ARTICLE IN PRESS

Technovation xxx (xxxx) xxx

Contents lists available at ScienceDirect

Technovation

journal homepage: www.elsevier.com/locate/technovation

Ecosystem-as-structure and ecosystem-as-coevolution: A constructive examination

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ABSTRACT

As a response to the call for cumulative knowledge in ecosystem research, this paper focuses on ecosystem literature from the perspective of a focal firm. Through an in-depth analysis of modern and classic ecosystem conceptual works, this paper clarifies the theoretical underpinnings of the structure view and the coevolution view of ecosystems. Whereas according to the structure view an ecosystem features a modular structure of multilateral interdependences, coevolutionists envisage it as a community of affiliated and interacting actors which keeps open exchange with environments. To deal with this tension, instead of proposing an integrative or overarching ecosystem definition, this research offers an integrative framework which can accommodate the merits of both views. We do so by suggesting that 1) the coevolution view helps understand where value proposition and complementarities come from and how they come about; 2) the structure view infuses granularity into the coevolution view to specify the ecosystem affiliation as a premise on which coevolution can be orchestrated; 3) affiliation plays the role as a linking concept between the two views, allowing for the focal firm's continuous innovation to be explained.

1. Introduction

With the publication of two influential conceptual papers (Adner, 2017; Jacobides et al., 2018), the ecosystem construct in strategic and innovation management has been more precisely defined and theoretically recognisable. These works help the ecosystem research community respond to previous critiques, mostly on Moore's (1993, 1996) pioneering work, such as inconsistency (Koenig, 2012), unclear definition, scope, boundaries, theoretical roots (Oh et al., 2016; Ritala and Almpanopoulou, 2017) and little added-value for analysis (Aarikka-Stenroos and Ritala, 2017). However, there are still some unanswered questions which need to be addressed. While Adner (2017) and Jacobides et al. (2018), respectively, set value proposition (VP) and non-generic complementarities as the starting point of their reasoning, it is unclear where the VP and complementarities come from and how they come about. Case studies have revealed that in real businesses neither the visibility of VP (Ansari et al., 2016; Dattée et al., 2018) nor that of complementarities (Deken et al., 2018) should be taken for granted. They draw such conclusions by shedding light on the processual interaction among ecosystem actors, essentially following the classic coevolution view of ecosystems (Iansiti and Levine, 2004; Moore, 1996; Teece, 2012). Since contrastive reasoning can facilitate theory building (Tsang and Ellsaesser, 2011), it seems fit to contrast the structure view and the coevolution view in a constructive context to develop a more satisfying ecosystem theory.

However, this direction is still disregarded by ecosystem scholars. For theorists with a structure view on ecosystems – such as Adner (2017) and Jacobides et al. (2018) – juxtaposing the two views for a theoretical dialogue may seem senseless as they deem coevolution to be a notion borrowed from ecology with little, if any, theoretical elaboration. By contrast, advocates of the coevolution view – such as Dattée et al. (2018) and Hou et al. (2020) – often criticise the structure view in their case studies while ignoring the possible lessons which could be learnt from it. There have been numerous ecosystem reviews attempting to offer a synthesised ecosystem framework (Bogers et al., 2019; Granstrand and Holgersson, 2020; Phillips and Ritala, 2019; Thomas and Autio, 2020; Tsujimoto et al., 2018). However, these works focus more on identifying common elements from comprehensive literature and rendering inclusive definitions than on contrasting different views in theoretical depth. Taken together, extant ecosystem literature lacks a constructive dialogue between the underlying theoretical assumptions of the structure view and the coevolution view.

This paper aims to fill this gap. In section 2 and 3, the two views are clarified. Section 2 gives an in-depth analysis of Adner (2017) and Jacobides et al. (2018), arguing that they share the same structure view but give different emphasis to value creation and value capture. Section 3 argues that Moore (2006) has offered a preliminary framework of the coevolution view, which has been unfortunately missed by the ecosystem research community, yet implicitly supported by recent developments in the platform ecosystem (PE) – as show-cased by Tiwana

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https://doi.org/10.1016/j.technovation.2020.102193
Received 19 March 2020; Received in revised form 4 September 2020; Accepted 14 October 2020

et al.'s (2010) work – and service ecosystem – as show-cased by Vargo and Lusch's (2011) work. A summary of the comparative analysis can be found in Table 1. Section 4, built on the above findings, proposes to replace the structure vs affiliation framing (Adner, 2017) with the structure vs coevolution framing, while using affiliation as a linking concept. Doing so allows this paper to offer an integrative framework. In section 5, various aspects of this framework are discussed.

This paper uniquely and constructively contributes to the cumulative knowledge of ecosystem literature. Compared with other comprehensive reviews, the emphasis of this research is placed on an in-depth analysis of several conceptual pieces, including Adner (2017), Jacobides et al. (2018) and Moore's (2006). While other authors ceremonially mention the complementarity of different ecosystem views, the in-depth analysis allows this paper to specifically point out that complementarities exist between the structure view and the coevolution view in a form of mutual constitution: the two sides of tension can be complementary and one side can be drawn on to enable the other (Farjoun, 2010; Schad et al., 2016). This paper shows that the structure view provides a backdrop against which the coevolution view can demonstrate its unique value. That is, the coevolution view helps address where the VP and complementarities come from and how they come about; meanwhile, the structure view infuses granularity into the coevolution view by specifying the ecosystem affiliation as a premise on which coevolution can be orchestrated. Therefore, instead of proposing integrative (Granstrand and Holgersson, 2020; Tsujimoto et al., 2018) or general (Bogers et al., 2019; Thomas and Autio, 2020) definitions, this research proposes an integrative framework which maintains the two differentiated views – as well as their respective definitions – as separate yet interdependent components. The simultaneous presence can promote creativity and a sense of wholeness (Schad et al., 2016). That is, an ecosystem as a community of actors – as proposed by the coevolution view – and an ecosystem as a configuration of activities – as proposed by the structure view – with the former being anchored to the focal firm and the latter being anchored to focal innovation, trigger each other and work together to continuously produce continuous innovative practices and assure the focal firm's long-term prosperity.

2. Analysis of the modern ecosystem structure view

In this section, an in-depth analysis of Adner (2017) and Jacobides et al.'s (2018) work is given. This section shows that, with the solid consensus that an ecosystem should be a multilateral interdependent structure, these two works are different from but complementary with each other in several important aspects.

2.1. The ecosystem structure view

Adner (2017) defines an ecosystem as the alignment structure of the multilateral set of partners which need to interact in order for a focal value proposition (VP) to materialise. These interactions are based on multilateral interdependence which cannot be decomposed into multiple dyad relationships (Davis, 2016). This nature makes ecosystems a new structure of economic relationships compared to those which have been examined by other theories like transaction-cost economics, supply chain and value chain, and alliance and strategic network (Adner, 2017; Davis, 2016; Kapoor, 2018). Concurring on this, Jacobides et al. (2018) define an ecosystem as a set of actors with varying degrees of multilateral, non-generic complementarities which are not completely hierarchically controlled. While complementarity has been emphasised by almost all ecosystem studies since Moore (1993), it is the structure view that explicitly links this economic relationship to the structure of value creation.

