Elevating Business Models to the Ecosystem Level:
Evidence from Web3 and Beyond

Annika Bengts	Ville Eloranta	Esko Hakanen	Taija Turunen	Valeska Tullney
Aalto University	Aalto University	Aalto University	Aalto University	Aalto University
annika.bengts@aalto.fi	ville.eloranta@aalto.fi	esko.hakanen@aalto.fi	taija.turunen@aalto.fi	valeska.tullney @googlemail.com

Abstract

Business models integrate activities for value creation and capture. While ecosystems have emerged as potent catalysts for value creation through collaborative innovation, the common understanding is that value capture occurs within individual firms. This paper challenges this dichotomy. In an empirical study using a polar types case approach, we first illustrate how two ecosystems employ decentralization technology, specifically blockchain-based Web3 platforms, to elevate value capture to the ecosystem level. We then outline the implications beyond the blockchain domain using two non-Web3 cases. Specifically, we show—from the perspectives of value proposition, value constellation, and profit equation— how business models can rise to the ecosystem level.

Keywords: Business model, ecosystem, value creation, value capture, blockchain

1. Introduction

In the dynamic and complex world of contemporary business, the concept of ecosystem has gained considerable traction, particularly in the realm of interorganizational arrangements (Adner, 2017; Moore, 1993). However, a contentious point remains: while ecosystems indeed stand as efficient value creation engines, the ensuing process of value capture predominantly falls within the purview of individual firms (Thomas & Autio, 2020; Jacobides et al., 2018). Our study challenges this stance and explores the potential for more distributed, ecosystem-level value capture.

By bringing together firms with aligned goals, ecosystems enable the joint development of new solutions and act as cradles of collaborative synergies, facilitating value creation on a scale that surpasses the capacities of individual firms (Iansiti & Levien, 2004). The Linux, Android, and ARM ecosystems, for example, illustrate this principle, showing how open-source platforms can accelerate innovation and value creation through collaborative efforts (Gomes et al., 2018).

Conversely, the process of value capture within ecosystems tends to be concentrated in individual firms. The mainstream theoretical discourse on business model innovation restricts value capture to firm-level analyses (Adner, 2017; Gomes et al., 2018; Ritala et al., 2013). By leveraging their unique positions within an ecosystem, firms extract and privatize the created value for their exclusive benefit (Baldwin & Woodard, 2009; Hannah & Eisenhardt, 2018; Pagani, 2013; Teece, 2018). This is often enabled by control points or bottlenecks, such as centralized platforms and modular technologies, dominated by individual firms (Baldwin & Clark, 2000; Boudreau, 2010).

This dichotomous view of ecosystem value creation vs. capture raises certain questions: Is value capture restricted to the firm level merely because of taken-for-granted business structures and underdeveloped (technological) institutions? Might there be untapped potential for value capture to occur at the ecosystem level? The perceived inability (or sometimes even irrelevance) of ecosystems themselves to capture value may, in fact, be a limitation imposed by our current thinking rather than a fundamental characteristic of ecosystem business. Indeed, emerging developments, especially in the Web3 (blockchain and other distributed ledger technology -based platform businesses) sector, suggest that ecosystem-level value capture is not only possible but already operational in some (albeit niche) contexts. We see instances in which, enabled by decentralized institutional technology (Leiponen et al., 2022; Lovett & Thomas, 2021), an ecosystem itself captures value and (at least semi-autonomously) redistributes it among contributors, challenging traditional notions of firm-level value appropriation (Hakanen, 2021; Massa et al., 2018).

Thus, in this paper, we posit that the traditional division between value creation at the ecosystem level

and value capture at the firm level is ripe for reevaluation. We bridge this divide by integrating strategy-driven ecosystem research (Adner, 2017; Jacobides et al., 2018) with practice-driven business model research (Amit & Han, 2017; Massa et al., 2017; Zott & Amit, 2013), thereby elevating the concept of business model to the level of ecosystems. In our empirical study, we assessed the business models from the perspectives of value proposition, value constellation, and profit equation (Yunus et al., 2010). To summarize, our research question is: *How can business models rise to the ecosystem level?*

We adopted a polar types case approach. We purposefully selected two ecosystem cases from the Web3 sector in which value creation and capture occur at the ecosystem level with the support of techno-institutional arrangements (blockchain ledgers, smart contracts, and ecosystem-specific economic instruments). Further, recognizing that not all business contexts can directly align with Web3 models and that the Web3 domain is still emerging and has limited explanatory power, we extended our reasoning to two non-Web3—namely, healthcare industry—cases to broaden the applicability of our findings and set boundary conditions for our theorizing.

