

Sustaining complementor engagement in digital platform ecosystems: Antecedents, behaviours and engagement trajectories

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Abstract

Digital platform ecosystems increasingly dominate the enterprise software domain, and the persistence of platforms depends on the sustained engagement of complementors. However, there is a limited understanding of its antecedents, complementors' evaluation of antecedents and the manifestations and dynamic changes of complementors' engagement. Therefore, we investigate complementors' engagement within platform ecosystems over time. We draw on actor and stakeholder engagement from service research to conceptualise complementor engagement (CE) and create an integrated empirical understanding of CE and its dynamics in digital platform ecosystems. Our embedded case study builds on 30 interviews with complementors in Anubis and Osiris enterprise software platform ecosystems. Inductive data analysis reveals five CE antecedents: platform resources and rules, platform value proposition, platform agents, customer needs and other complementors' value propositions. The antecedents are associated with three CE behaviours: generating, networking and synchronising. Further analysis of CE over time resulted in 26 different sequences representing stable and changing engagement trajectories, the latter comprising selective, growing and abating engagement as subcategories. We show how complementors' evaluations of antecedents lead to behaviour

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changes, providing a novel perspective on the dynamics underlying CE. Finally, we link complementors' evaluation outcomes to their (dis)satisfaction, contributing to the discussion on what drives and impedes CE. The findings implicate the debate on dynamic platform governance and inform platform owners about using cooperative and competitive approaches in the short and long term.

KEYWORDS

case study, complementor engagement, digital platform ecosystem, ecosystem dynamics, persistent platforms, platform governance

1 | INTRODUCTION

Digital platform ecosystems in the enterprise software industry depend on the continuous resource contributions of autonomous third parties subsumed as *complementors* (Bonina et al., 2021; Tiwana et al., 2010). Those complementors develop complementary products or services that enhance the platforms' functionalities, which makes them the growth engine of digital platforms (Foerderer et al., 2019; Sarker et al., 2012). Consequently, platform owners such as Microsoft, Salesforce, and SAP are challenged to sustain the engagement of thousands of complementors (Altman et al., 2022; Li & Kettinger, 2021).

Research on digital platforms has created a thorough understanding of factors and strategies that attract complementors and lead them to adopt a particular platform (Caillaud & Jullien, 2003; Evans & Schmalensee, 2010). While those studies help explain platform emergence from the perspective of platform owners, they view complementor engagement (CE) as a binary choice made at the outset (O'Mahony & Karp, 2022). Only recently have studies intensified their focus on complementors and informed IS research on their dynamic engagement (Hurni et al., 2022). For example, Google's market entry with its photo application changed the engagement of complementors with similar applications (Foerderer et al., 2018). Another example is the change in CE after attending developer conferences (Foerderer, 2020). Both examples illustrate that CE can change over time and that platform owners need to monitor this engagement to effectively govern the platform's evolutionary trajectory (H. Li et al., 2022; McIntyre et al., 2021).

Research on platform governance, which is deeply rooted in IS research (Tiwana et al., 2010), investigates the interplay of platform governance and CE. Recently, for instance, studies examined how perceived governance adequacy influences CE (Huber et al., 2017; Hurni et al., 2021). In addition, studies have shown that a change in platform governance can backfire, leading to adverse engagement (Karhu et al., 2018). While those studies show the interdependence between platform governance and CE, they call for future research to further unpack interactions between platform owners and complementors.

The challenge of governing sustainable third-party engagement is well-known in service research and marketing practice related to firm-customer relationships. Vast practical and scholarly interest in the problem led to the concept of *customer engagement*, which aims to secure continuous interactions between firms and their customers (Brodie et al., 2011; Van Doorn et al., 2010). Later, *actor engagement* (Alexander et al., 2018; Storbacka et al., 2016), and more recently, *stakeholder engagement* (Hollebeek et al., 2022) have gained increasing attention. Although actor engagement considers engagement to follow a stable process independent of its context, stakeholder engagement proposes the consideration of differences in context, roles and goals, assuming engagement states fluctuate over time (Hollebeek et al., 2022). In addition to these conceptual advancements, variations in engagement over time and its application to specific contexts remain unexplored (Hollebeek et al., 2022).

The concept of engagement from service research can inform research on CE and platform governance in IS. By contextualising the engagement concept towards CE (Hong et al., 2014), research on digital platforms can get unique insights into the dynamics of CE and its constituent elements. Furthermore, those dynamics can provide a deeper understanding of the antecedents implicating engagement and their changes, such as adjustments of governance mechanisms from competitive to cooperative strategies, to sustain CE over time (Huber et al., 2017; Jacobides et al., 2018). Hence we go beyond current conceptualisations of CE that reduce the concept to the mere contribution of complementarities and compliance with rules and processes (Saadatmand et al., 2019; Wang & Miller, 2019). Ultimately, a better understanding of CE is integral for research on platform governance due to the interdependent nature of the two concepts (Chen et al., 2022). Therefore, this study has two objectives:

1. to contextualise CE from the engagement literature; and
2. to provide an integrated theoretical understanding and empirical evidence of dynamic CE in digital platform ecosystems.

First, we synthesise the literature on actor and stakeholder engagement, resulting in the service-research-informed contextualisation of CE in the IS domain. We define CE as *a complementor's state-based, partly volitional resource contribution in its interactions, activities, and relationships in a digital platform ecosystem*. Hence, we use CE to (1) explain the antecedents and manifestations of complementors' engagement in digital platform ecosystems, (2) examine and relate changes in antecedents and manifestations, and (3) account for variations of CE in digital platform ecosystems over time.

Based on this contextualisation, we use CE as an analytical lens and conduct an embedded case study of two digital platform ecosystems in the enterprise software industry. The complexity and dynamics of this domain make it particularly suitable for investigating the dynamic changes in CE. Based on 30 interviews with complementors over 18 months, we identified five antecedents that lead to three main CE behaviours. Each evaluation phase and expressed behaviour constitutes one engagement stage. Our analysis further reveals how antecedent changes implicate behaviours in subsequent stages through complementors' evaluations and how those stages form CE trajectories. As a result, we further identify four types of engagement trajectories and describe 26 instantiations.

The results inform the discussion on dynamic CE and how platform governance as one antecedent can change those dynamics. First, we inform the literature on dynamic CE by revealing antecedents of CE and how they unfold as dynamic CE trajectories (Altman et al., 2022; Li & Kettinger, 2021). Furthermore, we describe how complementor (dis)satisfaction can increase or decrease their future engagement. Hence, we add to the literature on complementor participation strategies (Cenamor, 2021; Hurni et al., 2022) and how complementors shape their environments (Wang, 2021). As platform governance is one important antecedent, we also contribute to discussions on dynamic platform governance to manage CE over time (Foerderer et al., 2019; Hurni et al., 2022). Our findings suggest that cooperative and competitive governance approaches have different implications for CE in the short and long term. Combining both approaches leads to sustained CE, enabling platform owners to build persistent platforms.

2 | LITERATURE REVIEW

2.1 | The engagement of complementors in digital platform ecosystems

Digital platform ecosystems are semi-open collectives of actors around a (largely) stable platform core (Bonina et al., 2021; Tiwana et al., 2010).¹ The relevant stakeholders comprise the platform owner providing the platform, complementors offering complementary products and services, and customers using the platform and its

¹We will use the terms *digital platform (ecosystem)* and *platform (ecosystem)* interchangeably in the following.

complements according to their needs (Hein, Schrieck, et al., 2019). As autonomous third parties, complementors can choose whether and what resources to invest in a particular platform (Hurni et al., 2021, 2022; Tan et al., 2020). In this setting, platform owners want to attract and engage complementors sustainably. Nevertheless, complementors engage with varying intensity (i.e., resource contributions) over time, creating a dynamic and interactive context, which we will introduce below.

2.1.1 | Variations in the engagement of complementors

Complementors participate in platform ecosystems to co-create and capture value from their interactions with others (Ceccagnoli et al., 2012; Iansiti & Levien, 2004). The contributions of complementors (e.g., products and services) determine the platform ecosystem's innovative potential and generativity (Thomas & Tee, 2022) and address customer needs (Parker et al., 2017; Tan et al., 2020). They act autonomously and contribute or withdraw resources from one or more digital platform ecosystems (Engert et al., 2022; Hurni et al., 2022). However, this autonomy can be undermined by increased dependence on the platform, as with online marketplaces or mobile applications, forcing complementors into submission (Cutolo & Kenney, 2021; Hurni et al., 2022).

Generally, the autonomy of complementors leaves them to make strategic choices that affect their offerings and, thus, the entire platform ecosystem. For instance, Wang and Miller (2019) find that large publishers hold back their most important revenue-generating books from Amazon Kindle but offer them as physical prints, impacting Kindle's overall attractiveness to customers. As shown, complementors make strategic and operational decisions to create and maintain competitive advantages (Cenamor, 2021). Consequently, complementors are not always cooperative towards the platform owner but engage in competitive, even antagonistic behaviours (Eaton et al., 2015; Karhu et al., 2018).

Besides strategic choices and competition aspects, complementors' engagement commitment may vary based on changes in customer demand or the underlying platform technology (Kapoor & Agarwal, 2017). For instance, Cennamo (2018) highlights the increased efforts for complementors to upgrade their complements to new platform generations in the video game industry.

In essence, CE in digital platform ecosystems takes many different forms. However, the literature on different forms of engagement, short- and long-term variations, and stimuli leading to changes in engagement is highly fragmented and underdeveloped (Altman et al., 2022; Li & Kettinger, 2021). For sustaining engagement, prior work has suggested different stimuli and orchestration capabilities for platform owners to motivate complementors to participate and continuously contribute to their platform ecosystems, ensuring sustainable growth (Blaschke et al., 2018; Schrieck et al., 2021).

2.1.2 | Sustaining CE for platform survival

From the perspective of platform owners, sustaining and increasing the engagement of complementors is essential for the survival of their platform ecosystem (Blaschke et al., 2018; McIntyre et al., 2021). To that end, platform owners, too, balance their value-co-creating and value-capturing activities to stimulate third-party contributions while ensuring value capture for themselves (Schrieck et al., 2021; Uzunca et al., 2022).

As the central actor in the ecosystem, platform owners provide and develop the technological base on which complementors build their value propositions (De Reuver et al., 2018; Hein, Weking, et al., 2019). In addition, platform owners continuously (re)create platform governance to manage complementors and their respective engagements (Wareham et al., 2014). Platform governance must balance individual and collective interests, spurring or halting complementors' dedication and engagement towards the platform ecosystem (Huber et al., 2017; Hurni et al., 2021). In its broadest sense, platform governance comprises the design and provision of the core technology,

the platform boundary resources (e.g., Application Programming Interfaces [APIs]) Ghazawneh & Henfridsson, 2013; Petrik & Herzwurm, 2020), and the rules that determine interactions across the ecosystem (Song et al., 2018). Over time, platform owners adjust the governance, impacting value creation and distribution among complementors (Uzunca et al., 2022). Furthermore, platform owners must balance competitive and cooperative governance to stimulate and steer complementors' engagement (Eaton et al., 2015; Foerderer et al., 2019).