A deeper analysis reveals that both studies attempt to define ecosystems narrowly. Jacobides et al. (2018) clarify that not all types of complementarities entail the coordination of multilateral interdependence. They argue that firms can draw on generic complementarities, such as a teacup or boiling water, through market-mediated transactions, instead of resorting to an ecosystem. Moreover, they contend that ecosystems do not operate if the generic complementarities exist either at the consumption side – e.g. based on open standards in PC industry – or at the production side – e.g. products sold on Amazon and the marketplace. In other words, ecosystems, by their definition, only deal with situations in which complementarities at the consumption and the production sides are *both* non-generic. While it is unclear whether

Table 1
Comparison of ecosystem-as-structure and ecosystem-as-coevolution.

	Ecosystem-as-structure		Ecosystem-as-coevolution	Note
Core literature	Adner (2017)	Jacobides et al. (2018)	Moore (1996, 2006)	
Ecosystem definition	An alignment structure of the multilateral set of partners which need to interact in order for a focal value proposition to materialise.	A set of actors with varying degrees of multi-lateral, non-generic complementarities which are not completely hierarchically controlled.	A community of affiliated and interacting actors which keeps open exchange with environments for continuous innovation.	'Actor' for structuralists is reduced to the role or activity performed by the actor.
Ecosystem function	Facilitating value cocreation	Facilitating coordination	Facilitating coevolution	
Research question	Why ecosystems are unique	When and why ecosystems emerge	How ecosystems emerge and evolve	
Ecosystem premise	The need for realignment	Non-generic complementarity	The need for coevolution	
Ecosystem ontology	Multi-lateral interdependence structure		Becoming instead of being	
Environmental assumption	None		Boundless opportunity space	
Strategy theory	Value creation	Competitive advantage	Dynamic capabilities	
Focal firm	Ecosystem designer	Ecosystem coordinator	Ecosystem captain	
System nature	Semi-closed system		Complex adaptive system	
System objective	A focal innovation		Continuous innovation	Coevolutionism studies can analytically focus on a single innovation.
System composition	Interdependent activities	Interdependent modules	Interacting actors	An activity can be a module
Boundary concept	Value proposition	Complementarity-specific affiliation	Actor-based affiliation	
Ecosystem dynamics	Search of alignment	Balancing value creation and capture	Macro and micro coevolution	The structural view is not necessarily static
	Role-based dynamics		Actor-based dynamics	

Adner would agree with setting such a strict standard, it is clear that Jacobides et al. (2018) concur with and sharpen Adner's (2017) point that ecosystem logic is not necessary in cases that value creation does not entail realigning multilateral partners. Indeed, for Jacobides et al. (2018), it is when answering the question of when the multi-lateral alignment (Adner, 2017) will emerge that non-generic complementarities are identified and theorised to define ecosystems.

Therefore, Adner (2017) and Jacobides et al. (2018) consistently emphasise that multilateral interdependence exists at the level of a set of roles. As highlighted previously, a set of the relationships which link the roles should be analysed or designed as a whole. The premise is that partners or actors are grouped in the ecosystem by the role they play or the activities they perform. Indeed, Adner (2017) treats actors as entities which undertake activities and views ecosystems as 'configurations of activity defined by a VP' (p. 40). Kapoor (2018) adds that this macro view on external actors' activities complements the micro view provided by traditional value chain analysis on internal activities. Instead of following the activity perspective, Jacobides et al. (2018) draw on modularity literature (Baldwin and Clark, 2000) to theorise ecosystems. They assert: 'What makes ecosystems unique is that the interdependencies tend to be standardised within each role' (p. 2265). The two perspectives are therefore consistent with each other as both the modular system and the activity system are systems of division of labour (Albert et al., 2015; Baldwin, 2008). This might also explain why Thomas and Autio (2020) coin 'modular ecosystem' as an umbrella concept of Adner (2017) and Jacobides et al.'s (2018) work.

In summary, Adner (2017) and Jacobides et al. (2018) represent the modern ecosystem approach from a structure view. In essence, both studies regard an ecosystem as a structure of multilateral interdependences. However, this does not mean that the two discourses are exactly the same.

2.2. Differences between Adner (2017) and Jacobides et al. (2018)

Our analysis reveals that Adner (2017) and Jacobides et al. (2018) differ from each other in their motivations and starting points, as well as in their position against the classic business ecosystem (BE) and strategy literature. While Adner (2017) is motivated by the question of why ecosystems are phenomenologically unique, Jacobides et al. (2018) are keen on clarifying when and why ecosystems emerge. Furthermore, Adner's (2017) work is influenced by a series of compelling empirical studies on technology innovation and commercialisation – such as Adner (2012) and Adner and Kapoor (2010; 2016) – whereas Jacobides et al. (2018) are more influenced by previous studies on Industry Architecture (e.g. Brusoni et al., 2009; Jacobides et al., 2006; Jacobides and Tae, 2015). As a result, Adner's (2017) starting point involves setting a VP, whereas Jacobides et al.'s (2018) theory starts with the challenge of coordination based on the modularity assumption (Baldwin, 2008; Baldwin and Clark, 2000).

This brings about two distinct perspectives on ecosystem strategy. For Adner (2017), ecosystems arise from firm's need for an ecosystem strategy to realign partners to materialise a VP, whereas Jacobides et al. (2018) argue that ecosystems provide a novel governance structure to deal with non-generic complementarities. For Adner (2017), an ecosystem is mainly a value creation concept (Adner and Kapoor, 2010). By contrast, Jacobides et al. (2018) shift the emphasis to value appropriation by linking ecosystem analysis to the extended resource-based view (Dyer and Singh, 1998; Lavie, 2006), the profit-from-innovation framework (Teece, 1986, 2018) and the Industry Architecture theory (Jacobides et al., 2006).

These differences lead to the investigation of different types of ecosystem dynamics. The ecosystem strategy defined by Adner (2017) is inherently dynamic as it is based on the search for alignment. Ecosystem dynamics are therefore derived not only from activity-based challenges – such as co-innovation risks and adoption chain risks (Adner, 2006) – but also from actors' expectation gaps about structure and roles and about who will take the role of leader or follower in particular. By contrast, Jacobides et al. (2018) mainly consider the ecosystem dynamics which arise from the tension between value capture and value creation, which can be determined by the choice of different attributes of complementarities. Jacobides et al. (2018) argue that "[t]he very things that make it (the ecosystem leader) easy to capture value within an ecosystem make it harder to recruit (and, less so, retain) members" (p.2268).

It is worthy to note that there is an explicit divergence in Adner and Jacobides et al.'s position against the classic BE literature and the platform ecosystem (PE) literature. Adner (2017) distances his approach from BE and PE literature, which are labelled as 'ecosystem-as-affiliation' as the two streams of literature define an ecosystem as a community of actors affiliated to a focal firm or a focal platform. It is understandable from his standpoint as BE and PE studies seldom set out from a specific VP. On the contrary, delving into various types of complementarities, Jacobides et al.'s (2018) work highlight those types which can result in the affiliation. According to the authors, the defining feature of ecosystems, namely the non-general complementarity, entails some degree of customisation. Non-general complementarity can be either unique or supermodular (Jacobides et al., 2018). Unique complementarity underpins the idea of cospecialisation (Teece, 1986). In production, supermodular complementarity can lead to the higher return from coordinated investments – as shown in Venkatraman and Lee (2004) – while in consumption, it is the basis of network effects – as shown in Katz and Shapiro (1985). In this sense, Jacobides et al. (2018) offer a structure view which circumscribes innovation ecosystems (Adner and Kapoor, 2010), BEs (Moore, 1996) and PEs (Parker et al., 2016). As a result of Jacobides et al.'s emphasis on proprietary standard-based coordination, ecosystem actors are affiliated to the ecosystem leader by adhering to certain standards or platforms, which would be at odds with Adner (2017).

