Foss, Nicolai; Schmidt, Jens; Teece, David

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Ecosystem leadership as a dynamic capability

Nicolai J. Foss a,*, Jens Schmidt b, David J. Teece c

a Copenhagen Business School, Denmark
b Aalto University, Finland
c University of California, Berkeley, USA

ABSTRACT

We analyze the role and effect of ecosystem leadership understood as the exercise of effort towards others with the purpose of establishing and maintaining an ecosystem around a focal systemic innovation. While there has been much attention to the firms that sponsor ecosystems in the ecosystem literature, ecosystem leaders are usually characterized in an atheoretical manner, and the emphasis is on leadership in existing ecosystems, thus neglecting the role leadership might play in ecosystem emergence. We clarify and provide theoretical grounding for the important role of leadership in emerging and maturing ecosystems. Building on transaction cost economics, we conceptualize an ecosystem as a governance structure that enables and sustains coordination and cooperation among multiple economic agents towards a focal innovative value proposition. Our basic argument is that the emergence of such an ecosystem is hampered by coordination and cooperation problems which markets and the price system cannot solve by itself. Resolving these problems requires assistance, and such assistance is what we call ecosystem leadership. To further characterize the exercise of leadership we use Teece’s tripartite dynamic capabilities scheme. Leadership enables ecosystem emergence through three externally-oriented dynamic capabilities: facilitating the formation of a shared vision (sensing), inducing others to make ecosystem-specific investments (seizing) and engaging in ad hoc problem solving to create and maintain stability (reconfiguring/transforming). The latter capability in particular often continues to be important in a mature ecosystem. We provide a characterization of these capabilities and argue that the ecosystem leader role in a mature ecosystem likely stems from having successfully exercised these capabilities and that their exercise also puts the leader in a prime position for value capture. We discuss implications of our arguments for ecosystem theories, for managers and for policy makers.

Introduction

Many innovations are systemic in nature, which means that commercializing them involves changing, adapting and co-specializing multiple assets to align them (Teece, 1986, 2006; see Midgley and Lindhult, 2021, for a review). Systemic innovations are increasingly brought about and commercialized through ecosystems, which we here define as groups of (mostly) legally independent but interdependent economic actors that invest in complementary and possibly ecosystem-specific assets and abide by mutually agreed-upon rules and agreements necessary for an innovative joint value proposition to materialize (Adner, 2017; Baldwin & Clark, 2000; Thomas & Autio, 2020).1 The value proposition is maintained and perhaps expanded by ongoing innovative activity, often orchestrated by a lead firm that is orchestrating the requisite assets. Examples of ecosystems that bring about and commercialize systemic innovations are ubiquitous and include telecommunications (Datté, Alexy, & Autio, 2018), mobile payments (Ozcan & Santos, 2015), tires (Adner,

1 Corresponding author.
E-mail addresses: Njf.sj@cbs.dk (N.J. Foss), Jens.Schmidt@aalto.fi (J. Schmidt), teece@haas.berkeley.edu (D.J. Teece).

1 Our usage of the term follows typical usage in the strategy literature, which simply speaks of ecosystems (e.g., Adner, 2017; Jacobides, Cennamo, & Gawer, 2018). It corresponds to what Thomas and Autio (2020) call innovation ecosystem, which they distinguish from entrepreneurial and knowledge ecosystems. The latter two types of ecosystem differ in terms of the ecosystem target output and are thus not covered in our treatment. For a further systematic review of the various definitions of innovation ecosystems, see Klimas and Czakon (2021), and for a review of the broad ecosystem literature vis-à-vis the literature on interorganizational relationships and networks, see Shipilov and Gawer (2020).

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Farrell, 1994), these problems are well described in the extensive literature on economic organization (Becker, 2001; Milgrom & Roberts, 1992; Teece, 1984; Williamson, 1996), which explains how alternative governance structures (firms, hybrids and markets; Williamson, 1996) address challenges of coordination and cooperation.

The classical remedy of problems of complex coordination with cospecialized assets is vertical integration which yields the benefit of hierarchical coordination while providing safeguards against recontracting hazards (Williamson, 1985). However, vertical integration may not work well when many relevant complementary assets that are dissimilar (Richardson, 1972, de Figueiredo & Teece, 1996) or when acquiring complementary assets is infeasible due to, for example, cash constraints or complementors’ superior capabilities (Teece, 1986). In such cases, a well managed ecosystem can be the superior governance structure. However, when a systemic innovation is commercialized by means of an ecosystem, coordination and cooperation among ecosystem participants can generally not be based simply on arms-length transactions using markets. Instead, ecosystems management by one or more of the leading firms is required (Altman, Nagle, & Tushman, 2022; Gulati et al., 2012). Such firms are variously labeled in the literature as “orchestrator” (Dhanaraj & Parkhe, 2006), “platform leader” (Gaver & Cusumano, 2002), “captain” (Teece, 2016), “platform sponsor” (Besen & Farrell, 1994), “hub” (Iyer, Lee, & Venkatraman, 2006) or “keystone” (Iansiti & Levien, 2004).

In this article, we argue that conceptualizing ecosystem leadership in terms of solving ecosystem-wide coordination and cooperation problems provides a new vantage point from which to analyze leadership in ecosystems and, in particular, to explain whether an ecosystem will be established in the first place. The ecosystem leadership literature too often sees leadership as a role assumed by one or more of the participants and has thereby taken a post hoc perspective that risks failing to acknowledge that entrepreneurial efforts to establish ecosystems may be in vain, so that an envisioned ecosystem does not materialize. In short, the literature tends to take the vitality and robustness of ecosystems – once established – for granted. A reason for this bias in the ecosystem literature is that it is relatively atheoretical, using case studies and conceptual work to provide lists of activities that ecosystem leaders engage in, such as designing roles, orchestrating resource flows and attracting participants (Dedehayir, Makinen, & Ort, 2018; Hou, Cui, & Shi, 2020). We instead define ecosystem leadership as the exercise of effort and investments to influence, control and constrain other (potential) ecosystem participants with the purpose of establishing and maintaining a robust ecosystem. The purpose of this article is thus to offer a theory of ecosystem leadership based on transaction cost economics (TCE), which helps to understand the fundamental problems that confront ecosystem participants (Williamson, 1985, 1996). We draw on dynamic capabilities theory (DCT) (Teece, 2007; Teece, Pisano, & Shuen, 1997) to understand how these problems can be addressed through ecosystem leadership.

Specifically, we draw on TCE to characterize the coordination and cooperation problems that must be solved for an ecosystem to successfully emerge and become stable and mature (Williamson, 1985, 1991). We identify three types of coordination and cooperation problems inhibiting ecosystem emergence. The first such problem is the challenge of developing modular understanding, notably about the value proposition, the need for ecosystem-specific investments, and characteristics of the different participants due to uncertainty and the need of a sufficiently common view or “vision.” The second problem is the challenge of getting a level of commitment that ensures ecosystem-specific investments and make participants subscribe to common rules and agreements, or what Adner (2017) calls a “multilateral alignment structure” to support the integrated value proposition. The third problem is the existence of (at least partly) unforeseen problems and the potential inability of rules and agreements to satisfactorily deal with these. Failure to solve these coordination and cooperation problems adequately will induce transaction costs associated with misalignment and the inability to reach durable agreements. In the absence of leadership these costs may be so high that the ecosystem will fail to materialize in the first place.