2. Theory

2.1. Value creation–capture decoupling in ecosystem research

We adhere to the definition of ecosystems as "interacting organizations, enabled by modularity, not hierarchically managed, bound together by the nonredeployability of their collective investment else-where" (Jacobides et al., 2018, p. 2255). Ecosystems constitute a unique interorganizational arrangement distinct, for example, from networks and supply chains (Adner, 2017; Gomes et al., 2018). The organizing structures for ecosystems range from centralized types in which members connect to one main organization to decentralized or multilateral types that focus on shared focal value propositions (Adner, 2017).

The literature has analyzed the concepts of value creation and value capture within ecosystems in great detail (Gomes et al., 2018). However, the discussion has evolved into two distinct streams of research: a predominantly innovation-oriented and an economics-centered perspective (Gomes et al., 2018). Innovation-driven reasoning primarily concerns value creation, focusing especially on "innovation ecosystems." On the other hand, the debate on value capture, often using

the term "business ecosystem," draws primarily on economic theories.

The value creation literature has explored how networks of firms collaboratively innovate and bring complex offerings to the market (Adner & Kapoor, 2010; Kapoor & Lee, 2013). Here, the ecosystem itself is the primary unit of analysis (Jacobides et al., 2018), and individual firm offerings are combined into a comprehensive cocreated whole (Adner, 2006; Adner & Kapoor, 2010). Such ecosystems often attract firms by offering an environment in which the challenges of innovation are shared by the ecosystem's members (Adner & Kapoor, 2010). An intensive collaborative approach to knowledge creation, dissemination, and utilization is developed. Close integration between firms stimulates coevolution and shared resilience (Rohrbeck et al., 2009).

In contrast to value creation, value capture in ecosystems has been predominantly examined through an economics lens (Gomes et al., 2018). This approach emphasizes the bargaining power of individual firms within their ecosystems (Porter & Heppelman, 2014) rather than adaptive collaboration between firms (Jacobides et al., 2018). Consequently, the unit of analysis is the individual firm (Jacobides et al., 2006; Teece, 2018). Value capture is often attributed to firms' appropriability regimes (Jacobides et al., 2006; Teece, 2018): ecosystem members establish control points within the ecosystem (Pagani, 2013) and identify and leverage ecosystem bottlenecks (Hannah & Eisenhardt, 2018).

To complement the two abovementioned mainstream perspectives, Jacobides et al. (2018) highlighted the new research lens of "platform ecosystems." This approach supplements the innovation and economics approaches by focusing on how ecosystems are structured around a technological base (Gawer, 2014; Jacobides et al., 2018). Over the past decade, platform ecosystem perspective has striven to merge the innovation and economics viewpoints—value creation and capture—into a single domain, most notably through the concept of meta-organization (Gawer, 2014; Kretschmer et al., 2022). However, in practical platform ecosystem analysis, the pattern of value creation at the ecosystem level and value capture at the individual firm level seems to persist (e.g., McIntyre & Srinivasan, 2017; Teece, 2018).

2.2. Business models and ecosystems

Like value capture, the business model concept has largely been investigated through firm-level analyses. A business model describes a firm's value proposition, value constellation, and profit equation

(Yunus et al., 2010). These components embody the firm's logic for value creation and capture, offering a "simplified and aggregated representation of the relevant activities of a company's relevant activities and interactions" (Wirtz et al., 2016, p. 39).

Recent business model research (Amit & Han, 2017; Amit & Zott, 2015; Foss & Saebi, 2017) has highlighted the need for better analyses of networked value creation and value capture. To understand the economic rationale behind ecosystem business, it is considered necessary to extend the analytical perspective of business model research to multilateral settings—that is, beyond dyadic agreements (Adner, 2017; Hakanen, 2021; Zott & Amit, 2013). This requires a shift away from a firm-dominated perspective while maintaining the practical, firm-level relevance that has always characterized the business model discourse (Massa et al., 2018; Zott et al., 2011).

Rising to the ecosystem level presents several practical challenges for business model analyses. Deprivatizing value capture from firms entails risks for value appropriation (Frankenberger et al., 2014). Sharing value among multiple firms requires stability, rules, and predictability (Berglund & Sandström, 2013; Dahlander & Gann, 2010; Frankenberger et al., 2014; Holm et al., 2013). The scalability of multilateral arrangements may also be a concern, as their success often hinges on the trust established among the interacting parties (Berglund & Sandström, 2013).