In summary, the two conceptual papers jointly enrich the ecosystem structure view by providing a balanced emphasis on the value creation and value capture of ecosystem innovation. The diverging position of the two papers on BE and PE literature is a result of their diverging analytical perspectives on the same structural ecosystem ontology, which is secondary.

2.3. Unaddressed issues of the ecosystem structure view

Overall, the structure view clarifies several theoretical questions on ecosystems such as why they are unique (Adner, 2017) and when they can emerge (Jacobides et al., 2018). However, regardless of the starting point – whether it be with a VP or with complementarities – this school of thought seems uninterested in addressing how the starting point comes about to evoke the ecosystem logic.

Adner (2017) defines an ecosystem strategy as the way in which a focal firm approaches the alignment of partners and secures its role in a competitive ecosystem. Interestingly, despite the extreme importance Adner gives to VP in his definition of ecosystems, VP is absent from his definition of ecosystem strategy. An inference can be drawn that the VP would have been assumed as a priori such that its adjustment should not be incorporated into an ecosystem strategy. Likewise, in explaining the ecosystem dynamics of alignment, Adner (2017) considers actor expectation gaps about roles and structure, while disregarding the gap about the VP. Unsurprisingly, as the VP has been found changeable over time in parallel with the search of alignment (Ansari et al., 2016; Dattée et al., 2018), Adner (2017) is accused of assuming a VP self-evident and nurturing a deterministic and linear view (Dattée et al., 2018). Of note, this does not mean that Adner's argument (2017) would be invalid once an existing VP is changed but it just implies that his argument may not take into account the ecosystem dynamics during the change of the VP.

Jacobides et al. (2018) avoid assuming VP as a priori but seem to take for granted the visibility of complementarities. The issues of Jacobides et al.'s (2018) work could be epitomised by Deken et al.'s

(2018) argument that '*rather than seeing resource complementarity as a strategic condition that explains the initiation of collaboration, it is a condition that itself requires further examination*' (p.1920).

Asserting that ecosystems come from the need of coordinating non-generic complementarities, Jacobides et al. (2018) seem uninterested in addressing where the complementarities come from in the first place, which can be an issue. In a systematic review, Ennen and Richter (2010) conclude that a theory of complementarity has to consider contextuality seriously as 'complementarities may only become fully effective when embedded in an overall system involving many elements' (p.224). The authors also argue that '[r]esearchers may interpret interactions among individual factors as complementarities, but only *ex post*, as the complementarity perspective provides little guidance *ex ante* … ' (p. 210). The need for considering the spatial and temporal contexts of complementarities has been supported by several case studies (Deken et al., 2018; Hou et al., 2020).

Indeed, although Jacobides et al. (2018) draw heavily on Teece's (1986) notion of cospecialisation, they do not give much consideration to the dynamic orchestration of cospecialised assets, which not only entails that cospecialised assets are aligned, but also emphasises the need to identify new cospecialised assets (Teece, 2010). Another issue which is not addressed by Jacobides et al. (2018) is complementor heterogeneity. Their emphasis on standard-based coordination and supermodularity is compatible with established platform theories (see McIntyre and Srinivasan, 2017), and one of the weaknesses their work inherits from platform literature is that '*very little attention [is] paid to the antecedents of complementor support — how complementor attributes influence their incentives to support specific platforms*' (McIntyre and Srinivasan, 2017, p. 115).

3. Rediscovery of the classic ecosystem coevolution view

Instead of offering a comprehensive multi-disciplinary review, we argue that an acceptable version of the ecosystem coevolution view is present in Moore's articles – notably in Moore (2006) – which, unfortunately, has not been taken seriously by most ecosystem studies. Drawing on this literature, and on other ecosystem literature which explicitly places the coevolution notion at its core (e.g. Lusch and Vargo 2014; Tiwana et al., 2010), this paper will briefly outline the ecosystem coevolution view. Then, a comparative analysis which reflects the uniqueness of this view will be performed.

3.1. The profile of the ecosystem coevolution view

Moore (1996) defines an ecosystem as '*an economic community supported by a foundation of interacting organisations and individuals – the organisms of the business world*' (p. 26). Researchers concur that BE literature is unique in its notion of coevolution (Jacobides et al., 2018; Lengnick-Hall and Wolff, 1999; Moore, 1993; Ritala and Almpanopoulou, 2017; Teece, 2012). However, since borrowed from ecology and principally by Moore (1993, 1996), on most occasions, this notion has only been used loosely or implicitly at a descriptive level and has generated few insights and mechanisms (Jacobides et al., 2018; Thomas and Autio, 2020). Interestingly, with few exceptions (e.g. Li 2009), ecosystem authors seem to seldom pay specific attention to Moore (2006), although he provides an acceptable coevolution framework. Associating coevolution with ecosystems as a means of coordinating production, Moore (2006, p.35–36) states:

> *Markets facilitate transactions for goods. Hierarchies facilitate control over activities that produce goods. Ecosystems facilitate coordination of innovation in goods and the activities that produce them, as well as facilitate managed co-evolution of the complex web of markets and hierarchies themselves. What differ, in the three forms of organisation, are the ideal relationships that are sought and the levels of analysis used to judge performance. In markets, the ideal is perfectly transparent transactions for contributions, i.e., goods and services. In hierarchies, the ideal is perfect control of tasks. In [BEs], the ideal is perfect co-evolution of innovation across a multitude of contributors.*

This paragraph explicitly claims that facilitating coevolution is a function of ecosystems. Moore (1993) and Teece (2012) provide a standard understanding of coevolution as a process through which the attributes of two organisations become more and more complementary. While this coevolution seems as occurring within an ecosystem, it is noteworthy that the ecosystem, by the definition of Moore (1996), is nested in a wider 'foundation'. According to Moore (2006), this foundation should be understood as an opportunity space, which is 'comparatively unbounded, open, with limits that are unexplored and will only be defined by the establishment of [BEs] within them' (Moore, 2006, p.35–36). Consistent with Moore (2006), service ecosystem literature (Chandler and Vargo, 2011; Lusch and Vargo, 2014) emphasises that an ecosystem is simultaneously shaped by the downward force from the macro-level institutions for stabilisation and the upward force from the micro-level actor-to-actor interactions for the emergence of new structures. Recognising an environment exogenous to ecosystems, this stream of literature suggests that coevolutionary dynamics can occur not only within an ecosystem (Gawer and Cusumano, 2014; Moore, 1993; Rong et al., 2015a; Teece, 2012), but also between an ecosystem and its environment (Thomas and Autio, 2020; Tiwana et al., 2010).

This is in line with general coevolution literature. In organisational studies, Lewin and Volberda (1999) distinguish between the micro coevolution within an organisation and the macro coevolution between the organisation and its environment, presenting multi-levelness as a core attribute of coevolution. In line with the Santa Fe view of emergence which emphasises self-organisation, micro coevolution holds that agents within a system coevolve to create higher-level structures which become the selection contexts for the subsequent behaviour of agents (McKelvey et al., 2012). This process emphasises that, through positive feedback and nonlinear mechanisms, small instigating events can cause consequences at the system level. By contrast, in line with the European view of emergence rooted in Prigogine's dissipative structures model (Prigogine, 1963), the macro coevolution of a system occurs during the permanent exchange of resources between a system and its environment; this maintains the vitality of the system and, in turn, shapes the environment (McKelvey et al., 2012). As implied by the definition of Moore (1996), this approach sheds light on mobilising resources from the environment – i.e. the foundation – to the ecosystem. In empirical ecosystem studies, depending on the research design, the micro approach (Dattée et al., 2018; Hou et al., 2020) and the macro approach (Ansari et al., 2016; Snihur et al., 2018) have proven to be both fruitful.