We apply and extend TCE by arguing that successfully solving these coordination and cooperation problems will ensure adaptation. This requires that some firms exercise influence over other firms beyond their own boundaries—that is, provide ecosystem-level leadership. From the perspective of TCE, leadership is a governance mechanism for solving coordination and cooperation problems (Williamson, 1991). Our theory thus explains leadership in terms of the useful functions it provides for a set of actors that are to a large extent legally independent, but at the same time technologically and economically interdependent (see also Dhanaraj and Parkhe (2006); Granstrand and Holgersson (2020); Gupta, Jain, and Sawhney (1999); Jacobides et al. (2018); Wareham et al. (2014). Our core argument is that an ecosystem in which at least one firm successfully exercises leadership has lower transaction costs (and is thus a more “efficient” governance structure) than an ecosystem in which no leadership exists. The essence of leadership is to guide the process towards higher joint value and, if needed, to ensure continuous adaptation when the ecosystem is more established. In essence, ecosystem leadership helps markets work, as unassisted ecosystems are very unlikely to emerge just by chance. An important role for innovation and the avoidance of market failure is associated to the ecosystem leader, both as individual(s) and as organization.

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2 This is consistent with Teece’s (2010) notion that managers play a critical non market role in orchestrating non-priced complementary assets.
To better understand the nature of adaptation and leadership in ecosystems, we draw on the (microfoundations\(^3\)) of DCT (Teece, 2007). DCT frames ecosystem leadership activities as the exercise of dynamic capabilities geared towards adaptation, that is solving coordination and cooperation problems. Specifically, building on Teece’s (2007) tripartite scheme of sensing, seizing and reconfiguring capabilities, we analyze the externally-oriented activities of ecosystem leadership and associate each type of capability with the resolution of one of the three types of coordination and cooperation problems that we outlined above. Sensing then means overcoming uncertainty by employing a “wide lens” (Adner, 2012; Brusoni, Prencipe, & Pavitt, 2001) and exercising cognitive leadership (Witt, 1998) by engaging in strategic and persuasive communication and irreversible investments to coax prospective ecosystem participants towards adopting a shared vision. Seizing means enticig other ecosystem participants to also commit to making ecosystem-specific investments and to subscribe to common rules and agreements. The key is to be able to craft mutually acceptable agreements and to achieve consensus among the participants. Finally, reconfiguring means to deal with unforeseen problems that are not addressed by the agreed-upon rules through engaging in and leading ecosystem-level problem solving efforts, which is facilitated by system-wide knowledge of incentives, capabilities, technology and customer needs.

We further argue that the successful application of these dynamic leadership capabilities has implications for the nature of ecosystem leadership, the characteristics of the role of the leader, and the leader’s ability to capture value once the ecosystem has been established and is mature. While new coordination and cooperation problems do not arise in some mature ecosystems, when they do the task of ecosystem leadership is to bring about adjustment through reconfiguring (a dynamic capability) in order to maintain robustness and deal with emerging issues. When the reconfiguration of mature ecosystems is required, it is likely to be provided by the same firm that performed the leadership role in the emerging ecosystem. In other words, a firm becomes an ecosystem leader not only by catalyzing the ecosystem in the first place but also by virtue of successfully solving new coordination and cooperation problems as they arise. Finally, because successfully solving coordination and cooperation problems requires that other ecosystem participants accept rules, the leader is likely to be well positioned to appropriate a reasonable part of the value stream associated with the novel value proposition (Uzunca, Sharapov, & Tee, 2022; Yang, Hurmelinna-Laukkanen, Sharma, & Westerlund, 2021). On the other hand, competition between ecosystem, and the knowledge that overreaching can crimp the innovation in the ecosystem, are two of many factors checking the value capture proclivities of the leader, as failure to leave enough rewards for all will hurt the ecosystem and the leader too. In sum, our article contributes to the literature on leadership in ecosystems by offering a framework (grounded in TCE and DCT) that explains why and how leadership is needed to spawn ecosystems and keep them robust.

In the next section, we provide theoretical background on the coordination and cooperation problems that characterize ecosystems and the consequent need for leadership as a governance mechanism to address the need for adaptation. We then describe the three coordination and cooperation problems in ecosystems and apply DCT to develop our framework and formulate six propositions about how ecosystem leaders handle such adaptation and contribute to the establishment of an ecosystem, after which we discuss the implications for leadership in mature ecosystems. We close by discussing contributions, limitations and opportunities for further study and outlining implications for managers and policy makers.

The Need for Leadership in Ecosystems

The Distinctive Coordination and Cooperation Needs in Ecosystems

A market economy uses the price system to achieve coordination of disparate entities. It also uses managerial methods of coordination and cooperation when assets are unpriced. The nature and severity of problems of coordination and cooperation depend on the degree of interdependence among assets and actions and the need for (mutual) adaptation, given a dynamic reality (Becker & Murphy, 1992; Makowski & Ostroj, 2001; Thompson, 1967; Williamson, 1985). Ecosystems are no exception to this argument. The coordination and cooperation needs of ecosystems are distinctive—raising distinctive challenges for adaptation, and therefore for leadership and governance. In ecosystems, the coordination and cooperation problems arise from multilateral interdependencies in the presence of cospecialization. Multilateral interdependencies emerge because products and services are often part of an integrated value proposition involving complementarities.\(^4\) Accordingly, different ecosystem participants will often need to coordinate their plans and investments so that the parts fit together and the value is realized (Richardson, 1960). There may also be a need to tailor products and services and make ecosystem-specific investments to allow value to be created and captured (Teece, 1986). Because of the necessity to make ecosystem-specific investments, there is thus also a potential cooperation problem as such investments may create contractual hazards (Williamson, 1996). As an example, for the value proposition behind Michelin’s new Pax tire innovation to materialize, repair garages would need to make coordinated investments in co-specialized equipment (Adner, 2012). These interdependencies are also often multilateral rather than bilateral (Kapoor, 2018); in the extreme, solutions to a problem introduced by one participant in one part of the ecosystem may have implications for everyone else. For example, Michelin’s new value proposition required not only repair garages but also car dealers and consumers to coordinate and cooperate.

Coordination and cooperation problems mainly arise when uncertainty exists surrounding the interdependencies, for example, about how interdependencies are best managed or whether one ecosystem participant will seek to renegotiate an agreement after co-

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\(^3\) We use the term microfoundations as it is used in Teece (2007): to denote the “the organizational and managerial processes, procedures, systems, and structures that undergird each class of capability” (p.1321). Such microfoundations are thus not necessarily at the level of individual managers. See Felin et al. (2015) for a discussion of levels issues in the context of microfoundations.

\(^4\) For analyses of complementarities in ecosystems, see Teece (2018) and Jacobides et al. (2018).
specialized investments have been made. Uncertainty is particularly high when an ecosystem is just emerging and many unanticipated problems manifest. In fact, coordination and cooperation problems might be so severe that the ecosystem does not form at all (as was the case in the PAX tire example; see also the failure of the mobile payment ecosystem to emerge described by Ozcan and Santos, 2015). Even in an established ecosystem, new coordination and cooperation problems may still emerge, for example when a newly arising interdependency require coordinated and co-specialized investments (Williamson, 1985).

Leadership as a Solution to Coordination and Cooperation Problems in Ecosystems

Given the need to deal with these coordination and cooperation problems for value to be created, the question arises as to how they should be best addressed, or how they may even be prevented to the largest possible extent. Because it directly compares different governance structures in terms of how they address such problems, TCE is a highly suitable theoretical lens to begin answering this question (Williamson, 1991). From the perspective of TCE, an ecosystem is a governance structure for the provision of an integrated value proposition and is thus an alternative to the vertically integrated firm, in which coordination and cooperation problems are internalized. Specifically, whereas in vertically integrated firms such problems are addressed through the corporate hierarchy, in ecosystems they are dealt with through rules and agreements, which constitute (implicit or explicit) contracts between legally independent firms (Jacobides et al. 2018). Vertical integration has been argued to have both coordination and cooperation benefits when it comes to delivering novel value propositions that are subject to multilateral interdependencies (i.e., systemic innovations; Teece 1984). However, vertical integration is often not feasible or too costly or slows the innovation process down, in which case contractual arrangements may be considered as alternatives (Teece, 1986, 1992, 2018). For example, for Michelin developing an extensive service network for repairing tires or acquiring garages to become a major player in the car aftersales market is likely infeasible (and might also be ruled out due to antitrust issues). Similarly, by tapping into the creative capacities of independent software developers, Apple is able to get a larger variety of its apps than it could do through internal development.