Despite the growing body of work on digital platform ecosystems, particularly from a platform owner perspective, answers to the intricate problem of understanding, systemizing and balancing the CE and its dynamics remain vague (Jacobides et al., 2018; Li & Kettinger, 2021; McIntyre et al., 2020). To advance this opportunity and inform IS research, we contextualise engagement from the adjacent stream of service research, which has received significant attention from service and marketing researchers and practitioners alike.

2.2 | The evolution of engagement in service research

Initially motivated by the insight that 'sustaining and nurturing the customer base may require the firm to look beyond repurchase behaviour alone', service researchers started to investigate customer engagement and engagement behaviours as their manifestations (Van Doorn et al., 2010, p. 253). Research on customer engagement argues that it can be understood as a dynamic, iterative process of different engagement levels comprising psychological and behavioural dimensions that result in co-created value (Brodie et al., 2011; Jaakkola & Alexander, 2014). Furthermore, research acknowledges that customer engagement comprises antecedents, manifestations, and outcomes and that the process ranges from short to long term, expressing variability over time (Brodie et al., 2011; Van Doorn et al., 2010).

Later, service research developed the notion of actor engagement by broadening the perspective beyond customers and considering any actor's ability to engage. Actor engagement is a micro-level concept, taking the perspective of an individual actor as part of a broader service ecosystem (Storbacka et al., 2016). Hence, in actor engagement, other actors and their value propositions are explicit or implicit antecedents to the focal actor to engage with them (Chandler & Lusch, 2015; L. P. Li et al., 2017).

As the most recent development, research has suggested overcoming shortcomings of actor engagement concerning sociopolitical tensions through stakeholder theory. To that end, Hollebeek et al. (2022) developed stakeholder engagement as 'a stakeholder's state-based, boundedly volitional resource endowment in his/her role-related interactions, activities and/or relationships' (Hollebeek et al., 2022, p. 9). The state-based nature of stakeholder engagement allows researchers to investigate and describe changes in engagement states in different temporal stages as part of an overarching engagement trajectory.

In the past decade, the evolution of engagement research from customer to actor and stakeholder engagement in service research resulted in a broad conceptual basis. However, in their recent study, Hollebeek et al. (2022) call for further research on stakeholder engagement and its constituent sub-concepts to account for the idiosyncrasies of different contexts. By contextualising insights on the engagement of complementors in light of the richness of engagement-related research, particularly stakeholder engagement, we put forward the concept of CE for the context of digital platform ecosystems.

2.3 | Towards CE in digital platform ecosystems

Following stakeholder engagement (Hollebeek et al., 2022), we conceptualise CE as *a complementor's state-based, partly volitional resource contribution in its interactions, activities and relationships in a digital platform ecosystem*. Complementors make role-related decisions concerning the resources they give to the platform ecosystem (or individual actors). Differences in interests, such as platform entry into complementary markets, can create sociopolitical

tensions. These tensions require additional resources to facilitate their effective resolution by, for example, negotiating, building trust and collaborating.

Based on the understanding of actor engagement (Brodie et al., 2019; L. P. Li et al., 2017), CE takes the micro-level perspective of complementors. CE is expressed as a state formed from CE antecedents and taking a concrete manifestation as a CE behaviour. Due to changing antecedents, the behaviours, and thus CE, changes over time across subsequent stages. As a result, CE varies along its trajectories.

CE serves as a contextualised, analytical lens to investigate the engagement of complementors. Thus, we extend the current understanding of CE, which only refers to the contribution of complementarities and compliance with rules and processes (Saadatmand et al., 2019; Wang & Miller, 2019). Instead, we focus our analysis on the unique antecedents that influence CE, adding to our understanding of the conditions that lead to CE as requested by extant work (Eckhardt et al., 2018; Jacobides et al., 2018). In addition, we aim to investigate CE behaviours, representing the manifestations of CE, which have been only described selectively. In addition, CE allows the investigation of changes in CE and the consequences of platform governance moves that affect antecedents and CE (Altman et al., 2022; Li & Kettinger, 2021).

3 | RESEARCH APPROACH

We follow an exploratory embedded-case study (Yin, 2018) to create a detailed, empirical understanding of CE. Case studies are suitable when the unit of analysis cannot be isolated from its surroundings, as is the case of complementors' interactions with the platform and the ecosystem of actors around it (Benbasat et al., 1987; Yin, 2018). Based on interviews with complementors of two platform ecosystems, Anubis and Osiris, as our two units of analysis, we investigated the antecedents that influence CE and how CE behaviours subsequently manifest. As a starting point, we aimed to identify instances and commonalities concerning CE among complementors. Then, we linked subsequent stages of antecedents, the evaluation thereof, and behaviours as manifestations that result in CE trajectories.²

The enterprise software industry is an intriguing setting to investigate how CE emerges and evolves. Complex and heterogeneous customer needs characterise this industry, requiring highly specialised and customised solutions to integrate existing infrastructures and processes. In addition, the subscription-based nature of cloud-based software requires ongoing interactions and close relationships with customers. The enterprise software industry is the largest segment within the global software market, with fierce competition among customers and complementors (Statista, 2021). From that industry, we choose two of the fastest-growing enterprise software firms, Anubis and Osiris, as our units of analysis:

Anubis is a provider of a cloud-based platform in relationship management with 2000 applications in its marketplace. Osiris is a process management platform that integrates data sources into automated workflows with 700 applications. Hence, both case companies have attracted and engaged many complementors to provide applications (excluding connectors, system integrations and other third-party pieces of software for comparability), making them suitable objects for our study.

3.1 | Data collection

Our data collection concentrates on 30 semi-structured interviews with complementor organisations acting as independent software vendors (ISVs) in Anubis or Osiris (see Tables 1, 2, B1, B2, C1, D1, E1, and F1). For complementors to be eligible, they had to have at least one application in the respective application marketplace with at least three

²Appendix A illustrates how CE antecedents and subsequent behaviours form engagement stages, which, in turn, lead to CE trajectories.

TABLE 1 Overview of cases and interviews.

Company	# Of interviews in the first set	# Of interviews in the second set	Avg. interview duration (min)	Interview partner ID (IP#)
<i>Anubis</i>	14	5	40	IP1 to IP14
<i>Osiris</i>	9	2	54	IP15 to IP23
Sum	23	7		

published customer reviews as a proxy for the complementor's active engagement in the ecosystem and to ensure they did not join the ecosystem just recently. Furthermore, we made sure that all complementors were small-to-medium-sized entities. This theoretical sampling strategy increased the probability that complementors' engagement is highly relevant to their business success and that resource contributions towards the platform are made according to their strategic goals.

We conducted the first set of interviews with 23 representatives of complementors. After evaluating the interviews, we contacted the respondents about 16 months later to conduct a second set of seven interviews with the same interviewees.³ This step allowed us to take a longitudinal perspective towards CE and capture engagement over time in greater detail, giving the research team additional insights into unfolding engagement trajectories. The interviews are slightly skewed towards *Anubis* due to the size of the respective ecosystems and the resulting availability of interview partners. We switched from data collection to data analysis and back, adjusting the interview guidelines based on our findings (see Appendix B). When theoretical saturation of categories was reached while coding new interviews, we ended the first and second rounds of data collection.

We conducted all interviews with CEOs, C-level executives or high-ranking managers tasked with maintaining relationships with their respective platforms, attending events and meeting regularly with the respective platform owner (see Table B1). The interview data comprises 1214 min of recordings, which we transcribed. In addition, we used secondary data such as websites, blogs, whitepapers and the platform partner programmes to triangulate our findings.

3.2 | Data analysis

We applied different coding procedures for data analysis, allowing for a structured and transparent knowledge-generation process and focusing on emerging themes (Glaser & Strauss, 1967). Thus, we iteratively applied open, axial and selective coding. The overarching aim to identify relevant aspects of CE and its underlying dynamics guided the data analysis process. Building on the concepts of CE, we considered CE antecedents, behaviours, and trajectories as analytical concepts. Therefore, we conducted three rounds of coding to identify engagement antecedents (round 1), behaviours (round 2) and trajectories (round 3) independently of each other as part of our inductive research approach.

In round 1, we openly coded the initial interviews to identify different CE antecedents. This step helped us gain an overview of the data and all aspects impacting CE. Next, we developed axial codes from all open codes and integrated them during a selective coding step, resulting in different concepts influencing complementors' engagement decisions. Finally, based on discussions among the research team, we refined the concepts until we reached the final categories, comprising five engagement antecedents (see Appendix C).

³From 23 first round interviews, three were conducted less than 8 months before starting the second round, which is why we excluded them from the second round. Hence, we contacted 20 of our initial interview partners, 7 of which had left the respective company by the time of our second request. From the remaining 13 contacted interview partners, 7 participated in the second round, resulting in a 54% response rate.

TABLE 2 Detailed sample of complementors.

ID	Position	Platform ecosystem	Product focus	Interview duration (min)
IP1	Head of Business Development Region	Anubis	Sales	41 + 47
IP2	Managing Director and Vice President Region	Anubis	Visual Support Tools	38 + 50
IP3	Vice President of Commercialisation	Anubis	Product Lifecycle Management	30 + 44
IP4	Head of Alliances and Partnerships Region	Anubis	Customer Management	29
IP5	Business Development of two Regions	Anubis	Service Management	48
IP6	Head of Alliances and Partnerships Global	Anubis	Operations and Planning	37 + 53
IP7	Vice President of Sales	Anubis	Incentive Programmes	25
IP8	General Manager, International	Anubis	Resource Planning	31 + 52
IP9	Manager Alliances Region	Anubis	Sales	44
IP10	Vice President Region	Anubis	Document Management	35
IP11	Chief Executive Officer (CEO)	Anubis	Quality Management	26
IP12	Head of Solutions for Platform A	Anubis	Customer Management	28
IP13	Head of Sales Region	Anubis	Call Management	41
IP14	President	Anubis	Collaboration Platform	58
IP15	Vice President of Sales	Osiris	Architecture Management	72
IP16	Chief Executive Officer (CEO), Founder	Osiris	Service Management	75 + 57
IP17	Managing Director	Osiris	Project Management	49
IP18	Manager Strategic Partnerships	Osiris	Security Solutions	50
IP19	Director Sales	Osiris	Contract Management	50 + 49
IP20	Chief Executive Officer (CEO), Founder	Osiris	Financial Services	55
IP21	CEO Country	Osiris	Data Management	47
IP22	COO	Osiris	Project Management	53
IP23	CEO	Osiris	Communication Management	55
Total				1214

In round 2, and similarly to round 1, we used open, axial and selective coding steps to identify the three main CE behaviours from the initial interviews. In addition, this iteration was guided by conceptualising CE behaviours as observable manifestations of resource contributions towards the platform ecosystem. Again, the three final engagement behaviours arose inductively from the data without any prior category (see Appendix D).