Moore (1996) and Moore (2006) demonstrate his intention to offer an integrative coevolution framework for ecosystem studies. However, the coevolution view's theoretical assumptions – such as system goal, nature, boundary and composition – have been virtually undeveloped since. Therefore, sections 3.2 and 3.3 will delve into Moore (2006) and other ecosystem coevolution literature to provide an updated ecosystem definition; i.e. a community of affiliated and interacting actors which keeps open exchange with environments for continuous innovation.

3.2. Open exchange with environments for continuous innovation

From the macro coevolution view, an ecosystem is permanently exchanging with environments for continuous innovation. To deal with the unlimited opportunities and threats (Moore, 2006), ecosystems are also elusive and open-ended, further increasing interdependency, dynamism and instability, which entails a more far-reaching understanding of the relevant actors, technologies and institutions (Aarikka-Stenroos and Ritala, 2017). In this sense, Jacobides et al. (2018) argue that BE studies are all about strategy dynamics which are centred on a firm and its environment. Indeed, BEs have been studied to better understand the dynamics of delivering a single innovation (Ansari et al., 2016; Dattée et al., 2018), continuous innovation of a single business (Rong and Shi, 2014) or continuous innovation of corporate businesses (Hou et al., 2020).

While studying focal innovation can be an option of research design, the coevolution is inherently oriented by continuous innovation over time. As noted by Moore (1993), '*companies coevolve capabilities around a new innovation … eventually incorporate the next round of innovations*' (p. 76). Moore (2006) dives deeper into this point, arguing that the only way for a firm to stand against constant competition and commoditisation is to be a continuous innovator. Thus, '*the co-evolved ecosystems incorporate combinations of markets and firms, with new and existing markets, as well as new and existing firms*' (Moore, 2006, p. 73). As a result, Moore (2006) argues that a firm should be defined by its innovation trajectory rather than by its current products, services and tangible assets. It is clear from this coevolution view that ecosystems should not be regarded as constrained by a defined market or audience.

Since the coevolution view assumes that the fundamental mission of an ecosystem is to facilitate continuous innovation, it makes sense that Adner (2017) makes a distinction between defining an ecosystem around a focal innovation and around a focal firm (i.e. a serial innovator). It is worthy to note that this distinction is not made as an analytical choice, but a result of the different assumptions of the nature of an ecosystem. Coevolutionists view an ecosystem as a complex adaptive system which functions to digest external shocks and absorb external opportunities. By contrast, in the absence of an explicit role of external environments, Adner (2017) places a given VP as the endogenous ecosystem boundary, virtually conceptualising an ecosystem as a semi-closed system. While the perspective of Jacobides et al. (2018) allows studies to deal with temporal and structural dynamics which may involve the shift of an ecosystems' VP, this theory is not intended to address continuous innovation as well. Indeed, Jacobides et al. (2018) tend to regard an ecosystem as a particular type of Industry Architecture, which implies that the categories of the concerned innovation would be limited.

3.3. A community of affiliated and interacting actors

From the micro coevolution view, two fundamental issues are ecosystem boundary and ecosystem composition (Aarikka-Stenroos and Ritala, 2017; Phillips and Ritala, 2019). The boundary and the composition are mutually constituted; the boundary comes from and is prompted forward by the continuous coevolution of compositional elements.

Before Jacobides et al. (2018), Moore (2006) had defined ecosystems as an alternative to markets and hierarchies, similarly putting affiliation as the boundary concept of ecosystems, albeit from a different theoretical perspective. Indeed, he explains the boundary issue in the coevolution context as follows:

> *Just as the firm internalized markets under the visible hand of the entrepreneur, the ecosystem form internalizes systems of firms and the markets that connect them under the guiding hands of community leaders … Just as the firm brings production under the control of Coase's "entrepreneur-coordinator," the ecosystem brings co-evolution of production under the hand of a group of allied entrepreneurs and ecosystem leaders (*Moore 2006*, p. 73).*

The metaphor of the *guiding hand* implies that 1) an ecosystem is bounded by the affiliation to or the influence of the focal firm and 2) coevolution is facilitated by leveraging the affiliation or the influence. As a boundary concept (Santos and Eisenhardt, 2005), the focal firm's influence is reflected by well-accepted metaphors like keystone (Iansiti and Levine, 2004), hub firm (Dhanaraj and Parkhe, 2006) and ecosystem captain (Teece, 2012).

It is worthy to note that, while the notion of affiliation may appear in both camps, its connotation in the structure view is usually much narrower than it is in the coevolution view. The structuralists' narrowness signifies when Adner (2017, p.17) argues that '*if the same group of partners pursues multiple value propositions, the ecosystem-as- structure approach would place those initiatives in different ecosystems*.' It is not unlike artificially separating the influence of a single ecosystem, in the sense of the coevolution view, into multiple ones, in the sense of the structure view. The narrowness also features Jacobides et al. (2018) as this theory exclusively attributes the ecosystem affiliation to standard-based coordination and cospecialisation. Such treatments would be unacceptable from a coevolution standpoint as they can lead to underestimating the scope and the potential of ecosystem coevolution. As Hou et al. (2020) note: '*It is odd … that an ecosystem actor should engage with others in certain ways that satisfy the authors' narrow definition*' (p.3).

This divergence might be rooted in the two camps' differentiated view on ecosystem composition. For the structure camp, affiliation is the result of interdependences of a particular set of roles, and its utility lies mainly in determining the value distribution across these role performers (Jacobides et al., 2018). By contrast, since coevolutionists view actors, instead of roles, as the ecosystem's composition, there would be a wider range of sources of the affiliation and its utility would be dynamic.

It essentially involves understanding how and why actors should not be reduced to roles. The actor orientation (Fjeldstad et al., 2012) in ecosystem studies originates from classic BE literature (Moore, 1996, 2006; Teece, 2012) but is matured in service ecosystem literature in marketing (Ekman et al., 2016; Lusch and Vargo, 2014; Vargo and Lusch, 2011). Initially, Moore (1993; 1996; 2006) deemed actors as innovators whose capabilities coevolve to mutually improve goods, services and activities. While this may sound similar to Jacobides et al.'s emphasise on cospecialisation, as pointed out by Thomas and Autio (2020), actor roles in BEs are often less fixed and can change depending on the dynamics of the ecosystem.