One can imagine ecosystems existing as decentralized contractual arrangements, where participants are not subject to fiat-based hierarchy but all abide by mutually agreed-upon rules and agreements (which can be seen as both formal and informal contracts; Baker, Gibbons, and Murphy 2002). Adner (2017) calls such rules and agreements the “alignment structure” and Baldwin and Clark (2000) refer to them as “design rules.” Together with (co-)specialized assets, they structure the multilateral dependencies that exist among participants seeking to bring about a novel integrated value proposition (Adner, 2017; Kapoor, 2018)—that is, they are means to address the coordination and cooperation problems that exist between the multiple parties in an ecosystem.

However, there are two reasons why the extent to which these problems can be solved through such contracts is limited. First, uncertainty and complexity imply that unforeseen contingencies that impact more than a single actor in the ecosystem will unavoidably manifest. As a consequence, any rules or agreements are not capable of addressing all future contingencies, which means that relationships in an ecosystem will generally be structured by highly incomplete contracts (albeit supported by norms and standards). Second, and even more importantly, the ecosystem participants may even fail to agree on either contracts or understandings, and thus the ecosystem may not become established in the first place. This makes it paramount to choose governance arrangements that secure adaptation, that is, choosing responses to unanticipated contingencies in a coordinated and non-conflictual manner.

Ecosystem leadership is a governance mechanism (Williamson, 1991) that helps resolving or mitigating the coordination and cooperation problems inherent in an ecosystem. It ensures convergence of expectations and coherent adaptation among a set of ecosystem participants even when there is no common ownership and when rules and agreements are incomplete. While an ecosystem leader does not have access to legally backed fiat power, it can nevertheless realize some of the benefits of hierarchy, notably the ability to influence other participants through its control of core assets (such as a core platform (Baldwin & Woodard, 2009) or bottleneck (Jacobides, Knudsen, & Augier, 2006)), while also tapping into some of the benefits of the market, notably its superior incentive properties (Williamson, 1996). Additionally, ecosystem leadership may selectively intervene when coordinated adaptation in the face of change is necessary, and it may adopt a hands-off approach when autonomous adaptation by individual participants is sufficient (cf. Williamson, 1991). Even more fundamentally, ecosystem leadership also helps establish the rules and agreements in the first place and thus catalyze the formation and emergence of the ecosystem. Thus, ecosystem leadership, like leadership in general, is not just about influencing and coordinating followers’ strategies concerning what to do and motivate them to actually choose these strategies within an existing setting; it is also about creating this setting in the first place—a problem of meta-coordination in the sense that the leader helps to coordinate about what to coordinate about (Pietraszewski, 2020).

Ecosystem Leadership as a Dynamic Capability

We are, of course, not the first to argue for the important role of ecosystem leadership or to conceptualize ecosystems as distinct governance structures (e.g., Altman et al., 2022; Boudreau & Hagiu, 2009; Gulati et al., 2012). However, the ecosystem leadership literature is to a large extent atheoretical. It relies on case studies and conceptual work to identify the activities that ecosystem leaders engage in, such as designing roles, orchestrating resource flows and attracting participants (see Dedehayir et al. (2018) for a review). In addition, ecosystem leadership is often characterized as a role assumed by one or more of the participants (Besen & Farrell, 1994; 5 We follow Klein, Mahoney, McGahan, and Pitelis (2019) and define governance structure as “the formal and informal rules and procedures that control resource accumulation, development, and allocation; the distribution of the organization’s productions; and the resolution of the conflicts of interest associated with group behavior” (p.9).
Gawer & Cusumano, 2002; (Dhanaraj & Parkhe, 2006; Iansiti & Levien, 2004; Iyer et al., 2006; Teece, 2016). We instead focus on the role that ecosystem leadership plays in solving coordination and cooperation problems and thereby enabling the emergence and adaptation of ecosystems. The activities underlying ecosystem leadership thus constitute dynamic capabilities in the sense of Teece (2007): they exist and are used for the purpose of adaptation and are valuable under conditions of change.

The dynamic capabilities framework helps us understand the form ecosystem leadership takes. We specifically extend the notion of dynamic capabilities from its concern with the internal adaptation of firms to changing contexts (e.g., Teece, 2007) and conceptualize ecosystem leadership as an externally-oriented dynamic capability. In what follows, we revisit prior literature on ecosystem leadership and ecosystem dynamics, using Teece’s (2007) tripartite scheme of sensing, seizing and (re)configuring as an organizing scheme. In an ecosystem, the dynamic capability of sensing is about creating a shared vision and enabling others to see the “big picture” and their role in it. Seizing concerns the creation of shared rules and agreements and enabling and convincing others to make co-specialized investments. Finally, (re)configuring is about ensuring continuous alignment between the actors in the ecosystem and the leader engaging in (ad hoc) problem-solving.

The nature and prevalence of the three types of capabilities also varies based on the development stage of the ecosystem (Teece, 2017). While the number of distinct stages identified in prior research varies, the literature maintains that the two broad stages of emergence and maturity can be distinguished (Dedehayir et al., 2018), a point associated with the industry lifecycle literature that similarly distinguishes two stages (Abernathy & Utterback, 1978; Anderson & Tushman, 1990). We argue that these two stages differ in their adaptation challenges. In emerging ecosystems, uncertainty is high, rules must be created and agreements must be made, and the challenge is whether firms are even able to achieve a common view and are able to coordinate their investments toward an integrated value proposition. The hallmark of a fully mature ecosystem, on the other hand, is that innovation activities are modularized and many if not most of the problem-solving activities can be done by individual ecosystem participants without the need for coordinating amongst each other (Baldwin & Clark, 2000). However, even at the mature stage uncertainty is not always completely resolved and there will often be a need for reconfiguration activity.

In the following, we first describe three types of coordination and cooperation problems in an emerging ecosystem that must be resolved for the ecosystem to become established, and we explain how the three types of leadership capabilities (sensing, seizing and reconfiguring) contribute to solving these problems and thus to ecosystem emergence (see Figure 1 for an overview of our framework). After presenting these we discuss the implications of the successful application of these capabilities for leadership in a mature ecosystem, including the nature of ecosystem leadership, the characteristics of the role of the leader, the leader’s ability to capture value. Also note that our focus is on the nature and presence/absence of leadership. We abstract from issues of competition for leadership and divided leadership, but return to them in the discussion section.

Leadership in an Emerging Ecosystem

Coordination and Cooperation Problems in Emerging Ecosystems

Initially, an innovation system is a mere possibility. Ecosystem emergence requires participants that commit themselves to the ecosystem by making ecosystem-specific investments and subscribing to common rules. For the ecosystem to emerge and flourish, three distinct coordination and cooperation problems need to be addressed and dealt with (see the left and right side of Figure 1). Below we explain them and show how ecosystem leadership, and in particular the ecosystem leader’s sensing, seizing and reconfiguration capabilities, may be efficient ways to address these (see the middle of Figure 1). We summarize these three problems briefly.

First, early-stage emerging ecosystems are subject to high levels of uncertainty, as the prospective value proposition, the set of players, the task structure, the needs for each participant to make potentially (co-)specialized, ecosystem-specific investments as well as the rules under which they cooperate, are initially unclear and undefined (Dedehayir et al., 2018). These coordination and cooperation problems can be mitigated by the existence of a common view or “vision” of the ecosystem, the respective roles of the ecosystem participants and the overall value proposition to be delivered. To have this function, such a common vision must be sufficiently shared among participants. In emerging ecosystems, the dynamic capability of sensing is about creating a shared vision and the leader enabling others to see the “big picture” and their role in it, while also creating sufficient trust among them that they are willing to follow and make ecosystem-specific investments.