In round 3, we extensively analysed all initial interviews concerning the engagement trajectories described therein (see Appendix E). Two members of the research team first coded all engagement trajectories described in all first-round interviews openly, using the antecedents and behaviours specified in prior iterations to identify 81 engagement trajectories. Next, we compared trajectories and derived similarities and differences during axial coding while documenting changes and ideas for overarching types via memoing. Finally, applying selective coding, the research team clustered similar trajectories.

Last, we conducted the second set of interviews after coding all 23 interviews from the first set. Here, the existing categories guided the interview guideline. Since we had gathered little evidence on decreasing engagement, we integrated a dedicated question into the interview guidelines of all remaining interviews (see Appendix B, second set), resulting in additional evidence and examples. Based on the analysis of the second set of interviews, we added new engagement trajectories and adjusted existing ones for each complementor until we reached a point of saturation, leading to 101 coded instances, which we grouped as 26 different types of sequences (see Appendix F).

4 | RESULTS

The case study analysis results in a conceptual model comprising antecedents and behaviours of CE in digital platform ecosystems (see Figure 1), describing the basic building blocks of one engagement stage. Moreover, complementors (often implicitly) evaluate the antecedents and derive motives that lead to different behaviours. Those motives are transient states that describe the evaluation of upsides and downsides based on antecedents. Through engagement behaviours, complementors contribute resources to the platform ecosystem and influence their environment, affecting antecedents and the evaluation in later stages. This process results in interlinked stages of repeated evaluations of antecedents, enactment of behaviour and resource contribution represented as an engagement trajectory.

Across several stages, complementors' engagement trajectories can either be stable or change, reflecting an iterative and dynamic CE process. The following sections present the identified CE antecedents, manifestations of CE behaviours and the resulting CE trajectories using examples of specific sequence instantiations of stages inferred from our empirical evidence.

4.1 | Antecedents and CE behaviours

4.1.1 | Antecedents of CE

The interviews revealed five engagement antecedents, which are associated with the platform owner (*value proposition, agents, resources and rules*), customers (*needs*) and other complementors (*value proposition*) influencing CE behaviours subsequently.

Platform owner

The platform owner is the central actor and leading business partner of complementors within proprietary platform ecosystems, with its value proposition, agents, resources and rules determining CE. The *platform value proposition* (Platform VP) consists of the platform's technological and commercial capital, which refers to what the technology platform can do and how well that is perceived and established in the market. Interview partners agree that the platform owner's market dominance in market share, growth and prospects are important considerations for engagement. For instance, the accessibility of the complementor's target customers via the platform is a critical commercial aspect [IP2; IP4; IP6; IP15]. In addition, complementors value the platform technology and its capabilities: IP17 demonstrate their enthusiasm by stating: 'It is absolutely amazing what you can do with Osiris, and it is incredibly customizable'.

The platform owners' *agents* (Platform Agents), embodied as partner managers, account managers, sales managers or solution engineers, are key interaction points with complementors, impacting CE. According to IP9, 'human contact is the most critical thing in any engagement', and building and maintaining good relationships 'is the best way to work'.

The *platform resources and rules* (Platform Resources and Rules), such as platform boundary resources (e.g., APIs, the application marketplace, events) and control rules (e.g., app security checks), provide structural support and guardrails for CE. Several interview partners mention that the platform marketplace serves as an information channel or store window and initial point of contact for customers, facilitating engagement [IP1; IP4; IP5; IP12; IP13].

Customers

The motivation for complementors to engage with the platform ecosystem depends on existing and emerging *customer needs* (Customer Needs), such as customers that want to automate their IT-related processes. Complementors cater to the needs of their potential customers in the enterprise segment more effectively when engaging with a platform ecosystem since customers demand integrated end-to-end solutions instead of single products [IP2; IP4; IP9; IP13; IP17; IP20].

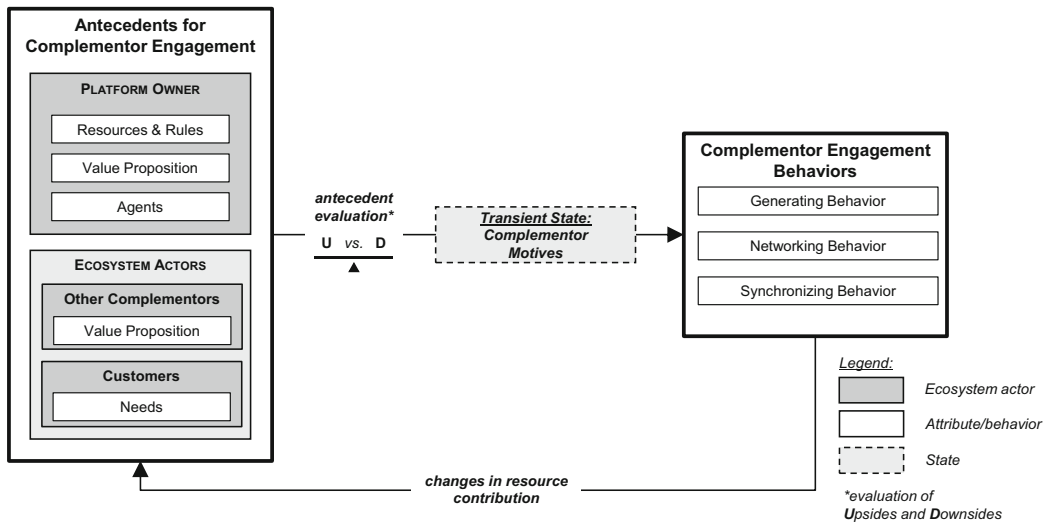


FIGURE 1 Conceptual model of one stage of complementor engagement in digital platform ecosystems.

Other complementors

Complementors compete and collaborate with other complementors. They collaborate by connecting their applications once a clear path towards added value is apparent. In these cases, the *other complementors' value proposition* (Other Complementors), such as specialisation in specific technologies, market segments or functionalities, is a signal for others to collaborate or compete. Complementors reveal that they might collaborate with partners once their solutions are 'complementary' [IP4; IP7; IP8; IP10] and extend the functional scope of each complementor's solution [IP1; IP5; IP6]. Complementors engage with each other when the overlap in the value propositions is small or synergistic. If value propositions are similar and overlapping or trust is low, complementors compete.

4.1.2 | Antecedent evaluation and complementor motives

Complementors evaluate antecedents by weighing upsides against downsides. Positive evaluations (i.e., upsides > downsides) are associated with complementors' satisfaction, while negative evaluations (i.e., upsides < downsides) correspond to dissatisfaction.

Based on the result of the evaluation, complementors create motives that are usually not communicated explicitly but resemble implicit, transient states. Motives are shaped by changes in antecedents and thereby influence engagement behaviour. Hence, motives are short-term such as bypassing official communication channels by leveraging personal relationships 'outside the official partnership' to gain even deeper insights from platform agents [IP3]. Other motives include deepening or reversing platform integration, multi-homing or exploiting opportunities to grow their market share by offering new products and services.

4.1.3 | CE behaviours

The interviews show that complementors engage with platform ecosystems through observable CE behaviours. We identify *generating*, *networking* and *synchronising* behaviours from our case study. Each behaviour enacted by the complementor also results in a change in resource endowment towards the platform ecosystem.

Generating behaviour

The core of a complementor's engagement in platform ecosystems is generating and delivering applications and services (Generating Behaviour). Complementor 7, for instance, extends the platform by offering an application that automates customer incentive programmes: 'We bring our core functionality, which does not exist in that way in the Anubis environment' [IP7]. Furthermore, as customer problems and out-of-the-box solutions in enterprise settings regularly diverge due to the specificity of customer needs, there is a constant need for customisation and consulting services [IP19].

Networking behaviour

Complementors build networks across platform ecosystems through personal relationships (Networking Behaviour) with platform owner agents, customers and other complementors. Events, for example, are 'essential for business success' [IP15] and are used to network and maintain relationships. Networking behaviour facilitates the exchange of information and knowledge within a network of actors: 'We developed a personal relationship, [which is] very good. People know me, talk to me, support me and it goes both ways' [IP16]. Furthermore, networking behaviour helps ease tensions and fosters trust among various actors.

Synchronising behaviour

Complementors continuously ensure the fit and alignment between their offering, the platform's value proposition and other complementors they collaborate with (Synchronising Behaviour). For instance, complementors synchronise with the platform owner to sell to customers jointly, as exemplified by Complementor 8, which collaborates with Anubis to replace a competitive system for a large 'number of accounts in Japan, [being an] initiative driven by Anubis that is very fruitful' [IP8]. Ultimately, synchronising behaviour increases alignment between actors, resolves tensions and fosters collaboration. Thus, it creates advantages for both parties in the short term, sometimes leading to long-term strategic partnerships.

4.2 | CE trajectories

By integrating CE stages of antecedents, evaluation, behaviours and changes in resource contribution into sequences over time, our data reveal two major engagement trajectories: *stable* (i.e., stable resource contribution) and *changing engagement* (i.e., changing resource contribution). For instance, sequence S1 describes a stable engagement trajectory, which we found eight times in our data. Further analysis of changing engagement resulted in selective, growing and abating engagement as its constituent subcategories. Figure 2 shows the engagement trajectories, including exemplary sequences and an illustration of each trajectory based on a complementor's resource contributions towards the platform ecosystem over time. In addition, we identified variants of some sequences, such as S13.1 and S13.2 of S13.

Along engagement trajectories, a complementor evaluates antecedents that can lead to changes in their engagement. The evaluation of upsides and downsides is often an implicit reaction to changing antecedents, resulting in transient motives and implicating subsequent engagement behaviours. Contrasting prior assumptions, our findings stress that CE does not require complementors' satisfaction (positive evaluation) but can also result from dissatisfaction (negative evaluation). Moreover, CE does not per se increase the alignment with the platform ecosystem but may drive operational and strategic divergence or opposition.

4.2.1 | Stable engagement

The first CE trajectory is *stable engagement* and follows a steady trajectory across stages with minor changes concerning resource endowment. It represents complementors' baseline engagement with the platform ecosystem and their ongoing and steady resource contributions.