Regarding this, service ecosystem literature has conceptualised generic actors, adding the actor context dimension (i.e. multi-embeddedness) and the actor behaviour dimension (i.e. interaction) to the outcome (i.e. new capabilities and resources). In terms of the context, Lusch and Vargo (2014) denote that their use of the term actor is underlined by the assumption that an actor is usually embedded in multiple and overlapping structures. A related concept is relational pluralism (Shipilov et al., 2014), which has been argued to be beneficial to ecosystem coevolution and business model innovation (Hou et al., 2020). Positions, knowledge, cultures and goals associated with such embeddedness contribute to actor heterogeneity (Corsaro et al., 2012) or participant heterogeneity (Thomas and Autio, 2020). This echoes the original emphasis of the ecosystem concept (Moore, 1993) that members usually join in ecosystems from diverse industries. On the other hand, in terms of the interaction, service ecosystem literature argues that actors, regardless of the businesses or consumers (Vargo and Lusch, 2011), are simultaneously resource beneficiaries and resource integrators (Vargo, 2008), who permanently interact with each other to seek resource density, i.e. the best combination of resources that is mobilised for a particular situation (Lusch and Nambisan, 2015; Michel et al., 2008). The blurring boundary of consumers and producers in service ecosystem literature is consistent with Moore (2006, p. 63) who states that '*[t]he [BE] analogue for sunlight is customer interest, expressed in money paid for goods and services*' (see also Gawer, 2014). This dimension shifts attention from the interdependence structure to the interaction process through which the interdependences are created (Dattée et al., 2018; Fjeldstad et al., 2012). Taking these dimensions together, as summarised by Ekman et al. (2016, p. 51–52), '*the proper way to define the generic actor is as one that fluidly assumes multiple roles and exhibits various behaviours in complex exchange settings, rather than as one that exhibits a constrained set of behaviours due to the assumption of a specific role vis-à-vis another actor.*'

If the explicit environmental assumption is to underpin the macro coevolution view of ecosystems, the above understanding of actors can be said to cultivate the micro view. Given this understanding, ecosystem affiliation from the coevolution view should not be limited to a particular source such as multi-lateral non-general complementarities (Jacobides et al., 2018). So long as it can facilitate the coevolution process and allow the ecosystem leader to exert influence on an actor to establish new roles vis-à-vis others, there is no reason to exclude the affiliated relationships or the affiliated actors from the ecosystem.

By dynamically facilitating the focal firm to internalise the systems of the firms and the markets, the initial affiliation itself will be renewed as well. In other words, the utility of affiliation for coevolution should be dynamic and keep evolving, making it difficult to capture through snapshots. The underlying rationality of not excluding any form of affiliation from ecosystems is that the to-be-renewed relationships cannot be predetermined due to the uncertain external environment. In this sense, the micro and macro aspects of ecosystem coevolution are inherently unifying.

3.4. Unaddressed issues of the coevolution view of ecosystems

The coevolution view offers a holistic view, both spatially and temporally, on ecosystems. However, despite the implicit importance of affiliation, ecosystem coevolution studies rarely explain the modality of affiliation or delve into affiliation dynamics. As criticised by Adner (2017), ecosystem-as-affiliation studies often take the affiliation for granted or treat it abstractly by focusing on the focal actor's network position, the number of ties and the centrality. It leads to three aspects that can impede the development of the coevolution view.

First, the coevolution view may suffer from an unbalanced emphasis between value creation and value capture. Profiting from innovation (Teece, 2018) is inherently critical for developing this view as continuous innovation is impossible without sustainable corporate funding. While there are a few exceptions (e.g. Dattée et al., 2018), perhaps because of the entrepreneurial (i.e. opportunity-seeking) nature of ecosystem coevolution (Moore, 2006), this stream of work tends to ignore mechanisms of value capture such as affiliation of complementary assets. Tivo, a pioneer of Digital Video Recorder, is an interesting example. It has been considered a successful case of organising a value-creating ecosystem by coevolving with the TV industry in the United States (Ansari et al., 2016). But this perspective seems unable to notice and explain Tivo's difficulty in profiting. By contrast, as documented by Ceccagnoli and Rothaermel (2016), this difficulty can be painful and it should be attributed to Tivo's ignorance of the appropriability regime and the specialised complementary assets, which are in large part a concern of structure.

Second, specific insights on the mechanisms of the guiding hands (Moore, 2006) or the ecosystem orchestration (Helfat and Raubitschek, 2018) are difficult to produce (Jacobides et al., 2018). Orchestration has been defined as purposively exerting influences on a network of actors (Möller and Svahn, 2003). When resources reside within the boundary of the orchestrator, which means having full control of the resources, resource orchestration (Sirmon et al., 2011) is largely a matter of choice. However, when resources to be orchestrated reside beyond the boundary of the firm, the orchestration is premised on the orchestrator's ability to reach them and exert proper influence on them. Affiliation – the indicator of influence on actors (Santos and Eisenhardt 2005) – thus becomes a crucial factor in conducting various orchestration processes (Dhanaraj and Parkhe, 2006; Nambisan and Sawhney, 2011). Therefore, without a good understanding of affiliation, it is difficult to understand how the ecosystem orchestration could take place in a desirable manner.

Third, the insufficient understanding of ecosystem affiliation may prevent us from dealing with the innovation dilemma that the innovativeness of ecosystem outputs may be reduced by an increase in affiliation or centrality (Gadde et al., 2003; Gulati et al., 2012; Luo, 2018; Schmidt and Braun, 2015). In the platform context, scholars have investigated mechanisms to balance ecosystem stability and ecosystem evolvability (e.g. Saadatmand et al., 2019; Wareham et al., 2014). Indeed, it is largely due to the fact that the affiliation structure of platform ecosystems has been concretised that platform scholars can do so. Admittedly, for a general ecosystem and from the coevolution view, concretising affiliation *ex ante* as the platform studies do can be inherently difficult. However, doing so *ex post* is still valuable as, in a longitudinal process of continuous innovation, the affiliation formed in the last period can impact the formation of new affiliations in the following period (Hou et al., 2020).

4. Cross-fertilising ecosystem structure and ecosystem coevolution

In this section, we suggest reframing the tension in ecosystem literature from between structure vs affiliation to between structure vs coevolution. Then, the relationships between the structure view and the coevolution view will be elaborated, thereafter allowing the introduction of an integrative framework of ecosystems.

4.1. From structure vs affiliation to structure vs coevolution

Our analysis suggests that extant ecosystem literature should be framed as structure vs coevolution, instead of structure vs affiliation. The counterpart to the structure view would be the coevolution view which does not regard structure-related attributes as a priori. By contrast, affiliation is a concept which is incorporated in both views. Jacobides et al. (2018) highlight the importance of affiliation in the structure view. But affiliation is also relevant for the coevolution view, as it allows the focal firm to guide the coevolution. Nevertheless, while affiliation is deemed by structuralists as role-level relationships based on non-generic complementarities, authors following the coevolution view describe it as actor-level relationships.

To illustrate this argument, consider PE literature. PE literature is complex (see Gawer, 2014; McIntyre and Srinivasan, 2017) and has been compounded by the proliferation of digital platform literature (Constantinides et al., 2018; De Reuver et al., 2018; Yoo et al., 2012). The majority of PE literature (Cennamo and Santaló, 2019; Gawer and Cusumano, 2014; Hagiu and Wright, 2015; Kapoor and Agarwal, 2017; Parker et al., 2016) falls into the structure camp. In this context, platforms typically enable a multilateral structure of leverage (Thomas et al., 2014), and ecosystem dynamics are discussed with the assumption that this structure is relatively stable (McIntyre and Srinivasan, 2017). However, the framing provided by us allows for an emerging stream of PE literature, which falls in the coevolution camp, to be identified. Gawer (2014) introduces an agent-based platform definition without predefining a structure. This definition has been used to conceptualise a so-called interactive platform (Ramaswamy and Ozcan, 2018) which enables open-ended value cocreation. It has also been cited in various platform studies on digital innovation (De Reuver et al., 2018; Henfridsson et al., 2018; Lusch and Nambisan, 2015). As a result of the layered modularity of digital technologies (Yoo, 2013), cospecialisation usually does not occur with digital innovation. To establish the affiliation, instead, digital platforms (e.g. Google map) rely on capturing connections as many as possible with other actors who combine these platforms with other digital resources for their own use (Henfridsson et al., 2018).