Second, participants must commit to the ecosystem: rules and agreements must be made among them, and they must make co-specialized investments so that the integrated value proposition can in fact materialize. However, terms and conditions of investments and the underlying contracts and ownership to protect these must initially be written and agreed upon. Seizing thus concerns the creation of shared rules and agreements and the leader enabling and convincing others to make co-specialized, ecosystem-specific investments.

Third, the rules and contractual agreements may still be incomplete and may not have solved all coordination and cooperation problems (Williamson, 1985). In particular unforeseen issues brought about by, for example, changes in technologies create a new need for adaptation. In an emerging ecosystem the dynamic capability of (re)configuring is thus about ensuring continuous alignment...
between the ecosystem partners and the leader engaging in (ad hoc) problem-solving.

These three coordination and cooperation problems and their resolution are logically sequential (see the downward-pointing arrows on the right side of Figure 1). Accordingly, we describe how dynamic leadership capabilities address them in sequential order in the following, but fully acknowledge that in practice their resolution overlaps in time.7

Ecosystem Leadership and Sensing in Emerging Ecosystems

Nature of the dynamic capability. The emergence of an ecosystem is facilitated when the relevant set of ecosystem participants shares a sufficiently common view or shared vision about the ecosystem, which prompts them to embark on the joint effort of creating the ecosystem. A shared vision serves as a coordinating device by which the different ecosystem participants match their complementary investment plans (Richardson, 1960). It is a basic cognitive representation of what Adner (2017) calls a multilateral alignment structure, which includes a perspective on the possible integrated offering, the interdependencies among them, the governance model, and their respective role and contribution to the overall ecosystem. Thus, even though the vision may be coarse and subject to change (what Datté et al. (2018) call a “protovision”), to contribute to ecosystem emergence it must include sufficient mutual understanding of the likely coordination and cooperation challenges faced by each of the participants so that they will embark on the joint effort to create the ecosystem and make the necessary ecosystem-specific investments and subscribe to common rules and agreements.

However, it cannot be taken for granted that all players initially have such a common perspective. The cognitive challenge is that the problem faced by the potential ecosystem participants may be ill-structured (Baer, Dirks, & Nickerson, 2013; Simon, 1973); it is not yet fully understood, let alone decomposed. In fact, different actors may not only have different views regarding a novel value proposition but they may not even see it as a possibility in the first place. For example, in the early 1980s, when Intel was approached by IBM for having their chips included in the IBM PC, Intel had not even considered the PC as an opportunity. Even if potential ecosystem participants are aware of the opportunity, there is not yet mutual understanding among them concerning the possible integrated offering, the interdependencies among them, the governance model, and their respective role and contribution to the overall ecosystem. Overcoming the unawareness and non-overlap of representations of opportunities through a shared vision is thus an iterative process (Dattée et al., 2018) that contributes to participants’ willingness to participate in terms of making investments that are specific to the ecosystem (i.e., co-specialize to other participants as well as to the standards, platforms, etc. that may be associated with the ecosystem).

Ecosystem leadership at the early stage of ecosystem emergence is therefore about helping the potential ecosystem participants to arrive at a shared and aligned understanding of the integrated value proposition and a first shared understanding of the benefits as well as the challenges they face in bringing about the integrated value proposition. In fact, it is precisely in situations of substantial uncertainty when individual leadership may have the greatest impact by shaping the path that ecosystem participants will jointly take (David, 1992). Initially, the vision exists at the individual level and only becomes shared over time (Witt, 2007).8 At the emergent stage, a central aspect of ecosystem leadership is thus to influence other participants so that a shared vision will eventually form. This is

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7 Note that this sequence is also implicit in Teece (2007): opportunities must first be sensed before they can be seized, and reconfiguring assumes that seizing activities have taken place.

8 The process by which a shared vision comes about may be highly iterative (Dattée et al., 2018), so our treatment of the process is of course highly simplified.
an act of cognitive leadership or what Foss (2007) calls “strategic belief management.” Cognitive leadership is essentially about influencing others’ beliefs in order to achieve coordinated states with a high level of cooperation by means of the “provision and enforcement of cognitive frames” (Witt, 1998: 166). Specifically, in situations with interdependencies between participants, multiple equilibria that are associated with different payoffs are usually possible. Even abstracting from incentive conflicts, participants that seek to coordinate their actions unassisted and perhaps even non-cooperatively may not succeed in coordinating on best outcomes (e.g., for reasons of risk-aversion). Iterative play and explicit multilateral coordination may remedy this, but may be more costly than having one of the players explicitly assume the coordination role. Leadership that is prescient, communicative, and trusted is a mechanism that can reduce initial coordination costs (Foss, 2001).

**Microfoundations.** There are two critical microfoundations for the leader’s sensing capability in an emerging ecosystem. First, in order to be able to influence others towards a shared vision, ecosystem leadership requires taking a “wide lens” (Adner, 2012), that is, a holistic, system-level perspective beyond the boundaries of one’s firm (Nambisan and Sawhney, 2011). A wide lens approach involves an identification of 1) the relevant set of potential participants; 2) their capabilities; and 3) the interdependencies between these. Overall, this amounts to a conceptualization of the roles of potential participants in the ecosystem as a whole, that is, an understanding of what they can bring to the table in terms of adding to the integrated value proposition (Brandenburger & Stuart, 1996), and how they bring this about. More specifically, understanding coordination challenges involves identifying the individual components, capabilities, and actors that need to come together, what these need to contribute in terms of efforts, and their ecosystem-specific investments that are needed for the overall value proposition to materialize (Adner, 2017), and of course by which means these efforts and investments can be coordinated. For example, Adner (2012) shows how Michelin failed to see that garages had no incentive to adopt its new tire innovation, which subsequently failed. In addition, as other participants might have their own visions for the ecosystem, the leader may be aware of these based on prior interaction or if they have been stated publicly. To create alignment on a shared vision, a firm may also have to adapt its own vision and synthesize with others’ visions so as to create a mutually beneficial situation.

Of course, ecosystem participants will not form an ecosystem-level vision from a blank state. Rather, in various ways they build on their relevant prior experience, which concerns multiple aspects about the different possible ecosystem participants and their interrelations. Experience from interactions with customers can inform the understanding of the necessary capabilities and players for an integrated value proposition (Zander & Zander, 2005). Knowledge of technological architecture and platforms can help to identify coordination challenges and solutions for them, for example, through standards (Baldwin & Clark, 2000). Prior experience of working with particular other players can inform assessments of both their capabilities and their incentives. We thus propose:

**Proposition 1.** (sensing): A shared vision among prospective ecosystem participants is more likely to form (and thus an ecosystem is more likely to emerge) when there is a leader who is able to adopt a wide lens and form an ecosystem-level vision that accounts for and provides responses to coordination and cooperation problems among prospective ecosystem participants.

Second, leaders need to be able to convey their vision, or specific elements of it, to others in a way that convinces them to adopt it. Conveying a vision or elements of it means influencing others’ cognitive frames or mental models. Potentially, others will also have to change their minds and revise deeply entrenched beliefs. Authority and formal communication are of only limited use when the goal is to influence others’ cognitive frames. Instead, influence must use means of informal communication, which is facilitated by strategic and persuasive communication (Foss, 2007) or by leading by example (Hermalin, 1998). The latter involves taking the lead in making major fundamental and partly irreversible investments in the ecosystem, such as developing and offering beta-versions of platforms in the case of platform ecosystems. Strategic communication involves the transmission of information, which not only convinces potential participants that the leader possesses superior insight regarding the returns to the new innovative offering (Hermalin, 1998), but may also genuinely surprise participants by suggesting issues or possibilities they had been previously unaware of (Komai, Stegeman, & Hermalin, 2007). For example, as noted above, before being approached by IBM, Intel had not considered the possibility that its microprocessors could be an essential part of an emerging PC ecosystem. Information transmission may also involve symbolic communication and signaling.