Complementor Engagement Trajectory Type		Identified Sequences Across Engagement Stages [exemplary sequences as presented in the results section]* <i>(one stage: antecedent > behavior)</i>	Illustration (resource endowments over time)
Stable Engagement		<ul style="list-style-type: none"> S1 (8x): Platform Resources&Rules > Networking >> Platform Resources&Rules > Networking [...] S3 (5x): Platform Resources&Rules > Synchronizing >> Platform Resources&Rules > Synchronizing [...] S4 (5x): Platform VP > Generating >> Platform VP > Generating [...] 	
Changing Engagement	Selective Engagement	<ul style="list-style-type: none"> S7 (2x): Customer Need > Synchronizing >> Agents > Generating S7.1: (3x) Customer Need > Generating >> Customer Need > Generating S8 (4x) Customer Need > Generating >> Platform Resources&Rules > Generating 	
	Growing Engagement	<ul style="list-style-type: none"> S13 (8x): Platform VP > Generating >> Agents > Generating >> Agents > Synchronizing S13.1 (4x): Platform VP > Generating >> Agents > Networking >> Agents > Synchronizing S13.2 (3x): Agents > Networking >> Agents > Synchronizing >> Agents > Generating S15 (4x): Platform VP > Synchronizing >> Agents > Synchronizing >> Customer Needs > Synchronizing 	
	Abating Engagement	<ul style="list-style-type: none"> S24 (1x): Platform VP > Generating >> Platform Resources&Rules > Generating >> Platform Resources&Rules > Generating S26 (1x): Agents > Synchronizing >> Platform VP > Synchronizing >> Agents > Synchronizing 	

*a complete list comprising all 26 identified complementor engagement trajectories can be found in the appendix

FIGURE 2 Complementor engagement trajectories and exemplary sequences.

A prototypical example (S4) is regular platform changes such as new platform features and capabilities (e.g., new user interface technology) in one stage (*Antecedent: Platform VP*). Subsequently, complementors update their applications to pass on new functionalities or security features to customers (*Behaviour: Generating*). These cycles result in continuous, unvarying CE:

We want the deepest of all integrations. That means that every time Osiris says that they are working on a new [platform] version, we are informed very early and are involved in the processes very early. We have already started to ensure that our version runs right along with it when the new Osiris version is released. [IP19]

Another example (S1) of a stable engagement trajectory is based on events (*Antecedent: Platform Resources and Rules*) organised by the platform owner, which complementors mostly regard as an opportunity to ‘meet and speak with people [...] a place where we can go and look for business’ [IP10]. Complementors regularly visit events to meet and network with potential customers (*Behaviour: Networking*) to increase their sales reach [IP15]. These ongoing activities result in constant resource contributions towards the platform ecosystem.

Besides continuously engaging to update products and find new customers, several interview partners mentioned (S3) aligning with their respective partner programmes (*Antecedent: Platform Resources and Rules*). In addition, complementors check and improve on different key performance indicators (KPIs), such as the number of certified employees across stages (*Behaviour: Synchronising*), to comply with the platform owner’s requirements and improve their standing:

We use these KPIs to measure our health and status and focus on ourselves. [...] we keep an eye on those figures—on, let’s say, a weekly or biweekly basis. [IP22]

However, environmental changes can impact the complementors’ evaluation of antecedents and lead them to leave their stable engagement trajectory. For instance, they may change their engagement due to shifts in the partner programme:

Anubis has also recently launched a new partner programme, and we’re not at the top level, but we’re at the second level. [...] I’m aware that there is a level that is above us that we can capture. And there are a couple of things which we are missing. So, let’s work on that. [IP6]

We capture these instances as *changing engagement* trajectories.

4.2.2 | Changing engagement

The second CE trajectory is *changing engagement* and describes adjustments to the resources contributed to the platform ecosystem over time. A detailed analysis of the changes in complementors' resource contributions across stages resulted in three manifestations: *selective engagement*, *growing engagement* and *abating engagement*.

Selective engagement

Complementors engage in selective engagement by selectively contributing resources to the platform ecosystem in one stage but reducing their engagement in subsequent stages.

For instance (S7), complementors of Anubis that offer applications via the platform sometimes encounter potential customers (*Antecedent: Customer Needs*), which first need to instal the platform before getting the application in a 'downstream project' [IP13]. Complementors then invest resources ad-hoc to understand the customer's needs (*Behaviour: Synchronising*) and work with platform owner representatives (*Antecedent: Platform Agents*) to convince customers to use Anubis. After that, they deliver their application to the customer (*Behaviour: Generating*) before their engagement recedes:

We often get requests for our system, then make a discovery call with customers. The most important question in the call is how they use Anubis. And if they don't use it, [...], we do a demo and show how close the interaction can be between Anubis and us. [...] we then pass on [their] names to our partner manager to [...] get in touch with them. [IP13]

According to IP13, only 'about 5%' of customer requests require these situational resource investments.

Another instance (S8) of selective engagement prevalent in the Osiris ecosystem relates to the spontaneous development of applications: 'We did a custom development for a customer and said: "Well, this is a great product, let's develop it further and distribute it"' [IP16]. In the first stage, complementors work with customers (*Antecedent: Customer Needs*) in consulting projects (*Behaviour: Generating*). Seeing a long-term business opportunity in offering applications through the app store (*Antecedent: Platform Resources and Rules*), they generalise these custom solutions to more generic applications. For instance, Complementor 23 published an application for dispatching letters directly from Osiris as a generic application for the marketplace (*Behaviour: Generating*). Once the application is developed and published, complementors' resource contributions towards the application again receded.

In addition to situational engagements, we observe changes to resource contributions resulting in higher or lower engagement levels in subsequent stages.

Growing engagement

Correlated with the growth of Anubis's and Osiris's ecosystem, we encountered *growing engagement* as an increase in complementors' resource contributions towards the platform ecosystem as the prevailing CE trajectory. In its initial stage, this trajectory starts at a low (or zero) level of engagement and increases over time until it reaches an elevated engagement level. Prototypical examples describe increasing alignment and collaboration with other ecosystem actors, such as the platform owner or other complementors. In contrast to suggestions by prior work, CE is not dependent on complementors' satisfaction. Dissatisfaction and tensions among actors can be strong drivers for complementors, motivating them to engage and change things in their favour by, for instance, seeking to strengthen their alignment.

We find three variants of growing engagement based on the respective complementor's market success (S13), the ease of technological and cultural alignment (S13.1), and the intensity of their networking (S13.2). Under variants (S13) and (S13.1), complementors that leverage the platform (*Antecedent: Platform VP*) to develop an application

(*Behaviour: Generating*) in an initial stage get little attention from platform owner representatives (*Antecedent: Platform Agents*):

Typically, an Anubis customer will ask their salesperson, account manager, or customer success manager when looking for a technical solution. And usually, [these] people don't know all the applications [...] We try to position ourselves so that they know us so that they don't just know us from [the app store], but also know our service. [IP13]

In (S13), with increasing market success (*Behaviour: Generating*) in the second stage, the awareness of representatives grows (*Antecedent: Platform Agents*). As IP8 put it: 'If we generate revenue, then there will be more focus. It's very simple: Money talks'. In the third stage, complementors started to pitch their products to customers with the platform owner as a part of a joint go-to-market strategy:

Later on, we started cracking deals. So, we came into the limelight of Anubis that these guys bring value to pharma customers so that customers are interested in looking at the solution. And that is the primary reason that in the last 1.5 years, we were able to define a joint go-to-market with Anubis [...]. We [...] keep evolving and keep working closely with Anubis. [IP6]

The collaboration is then elevated towards a strategic partnership once the platform owner understands the value a complementor brings to the platform (*Behaviour: Synchronising*):

The relationship with Anubis has matured, [...] one and a half years ago, I think the awareness of [Complementor 8] was not that great, but today, most people within Anubis know who we are, and [...] the gap we're filling. So, if they have a manufacturing, distribution, or supply chain customer - they know where to go. [IP8]

In (S13.1), the ease of alignment concerning the 'technical fit' and 'corporate philosophy' [IP2] drives complementors to network with partner managers and account executives (*Behaviour: Networking*) in the second stage. Similar to (13), this nurtures agents' awareness (*Antecedent: Platform Agents*) and elevates the collaboration efforts (*Behaviour: Synchronising*).

Under variant (S13.2), complementors get little to no attention from platform agents (*Antecedent: Platform Agents*), resulting in a short-term negative evaluation of the situation. Hence, they invest resources to build meaningful relationships with account managers and sales managers (*Behaviour: Networking*): 'It is about how you're able to make a rapport and trying to get the right messages on what's in for them'. [IP6]. However, they are dissatisfied with the progress in building relationships: 'Sometimes it becomes [a] little difficult and challenging for the Anubis [partner] account team to get on a call with us'. [IP6].

Nevertheless, complementors keep intensifying their efforts by pitching and demoing their application to even more platform agents (*Antecedent: Platform Agents*). That way, they continuously grow their network within the platform owner (*Behaviour: Synchronising*). As a result, in subsequent stages, the awareness of platform representatives increases (*Antecedent: Platform Agents*), ultimately resulting in more joint deals (*Behaviour: Generating*) and long-term complementors' satisfaction:

We also do demos, lunch and learn sessions, and other things. So, when [Anubis representatives] are asked by customers whom they know [to solve a particular problem], they automatically say: 'Yes, you just call the guys from [Complementor 13]'. That is a very easy approach to going to market today. [IP13]

While all these trajectories (S13 and variants) resulted in increased CE, complementors' evaluation of antecedents can be negative. However, also negative evaluation outcomes and tensions among actors can spur engagement in the next stage:

[Anubis] should keep their [partner] account team constant. That is critical because [when] they change the account team, [the agents] have to build rapport with the partner, and they have to build rapport with the customer, [which] hurts both sides. [IP6]

As a result, complementors have to spend additional resources regularly to educate new platform agents on their solutions and rebuild a trusted relationship.

Moreover, our case study revealed that platform owners invest in complementor businesses (S15). In the early stages, Anubis's market-leading position (*Antecedent: Platform VP*) motivated IP3 to expand its Anubis-related business by deepening its collaboration with Anubis. Frequent exchanges (*Behaviour: Synchronising*) increased Anubis agents' awareness of Complementor 3's solution (*Antecedent: Platform Agents*). Getting an offer for Anubis's investment, IP3 accepted the offer (*Behaviour: Synchronising*):

We do get a lot of attention and strategic direction from Anubis. We do have a lot of executive engagement. We do have an executive sponsor since we are part of the Anubis investment portfolio. So, we definitely get insight in terms of product direction, [and] sales direction. [IP3]

In subsequent stages, Complementor 3 and the platform owner turned from frequent exchanges to deepening their development and sales efforts to provide innovative functionalities to customers together (*Antecedent: Customer Needs*). Similarly, Complementor 8 became a strategic partner for the manufacturing industry after getting an investment from Anubis. Hence, the success of the previous engagement led to even closer alignment on a strategic level (*Behaviour: Synchronising*).

Finally, changes in engagement across stages may also result from complementors' abating resource contributions towards the platform ecosystem across stages.

Abating engagement

CE trajectories that start at a high(er) level of engagement and decrease over time (i.e., withdraw resources) until they reach a lower (or zero) level are *abating engagement* trajectories. Notably, our case study revealed only four different abating engagement trajectories with only one example each. Due to the growth of the enterprise software industry in the recent decade, most complementors only infrequently lower their engagement. One example (S24) is Complementor 17, which ceased to update its application in the marketplace:

In the first stage, Complementor 17 started from a high level of engagement, motivated by Osiris's growth and strong customer base (*Antecedent: Platform VP*). Aiming to expand, they soon developed and maintained a certified resource management application in the application marketplace (*Behaviour: Generating*): 'When we became an Osiris partner, we were very enthusiastic about the store. And we also developed solutions for it' [IP17].