As a result, incontrast to simply excluding platform literature from the structure camp (Adner, 2017) or merely emphasising the cospecialisation-based affiliation (Jacobides et al., 2018), the structure vs coevolution framing allows for a more inclusive investigation of platform literature. This inclusiveness, in turn, allows for ecosystems to be appreciated from different views. Therefore, we contend that the structure vs coevolution framing is more constructive and reflects the nuance of the various ecosystem conceptualisations.

4.2. The integrative ecosystem framework for continuous innovation

The framework, as shown in Fig. 1, integrates the findings from the analysis in previous sections. Integrating the above layer, the ecosystem structure, and the below layer, the ecosystem coevolution, facilitates the understanding of both of them. For the structure view, the framework offers a holistic and dynamic explanation of focal innovation by tracing back to the antecedent of VP and complementarities. For the coevolution view, it draws attention to the affiliation dynamics which ideally sustain ecosystem orchestration for continuous innovation. Since affiliation is a concept shared by both views, the affiliation dynamics create a bridge between the two layers through which the feedback can iterate over time.

How VP is discovered. Moore (2006, p. 62) describes VP as 'an invitation to others within and beyond the focal firm to make a new market.' Casting light on the processes of communication, learning and negotiation among potential actors, Moore (2006) terms the process of discovering VP as a 'campaign' and describes it as a social movement which produces public goods to sustain the ecosystem momentum. He observes that contributors are always distracted away from community concerns. Therefore, the coevolution momentum has to be maintained through campaigns to keep the shared vision alive. Similarly, Frow and Payne's (2011) five-step iterative framework of VP creation provides a reference model. It cyclically starts from identifying actors and ends with co-creating VP; in between, it involves determining core values, facilitating dialogues, and identifying value co-creation opportunities.

Ecosystem coevolution studies reveal at least two antecedents to VP discovery. On the one hand, VP discovery can be determined by micro aspects of ecosystem actors. For example, the process of VP discovery is shaped by ecosystem actors' cautious delay of resource commitment to avoid undesirable losses and to keep option space open or desirable outcomes (Dattée et al., 2018). On the other hand, VP discovery has also been found to be determined by macro aspects of environments. For example, Tivo had to reframe its disruptive VP because it could not establish its intended disruptive innovation ecosystem without the support of industrial incumbents who had been supposed to be the victim (Ansari et al., 2016). These examples indicate that the structuralist ecosystem model which uses VP as its starting point (Adner, 2017) can be enriched by incorporating factors from the coevolution view.

How complementarities are orchestrated. In general, orchestration can be seen as shaping the development of networks by influencing the beliefs, goals and behaviour of other key actors (Dhanaraj and Parkhe, 2006; Helfat and Raubitschek, 2018; Möller and Svahn, 2003; Teece, 2007, 2012). More specifically, Teece (2010) highlights that orchestration aims not only to keep cospecialised assets in value-creating alignment, but also to identify new cospecialised assets and divest or run down old cospecialised assets. Given this, the coevolution view can add to the structure view by emphasising that complementarities do not simply appear, but emerge from resources embedded in multi-level contexts, which can only be enacted, shaped and established by the focal firm's proactive orchestration of resources.

In this process, depending on where the resources involved in the orchestration are embedded, both micro coevolution and macro coevolution can play a role. Micro coevolution is involved when the orchestrated resources come from within the focal firm's existing social network (Gulati and Gargiulo, 1999) or established ecosystem (Hou et al., 2020). Since the required complementarities cannot always be known *ex ante* (Deken et al., 2018; Engel et al., 2017), the micro context is important for exploring the complementary use of existing and emerging resources. However, one cannot expect that the desired complementarities will always be supported by the existing ecosystem actors. Therefore, macro coevolution between the ecosystem and its broader context, such as the industry (Ansari et al., 2016) and competition (Tiwana et al., 2010), also has a role to play. Sometimes, environmental conditions can prevent the formation of desired complementarities (see Tee and Gawer, 2009). In this case, the advantage of the coevolution view lies in its consideration of the exogenous environment.

How affiliation evolves to sustain continuous innovation. The affiliation which allows the focal firm to exert influence on actors is important for making coevolution/orchestration happen. Affiliation is a power-based phenomenon (Santos and Eisenhardt, 2005), and the

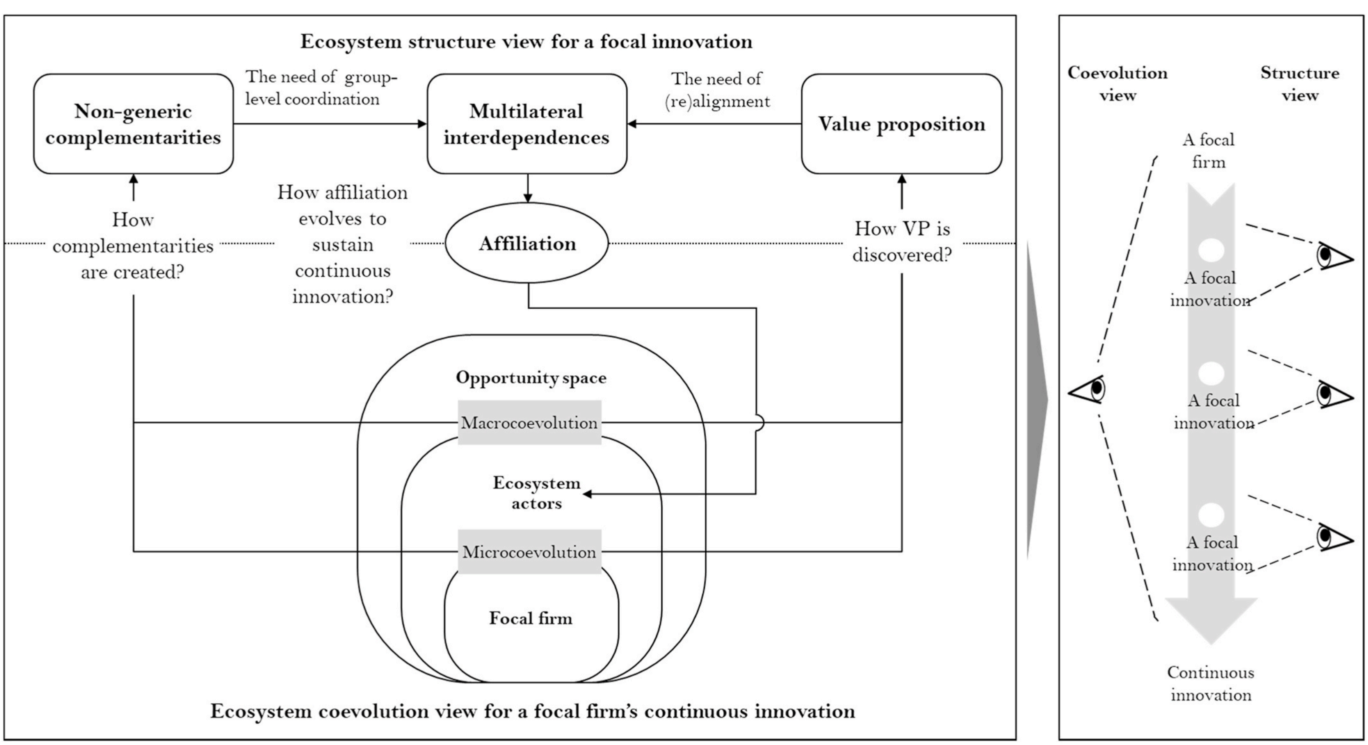

Fig. 1. An integrative ecosystem framework for continuous innovation.

power should be examined with the structure of interdependence (Pfeffer and Salancik, 1978). The ability of the structure view to depict the structure of affiliation allows it to contribute to the development of the coevolution view. In this vein, Luo (2018) suggests that an ecosystem's evolvability, which is defined as its ability to innovate continuously, can be impacted by the ecosystem's architecture, which is characterised by interfirm influence diversity and density. Specifically, an ecosystem's evolvability is enhanced by influence diversity – i.e. the variety of ecosystem actors or the scope of affiliation – but limited by influence density – i.e. the reverse indicators of autonomy or the strength of affiliation.