However, strategic communication for the purpose of creating a shared vision is more than transmitting information and engaging in signaling. Such communication must also be persuasive. This means that the leader must account for how the message resonates with others, which includes both their prior beliefs and their goals. Here, also the leader’s charisma may help to persuade others towards a joint effort (Langlois, 1998; Weber, 1947). Steve Jobs’ “reality distortion field,” which he applied to convincing the senior executives of the record companies of the viability of the iTunes ecosystem, is a case in point. It should also be noted that persuasion and changing such beliefs goes hand in hand with motivating others towards a common goal. When Jobs sought to convince the senior executives of the record companies of the viability of the iTunes ecosystem, he had to overcome their resistance to selling music in digital form. This was partly achieved by introducing digital rights management that would protect the record companies’ property rights. In sum, cognitive leadership is persuasive and trusted communication that aims at creating a shared view of the mutually beneficial future and which requires taking the beliefs and motives of potential participants into account (i.e., perspective-taking). To summarize:

**Proposition 2.** (sensing): A shared vision among prospective ecosystem participants is more likely to form (and thus an ecosystem is more likely to emerge) if there is a leader who is able to engage in strategic and persuasive communication towards other prospective ecosystem participants.
Ecosystem Leadership and Seizing in Emerging Ecosystems

Nature of the capability. For an ecosystem to emerge, participants not only need a sufficiently shared vision but they also need to make commitments to the joint ecosystem effort in the form of ecosystem-specific investments. They also need to subjugate themselves to mutually agreed upon rules and standards, which include agreements about the product architecture (Ulrich, 1995), the technical interfaces that ensure compatibility among components provided by different ecosystem members (Langlois, 2002), or the specific requirements concerning quality or features imposed on organizations and agreed-upon measurements (Barzel, 1982). These serve as basis for coordination and cooperation and specify, among others, the terms and conditions under which the different participants transact with each other. The rules may also stipulate that certain investments must be made. For example, in the Pax tire case, the garages needed to make investments into specialized equipment and have their mechanics certified in using it.

However, even if there is a shared vision the commitment of ecosystem participants is not guaranteed. Uncertainty about the eventual architecture (including the standards the different players will commit to) remains, as does uncertainty about the specific customer preferences and thus about whether customers will eventually value the integrated value proposition. For example, when the members of the Open Handset Alliance in 2007 agreed to support the Android operating system as a standard component of the Android mobile ecosystem, the platform and the technical interfaces had yet to be developed. Thus, it cannot be taken for granted that all ecosystem participants even find it worthwhile to make such investments or to accept the rules to participate in the ecosystem. To the extent that investments are ecosystem-specific, they are only worthwhile if other participants also make their respective investments into the ecosystem and, in particular, if there is sufficient assurance not to be taken advantage of ex post. There are also multiple forms the rules and agreements can take, as there is not necessarily a precedent and therefore new rules need to be drawn up for multiple parties to agree on.

Solving these coordination and cooperation problems calls for leadership, which takes two forms when it comes to seizing. First, leadership means acting first in terms of making investment commitments to the ecosystem. Such signaling tells other participants that the leader is serious about the ecosystem effort and thus makes it more likely that others will follow suit. Second, leadership also means proposing and implementing rules for others to subscribe to as well as establishing standards that serve the ecosystem as a whole. For example, Wareham et al. (2014) show how the leader of business software ecosystem provides configuration tools and templates, certifies personnel and solutions, offers project management tools, as well as education and training facilities, and provide community platforms that enable the reuse of code. Here leaders face a trade-off (Tilson, Lyttinen, & Sørensen, 2010; Wareham et al., 2014): the rules must be sufficiently rigid not to compromise coordination among participants in the ecosystem (e.g., not to compromise interoperability among services or the quality delivered by products) but at the same time allow participants sufficient flexibility to respond to new opportunities and challenges. And they must of course also allow other ecosystem participants to earn enough of a return on their investments to make joining and continuous participation in the ecosystem worthwhile.

Microfoundations. Seizing an ecosystem opportunity rests on two critical microfoundations. First, even if other ecosystem participants share a common vision and understand interdependencies, they may be unsure about the leader’s own commitment to the ecosystem. The leader must thus signal commitment and establish its trustworthiness in order for others to even consider participation and thereby convince them to commit themselves to the ecosystem (Czakon & Czernek, 2016; Hermelin, 1998). Leaders often do this by initial investment into ecosystem-specific assets, which signals to other participants that the leader has superior information about the value proposition that will result from the efforts of the participants and that it committed to the ecosystem (because it will want to recoup its investments). Thus, when the start-up Better Place tried to build an ecosystem around electric vehicles in 2007, what it did get right (Better Place folded in 2013) was the need to lead by investing in charging stations and switch stations (that could quickly exchange batteries).

The credibility of the leader’s signal will be enhanced in proportion to the size of the resource commitment and the extent to which the leader undertakes ecosystem-specific investments. The key type of resources are the leader’s own core assets, such as their platform or technological assets (which may include patents). A firm may contribute core assets that potentially serve the ecosystem as a whole, such as a platform that others can build on or connect to (Baldwin & Woodard, 2009) or an IT system that allows for smooth co-ordination of interdependent innovation efforts (Argyres, 1999). In fact, a firm may naturally be seen as leader because it owns certain assets that are “inherently” core to the ecosystem (Davis & Eisenhardt, 2011), or because it plays a key role in an already existing ecosystem which greatly overlaps in terms of participants with the newly emerging ecosystem. In addition, a firm’s reputation may also help convince others to buy into its vision. This is helped by the way the firm is perceived (e.g., if the firm is perceived as fair and engenders trust by the other participants) based on past behavior (e.g., in comparable leadership situations).

**Proposition 3.** (seizing): Prospective ecosystem participants are more likely to make the necessary ecosystem-specific investments and subscribe to common rules and agreements (and thus an ecosystem is more likely to emerge) if there is a leader who is able to signal commitment and hence credibility to other prospective ecosystem participants.

The second critical microfoundation has to do with the crafting of agreements, which may happen in a number of ways. Sometimes agreements are made in ecosystem-level bodies that make decisions about common rules and standards and in which members from multiple ecosystem participants are represented, including project groups or consortia (Rysman & Simcoe, 2008). But coordination may also take place bilaterally between two ecosystem members at a time. In either case, leaders may influence the process by which

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9 As an example, in an experimental setting, Levati, Sutter, and Van der Heijden (2007) show that installing a leader who moves first in a public goods game persuades others to contribute more to the joint effort.
consensus is reached and decisions are made through, for example, providing decision premises (e.g., setting the agenda for issues to be discussed in a standards committee) or actually making decisions on behalf of others (if they have been authorized by other ecosystem participants to do so) (Leiponen, 2008). Whether or not consensus is reached in these discussions and negotiations and the degree to which the consensus achieved mitigates the coordination and cooperation problems noted above depends on how skillful the leader is in achieving these outcomes. Leaders must be skillful in building alliances, as Google was able to do in the 2000s around Android and Intel in the 1990s around the USB standard (Gawer & Cusumano, 2002). But they must go even further and be skillful in crafting agreements that are mutually acceptable (Argyres & Mayer, 2007). We thus propose:

**Proposition 4.** (seizing): Prospective ecosystem participants are more likely to make the necessary ecosystem-specific investments and subscribe to common rules and agreements (and thus an ecosystem is more likely to emerge) if there is a leader who employs capabilities for crafting mutually acceptable agreements and achieving consensus.

**Ecosystem Leadership and Reconfiguring in Emerging Ecosystems**

Nature of the capability. Sensing and seizing will enable the formation of an ecosystem as the different players recognize and understand interdependencies, make the necessary investments and accept ecosystem-level rules that govern their transactions. However, as the ecosystem moves towards maturity there are nevertheless coordination and cooperation problems that may still require adaptation. Failing to solve such problems may lead to costly renegotiation or may even trigger participants to renounce their commitment and abandon the ecosystem. For example, there may be unforeseen issues not contained in the players’ initial shared vision or that the rules and agreements don’t cover. This is because any agreement among ecosystem participants is at best a highly incomplete contract (due to the high levels of complexity and uncertainty), and may be thought of as a constitution that regulates subsequent contracting by setting out the general rules for future interaction (Williamson, 1985). Because the agreement speaks to overall ecosystem governance and is typically incomplete, cooperation problems may erupt between individual participants which are not regulated by the agreement. For example, Jones, Leiponen, and Vasudeva (2021) analyze how conflicts over value appropriation between participants in an ecosystem (specifically, the 3GPP project developing global mobile telecom standards) may trigger ecosystem-wide changes in the level and patterns of cooperation.