Importantly, however, in the context of business software, applications often require extensive sales cycles. These include cold-calling, demos, discovery calls and subsequent implementation and customisation projects. IP 17 soon realised this: '[The Osiris app store] is not something like an Apple AppStore where people download something, deposit some automated payment, and start using some solution right away'. During the next stage, Complementor 17 generated little revenue from the application through the application marketplace (*Antecedent: Platform Resources and Rules*): '[The app] is really, really useful, and we've already used it with various customers. However, so far, we haven't received any reasonable [customer] inquiries through the store' [IP17]. Consequently, they stopped upgrading their application in subsequent stages (*Behaviour: Generating*): 'To be honest, we have not updated it in the last 12 months. [...] But we intend to update it [in the future]'. [IP17]. Even though Complementor

17 decreased its engagement with the store, they are satisfied with the situation: 'It's an interesting marketing vehicle, and it positions us with certain expertise. [...] But generating revenue—that's definitely not the case'.

At the same time, abating engagement trajectories can arise from competitive tensions with the platform owner and other complementors (S26). Complementor 2's abating engagement trajectory, for example, starts from a high level of engagement spurred by high awareness of platform representatives (*Antecedent: Platform Agents*). They aimed to collaborate closely with Anubis and were 'very successful' and satisfied to do 'some very nice projects' in winning customers together after Anubis discontinued a platform feature similar to Complementor 2's product (*Behaviour: Synchronising*). In the next stage, Anubis invested in one of Complementor 2's competitors (*Antecedent: Platform VP*): 'And just as [the partnership] was on a roll, it turned out that Anubis had acquired a stake in one of our competitors through its venture capital arm' [IP2]. First, that 'cooled down' the partnership and led to a 'loss of trust' [IP2]. Evaluating the situation, Complementor 2 saw no immediate upsides in continuing their engagement but the downside of being driven out of the market. They reacted and increased their focus on other platform partnerships as part of their multihoming strategy, investing fewer resources towards Anubis (*Behaviour: Synchronising*).

Anubis's investment also impacted the incentive schemes of its representatives, including sales and account management (*Antecedent: Platform Agents*). Thus, the agents shifted towards favouring the partner Anubis invested in: 'The salespeople are very, very incentivized to run in this direction now, especially with large projects' [IP2]. During the next stage, Complementor 2 re-evaluated its partnership with Anubis and decided to do selective strategic projects only. However, they kept on winning projects against Anubis and its strategic partner. These wins stabilised the partnership and Complementor 2's engagement towards Anubis on a lower level (*Behaviour: Synchronising*):

We are still getting projects from Anubis. So, there was a short drop. And then Anubis realized they could not win certain projects with their strategic partner, and they returned [to us]. However, of course, it changed the way we work together. [IP2]

5 | DISCUSSION

The current study proposes and explores how changing antecedents can trigger CE behaviour resulting in dynamic engagement trajectories. Doing so informs researchers and practitioners about CE's variations and the influencing factors in digital platform ecosystems. We extend prior research on digital platform ecosystems that focused on situational engagement without considering ecosystem dynamics and the need to sustain CE and create persistent platforms (McIntyre et al., 2021; O'Mahony & Karp, 2022; Saadatmand et al., 2019). Moreover, our study has implications for platform governance, particularly the dynamics of balancing platform owners' cooperative and competitive approaches and the associated temporal dynamics (Foerderer et al., 2019; Parker et al., 2017).

5.1 | Antecedent evaluation and dynamics of CE

Our results reveal how complementors explicitly and implicitly evaluate antecedents and derive short-term motives, which serve as transient states that spur their subsequent engagement behaviours. Moreover, these evaluations comprise weighing upsides against downsides arising from the respective antecedents. Hence, we add further nuance to complementors' re-assessment of their engagement (H. Li et al., 2022; Selander et al., 2013) and answer the call to investigate the underlying criteria by Li and Kettinger (2021).

In particular, the results highlight the need to refine assumptions from prior work that complementors' satisfaction based on a positive evaluation of antecedents is a prerequisite for CE (Hurni et al., 2021; Petrik & Herzwurm, 2020). Our study counterintuitively shows that negative evaluation outcomes and the associated

dissatisfaction can increase CE. At the same time, positive evaluations can lead to abating engagement, depending on their *short-term* or *long-term* occurrence. The following discussion focuses on counterintuitive findings (e.g., abating engagement despite short-term satisfaction).

First, CE can grow despite complementors' short-term dissatisfaction, extending the literature on CE (Petrik & Herzwurm, 2020). Consider, for instance, Complementor 6, dissatisfied with the awareness and support from Anubis's platform agents, which led it to ramp up its networking engagement (S13.2). When complementors face unfavourable conditions in the short term (e.g., sparse support by platform agents), they can be motivated to engage and invest more resources that benefit the platform. However, engagement after dissatisfaction is not always positive, as studies on complementors jailbreaking iPhones have shown (Eaton et al., 2015). Hence, dissatisfaction can elicit antagonistic engagement (jailbreaking iPhones) and constructive engagement, as in the case of Complementor 6's networking. These examples emphasise that even if engagement increases, *not every engagement is good* (Karhu et al., 2018), which needs consideration when designing platform governance.

In addition, the results help to explain other studies' findings. For example, Google applied competitive governance and increased CE after entering the photography application market of the Android platform (Foerderer et al., 2018). While complementors negatively evaluated the increase in competition in the short term, many decided to increase their innovation efforts (i.e., CE) momentarily to address additional customer needs and change antecedents in their favour during the next stage. Many third-party photography apps, however, perished subsequently. This example shows that long-term dissatisfaction leads to abating engagement when complementors' attempts to influence antecedents are insufficient, leading them to reduce or redirect their resources.

Second, CE can decrease despite complementors' short-term satisfaction, questioning knowledge on what motivates complementors to engage (Boudreau & Jeppesen, 2015; Petrik & Herzwurm, 2020). For instance, Complementor 17 suspended app updates in the short term despite positively evaluating the capabilities of Osiris's application store (S24).

Again, this observation helps to explain findings from quantitative studies on digital platforms. For instance, platform awards represent a cooperative governance mechanism. They have been found to increase the winners' likelihood of multihoming in the short term (Foerderer et al., 2021), which is associated with a decrease in CE with the original platform. Hence, despite the positive evaluations of winning an award and gaining additional customer attention, complementors decided to reduce their engagement in the short term and focus on other platforms instead. These insights implicate how we theorise short-term incentives for complementors, such as subsidies (Rochet & Tirole, 2006) or exclusivity agreements (Parker et al., 2017), as they may decrease subsequent engagement. At the same time, long-term satisfaction often leads to growing engagement or motivates complementors to stabilise their engagement on a certain level.

Overall, the study contributes to understanding dynamics within platform ecosystems and the performance outcomes of complementors. First, we identify and structure antecedents of CE in enterprise software platforms, answering recent calls to provide the criteria influencing the sustained CE (Altman et al., 2022; Li & Kettinger, 2021). Second, we shed light on the interplay of antecedents and behaviours underlying dynamic CE, through which complementors seek to influence antecedents and the platform ecosystem in the next stage. This CE process illustrates the ongoing, recursive process of shaping and reshaping digital platform ecosystems (Li & Kettinger, 2021; Wang, 2021). For instance, we uncover how antecedents shape CE and how CE shapes the generativity of platform ecosystems through generative behaviours. In turn, the platform ecosystem's generativity shapes antecedents, such as intra-platform competition, that need to be continuously governed by the platform owner. These insights illustrate platform ecosystems' recursive dynamics and contribute to recent calls for further inquiry into generativity in this context (Thomas & Tee, 2022).

Moreover, we add more nuance to complementors' participation strategies in platform ecosystems (Cenamor, 2021; Hurni et al., 2022; McIntyre et al., 2021). Based on their respective evaluation, complementors balance different CE trajectories over time. Through CE, complementors can influence and determine their performance

outcomes. Thus, we add to the discussion on complementor performance, emphasising the individual's contribution to their respective performance and standing (Cenamor, 2021; Floetgen et al., 2021; Li & Kettinger, 2021). Our proposed model provides an empirical framework for the processes underlying these dynamics, and the identified trajectories demonstrate the repeated interplay of antecedents and behaviours over time.

5.2 | Cooperative and competitive platform governance for sustained CE

CE differs across complementors and dynamically varies based on changing antecedents. Hence, CE can rapidly fluctuate, and platform owners must take a flexible stance. Nevertheless, its variability makes CE malleable and thus manageable for platform owners via their governance. Essentially, platform governance allows platform owners to influence CE antecedents and steer engagement: Platform owners may govern strategic adjustments of resources and rules (Ghazawneh & Henfridsson, 2013; Song et al., 2018), the platform value proposition (Miric et al., 2021) or of platform agents (Huber et al., 2017). In addition, they may impact relations among complementors by, for example, steering intra-platform competition (Tiwana, 2015) and customer needs by entering complementary markets (Foerderer et al., 2018). As such, platform governance allows platform owners to steer antecedents, complementors' evaluations, and their subsequent engagement.

The outcomes of complementors' antecedent evaluation (i.e., positive or negative) correspond to the two modes of platform governance (Foerderer et al., 2019; Parker et al., 2017). The cooperative mode reflects positive evaluations by complementors, while the competitive mode is associated with negative evaluation outcomes (Gawer & Henderson, 2007). Our empirical evidence suggests that either mode can incite and deter CE.

First, our results emphasise the importance of cooperative governance in stabilising and growing engagement in the long term. Most of the identified growing engagement trajectories build on increasing alignment with platform agents, which are vital to operationalising cooperative governance (Huber et al., 2017; Hurni et al., 2021). Our results resonate with prior work stating that platform agents are fundamental in cooperative approaches by transferring knowledge (Foerderer et al., 2019) and aligning complementors with the platform owner (Huber et al., 2017). Nevertheless, we find occasional instances where cooperative approaches are associated with short-term abating engagement (e.g., S24), providing cautionary tales for platform owners.

Overall, we see increases in CE in light of cooperative governance when complementors see immediate short-term value in their engagement, such as new customer demand. In contrast, the lack of an immediate short-term value lowers CE despite complementors' satisfaction. Therefore, platform owners must communicate and highlight immediate benefits for complementors when using cooperative governance approaches to trigger increases in CE.

Second, competitive governance approaches in the long-term lead to abating engagement trajectories. For instance, IP12 described Anubis's development of features similar to their application without prior announcement decreased their synchronising activities (S23). The negative, long-term, and short-term impact of competitive approaches has been documented by extant work (Foerderer et al., 2018; Hurni et al., 2022). However, we find that, situationally, competitive approaches can act as short-term stimuli for increasing CE. For example, Complementor 16 is synchronising with Osiris to change the incentive schemes of platform agents towards ISV partners (S14).