Further, we suggest that the evolvability and architecture of an ecosystem are mutually shaped. While the established ecosystem's architecture at t_0 can impact the innovation generated at t_1 (Hou et al., 2020; Luo, 2018), the structure of the innovation at t_1, if implemented successfully, in turn, can impact the two dimensions of the ecosystem's architecture at t_2. The impact on the affiliation scope involves macro coevolution, which allows the ecosystem to attract new categories of actors from the opportunity space. By contrast, the impact on the affiliation strength requires micro coevolution to adjust the ties between existing actors. Specifying these dynamics would be impossible without distinguishing actors by their heterogeneous interdependences in the ecosystem. Therefore, to understand how the ecosystem's evolvability could be sustained, delving into each innovation from the structure perspective is important. As such, our framework outlines how the strength and scope of affiliation of ecosystem actors facilitate and, in turn, are impacted by, the process of continuous innovation.

Linking the dots. As a result, to fully understand a firm's continuous innovation, research should be conducted through an integrative approach. While the structure view covers innovation-specific ecosystem dynamics, the coevolution view guides observers to think about how such dynamics are initiated and how they contribute to the next round of innovation. In other words, through the integrative framework, the dots of innovation in different time periods are linked to the present and long-term development of the focal firm.

5. Discussion and contribution

5.1. The uniqueness of the integrative framework

This work does not intend to build a new ecosystem theory; it even deliberately avoids offering an ecosystem definition which is different from the existing ones. Instead, this research acknowledges and accommodates the merits of two diverse, if not opposite, ecosystem views in an integrative framework. It does so without dismantling either of the views. This paper reframes the literature tension of structure vs coevolution and identifies how the two views are deeply interdependent and mutually constituted. The unique features of the integrative framework, compared with other synthesis works, will be discussed below.

Persistent coexistence. This research acknowledges that both the structure view and the coevolution view have their own standalone value which produces high-quality insights. If the VP and the required complementarities could be identified *ex ante,* the structure view is quite useful in guiding the ecosystem design; it also offers rich implications on the value creation and value capture of either the focal firm or the complementors (Adner and Kapoor, 2010; Kapoor and Agarwal, 2017). If the VP and the required complementarities are of poor visibility, the coevolution view is perfect for examining the process through which the visibility could be established; it can also contribute to depicting the emergence of a viable ecosystem (Ansari et al., 2016; Dattée et al., 2018). Therefore, it is entirely possible to apply each of the two views independently to a particular scenario or stage of ecosystem innovation, without the risk of one contradicting the other.

Indeed, our strategy is not to resolve either of the two views, but to clarify the theoretical underpinnings and boundary conditions of each. This distinguishes our work from Tsujimoto et al. (2018) who propose a new coherent definition based on the actor-based understanding of ecosystems; our framework allows for the coexistence of the actor-based understanding and the activity-based understanding. The persistent coexistence also distinguishes this work from Granstrand and Holgersson (2020) who juxtapose actors and activities of ecosystems and combine them into a single definition; the combinative definition may emphasise the "coexistence" at the costs of "persistent" as it implicitly downplays the standalone value of each constituent element. As such, the distinguishing factor is that we offer an integrative framework rather than an integrative definition.

Differentiated natures. While both of the views seem logical and valuable on their own, this paper deliberately put them in the same context to contrast and sharpen their differentiated dimensions. The detailed analysis summarised by Table 1 clarifies the theoretical underpinnings of both the structure view and the coevolution view, rendering the tension salience. For example, while virtually all ecosystem authors acknowledge 'actor' as a component of their definition (Granstrand and Holgersson, 2020), this paper does not rush to claim it as a commonality. Instead, our analysis reveals that, in the structure view, 'actor' is reduced to the role or activities performed by the actor. Likewise, although coevolution case studies predominantly concentrate on ecosystems which are organised around a focal innovation – which seems similar to the structure view – we cite Moore (2006) to point out that it is just the result of empirical choices; the theoretical orientation of the coevolution view should be focal firms' continuous innovation.

Therefore, this work differs from others which seek an overarching ecosystem definition. While integrative definitions tend to integrate the two sides of tension in various manners, overarching definitions choose to shelve the tension using deliberately general terms. For example, Bogers et al. (2019) define an ecosystem as an interdependent network of self-interested actors jointly creating value. Similarly, Thomas and Autio (2020) define an ecosystem as a community of hierarchically independent, yet interdependent heterogeneous participants who collectively generate an ecosystem output. While such general definitions can provide a common language on the cumulative knowledge of ecosystems, they can also lead to negative outcomes. We agree with Ritzer (1990, p. 10), who argues that '*attempts to render an overarching theory often make their reader unable to fully understand the deeper meaning of a theory or the meta theoretical roots of a new theory.*'

Mutual constitution. With the differentiated dimensions of the two co-existent views being clarified, it is tempting to simply claim them as complementary. While it is true that the two views are complementary, the uniqueness of this work is that it proposes the mutual constitution as a specific form of the complementarity. That is, the coevolution view helps address where VP and complementarities – the central concepts of the structure view – come from and how they come about, while the structure view infuses granularity into the coevolution view by specifying the ecosystem affiliation as a premise on which coevolution can be enabled. Such a unique type of complementarity, through which one side can be drawn on to enable the other, is known as duality (Farjoun, 2010) or paradox (Schad et al., 2016). The cyclical relationship between the two views allows the integrative framework to develop explanations on a focal firm's continuous innovation over time.

Therefore, this work differentiates itself from others which assert complementarities between dimensions or perspectives without specifying the complementary effects. For example, claiming the complementarity between ecosystem-as-structure and ecosystem-as-affiliation, Adner (2017) indeed is uninterested in spelling it out. Synthesis reviews, such as Phillips and Ritala (2019), may conduct an excellent analysis of the differentiated natures of several dimensions (e.g. structural vs temporal) and call for integrating these dimensions' complementary considerations in research designs, but they do not specify mechanisms through which these considerations are leveraged to solve particular issues. Another noteworthy work is Meuer et al. (2015) which empirically investigates the integration of innovation systems. The authors find the coexistence of two layers of innovation systems: an unbounded 'central' layer which hosts generic innovation systems and a specific 'surface' layer which hosts regional and sectoral innovation systems. It is analogous to the coexistence of the coevolution view and the structure view. Meuer et al.'s analysis also reveals that the two layers have diverging natures, some of which are also consistent with the items listed in Table 1. However, again, it does not specify the dynamic interactions between the two layers as the current paper has done with the two views.

Parsimonious complexity orientation. While this research uses structure vs coevolution as a high-level overview of the extant ecosystem literature, there are a couple of nested and interwoven tensions that constitute this central theme (Table 1). As an effort to encapsulate these multi-level and idiosyncratic elements, our work results in an integrative framework which is inevitably characterised by complexity. Unsurprisingly, one may identify certain similarities between this work and others which consciously employ the perspective of complexity theory (Meuer et al., 2015; Phillips and Ritala, 2019; Russell and Smorodinskaya, 2018; Tsujimoto et al., 2018), some of which are mentioned above. However, instead of drawing heavily on complexity science literature as other works do, this research draws on ecosystem literature itself, notably by rediscovering the complexity elements from Moore (2006). This parsimony could be beneficial considering the high degree of conceptual abundance and the low degree of theoretical clarity of current ecosystem literature.