Concrete endeavors have also been undertaken to develop approaches aimed at aligning business models' value creation and capture at the ecosystem level. Such studies have highlighted the relevance of understanding the dynamics of ecosystem collaboration and complementarities and have emphasized the need for ecosystem-level business model designs focusing on defining what shared value is and developing and robustly implementing effective mechanisms for value sharing (Adner, 2022).

From a strategy perspective, John and Ross (2022) made an important contribution by showing that the share an ecosystem leader should capture from ecosystem value depends on the level and type of the complementarities generated by other agents within the ecosystem. Rong et al. (2021), in turn, assessed the role of shared economy platforms in value creation and capture, showing the importance of cocreating shared values in collaboration with other ecosystem members. Furthermore, Deng et al. (2022) introduced a profit framework for digital platforms focusing on value sharing and resource complementarities and emphasizing the key role of symbiosis between platform companies and their user bases in optimizing ecosystem profitability. Adding to these contributions,

conceptual definitions of ecosystem-level business model components have also been proposed, among others, by Westerlund et al. (2014), Leminen et al. (2018), and Van der Borgh et al. (2012). To this end, Thomas and Autio (2012) proposed a related concept of "ecosystem model," emphasizing participant symbiosis and institutional stability in ecosystem business.

Moreover, the niche Web3 literature has explored the organization of ecosystem-level collaboration already for some time (Lumineau et al., 2021). However, a business model perspective has only been explored anecdotally and has often highlighted significant practical implementation challenges (e.g., vulnerability to hacking (Seidel, 2018). Nevertheless, both technological maturity and the discussion of organizing business in Web3 have evolved in recent years. Blockchain-based distributed autonomous organizations (DAOs) (Buterin, 2014; Seidel, 2018) and related crypto-economic instruments, especially tokens, are increasingly viewed as vehicles for aligning value creation and capture in Web3 contexts (Abdollahi et al., 2023). In this regard, Saurabh et al. (2023) recently examined how DAOs are related to business model innovations. The authors portrayed DAOs as multilayered architectural implementation models for ecosystem business and mapped DAO characteristics to the business model canvas tool (Osterwalder & Pigneur, 2010).

3. Method

3.1. Research design

Given the emergent status of research in our interest area, we adopted a qualitative multi-case theory-building approach (Eisenhardt & Graebner, 2007). We were particularly interested in the business models of data-sharing ecosystems, as these contexts are characterized by wide-ranging collaboration and positive complementarities (Koutroumpis et al., 2017). Our sampling strategy relied on the polar types approach: we chose extreme cases to identify distinct and shared patterns and their boundary conditions (Eisenhardt, 1989).

We used the polar approach as follows. At one extreme, our interest was in Web3 projects, as they employ state-of-the-art techno-institutional arrangements (blockchain and smart contracts) that, by design, facilitate ecosystem-level value creation and capture. At the other extreme, we were interested in cases in which there was a desire to design ecosystem-level business models, but only traditional technological (centralized) solutions were available. Thus, we selected altogether four ecosystem business

model development projects from Web3 and non-Web3 contexts as cases (two from each context).

The large-scale use of Web3 technologies is still emerging, and many such development projects are in the early stages of market entry. Therefore, in Web3 cases, we focused only on prominent projects with multimillion-dollar investments to ensure that these cases demonstrated a long-term commitment and support from stakeholders. We selected two such Web3 cases, referred to as Alpha and Beta. Both cases were data-sharing ecosystems with no specific industry focus.

We selected the healthcare sector as a non-Web3 context because data sharing among different ecosystem actors in health care is an increasingly important topic, and attempts to create data-sharing ecosystems are multiplying rapidly (De Jong et al., 2018). Specifically, our cases, referred to as Gamma and Delta, were related to healthcare service and infrastructure development, both of which involved an emerging ecosystem-level business model.

3.2. Analytical approach to business models

Adopting the approach of viewing a business model as a "cognitive/linguistic schema" (Massa et al., 2017, p. 76), we were interested in the "*images* of real systems—such as real business models" (ibid, p. 82) held by project representatives. The power of such cognitive and linguistic schemas lies in their ability to capture the essence of business models as "recipes for creative managers" (Baden-Fuller & Morgan, 2010, p. 156). Therefore, in our empirical inquiry, we were primarily interested not in the attributes of the case projects and their business model implementations but in how the informants framed and described the value creation and value capture of the ecosystem-level business models that they were developing (Aspara et al., 2013; Chesbrough & Rosenbloom, 2002; Doganova & Eyquem-Renault, 2009).