Again, these insights expand our understanding of platform governance and its interplay with CE. Platform owners that opt for competitive approaches are advised to consider long-term effects, which may be clouded by short-term increases in CE as complementors respond and rally to compete or adjust. These insights follow findings from early work on platform ecosystems that moderate levels of intra-platform competition spur innovation while intensive competition risks crowding out innovation (Boudreau & Jeppesen, 2015). We advance this understanding of platform owner competition by introducing a temporal and dynamic element of intra-platform competition (i.e., short- and long-term effects) besides the intensity of competition considered by prior work (Cennamo & Santalo, 2013).

Generally, our study shows that platform owners can and should integrate cooperative and competitive governance approaches to steer CE across multiple stages. These insights add to the literature on dynamic platform governance and power dynamics (Foerderer et al., 2019; Huber et al., 2017; Hurni et al., 2022). Furthermore, cooperative governance has a positive, long-term impact on CE, while competitive governance has negative long-term consequences. Notably, long-term satisfaction of complementors is essential to grow, stabilise and sustain engagement.

However, cooperative governance can also lead to abating engagement in the short term. Platform owners are cautioned to monitor such instances, ready to react if the trend persists. Similarly, competitive governance can increase CE in the short term, motivating complementors to overcome barriers or change antecedents in their favour. Platform owners may use these insights to stimulate complementor investments (i.e., CE) in the platform as part of a well-balanced 'carrot-and-stick' approach that integrates cooperative and competitive governance. As a result, to sustain CE long-term, platform owners must couple their competitive moves, such as releasing competitive applications, with cooperative ones. Our study shows that short-term competition and subsequent cooperation combinations are strong drivers of growing engagement. Hence, using competitive actions to stimulate CE adds a new tool to platform owners' governance toolbox.

5.3 | Practical implications

Our findings also have concrete implications for platform owners and complementors in enterprise software platform ecosystems from a managerial perspective. First, we provide rich empirical evidence on the dynamics of CE for platform owners. Platform governance allows them to control or manipulate virtually all CE antecedents and, thus, CE. While platform owners are generally advised to follow collaborative governance approaches, this study encourages the deliberate and situational use of competitive elements to stimulate CE. In addition, we caution platform owners to consider short- and long-term effects on CE when designing governance mechanisms. In sum, platform owners must pay close attention to complementors' engagement and their repeated evaluations of antecedents.

Second, managers of complementor companies are advised to carefully and regularly assess antecedents concerning their upsides and downsides and to be willing to act accordingly. Complementors individually and collectively possess considerable power in platform ecosystems (Hurni et al., 2022). This study shows that complementors can further their positions by influencing antecedents through their engagement. Furthermore, complementors should consider calibrating their engagement to their situation and explore options such as strategically lowering their engagement in light of long-term dissatisfaction and pursuing alternative options. Finally, complementors should accurately evaluate platform owners' competitive actions and identify their associated opportunities.

5.4 | Limitations and future research

First, we study two well-established digital platform ecosystems in the enterprise software domain as units of analysis as part of a qualitative, exploratory approach. While descriptive, we are confident that the emerging theoretical abstractions (e.g., the CE model and its underlying categories and the four types of CE trajectories) are applicable in other contexts. Nevertheless, future research should investigate CE in contexts that require fewer upfront investments by complementors, such as mobile applications, creating an even more volatile environment to examine CE and its trajectories. Notably, reporting additional instantiations and variants of engagement trajectories will broaden our understanding of CE, particularly how combinations of antecedents influence subsequent engagement behaviours and the resulting trajectories.

Second, our analysis focused on sequences of two to four stages due to the available data and our study's goal to conceptualise CE and gain the first empirical evidence. However, sequences could span across a large number of

stages when analysing expanded periods. Hence, we encourage future work to use longitudinal study designs to investigate long-term CE trajectories comprising multiple stages. Moreover, different configurations of antecedents can lead to different CE outcomes, and qualitative comparative analysis methods will be suitable to investigate such configurations and the implications for platform governance.

Third, since the current study sampled only active complementors as interview partners, we cannot report why complementors disengage and leave (potentially thriving) platform ecosystems. Similarly, complementors whose applications have zero or few downloads are likely to engage differently, posing a necessary extension to our study. This further links to complementors' autonomy in hierarchical contexts such as digital platform ecosystems and how complementors can leverage their autonomy vis-à-vis top-down control.

Finally, our data collection focuses on complementors, excluding other relevant actors such as customers, partnering complementors and platform owner representatives. Thus, we encourage future work to broaden the perspective on CE by focusing on the ecosystem as the unit of analysis when further investigating CE and its effects.

6 | CONCLUSION

Sustaining the engagement of complementors in digital platform ecosystems is a significant success factor in creating persistent platforms (McIntyre et al., 2021). This study investigates CE dynamics and their interplay with platform governance.

To that end, we conceptualise CE based on service research's recent concept of stakeholder engagement (Hollebeek et al., 2022) and borrow antecedents and behaviours as building blocks of CE from actor engagement (Brodie et al., 2019; L. P. Li et al., 2017). We then explore CE and its variations over time in digital platform ecosystems in the enterprise software context. To understand how CE unfolds, we select Anubis and Osiris as two units of analysis in an embedded case study taking the complementor perspective. Our findings reveal five CE antecedents, which complementors repeatedly evaluate and determine subsequent CE behaviours. Analysing the temporal dimension, we differentiate four types of engagement trajectories and 26 instantiations thereof. Our findings illustrate the dynamics and variations of CE in digital platform ecosystems as a result of complementors' evaluations of upsides and downsides. Hence, the current study informs research on CE dynamics and the underlying decision-making by complementors. We refine earlier assumptions that CE depends on complementors' satisfaction (i.e., positive evaluations) by showing that dissatisfaction (i.e., negative evaluations) can stimulate CE in the short term. These insights add further nuance to the temporal perspective of CE.

Furthermore, platform owners' governance may impact all CE antecedents, illustrating their power to influence and steer CE over time. Finally, we shed light on the interplay of CE and platform governance, focusing on short- and long-term effects and cooperative and competitive governance approaches. Our results suggest that combinations of cooperative and competitive governance approaches can effectively increase CE, adding a new tool to the governance toolbox and informing the ongoing discussion on dynamic governance approaches.

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Research data are not shared.

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APPENDIX A: Formation of complementor engagement trajectories

Figure A1 illustrates an example of an engagement trajectory comprising a sequence of three engagement stages. Each stage comprises one engagement antecedent and an engagement behaviour that directly follows from the antecedent. Changes in antecedents and/or behaviours mark the beginning of a new stage. Hence, an engagement trajectory includes a sequence of at least two stages of engagement, that is, at least two distinct points in time associated with a particular context or theme. In the example, a complementor attended platform owner events (*antecedent*) to network with various customers, necessitating resources to visit the different events (*behaviour*) represented by engagement stage 1. Later, the complementor visited industry-specific events organised by the platform owner (*change in antecedent*), facilitating access to relevant customers and intensifying the complementor's networking activities (*change in behaviour*) in stage 2. Finally, in stage 3, the platform owner started to offer industry-specific platform features (*change in antecedent*), which the complementor included in its application, aligning even closer with the platform roadmap (*change in behaviour*). Thus, the complementor's resource contributions towards the platform ecosystem increase across the sequence, resulting in a growing engagement trajectory. The overarching context is the increasing industry focus of the platform owner, which drives the engagement of the example complementor.

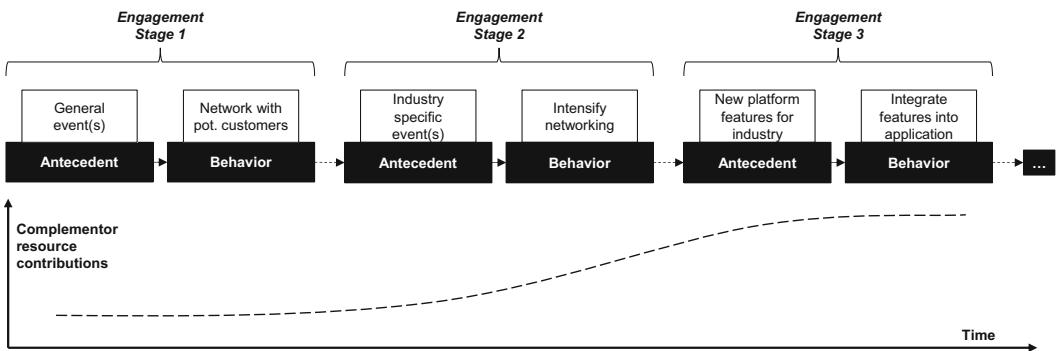


FIGURE A1 Illustration of a growing engagement trajectory comprising three engagement stages.

APPENDIX B: Overview of interview guidelines

TABLE B1 Overview of interview guidelines—First set.

Overview of interview guidelines—First set
<p>Complementor organisation and role of the interviewee</p> <ul style="list-style-type: none"> • Information about company <ul style="list-style-type: none"> ◦ Duration of platform membership; products and services offered • Interviewee position and role <ul style="list-style-type: none"> ◦ Role concerning platform owner and ecosystem
<p>Adoption decision and strategic aspects of partnership</p> <ul style="list-style-type: none"> • Reasons for joining the respective platform ecosystem <ul style="list-style-type: none"> ◦ Viable alternative platform ecosystems considered • Reasons for choosing the technology type of partnership as an Independent Software Vendor <ul style="list-style-type: none"> ◦ Applications in-app marketplace and further services offered ◦ Partner level status
<p>Ongoing engagement</p> <ul style="list-style-type: none"> • Positive and negative influences on engagement in respective platform ecosystems <ul style="list-style-type: none"> ◦ Success factors for current partnership ◦ Necessary resources provided by the platform ◦ Aspects that would enhance and deepen the partnership with a platform ◦ Possible reasons to end partnership with platform • Relationship and collaboration with other complementors

TABLE B2 Overview of interview guidelines—Second set.

Overview of interview guidelines—Second set
<p>Summary of time interval since the first interview</p> <ul style="list-style-type: none"> • Relationship with the platform owner <ul style="list-style-type: none"> ◦ What strengthened the partnership? ◦ What hampered the partnership? ◦ Have there been instances where you decided to invest fewer resources towards the platform ecosystem?
<p>Changes concerning</p> <ul style="list-style-type: none"> • ... complementor business <ul style="list-style-type: none"> ◦ Partnership status, new products or services ◦ Customer relationships • ... platform owner <ul style="list-style-type: none"> ◦ Technological changes to the platform ◦ Changes to product/service portfolio ◦ Strategic changes and acquisitions ◦ Resources provided • ... other ecosystem actors <ul style="list-style-type: none"> ◦ ... partnerships with other complementors ◦ ... changes of partnerships ◦ ... competitive position ◦ ... customer acquisition strategies

APPENDIX C: Detailed overview of coding scheme for antecedents

TABLE C1 Detailed overview of the coding scheme for complementor engagement antecedents.