5.2. Implication for ecosystem literature

With a narrow focus on integrating ecosystem insights from the standpoint of firm strategy, this research contributes to ecosystem literature by providing a textual analysis of both fashionable (Adner, 2017; Jacobides et al., 2018) and classic (Moore, 2006) core literature. The integrative framework derived from this analysis has three aspects of implications for ecosystem literature.

First, it integrates insights from Adner (2017) and Jacobides et al. (2018) to offer a more holistic structure perspective of ecosystems. On the one hand, both works regard an ecosystem as a structure of multilateral interdependences. On the other, they diverge on their relative emphasis on value creation (Adner, 2017) and value capture (Jacobides et al., 2018), which essentially makes them complementary. While Adner's (2017) stance regarding the role of affiliation opposes Jacobides et al.'s (2018), we argue that this conflict is not irreconcilable. The structure view and affiliation are not mutually exclusive. Indeed, affiliation as a power phenomenon has for a long time been approached from a structure perspective (see Pfeffer and Salancik, 1978). Furthermore, the mechanism of affiliation elaborated by Jacobides et al. (2018) is not dependent on network centrality but on value-creating interdependences, which is consistent with Adner (2017).

Second, this paper responds to the critiques of the coevolution view by reviewing Moore (2006). Based on an analysis of conceptual works (Chandler and Lusch, 2015; Moore, 2006; Teece, 2012; Tiwana et al., 2010) and case studies (Ansari et al., 2016; Dattée et al., 2018; Hou et al., 2020), an updated version of Moore's (1996) ecosystem definition is proposed: a community of affiliated and interacting actors which keeps open exchange with environments for continuous innovation. This definition aligns with the consensus that BE studies are characterised by coevolution (Adner, 2017; Jacobides et al., 2018; Moore, 1993; Thomas and Autio, 2020). More importantly, it underscores the coevolution view's five pillar concepts – generic actor, actor-based affiliation, micro coevolution within an ecosystem, macro coevolution between an ecosystem and environments, and continuous innovation – developing a preliminary theoretical structure for future investigation.

Third, this paper offers a holistic understanding of ecosystems which is based on the cross-fertilisation of the structure view and the coevolution view. It allows the structure view to note uncertainties rooted in opportunity space and actor autonomy, and draw on the coevolution view to explain the emergence of VP and complementarities. Meanwhile, our framework incorporates affiliation structure into the coevolution view. It argues that the aggregation of affiliation from the role level to the actor level, which can be indicated by the evolving influence diversity and influence density (Luo, 2018) of an ecosystem, plays a role in linking the two views (Fig. 1). Overall, the integrative framework supports the moderate theoretical pluralism which helps address the complexity of ecosystem dynamics.

5.3. Future directions

Macro coevolution. Overall, the macro aspect of coevolution draws attention to the role of environments in the coevolution process. While extant literature has recognised the existence and significance of the role of environments (Tee and Gawer, 2009; Tiwana et al., 2010), research on how to manage environmental effects, or the resultant external fit (Tiwana et al., 2010), to secure ecosystem viability is lacking. While extant literature has examined processes through which environmental resources can be mobilised into the ecosystem (Ansari et al., 2016; Snihur et al., 2018), such examinations seldom consider how the mobilised resources are subsequently organised into a structure which serves for a specific VP. Without such a consideration, it can hardly be clear how ecosystems can, in turn, shape environments as suggested by the notion of coevolution. In other words, to fill in these gaps, it is necessary to bring the contingency role of environments, the coevolution view, and the structure view together. Digital transformation of industries (Hinings et al., 2018) is an important empirical setting on which this theoretical cross-fertilisation could be elaborated. To some extent, the promise of digital technologies in transforming industries entails particular attention to the tension between the emerging ecosystems and their exogenous environments. Meanwhile, to understand how an industry is specifically transformed, the structure view of ecosystems should be employed. By the same token, internationalisation is another interesting topic which has attracted the attention of ecosystem scholars to apply the macro view (Nambisan et al., 2019; Parente et al., 2019; Rong et al., 2015b).

Micro coevolution. Extant micro coevolution studies – such as Dattée et al. (2018), Saadatmand et al. (2019) and Wareham et al. (2014) – are mainly conducted at the focal innovation level, leaving the unique potential of the coevolution view to investigate continuous innovation untapped. An exception is Hou et al.'s (2020) study which highlights the simple fact that an ecosystem actor may engage in multiple innovations anchored on the ecosystem captain. This implies that focusing on the interaction and interdependence associated with a focal innovation may lead the researcher to fail to capture the full effects of an ecosystem. Plenty of research opportunities can thus be derived from this observation. An example of a possible research question is: How are multiple innovations temporally and mutually determined, in the context of continuous ecosystem evolution, to support the cohesion of the firm's long-term development? In this case, the focal firm's intra-organisational ecology (Burgelman, 1991; Eisenhardt and Gahmic, 2000) would impact, or even determine, the ecosystem's micro coevolution. Therefore, research designs would have to take into consideration the interaction and interdependence of internal actors – such as business units – seriously, which is unusual in extant ecosystem literature. It would also be interesting to research how the micro coevolution of a set of internal and external actors can impact the creation of complementarities and VP. Researchers could also ask how to map an increasingly diversified ecosystem and to depict its properties, such as health (Iansiti and Levine, 2004). Following this line of thought, researchers could delve into how an increasingly diversified ecosystem could be governed to sustain its functionalities. This direction is of significant practical relevance. Nowadays, digital giants – such as Amazon and Google – compete fiercely and grow rapidly by taking advantage of their corporate ecosystem, but common knowledge about how these ecosystems are operated is scarce.

Affiliation dynamics. Using affiliation as the boundary concept of ecosystems allows for ecosystems to be linked to resource dependency theory (see Pfeffer and Salancik 1978) and the extended resource-based view of strategy (Lavie, 2006). Typology-based theorising is a desirable approach for a better understanding of ecosystem affiliation. Future studies may be able to investigate how various types of affiliation complement each other, as well as impact the competitive advantages and evolvability of an ecosystem simultaneously, by differentiated means. Linking affiliation dynamics to ecosystem orchestration, researchers can consider an ecosystem as an extended resource base up to orchestration, and broaden the application setting of dynamic integrative capabilities beyond platform business models. Therefore, such studies have opportunities to add to the resource orchestration framework (Sirmon et al., 2011) and dynamic integrative capabilities (Helfat and Raubitschek, 2018), providing a dynamic understanding of ecosystem-based advantages (Li et al., 2019; Williamson and De Meyer, 2012). As such, this direction is promising not only for ecosystem researchers but also for strategy researchers in broader areas.

5.4. Conclusion

This paper proposes framing ecosystem literature as structure view vs coevolution view. As the ecosystems envisaged by the two views are ontologically inseparable, an integrative framework is proposed, in which the merits of each view are appreciated and the shortcomings of each are compensated by the other. This paper argues that an integrative framework is an effective approach for enhancing ecosystem research.

Declaration of competing interest

None.

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgement:

We thank helpful comments from Marcel Bogers. The four anonymous reviewers' comments significantly help this paper focus on its main purposes.

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