We see this approach as particularly well suited to our context. In our view, when designing ecosystem-level business models, all ecosystem participants should interpret the joint targets similarly and commit to pursuing common goals. The target state needs to be efficiently communicated through cognitive or linguistic schemas that convey the underlying message of the ecosystem-level business model to later entrants. Such target images of real systems have been shown to shape the cognitive frames of managers pursuing an identified goal (Chesbrough & Rosenbloom, 2002; Massa et al., 2017; Tripsas & Gavetti, 2000). Therefore, an ecosystem-level business model needs to encapsulate a thinking pattern

or an established belief about the desired future state (Massa et al., 2017).

3.3. Data

We used many sources of data for each case (Eisenhardt, 1989). Project stakeholder (ecosystem member) narratives served as the primary sources and included 1) official company or project blog posts, 2) project white papers and formal project documentation (most recent versions), 3) project websites, and 4) ecosystem member interviews and workshops. These data were complemented by public interviews with project CEOs for two cases (Alpha and Gamma) and additional technical documents (Beta). A summary of the data sources is presented in Table 1.

Table 1. Data

Web3 sector		Non-web3 sector	
Alpha	**Beta**	**Gamma**	**Delta**
Blog articles			
25 articles (165 pages)	7 articles (67 pages)	-	19 articles (50 pages)
White papers and other formal project documentation			
1 white paper, 7 project documents	2 white papers	2 internal reports (58 pages)	2 internal reports (137 pages)
Project websites			
1 site	1 site	1 site	1 site
Ecosystem member interviews and workshops			
10 interviews, 8 workshops (4–7 participants each)		18 interviews	4 workshops (10–49 participants each)
Other materials			
2 company documents (incl. CEO interview)	1 document (reference framework) (25 pages)	1 document, CEO interview) (3 pages)	-

3.4. Analysis

In accordance with the principles of constructing multiple case theories, we used within-case analysis and cross-case pattern search techniques without preconceived hypotheses (Eisenhardt, 1989). In the first stage of the within-case analysis, we identified the initial codes to be selected for further analysis (Yin, 2009). We focused on how the data described the developed ecosystem-level business models. We analyzed the material with a view to answering the following questions: 1) What motivates stakeholders to cooperate with each other, and what is the main

purpose of the cooperation (value proposition)? 2) How should stakeholders work with each other, and how is cooperation facilitated (value constellation)? 3) How is the gained value shared among ecosystem stakeholders (profit equation)?

In the second stage of the within-case analysis, we proceeded by categorizing the codes inside the value proposition, value constellation, and profit equation themes. We performed the analysis at the case level, so the labels of the thematic groups varied between the cases.

We then performed a cross-case analysis (Eisenhardt, 1989). The selected comparative categories were ecosystem-level value proposition, ecosystem-level value constellation, and ecosystem-level value equation. We focused on identifying similarities and differences between the case contexts. During the analysis, we followed an iterative process, continually revisiting the emergent theory, case data, and literature. This iterative cycle allowed us to enhance the definitions of the emerging constructs, refine the levels of abstraction, and establish theoretical relationships (Eisenhardt, 1989).

4. Findings

4.1. Ecosystem-level value proposition

The ecosystem-level value proposition seemed to be often unclearly defined in the non-Web3 cases despite being recognized as a key driver of the investigated ecosystem businesses. The value propositions were often ambiguous, and the existing guidelines were fragmented. This led ecosystem members to interpret and implement the value propositions differently, resulting in a lack of alignment. Each ecosystem member followed their own set of guidelines, forming isolated structures that failed to produce collective ecosystem-wide endeavors. Thus, instead of pursuing collective success, the non-Web3 cases focused on maximizing ecosystem members' individual gains. Each member often prioritized their own power position or share of value capture, cumulatively undermining the ecosystem's unity. Further, bureaucratic control exerted by individual firms in power positions inhibited ecosystem members' willingness to invest resources in cross-member collaboration. Consequently, different ecosystem projects adhered to their own local or sector-specific principles.

In contrast, the Web3 cases took a distinct approach to ensuring the role of the value proposition as a guide within their ecosystems. The cases formalized their value propositions into a smart contract–based objective functions and used

ecosystem-native tokens (decentralized units of account maintained by the ecosystem's platform) as a means of enforcing this formalization. By tying the value propositions to the use of ecosystem tokens, the ecosystems' objectives were perceived as more transparent to all participants. The native tokens ensured that transactions and ecosystem functionalities (including auditing and infrastructure maintenance) followed the specific rules and objectives set for the ecosystems.