In such cases, there is a need for ad hoc problem-solving or “exception management” in order for the ecosystem to be able to adapt to these unforeseen events. This is facilitated by the existence of relational governance mechanisms that complement explicit agreements (Bouncken, Clauß, & Fredrich, 2016; Poppo & Zenger, 2002), by ecosystem-wide standards of communication that enable coordination among ecosystem participants (Srikanth & Puranam, 2014), as well as standard procedures and problem-solving routines among firms within the ecosystem (Dyer & Singh, 1998). But the need for ad hoc problem-solving also leads to a continuing role for ecosystem leadership in achieving coordination of joint problem-solving activities. A leader might establish an organization that is capable of ad hoc problem-solving, such as Boeing, which established a centralized integration center to facilitate multilateral coordination among specialists working on the 787 Dreamliner (Kotha & Srikanth, 2013). But addressing problems might not only require going beyond prior agreements but also interfering with and adjusting them, such as making changes in interface technologies (e.g., APIs) in a way that ensures continued participation (Von Hippel & Katz, 2002). In such cases new functionalities may be added (such as payments in the case of the Apple and Android mobile ecosystems), and such new functionalities may lead to new interdependencies that must then be incorporated into the platform, e.g., by introducing a new version of an API.

**Microfoundations.** There are two critical microfoundations that enable a leader to engage in ad hoc problem-solving in emerging ecosystems. First, to have the ability to coordinate ad hoc problem-solving processes across ecosystem participants, the leader must have integrative, system-wide knowledge and capabilities. These are based on knowledge about other participants, including their capabilities and incentives, knowledge of the overall technical architecture of the ecosystem (Brusoni et al., 2001; Helfat & Raubitschek, 2018) as well as knowing who among the other ecosystem members knows what (Argote & Singh, 1998). Such integrative knowledge and capabilities help the ecosystem leader not only in defining the initial division of labor in the ecosystem but also help the leader anticipate coordination and cooperation problems before they arise. Moreover, leaders may develop routinized integrative capabilities, which allow them to continuously monitor problem-solving processes both at the level of the ecosystem and at the level of individual ecosystem participants. There may also be capabilities for developing the technical architecture and standards, at least if the leader is able to control these, and for facilitating local innovative efforts. Thus:

**Proposition 5.** (reconfiguring): An emerging ecosystem is more likely to become stable and mature if there is a leader who has system-wide knowledge of incentives, capabilities, technology and customer needs.

Second, developing ecosystem-level problem-solving skills and routines helps in addressing newly arising issues. Such routines might be embedded in a common platform that is managed by the leader. For example, Siemens manages joint problem-solving processes between the many participants in its ecosystem and across its sixteen sites through the dedicated Siemens Open Innovation Network platform. Google and Apple have established routinized processes for how to manage and review apps rather than dealing with these on an ad hoc basis. Ad hoc problem solving capabilities may also be based on individuals who have an understanding of the system as a whole, including the ability to see how the parts fit together (Baldwin & Clark, 2006), as Brusoni’s (2005) study of engineering design activities in the UK-based chemical industry shows. Such individuals have a key role in inter-firm coordination, and they act as boundary spanners (Aldrich & Herker, 1977). To summarize, we propose:

**Proposition 6.** (reconfiguring): An emerging ecosystem is more likely to become stable and mature if there is a leader who employs ecosystem-level problem-solving capabilities and engages others in and leads joint problem-solving efforts.
Implications for Leadership in a Mature Ecosystem

The Nature of Ecosystem Leadership in a Mature Ecosystem

We have argued that leadership makes a difference to whether an ecosystem emerges and becomes mature. But does it still matter when an ecosystem has become mature? Ultimately, in an ideal-type mature ecosystem, innovation activities are fully modularized and most or almost all of the problem-solving activities can be done by individual ecosystem participants without the need for coordinating amongst each other (Baldwin & Clark, 2000). In general, as Adner (2017) notes, in mature ecosystems the ecosystem is often latent and not visible, as the structure is stable and changes are either taken care of by individual ecosystem participants or through ecosystem-level problem-solving routines.

However, coordination and cooperation problems may arise even in mature ecosystems. For example, due to multilateral interdependences new issues (e.g., new technologies like NFC chips in mobile phones) may arise that require coordination and new co-specialized investments within the established technological architecture and the mutually agreed-upon governance model. In this case, the task of ecosystem leadership is to guarantee adaptation through continuous reconfiguring to maintain stability and deal with newly emerging issues that require ad hoc problem-solving (as formulated in propositions 5 and 6 above). This is particularly likely to be the case (and ecosystem leadership is therefore more likely necessary) in those ecosystems in which one firm controls a core platform or technical architecture that is central to the interoperability of the products of the individual ecosystem participants. Examples of such ecosystems are those that have at their core a systems integrator like Boeing (Kotha & Srikanth, 2013) and those that are platform ecosystems in which a firm like Google controls the platform (Thomas, Autio, & Gann, 2014). These kinds of firms are in fact the prototypes of ecosystem or platform leaders that prior literature has identified (e.g., Gawer & Cusumano, 2002, 2014).

The Leader Role in a Mature Ecosystem

In case a recognizable leader role exists in a mature ecosystem, this is likely to be the same firm that performed the leadership role in the emerging ecosystem. The reason is that a firm becomes an ecosystem leader by virtue of successfully solving the coordination and cooperation problems we described, which entails that other ecosystem participants accept the leader firm’s way of solving these problems. This includes buying into the leader’s vision (proposition 1), accepting the rules and agreements offered by the leader (proposition 3) and relying on the leader for ecosystem-level ad hoc problem solving (proposition 5). Such acceptance carries into the mature ecosystem, as realizing the innovative value proposition based on the general acceptance of the leader’s vision, rules and agreements, and role as the main ad hoc problem-solver marks the establishment of a mature ecosystem. Thus, our arguments imply that the leader role in a mature ecosystem can often be explained in terms of the leader’s contribution during the process of ecosystem emergence to solving ecosystem-level coordination and cooperation problems (based on the leadership dynamic capabilities we described). Being an ecosystem leader is thus the successful outcome of such a process.

An interesting implication is that prior literature may have put too much emphasis on associating ecosystem leadership with the current control of rules, standards and platforms. While, for example, ex ante control of a platform may certainly help a firm in establishing itself as the leader, it is neither necessary nor sufficient for becoming a platform leader. For example, both Google and Microsoft had control over a mobile operating system, but only Google was able to rally support around Android. Successfully doing so had the twin effect of emergence of the Android ecosystem and of Google establishing itself as the leader in that ecosystem as it became established.

Ecosystem leadership and value Capture

Successfully solving coordination and cooperation problems requires that other ecosystem participants will be subject to and accept the leader’s influence. This implies that the ecosystem leader is likely to be well positioned to appropriate a significant part of the value stream associated with the novel value proposition (Teece, 1986). Value creation and value capture are inextricably linked due to the nature and effect of these dynamic capabilities as follows. While a shared vision contributes to ecosystem emergence, an ecosystem leader may be able to promote its own vision (proposition 2) in which it is in a prime position to capture value. Specifically, the leader may want to establish a joint vision in which it controls the key value-adding, scarce resources or bottlenecks (Baldwin, 2015; Dattée et al., 2018). Ecosystem emergence also hinges on the acceptance of mutually agreed upon rules and standards, but these may be deliberately designed in a way that favor the leader (proposition 4) and will be difficult to change at later stages (Uzunca et al., 2022).

