., 2012)—unless platform owners give their various organisational units the leeway to let them thrive.

6.2 | Limitations and future research

We acknowledge that giving primacy to an unusually long observation period required us to make some compromises. We needed to select interviewees with a birds-eye view on long-term development—possibly at the risk of overlooking more ephemeral micro-level aspects that might have helped us arrive at a more complete picture of complementor responses. Therefore, we call for research that further enriches the responses unpacked in this paper by focusing on the complex dynamics that play out within both the platform owner and the complementor organisations (e.g., across different hierarchical levels or between different domains).

Moreover, we encourage future research to extend our findings in at least two promising directions. First, future research should further explore the factors that influence why complementors engage in certain response patterns and when they abandon one and engage in another one. Whereas our study suggests that one-to-one correspondence between platform owner move and complementor response in terms of a deterministic, causal relationship may not be feasible to establish, the reasons that entice complementors to combine archetypes over time in a certain way may be an interesting question for future research. Our rich case narratives and descriptions of complementor responses provide first insights into the difficult trade-offs between short- and long-term consequences that could serve as foundation for such a study.

Second, to the extent that complementors partner with multiple platform owners (Cennamo et al., 2018), we expect that the moves of different platform owners will affect complementor responses jointly rather than independently. The moves of competing platform owners may be inconsistent, thus confronting complementors with even more difficult-to-resolve trade-offs. Future research on complementor responses to moves from different platform owners would lead to novel insights into the important question of how forces situated in different ecosystems shape the behaviours of the members of these ecosystems. Such insights have thus far been mostly absent in information systems research and its reference disciplines (McIntyre & Srinivasan, 2017).

6.3 | Managerial implications

Our findings have important implications for managers of both complementors and platform owners. For managers of complementor companies, our findings suggest that they need to acknowledge that their own managerial agency is always conditioned by what the platform owner does. The moves of the platform owner to a considerable extent shape the circumstances in which complementors can position themselves. Therefore, we recommend that complementors should try to actively influence the platform owner to create favourable conditions. Yet, for obvious reasons, platform owners are unlikely to listen and give in to the needs of a single complementor. One option for complementors could be to create their own associations and interest groups that advocate for the distinct needs of complementors directly with the platform owner (Huber et al., 2023). These should be legally and economically separate from more traditional industry associations of the software industry, which usually combine these actors in a single organisation and are often dominated by large platform companies.

Because the effects of platform owner moves hinge on the complementors' responses, platform owners need to be mindful about the fact that they can only achieve the goals that they desire if complementors follow suit. Therefore, when making their own moves, platform owners are recommended to give complementors the time and opportunity to find a new positioning. To achieve this, our findings suggest that if possible the moves of platform owners should be predictable and announced and communicated to complementors early and openly. Otherwise, they risk that complementors will not follow suit and instead try to work against the platform owner move and its intended effect.

DATA AVAILABILITY STATEMENT
The data are not publicly available to maintain anonymity of study participants. A full summary of the data is included in the manuscript.

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