However, formalization with smart contracts and native tokens presented its own challenges. One major issue was thought to be the accessibility of the ecosystems' smart contract codes used for formalization. While individuals with sufficient technical knowledge could decipher and interact with the code (and, consequently, the rules of the ecosystems), the code-based laws remained incomprehensible to (and thus unusable by) those who lacked the necessary skills. As a result, an exclusive circle of actors seemed to emerge in the nascent ecosystems—and, according to the informants, in the entire Web3 industry—forming a metaphorical "crypto-island," as our informants put it. This exclusivity and technical complexity counteracted the initial intention of the ecosystems' value proposition formalization and value creation–capture alignment.

In summary, both the non-Web3 and Web3 cases aimed at aligned interests in terms of collective ecosystem-wide value creation and capture. However, the non-Web3 cases struggled to establish strong shared value propositions; thus, collaboration was impeded by the divergent goals of ecosystem members. Web3 cases, on the other hand, used native tokens to formalize and enforce value propositions, achieving more shared and aligned interests. However, the Web3 firms faced their own set of challenges related to technical complexity and exclusivity.

4.2. Ecosystem-level value constellation

The non-Web3 cases revealed that, despite their agreed aim of unifying the ecosystems, the ecosystem-level value constellations were primarily formed to meet contractual needs instead of optimizing ecosystem collaboration. These diverse arrangements inhibited the optimal assembly of actors within the ecosystems. Each project network established its own principles of value sharing and value production independently for each actor and project. Therefore, the ecosystem-level value constellations resembled more assemblages of disparate project compositions than unified systems.

Our investigation also revealed the central role of clients and their processes in shaping ecosystem value

constellations despite the clients' potential expertise limitations. Contracts were typically concluded between clients and individual vendors, sidestepping the complex web of interactions between the various actors involved in the ecosystems. This resulted in suboptimal project execution and collaboration.

Moreover, the form of agreements prevalent in the non-Web3 ecosystems inadvertently fostered a divisive atmosphere. The contracts were structured to favor individual profit maximization, often at the expense of collaborative efforts, creating an environment that promoted conflict. Strikingly, the focus on individual gains and the provisions for dispute resolution within the agreements sometimes even fostered hidden agendas within the ecosystems. In the absence of strong ecosystem-wide collaborative value constellations, ecosystem members in positions of power sometimes created open-ended contracts with clients that left room for profit maximization as projects evolved. Consequently, problems arising within the projects were often seen as opportunities to extract additional profits at the clients' (and other ecosystem members') expense.

The Web3 cases revealed an alternative approach. In these settings, DAOs were used to partly transfer the control of value creation and distribution from individual entities to the wider value constellation. Such autonomous systems were thought to facilitate collective decision-making, allowing the value constellation to evolve in a manner that reflected its members' shared interests. Power balances (and the criteria affecting them) were specified in unambiguous smart contracts. This approach, at least at the vision level, democratized critical decision-making processes and prioritized community participation.

However, this decentralized approach also posed unique challenges. Again, not all ecosystem members possessed the expertise necessary for effective participation in complex code-based decision-making processes. Smart contracts ended up being either too complex to comprehend or too simple for interactions to be defined properly. Moreover, the presence of token speculators (DAO smart contracts were enforced using the ecosystems' native tokens) was thought to stimulate short-term, economic rent-seeking decision-making that endangered the long-term health of the value constellations.

4.3. Ecosystem-level profit equation

The concept of value sharing was seen as a key driver in both the non-Web3 and Web3 ecosystems' profit equations. However, the distinct challenges of each ecosystem's organization underscored the divergent traits across the cases. In the non-Web3

realm, ecosystem members' fight to retain value due to competitive pressures became a crucial hindrance to collective value appropriation. Moreover, the potential dominance of the biggest players within the ecosystems hampered collaborative attempts. Resource allocation, especially for development work but also for information and know-how, was one of the main challenges facing ecosystem members. Withholding crucial information to protect short-term self-interest thwarted transparency, thus breeding isolated knowledge hubs that reduced trust within the ecosystem.