For example, to use Android, handset manufacturers must use certain Google services, which feed into Google’s ad business. Finally, to use Android, handset manufacturers must use certain Google services, which feed into Google’s ad business. Successfully doing so had the twin effect of emergence of the Android ecosystem and of Google establishing itself as the leader in that ecosystem as it became established.

These arguments imply that in a mature ecosystem the leader is bargaining power over the other ecosystem participants based on controlling rules and standards. But this need not be to the detriment of other ecosystem participants because ecosystems are not a zero-sum game. As we argued, by solving coordination and cooperation problems leadership enables ecosystem emergence and thus value creation in the first place. Furthermore, in a mature ecosystem, the leader often still performs an important role by engaging in ad hoc problem-solving that may be necessary, for example, because rules and standards may not be able to capture all interdependencies among participants. Accepting the leader’s influence (both as the ecosystem emerges and when it is established) will thus be mutually
beneficial (in fact, if other ecosystem participants wouldn’t deem ecosystem-specific investments worthwhile the ecosystem wouldn’t emerge in the first place). This also has implications for managers and policy makers, which we address in the discussion section below.

Discussion

Contribution to Theory: the Emergent and Changing Role of Ecosystem Leadership

Building from TCE and DCT, our first contribution is to develop new theory on how leadership contributes to ecosystem emergence and how its role changes as the ecosystem becomes established and mature. Specifically, we use TCE to frame the ecosystem as a governance structure and to describe the coordination and cooperation problems that exist and that need to be overcome for an ecosystem to emerge (Williamson, 1985), and we use DCT to characterize the ways in which ecosystem leadership addresses these coordination and cooperation problems (Teece, 2007). Thus, our arguments highlight the important role of ecosystem leadership as a governance mechanism that plays a critical role in enabling the emergence of ecosystems and in stewarding the established ecosystem.

As such, our arguments address one major shortcoming of prior literature on ecosystems that has gone largely unnoticed: with a few exceptions (e.g., Adner, 2012; Ozcan & Santos, 2015) research on ecosystems, their emergence and the role of leaders therein has taken a post hoc perspective but has largely failed to acknowledge that efforts to establish ecosystems may be in vain and thus envisioned ecosystems may fail to materialize. Our work, instead, provides insights into the specific coordination and cooperation problems that need to be addressed to avoid such failure and the types of capabilities leaders employ to overcome these. We formulated propositions, which are in principle empirically testable.

We identified three types of coordination and cooperation problems, which we argued are logically sequential while overlapping in practice. Our arguments thus imply that ecosystem emergence will often require leaders to engage in a variety of activities to influence other ecosystem participants, and therefore the form ecosystem leadership takes may also change over time. One implication is that ecosystem emergence – at least to the extent that it is shaped by a leader – can be seen as a process of guided evolution (Lovas & Ghoshal, 2000) where the coevolutionary processes between leader and the other ecosystem participants affect the shape the ecosystem will take (Hou & Shi, 2021). Importantly, as neither the value proposition nor the structure and complementarities are known (and may not even be knowable) ex ante, there may be some leeway the leader has in shaping the ecosystem to their advantage. Of course, the extent to which this is possible hinges on a number of contingencies from which we have abstracted (such as whether there is competition for leadership, or the role of technological characteristics), but which we will discuss further below.

Limitations and Future Research on Ecosystem Leadership

Our main emphasis in this article has been on explaining the existence of leadership in ecosystems as a transaction-cost reducing response to generic coordination and cooperation problems associated with the emergence and maintenance of such ecosystems, which are exacerbated by the presence of uncertainty and complexity. Thus, our explanatory approach is essentially the same as that of TCE. The particular governance structure represented by an ecosystem with an active leader is explained as a rational response to exchange problems (here represented as coordination and cooperation problems). And as in TCE, we have characterized the ecosystem very abstractly. This makes our theoretical framework relatively generic and thus applicable to a range of different ecosystem contexts. However, this broad view comes at the cost that it neglects variation in contextual characteristics. A more fine-grained discriminating approach therefore needs to recognize that, first, ecosystems may differ in many dimensions, giving rise to different exchange challenges, and, second, that leaders may have many different instruments for facilitating coordination and cooperation at their disposal. Such differences include the ways in which leaders may influence others, the kinds of rules and agreements that they may employ as well as the types of relationships to other ecosystem participants. Below, we mention several factors along which ecosystems differ but also note that a future full-blown analysis should systematically link such governance instruments and how they are combined to the different challenges that different ecosystems give rise to in a discriminating (transaction cost-minimizing) manner. In the following we discuss several possible extensions and limitations and provide an overview of what we think are interesting opportunities for further study concerning leadership in emerging ecosystems.

Competition for leadership and collaboration in leadership. We abstracted away from the role and effect of competition for ecosystem leadership. Such competition may take place through competing visions (sensing) or through competing efforts to get others to adopt and support one’s rules, standards or platform (seizing). An interesting question is how closely these two are intertwined, and in particular whether a firm that initially misses out on proffering its vision may nevertheless be successful in getting others to accept its standards or join its platform. In addition, in many contexts there are no winner-takes-all dynamics (Cennamo & Santalo, 2013), so that multiple, competing ecosystems may emerge (which may or may not overlap in terms of the participants). There may also be divided leadership within a particular ecosystem (Casadesus-Masanell & Yoffie, 2007), which may happen when one potential leader firm only controls some of the capabilities required to adequately address coordination and cooperation problems in the emerging ecosystem, and another firm has complementary capabilities to fill the gap. Such divided leadership may not continue into the mature phase, as collaboration may turn into competition when the partners focus on value capture or when there are economies of scale in leadership activities that suggest that leadership is efficiently concentrated in one firm. Future research may examine the dynamics of competition for ecosystem leadership and the conditions under which they result in the emergence of one leader or divided leadership within an ecosystem or in the establishment of two or more competing ecosystems.

Firm characteristics and ecosystem leadership. The firm acting as leader in an emerging ecosystem may be an established firm or a startup. This leads to the Schumpeterian question whether established or new firms make for better and more successful ecosystem
leaders. There is reason to believe that either type of firm may have a distinct type of advantage. For example, while an established firm may initially have a seizing advantage thanks to controlling assets which it can use to signal commitment and credibility, startups may have a sensing advantage as they will often be less constrained in their thinking and thus more likely to apply a wide lens (Lingens, Miehê, & Gassmann, 2021). In such circumstances, to overcome its seizing disadvantage the startup may benefit from a charismatic leader with deep established networks. Another relevant firm characteristic is industry experience or whether the aspiring leader is an industry incumbent or a diversifying entrant. Either type of firm may be able to leverage prior ecosystem leadership capabilities. Trust also matters, and the existing position of incumbents may cause issues in that regard as potential partners may see conflicts of commitment if not conflicts of interest. A case in point is Microsoft, whose efforts to get a position in the emerging mobile ecosystem were always regarded with suspicion by its potential partners (West & Wood, 2013). Examining these issues empirically is an interesting avenue for further research on ecosystem leadership.

The role of the leader’s vision and learning processes. A vision can be a powerful force to guide subsequent actions, but it may also be based on false assumptions or omit some critical contingencies and thus be in need of change and revision (Ehrig & Schmidt, 2022). While ecosystem emergence requires leaders to engage in some forward-looking behavior and, in particular, proactively address some of the coordination and cooperation problems, it is equally important that leaders are open to learning and that they adjust their vision if necessary (Duftée et al., 2018). Given that ecosystem emergence also involves successfully persuading other ecosystem participants, this learning process is closely connected to the leader’s sensing and seizing activities oriented towards these others. The vision thus likely co-evolves with the process of ecosystem emergence. Future research may examine leaders’ and other ecosystem participants initial visions and how their thinking evolves over time.