Exemplary interview data (open codes underlined)	Exemplary concepts (axial codes)	Final model categories (selective codes)
<ul style="list-style-type: none"> • ‘And so, with [Complementor 7] incentivising different behaviours across different relationships, <u>we do come into contact with other ISVs greatly by linked applications and incentivising training or devising other processes that come with other ISV technologies. It is a co-work; we work together</u>’.—IP7 • ‘Yes, we have a partner with whom we work a lot. [...] <u>They have a financial system. So the reason we work with them is that we can sell a whole suite as [Complementor 5]. Say a customer already has [Anubis], then we can sell the financial system directly to the customer [on top of Complementor 5]. All that happens on the platform. That means you have one login, and everyone has different user rights. We are very committed to our partner</u>’.—IP5 • ‘So absolutely, <u>they are all complementary. Sometimes those relationships work, and sometimes there is a natural conflict</u>’.—IP10 	<ul style="list-style-type: none"> • Possibilities for complementor cooperation • Value propositions of other complementors • Level of competition among complementors 	Other complementors: Value propositions
<ul style="list-style-type: none"> • ‘Our app, our video platform, <u>actually works for the customer especially efficiently when it is integrated into the customer processes. We achieve this by embedding our application into Anubis systems, like [Anubis] offers one—perhaps the most successful one currently available. That’s why we decided to become a partner of [Anubis] and to be able to offer added value to our customers</u>’.—IP2 • ‘Many, many customers of ours use [Anubis], and they can <u>get far more value from their [Anubis] implementation by bringing together sentiment data with [Anubis’s] own data. [...] So, when our application is standalone if you think of the much-overused term of the 360° view of the customer, what you’d end up with is 180° in one system [and] 180° in another system, which were connected</u>’.—IP4 	<ul style="list-style-type: none"> • Meet customer expectations • Provide customer experience 	Customers: Needs
<ul style="list-style-type: none"> • ‘So clearly, the largest [factor] is the market reach of [Anubis]. <u>It is by far the leading Anubis system in the world</u>’.—IP1 • ‘Of course, this means for us <u>that by working with [Anubis], we will be able to reach very successful and large customers</u>’.—IP2 • ‘There are AEs [Account Executives] and SEs [Sales Executives] and account teams and <u>people like our partner account manager who support our solution managers. They help us to the co-sell process and make sure that the right [Anubis] customer, who can be helped by our product, is getting a chance to understand what we do and hopefully use our product</u>’.—IP7 • ‘But I believe it’s very critical for an enterprise solution which <u>needs blessings from a company like [Anubis], which is a huge brand name, is to have a leadership believe that his solution fits into their overall ledger strategy</u>’.—IP6 • ‘What we find fascinating about this platform is <u>the speed of innovation. You know, we find that end user-centric innovation is available to you in a rapid time frame</u>’.—IP11 	<ul style="list-style-type: none"> • Market potential of the platform owner • The customer base of the platform • Trust of customers in platform owner • Platform brand value • Technological innovativeness 	Platform: Value proposition

TABLE C1 (Continued)

Exemplary interview data (open codes <u>underlined</u>)	Exemplary concepts (axial codes)	Final model categories (selective codes)
<ul style="list-style-type: none"> • ‘[...] from a development perspective, it's very <u>easy for us to iterate and create new product functionality</u>. [...] we're built completely on [Anubis], <u>we don't have to worry a lot about a lot of underlying architectural things like how do we do data redundancy and backup and how do we, what's our role, what's our reporting infrastructure that we should be thinking about or what database do we run on</u>. All of that functionality is, it's not just a tech infrastructure platform, it's something that we can actually build off of those core business objects and business logic’.—IP3 	<ul style="list-style-type: none"> • Technological ease of use • Technological characteristics and performance 	
<ul style="list-style-type: none"> • ‘It was very difficult to find your way around at first. It is crazy how many partnerships there are. [...] you need an encyclopaedia for all these abbreviations. And that was really very difficult. And the partner management was not very cool about it either. So if it was easier, I think more people would decide to become partners. But it is hard to get around it, to figure out’.—IP12 • ‘That means <u>there are quite complex metrics behind it, which [Osiris] counts permanently. Which we also have to update permanently at [Osiris] in the partner portal. And this results in a certain point status, and that is how the partnership is defined</u>’.—IP17 • ‘That's also the reason why we have the applications in <u>there [Osiris app store], why we are also planning to update them. Because you simply get to talk about it with customers who may not be sitting in Germany right now but somewhere in the world</u>. And, of course, you can do a lot of things remotely in IT. And that makes it an interesting marketing vehicle for us. And, of course, it also positions us with certain expertise that we can then use in our own sales cycles’.—IP17 • ‘There are the <u>community or [Anubis] groups with the [Anubis app store]. They are very important</u>. We have people dedicated to discussing there, listening, providing constructive feedback or comments’.—IP7 • ‘And [Osiris's] platform is really mature and sophisticated. So there's reporting, there's a very good database, there are programming interfaces, interfaces to third-party providers, and so on. Basically a complete environment’.—IP16 	<ul style="list-style-type: none"> • Platform rules • Partner programme requirements • Access requirements • Availability and role of application marketplace • Online community • Technological interfaces 	<p>Platform: Resources and rules</p>
<ul style="list-style-type: none"> • ‘The support we get is actually great. They like us, and we like them. <u>We have a very good relationship with them. Our partner account manager helps me to get in touch with the people I need to get to know, and he gets good business back from us</u>. I think we were the third-best ISV partner in the DACH region last year, and he helps us, of course. And we also help you’.—IP13 • ‘We also get help from our direct [Anubis] contact when we say “we might be interested in this and that account. Could you introduce us to the company's [Anubis] account executive,” who then introduces us to the company, saying: “Listen, [Complementor 5] would bring you real value. Check it out.”’—IP5 	<ul style="list-style-type: none"> • Direct contact with the platform owner • Personal relationships 	<p>Platform: Agents</p>

(Continues)

TABLE C1 (Continued)

Exemplary interview data (open codes <u>underlined</u>)	Exemplary concepts (axial codes)	Final model categories (selective codes)
<ul style="list-style-type: none"> • ‘And that is where they [Anubis] bring us into work with new customers and win them over. <u>Then we appear together, and we make presentations together with [Anubis]. We are really a team of the [Anubis] account team</u>’.—IP13 • ‘[Anubis] <u>also assigns to you what they call a partner account manager. And this partner account manager is working with you side by side, helping you build the business, which basically means trying to understand where you are right now. What do you need? Who can I connect you with?</u>’—IP11 • ‘But <u>quite often, we get lots of leads through conversations. And for people like our partner account manager saying, “hey, if you need document generation or if you need contract lifecycle management or if you need a signature, you should reach out to the team of [Complementor 10].”</u>’—IP10 	<ul style="list-style-type: none"> • Account team • Partner Manager • Platform representatives 	

APPENDIX D: Detailed overview of coding scheme for behaviours

TABLE D1 Detailed overview of the coding scheme for complementor engagement behaviours.

Exemplary interview data (open codes <u>underlined</u>)	Exemplary concepts (axial codes)	Final model categories (selective codes)
<ul style="list-style-type: none"> • ‘Of course, especially in the initial phase, when we were at companies that did not yet have [Osiris], we either sold [Osiris] as well or hosted it with us, so to speak. I also know from 2 or 3 years ago that <u>we actually helped a lot with implementation</u>’.—IP19 • ‘Especially the enterprise companies, they want to have their landing pages with the brand logo. They want to see certain things. <u>They want the meta-model behind it to be adapted to their needs</u>’.—IP15 • ‘A lot of what we do is very simple, intuitive and I think one of the value propositions of [Complementor 10] is that when users work with [Complementor 10], <u>it’s sometimes difficult for them to understand whether they’re even using [Anubis] or [Complementor 10] because it looks the same. So, from a technical point of view, it is quite a compelling proposition because then you’ve only got to train end-users on one platform, and it looks like one platform, et cetera. So, there’s kind of the look and feel itself, which is quite important</u>’.—IP10 • ‘We want to <u>build our applications so that they run natively, scoped, and certified on [Osiris]</u>’.—IP19 	<ul style="list-style-type: none"> • Customise user implementation of the platform • Customise complement • Integrate app with platform 	Generating behaviour

TABLE D1 (Continued)

Exemplary interview data (open codes <u>underlined</u>)	Exemplary concepts (axial codes)	Final model categories (selective codes)
<ul style="list-style-type: none"> • ‘<u>Without these events, the exchange would not be so close.</u> So, the exchange between partner management, but also the exchange between partners and partners’.—IP12 • ‘[Anubis organising events] <u>does create a great opportunity to go and meet and speak with people</u> that are potentially looking in the system. [...] <u>We can go and look for customers. We can go and look for partners</u>’.—IP10 • ‘[...] <u>it's all about relationships, it's all about people that you meet</u>’.—IP9 • ‘[...] we do talk to partners. [...] <u>We collaborate and exchange information regularly</u>’.—IP17 • ‘[...] you have to develop a feeling for how far you can go, how much time you can invest in a certain customer. And, of course, that also works in coordination with [Osiris]. Where you say: “Hey, I'll call my sales representative from [Osiris]” and say: “Hey, that customer—what do you think? What can we develop there?” From that, slowly an idea is being created’.—IP21 	<ul style="list-style-type: none"> • Attend events • Build personal relationships • Personal exchange • Information exchange 	<p>Networking behaviour</p>
<ul style="list-style-type: none"> • ‘We have a partner with whom we work a lot. [...] That's basically a financial system. That means <u>the reason why we work with them is that we can then sell a whole suite [...]</u>’.—IP5 • ‘What's really important now is <u>working with the accounts teams driving the demand and closing business</u>’.—IP7 • ‘I think [Osiris] has a very large global sales organisation. So we try to use them, and that means, again, that word of mouth is the strongest type of marketing for them. Even if a sales or account manager of [Osiris] knows, okay, these [Complementor 22] can make it happen, can make the customer successful, can make me successful, can make my customer happy and willing to expand, I think that that means we are top of mind for those salespeople. So, we try to use the sales organisation of [Osiris] a lot’.—IP22 • ‘We haven't had a large technical team. They were very visionary, we were really leading and working with [Anubis] in a lot of their initiatives, and they were transforming as well. So, <u>all technical teams were quite closely aligned</u>’.—IP9 • ‘[we collaborate with a company], which is also an ISV partner of [Anubis], <u>with whom we are now also working intensively, with whom we have built an integration of our solution into their solution</u>’.—IP2 	<ul style="list-style-type: none"> • Cooperate on go-to-market strategy • Joint pitches to customers • Referrals of customers • Collaborate on products and services • Integrate products 	<p>Synchronising behaviour</p>

APPENDIX E: Detailed overview of coding scheme for trajectories

TABLE E1 Detailed overview of the coding scheme for complementor engagement trajectories.