Thus, in the non-Web3 cases, positive complementarities of data and information resources were not leveraged. This was seen as a particularly important deficit, as these cases were data and information sharing ecosystems. Withholding such resources inhibited ecosystem-wide business model innovation processes. Each actor's independent optimization led to inventing the same processes multiple times, causing suboptimization, which, in turn, further slowed business model innovation and aggravated short-sightedness.

Web3 cases, on the other hand, advocated transparency and open data and information exchange and institutionalized these principles through advanced token design features. These mechanisms were designed to incentivize ecosystem members to contribute and correlate the value of their present contributions with the ecosystems' future valuations. Thus, actions in the ecosystems were thought to transform from mere exchanges into tactical and strategic investments, nurturing a climate of shared growth.

Furthermore, in the Web3 cases, reputation was a critical soft incentive for ecosystem-level value sharing. Members who consistently abided by the ecosystems' rules and exhibited responsible behavior garnered a positive reputation. This elevated their status within the ecosystems, expanding the members' opportunities for prosperous collaborations. Nevertheless, complexities persisted. The perception of native tokens as speculative assets frequently obscured their original purpose of acknowledging and incentivizing significant contributions. This misrepresentation destabilized the value creation dynamics and hampered the alignment of incentives within the ecosystems.

Moreover, earning reputation-based rewards was sometimes considered challenging. In the Web3 realm (and in all open-source development contexts), the difficulty of tracking and evaluating contributions, especially those unrelated to programming, often inhibited the accurate acknowledgement of efforts. "Soft contributions," such as community outreach,

content creation, marketing, and strategic planning, received only little attention, diminishing the efficacy of the incentive system.

5. Concluding discussion

When combined with the extant theoretical knowledge our results highlight three important aspects related to our research question of how business models can rise to the ecosystem level: 1) the relevance of formalized, inclusive, and enforceable ecosystem-level value propositions as tools for ecosystem alignment, 2) the need to establish effective ecosystem-wide structuring practices for ecosystem-level value constellations and ensure their decentralized governance, and 3) the requirement of fusing long- and short-term perspectives in the formulation of ecosystems' value-sharing practices and profit equations.

5.1. Formalized, inclusive, and enforceable ecosystem-level value propositions

In our study, we probed into the mechanisms through which ecosystems collectively formulate and articulate value propositions that can draw in and offer advantages to all participating firms (Adner, 2017; Adner 2020). In line with the literature, as the non-Web3 cases show, incorporating numerous firms into open-style business models creates uncertainty (Berglund & Sandström, 2013; Dahlander & Gann, 2010; Frankenberger et al., 2014). A high degree of interpretative flexibility concerning an ecosystem's value proposition generates a lack of unity, leads to suboptimization, and exacerbates the difficulty of collectively innovating and operating ecosystem-level business models.

Our Web3 cases point to more standardized and enforceable ecosystem-level value propositions to align interests across the ecosystems in terms of collective value creation and capture. This is also in line with the literature, which emphasizes measures to restore business model stability and predictability via contractual agreements, joint institutions, and trust-based hierarchies (Berglund & Sandström, 2013; Dahlander & Gann, 2010; Frankenberger et al., 2014; Teece, 2018). However, such measures usually constrain a system's scale (number of actors), scope (system capabilities), or architectural adaptability (role division). Our results offer insights into a possible approach to attaining ecosystem-level business models with fewer restrictions.

Based on our results (summarized in Table 2), we propose that an *ecosystem-level value proposition*

needs to include a standardized set of guidelines that harmonize collective efforts in an inclusive, understandable, and enforceable manner. Such frameworks need to be formulated using an inclusive language comprehensible to all ecosystem members.

Table 2. Approaches to ecosystem-level value propositions and implications

Non-Web3 cases	Web3 cases
Aim of the ecosystem-level value proposition	
Aligned interests across the ecosystem in terms of collective value creation and capture	
Value proposition characteristics	
Intangibility, significant amount of interpretative flexibility	Strict formalization, unambiguous enforceability
Results of cases' approaches to ecosystem business	
Ecosystem as a mere composition of individual members	Shared ownership and aligned interests but exclusive community
Implications related to the research question	
An ecosystem-level value proposition needs to materialize as a set of standardized, enforceable guidelines that consolidate collective efforts inclusively and comprehensibly.	

5.2. Effective decentralized structuring for ecosystem-level value constellations

We also explored models that tap into the complex dynamics of ecosystems' operations. In pursuit of collective decision-making and equitable, efficient outcomes, the non-Web3 cases grappled with disparate project compositions and a lack of unified value creation and capture processes. Such setups result in value constellations that favor individual ecosystem members and client groups but are not aligned with the ecosystem as a whole.