Role of technology. Ecosystems differ in terms of the core technology. For example, in some ecosystems (e.g., smartphones) there is a core platform that coordinates and guides the activities of other ecosystem participants. Also, ecosystems may differ in terms of the complexity and novelty of the underlying technology which has implications for the two key contingencies that we have argued determines the severity of coordination and cooperation problems, namely uncertainty and complexity. Ecosystems based on simple or at least well-understood technology are capable of handling coordination and cooperation problems at lower cost than ecosystems with complex and emerging technologies and numerous multilateral interdependencies, and hence the need for leadership will be smaller. On the other hand, as is evident in the differences between the American (Amazon, Apple, Google etc.) and Chinese (Alibaba, Tencent etc.) platform ecosystems, the same underlying technology can lead to different ways in which ecosystems will emerge, which are arguably based on different ways in which coordination and cooperation problems are solved as the ecosystems emerge and mature. The interplay between ecosystem leadership and technology is thus an exciting area of further study.

Role of universities and public institutions. We have implicitly treated ecosystem leaders and other ecosystem participants as for-profit organizations. However, universities and public institutions can also play an important role in ecosystem emergence (that is, in the emergence of ecosystems to bring about and commercialize systemic innovations), and they may even assume leadership activities in this kind of ecosystems. While this is distinct from the role they may play in leading entrepreneurial or innovation ecosystems, it is complementary (Heaton, Siegel, & Teece, 2019). Universities and public institutions control some capabilities that are not available to firms and that are necessary for the innovative value proposition to materialize. This would make them a natural participant in an ecosystem even though another firm assumes leadership. However, universities and public institutions may also engage in leadership activities at early stages of ecosystem emergence, for example by facilitating assembling an initial set of possible participants or by influencing rules and regulations that enable ecosystem emergence. There is little research that examines such leadership activities geared towards bringing about and commercializing systemic innovations.

Leadership in alliance and business networks. The literature on strategic alliances and business networks is older and more mature than the literature on ecosystems, but there are also substantial overlaps between these literatures (Aarikka-Stenroos & Rita, 2017; Shipilov & Gaver, 2020). In fact, while the alliance and network literature has stressed the relational and cooperative aspects of inter-firm collaboration, it also has identified transactional hazards (Oxley, 1997), and it also recognizes the role of leadership (Dhanaraj & Parkhe, 2006). There are opportunities for further integration of these literatures. For example, research could examine how the ecosystem leadership capabilities we have described in this paper may be embedded in firms’ alliance management capabilities (Bouncken, Fredrich, & Gudergan, 2022; Schreiner, Kale, & Corsten, 2009). In addition, while we have focused on the role of agreements, standards and capabilities, structural characteristics of the networks (such as the centrality of a potential ecosystem leader in an existing network) may also affect the process of ecosystem emergence and network formation (Podolny, 2001).

Alternative theoretical perspectives. We built our article on the theoretical foundation of TCE and thus characterize ecosystem leadership in functional terms as a means to reduce coordination and cooperation costs, which in turn contributes to ecosystem emergence and robustness. This does not, however, rule out other theoretical mechanisms that may be at play in affecting ecosystem emergence and robustness. For example, leadership can also be based on and be exercised to create and maintain power asymmetries, which leads to dependencies between organizations and could even prevent some from participating altogether (Santos & Eisenhardt, 2009). In fact, our arguments about value capture in mature ecosystems are partially based on power considerations, but ecosystem leaders may also be a position to control the entry and exit of other ecosystem participants (Venkatraman & Lee, 2004). In addition, there is likely strong path dependency, with the process of ecosystem emergence being associated with routine dynamics across organizations as well as the creation and diffusion of new institutional practices (Leblebici, Salancik, Copay, & King, 1991).

Implications for Managers and Policy Makers

Our framework adds to prior work on managing for value creation and appropriation in settings in which complementarities and interdependencies among firms’ innovative activities exist. As Teece (2018) notes, with the increasing prevalence of digital
technologies, such interdependencies are becoming increasingly widespread. Our framework stresses the fact that, as noted above, in the context of ecosystems value creation and value appropriation go hand in hand from the perspective of ecosystem leaders. Leaders thus must maintain a fine balance between getting others to jointly innovate and keeping the spoils for themselves.

One issue is that we mostly observe those ecosystems that have actually materialized, while many attempts to design and nurture ecosystems likely fail (see Adner (2012) for a number of examples of failed attempts). While the prevalence of failed attempts is unknown, two possible reasons exist for such failures. First, there may be an undersupply of ecosystem leadership. If this is the case, our framework should be useful to managers by helping them to identify the activities they may engage in to facilitate the successful creation of an ecosystem. On the other hand, there may also be an oversupply of ecosystem leadership, which leads to clashes among competing visions (and thus no shared vision may emerge) or clashes during the seizing stage when multiple firms vie to influence each other to their own advantage but to the detriment of the emerging ecosystem (Ozcan & Santos, 2015). In such cases, further agreements are needed between firms concerning the leadership role, including its division, which can also be rotated over time (Davis & Eisenhardt, 2011).

Concerning policy, ecosystems have attracted considerable policy interest in recent, partly those ecosystems that are organized as digital platforms (cf. Jacobides & Lianos, 2021; Jullien & Sand-Zantman, 2021). Some commentators have observed that current policy approaches tend to emphasize static efficiency at the expense of dynamic efficiency (i.e., innovation) and have called for prioritizing the latter (Petit & Teece, 2021). We add two related points to this policy debate.

First, the current discussion regarding competition policy vis-à-vis ecosystems mainly addresses mature ecosystems with established leaders, and mainly consider value appropriation issues (related to control of critical ecosystem assets). As highlighted by Petit and Teece (2021), there is a need to consider value creation in a dynamic context and avoid disincentivizing value creating innovation.

However, leaders create value not just by innovating per se, but also by enabling ecosystem emergence by addressing coordination and cooperation problems at low costs. Creating value by reducing transaction costs is a standard argument in competition policy discussions that historically have spoken in favor of governance arrangements such as vertical integration, franchising, and, we add, leadership in ecosystems (see also Biggar & Heimler (2021)). Leadership and associated commitments to innovation are important to determining market outcomes. Our analysis indicates that such positions are superficial and highly incomplete.

Second, and relatedly, possible static efficiency losses associated with the ecosystem leader’s control over critical assets need to be traded off against a quite basic Schumpeterian consideration: Without the leader and the incentives provided by value appropriating, there simply may be no ecosystem in the first place (cf. Littlechild, 1981). Thus, while leaders economize with transaction costs by helping a group of potential ecosystem participants deal with the coordination and cooperation problems associated with bringing about a joint novel value proposition, their presence may be a necessary condition for the existence of the ecosystem. In other words, the presence of a leader helps bring about potentially substantial value creation in the form of consumer surplus as well as producers’ surplus (among other ecosystem participants) that would not exist in the absence of the leader. To be sure, value creation is smaller than the imaginary conditions envisaged in the fully competitive model, but the relevant standard of comparison is rather the level of value that would be created without the ecosystem leader (i.e., much less or none at all).

Conclusion

This article provides a novel perspective on leadership in ecosystems by highlighting the coordination and cooperation problems in such systems over time and how dynamic capabilities of ecosystem leaders address and handle these in a transaction cost-minimizing manner. Innovation requires an increasing number of different components and technologies to be orchestrated and integrated. When innovation is systemic in nature, the importance of ecosystem leaders is paramount. Network effects are secondary, requiring managers and policy makers in particular to rethink some conventional propositions about innovation in the digital economy.

Author statement

The authors contributed equally to this research.

Data availability

No data was used for the research described in the article.

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David J Teece Professor in Global Business and director of the Tusher Center for the Management of Intellectual Capital at the Walter A. Haas School of Business at the University of California, Berkeley. He is also the faculty director of the school’s Tusher Center for the Management of Intellectual Capital. He is the author of over thirty books and two hundred scholarly papers and co-editor of the Palgrave Encyclopedia of Strategic Management. Dr. Teece has received eight honorary doctorates and has been recognized by Royal Honors.