Identification of connected antecedents and behaviours and their respective stages	Documenting antecedents and behaviours in subsequent stages as part of a trajectory	Describe context and characterise resource contributions (i.e., trajectory) over time
<ul style="list-style-type: none"> • ‘[...] sometimes it becomes a little difficult and challenging for the Anubis account team to get on a call with us. Because Anubis is a large ecosystem and they have many partners, and everyone is trying to work with the Anubis account team to sell their solution and their particular account. [Antecedent, Stage 1] It is about how you are able to make a rapport and try to get the right messages on what's in for them. [Behaviour, Stage 1]’—IP6 • ‘[...] every time change happens, you need to build rapport with people [Behaviour, Stage 2], and everything falls apart. There can be a good individual who is replacing him, but ultimately, he has to start from scratch and build rapport and all these things. The challenge with Anubis is that Anubis AEs, most of the time, tend to change in 1 year. [Antecedent, Stage 2]’—IP6 	<ul style="list-style-type: none"> • Stage 1: Antecedent: Platform Agents (little awareness) Behaviour: Networking (build rapport and share information with SBRs; moderate level of engagement) • Stage 2: Antecedent: Platform Agents (regular change in SBR; new SBR has little awareness) Behaviour: Networking (again start networking with new SBR and build rapport; maintain engagement on a moderate level) 	<p><u>Context:</u> Continuous networking with platform owner (S2)</p> <p><u>Resource contributions over time:</u> Stable</p>
<ul style="list-style-type: none"> • ‘I think it's been the case for at least 3 years that we've been partners with Anubis. [...] To take this further, even from the personal, I would say the corporate philosophy of the employees of Complementor 2 fits very well with the philosophy that the Anubis teams display. [...] During this period, strategic factors have become much more important, and cooperation with the sales teams has also intensified considerably. But that often has to do with the partner advisors, in our case, with our account manager. He attaches great importance to this. This is now a very personal factor at this point’. [Antecedent, Stage 1] [...] ‘And with the pitch that we developed together with our Anubis Manager, which I also passed on to my colleagues in England and the US, and they were very successful there with this approach’. [Behaviour, Stage 1]—IP2 • ‘And just as [the partnership] was on a roll, it turned out that Anubis had acquired a stake in one of our competitors through its venture capital arm’. [Antecedent, Stage 2] [...] ‘It has cooled down the partnership. [...] In parallel, we have established a partner management organisation at our company. That means we have partner managers in the individual regions who look after these strategic partners. The ones in Europe, that's what I can judge, 	<ul style="list-style-type: none"> • Stage 1: Antecedent: Platform Agents (high awareness, close relationship) Behaviour: Synchronising (close collaboration and joint customer pitches with platform owner; high level of engagement) • Stage 2: Antecedent: Platform VP (investment in competitor; increase in product overlap with platform and competitive situation) Behaviour: Synchronising (decrease alignment and collaboration with platform owner; emphasise other partnerships; engagement level decreases) • Stage 3: Antecedent: Platform Agents (decreased incentives for SBRs to recommend Complementor 7 application) Behaviour: Synchronising (collaborate only in specific cases; decreased strategic 	<p><u>Context:</u> Decrease platform alignment due to platform investment in competitor (S26)</p> <p><u>Resource contributions over time:</u> Changing > Abating</p>

TABLE E1 (Continued)

Identification of connected antecedents and behaviours and their respective stages	Documenting antecedents and behaviours in subsequent stages as part of a trajectory	Describe context and characterise resource contributions (i.e., trajectory) over time
<p>have, of course, now focused more on the new partnerships [...]. [Behaviour, Stage 2]—IP2</p> <ul style="list-style-type: none"> • ‘Now Anubis has made an arrangement with our competitor, which I understand is that the salesperson gets 100% of the sales as target relief and commissioning basis, so, therefore, the one million means one million. And that, of course, makes it clear which way it's going to go. That is, the sales managers are then very, very intensified to run in this direction now. Especially with the large projects’. [Antecedent, Stage 3] [...] ‘We are still getting projects from Anubis. So, there was a short drop. And then Anubis realised that certain projects could not be won with the partner they now have as a strategic partner, and they returned to [us]. However, of course, it changed the way we work together’. [Behaviour, Stage 3]—IP2 	<p>alignment; engagement settles at lower level)</p>	
<ul style="list-style-type: none"> • ‘The events are important. I mean, when we started, there were really few manufacturing and distribution customers, so the ones that we look at’. [Antecedent, Stage 1] [...] ‘And so, of course, we do participate in the events, and they play a role. It's not unimportant at all’. [Behaviour, Stage 1]—IP8 • ‘But it's also the initiatives themselves. At the last [Anubis main event], Anubis released something that they call the [Anubis product for the manufacturing industry]. So, its initiatives like that that are really important to us’. [Antecedent, Stage 2] [...] ‘For us, you know, the relationship with Anubis has matured, so I think they, you know, were becoming for us, it's, you know, one and a half year ago, I think the awareness of Complementor 8 was not that great, but I think today, I mean, most people within Anubis know who we are, and what you know, the gap we're filling. So if they have a manufacturing, distribution, or supply chain customer, they know where to go. So you know, I think we are extremely complementary to Anubis. [...] Building a relationship takes time. [...] [And then the other company like Anubis, I mean, what they're looking at is the dollars or the revenue that we are generating for them. So it's, if we generate revenue, then there will be more focus’. [Behaviour, Stage 2]—IP8 	<ul style="list-style-type: none"> • Stage 1: Antecedent: Platform Resources and Rules (only general events by platform owner) Behaviour: Networking (participate in general events; moderate level of engagement) • Stage 2: Antecedent: Platform VP (set up initiatives for market segments and include dedicated modules to the platform technology) Behaviour: Synchronising (deepen partnership by joining campaigns, pitching to customers and creating joint revenues; increased level of engagement) 	<p><u>Context:</u> Increase direct cooperation with platform owner based on platform verticalisation strategy (S17)</p> <p><u>Resource contributions over time:</u> Changing > Growing</p>
<ul style="list-style-type: none"> • ‘when it comes to implementation projects, we do [Behaviour, Stage 1], for example, where a customer says: “that's very nice and good that you can now integrate e-mail addresses, but we want to integrate something completely different.” [Antecedent, Stage 1]. This is where you would have to create custom 	<ul style="list-style-type: none"> • Stage 1: Antecedent: Customer Need (need for the application and platform technologies and their customisation) Behaviour: 	<p><u>Context:</u> Situationally include platform owner for implementation issues (S10)</p>

(Continues)

TABLE E1 (Continued)

Identification of connected antecedents and behaviours and their respective stages	Documenting antecedents and behaviours in subsequent stages as part of a trajectory	Describe context and characterise resource contributions (i.e., trajectory) over time
solutions. And we definitely have the opportunity to work on projects [<i>Behaviour, Stage 2</i>] like this together with our colleagues from Anubis'. [<i>Antecedent, Stage 2</i>]-IP1	<p><i>Generating</i> (implementation of application)</p> <ul style="list-style-type: none"> • <i>Stage 2: Antecedent: Platform VP</i> (resources for complementors to work with in case of certain issues such as customisation) <i>Behaviour: Synchronising</i> (align with and use platform owner resources to address a customer need ad-hoc) 	<p><u>Resource contributions over time:</u> Changing > Selective</p>

APPENDIX F: Overview of identified complementor engagement trajectories

TABLE F1 Overview of identified complementor engagement trajectories.

Engagement trajectory type	Identified sequences	<i>n</i>	Engagement stages per sequence
Stable engagement	S1	8	Platform Resources and Rules > Networking >> Platform Resources and Rules > Networking >> Platform Resources and Rules > Networking [...]
	S2	6	Agents > Networking >> Agents > Networking >> Agents > Networking [...]
	S3	5	Platform Resources and Rules > Synchronising >> Platform Resources and Rules > Synchronising >> Platform Resources and Rules > Synchronising [...] alt.1: Platform Resources and Rules > Synchronising >> Platform Resources and Rules > Synchronising >> Agents > Generating [...]
	S4	5	Platform VP > Generating >> Platform VP > Generating >> Platform VP > Generating [...]
	S5	5	Customer Needs > Synchronising >> Customer Needs > Synchronising >> Customer Needs > Synchronising [...]

TABLE F1 (Continued)

Engagement trajectory type		Identified sequences	n	Engagement stages per sequence	
		S6	2	Platform Resources and Rules > Generating >> Platform Resources and Rules > Synchronizing >> Platform Resources and Rules > Generating >> Platform Resources and Rules > Synchronising [...]	
Changing engagement	Selective engagement	S7	5	Customer Needs > Synchronising >> Agents > Generating alt.1: Customer Needs > Generating >> Customer Needs > Generating	
		S8	4	Customer Needs > Generating >> Platform Resources and Rules > Generating	
		S9	3	Platform VP > Generating >> Customer Needs > Generating alt.1: Customer Needs > Generating >> Platform Resources and Rules > Generating	
		S10	1	Customer Needs > Generating >> Platform VP > Synchronising	
		S11	2	Other Complementors > Networking >> Platform Resources and Rules > Synchronising	
		Growing engagement	S12	17	Platform VP > Generating >> Other Complementors > Networking >> Customer Need > Synchronising alt.1: Platform Resources and Rules > Networking >> Other Complementors > Synchronising alt.2: Customer Needs > Synchronising >> Other Complementors > Synchronising
			S13	15	Platform VP > Generating >> Agents > Generating >> Agents > Synchronising alt.1: Platform VP > Generating >> Agents > Networking >> Agents > Synchronising alt.2: Agents > Networking >> Agents > Synchronising >> Agents > Generating
	S14		3	Agents > Networking >> Agents > Networking	
	S15		4	Platform VP > Synchronising >> Agents > Synchronising >> Customer Needs > Synchronising alt.1: Platform VP > Synchronising >> Other Complementors > Synchronising	
	S16		3	Customer Needs > Generating >> Customer Needs > Synchronising >> Agents > Synchronising alt.1: Customer Needs > Synchronising >> Platform VP > Generating >> Agents > Synchronising	
	S17		3	Platform Resources and Rules > Networking >> Platform VP > Synchronising	

(Continues)

TABLE F1 (Continued)

Engagement trajectory type	Identified sequences	<i>n</i>	Engagement stages per sequence
Abating engagement	S18	1	Customer Needs > Synchronising >> Platform VP > Generating >> Customer Needs > Generating
	S19	2	Platform Resources and Rules > Networking >> Platform Resources and Rules > Networking >> Platform Resources and Rules > Synchronising
	S20	1	Platform Resources and Rules > Networking >> Platform Resources and Rules > Networking >> Platform Resources and Rules > Synchronising
	S21	1	Platform VP > Generating >> Platform VP > Generating >> Platform VP > Synchronising
	S22	1	Platform VP > Generating >> Customer Need > Generating >> Platform VP > Synchronising
	S23	1	Platform VP > Generating >> Platform VP > Synchronising
	S24	1	Platform VP > Generating >> Platform Resources and Rules > Generating >> Platform Resources and Rules > Generating
	S25	1	Platform Resources and Rules > Synchronising >> Platform Resources and Rules > Synchronising
	S26	1	Agents > Synchronising >> Platform VP > Synchronising >> Agents > Synchronising

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