In line with existing research, the Web3 cases fostered value constellation governance through autonomous smart contract–based structures—that is, DAOs (Buterin, 2014; Seidel, 2018). Through DAOs, ecosystem members become technologically obligated to align with the ecosystem's contribution and value-sharing rules (Leiponen et al., 2022). Actors also perceived DAOs as targets of affiliation in the ecosystems (Adner, 2017).

Based on our results (summarized in Table 3), we propose that *forming ecosystem-level value constellations requires effective decentralized structuring practices across ecosystems*. The DAO model of the Web3 cases provides a template for this, but wider implementation requires addressing the (technological) complexity of decentralized decision-making and threats of "governance hacking." Moreover, the level for decentralization must be

balanced with the necessity of expertise, control, and usability in decision-making processes.

Table 3. Approaches to ecosystem-level value constellations and implications

Non-Web3 cases	Web3 cases
Aim of the ecosystem-level value constellation	
Collective decision-making, equitable and efficient outcomes	
Value constellation characteristics	
Disparate project compositions	Value constellation governance organized through a decentralized smart contract–based structure
Results of cases' approaches to ecosystem business	
Inefficiencies, conflicts, and suboptimal project execution; lack of unity	Perceived fair value sharing but complex decision-making and threats of "governance hacking" through token speculation
Implications related to the research question	
Ecosystem-level value constellations require the identification of ecosystem-wide structuring practices and ensuring their decentralized governance.	

5.3. Fusion of long- and short-term perspectives in ecosystems' profit equations

Finally, we investigated how profit equations can be elevated to the ecosystem level by focusing on equitable value distribution mechanisms. In the non-Web3 cases, ecosystem members sought collective benefits by ensuring individual gains, leading to suboptimization and hampering ecosystem collaboration especially in business model innovation efforts.

The Web3 cases were better positioned to bridge short- and long-term perspectives by linking ecosystem members' present transactions to their future valuations. This can be considered particularly important for ecosystems characterized by positive complementarities (John & Ross, 2022), such as those involved in data sharing (Koutroumpis et al., 2017).

Based on our results (summarized in Table 4), we propose that *ecosystem-level profit equations should link ecosystem members' contributions to their future value while avoiding short-term rent seeking*, such as the speculative use of ecosystem-specific accounting methods (like native tokens in the Web3 cases). Moreover, undesired bias toward certain types of contributions must be prevented.

Table 4. Approaches to ecosystem-level profit equations and implications

Non-Web3 cases	Web3 cases
Aim of the ecosystem-level profit equation	
Shared growth and collective profits	
Profit equation characteristics	
Seeking collective benefits by ensuring individual gains of ecosystem collaboration	Formally linking future valuation to present ecosystem contributions
Results of cases' approaches to ecosystem business	
Competitive pressures and isolated knowledge hubs	Destabilized value creation dynamics due to speculation, biased contribution evaluation
Implications related to the research question	
Ecosystem-level profit equations should link current contributions to their future value for the ecosystem while avoiding speculation and biased contribution evaluations.	

Acknowledgements

Declaration of Generative AI use

During the preparation of this work the authors used OpenAI ChatGPT 3.5 to improve grammar and text flow.

References

Abdollahi, A., Sadeghvaziri, F., & Rejeb, A. (2023). Exploring the role of blockchain technology in value creation: A multiple case study approach. *Quality & Quantity*, *57*(1), 427–451. https://doi.org/10.1007/s11135-022-01348-2

Adner, R. (2006). Match your innovation strategy to your innovation ecosystem. *Harvard Business Review*, *84*(4), 98–107.

Adner, R. (2017). Ecosystem as structure: An actionable construct for strategy. *Journal of Management*, *43*(1), 39–58. https://doi.org/10.1177/0149206316678451

Adner, R. (2022). Sharing value for ecosystem success. MIT Sloan Management Review, 63(2), 85-90.

Adner, R., & Kapoor, R. (2010). Value creation in innovation ecosystems: How the structure of technological interdependence affects firm performance in new technology generations. *Strategic Management Journal*, *31*(3), 306–333. https://doi.org/10.1002/smj.821

Amit, R., & Han, X. (2017). Value creation through novel resource configurations in a digitally enabled world.

Strategic Entrepreneurship Journal, 11(3), 228–242. https://doi.org/10.1002/sej.1256

Amit, R., & Zott, C. (2015). Crafting business architecture: The antecedents of business model design. *Strategic Entrepreneurship Journal*, *9*(4), 331–350. https://doi.org/10.1002/sej.1200

Aspara, J., Lamberg, J.-A., Laukia, A., & Tikkanen, H. (2013). Corporate business model transformation and inter-organizational cognition: The case of Nokia. *Long Range Planning*, *46*(6), 459–474. https://doi.org/10.1016/j.lrp.2011.06.001

Baden-Fuller, C., & Morgan, M. S. (2010). Business models as models. *Long Range Planning, 43*(2–3), 156–171. https://doi.org/10.1016/j.lrp.2010.02.005

Baldwin, C. Y., & Clark, K. B. (2000). *Design rules: The power of modularity* (Vol. 1). MIT Press.

Baldwin, C. Y., & Woodard, C. J. (2009). The architecture of platforms: A unified view. *Platforms, Markets and Innovation*, 19–44. Research Collection School Of Information Systems.

Berglund, H., & Sandström, C. (2013). Business model innovation from an open systems perspective: Structural challenges and managerial solutions. *International Journal of Product Development, 18*(3): 274–285. https://doi.org/10.1504/IJPD.2013.055011

Boudreau, K. (2010). Open platform strategies and innovation: Granting access vs. devolving control. *Management Science*, *56*(10), 1849–1872. https://doi.org/10.1287/mnsc.1100.1215

Buterin, V. (2014, May 6). DAOs, DACs, DAs and more: An incomplete terminology guide. *Ethereum Blog*. https://blog.ethereum.org/2014/05/06/daos-dacs-das-and-more-an-incomplete-terminology-guide

Chesbrough, H., & Rosenbloom, R. S. (2002). The role of the business model in capturing value from innovation: Evidence from Xerox Corporation's technology spin-off companies. *Industrial and Corporate Change*, *11*(3), 529–555. https://doi.org/10.1093/icc/11.3.529

Dahlander, L., & Gann, D. M. (2010). How open is innovation? *Research Policy*, *39*(6), 699–709. https://doi.org/10.1016/j.respol.2010.01.013

De Jong, J., Ogink, P., Van Bunningen, C., Driessen, R., Engelen, L., Heeren, B., Bredie, S., & Van De Belt, T. H. (2018). A cloud-based virtual outpatient clinic for patient-centered care: Proof-of-concept study. *Journal of Medical Internet Research*, *20*(9), e10135. https://doi.org/ 10.2196/10135

Doganova, L., & Eyquem-Renault, M. (2009). What do business models do? Innovation devices in technology entrepreneurship. *Research Policy*, *38*(10), 1559–1570. https://doi.org/10.1016/j.respol.2009.08.002

Deng, T., Qiao, L., Yao, X., Chen, S., & Tang, X. (2022). A profit framework model for digital platforms based on value sharing and resource complementarity. *Sustainability*, *14*(19), Article 11954. https://doi.org/10.3390/su141911954

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review, 14*(4), 532–550. https://doi.org/10.5465/amr.1989.4308385

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges.

Academy of Management Journal, *50*(1), 25–32. https://doi.org/10.5465/amj.2007.24160888

Foss, N. J., & Saebi, T. (2017). Business models and business model innovation: Between wicked and paradigmatic problems. *Long Range Planning*, *51*(1), 9–21. https://doi.org/10.1016/j.lrp.2017.07.006

Frankenberger, K., Weiblen, T., & Gassmann, O. (2014). The antecedents of open business models: An exploratory study of incumbent firms. *R&D Management*, *44*(2), 173–188. https://doi.org/10.1111/radm.12040

Gawer, A. (2014). Bridging differing perspectives on technological platforms: Toward an integrative framework. *Research Policy*, *43*(7), 1239–1249. https://doi.org/10.1016/j.respol.2014.03.006

Gomes, L. A. V., Facin, A. L. F., Salerno, M. S., & Ikenami, R. K. (2018). Unpacking the innovation ecosystem construct: Evolution, gaps and trends. *Technological forecasting and social change, 136*, 30-48. https://doi.org/10.1016/j.techfore.2016.11.009

Hakanen, E. (2021). What is a business model – for products, platforms, or ecosystems? *Journal of Business Models*, *9*(4), 1–12. https://doi.org/10.5278/jbm.v9i4.6475

Hannah, D. P., & Eisenhardt, K. M. (2018). How firms navigate cooperation and competition in nascent ecosystems. *Strategic Management Journal, 39*(12), 3163-3192. https://doi.org/10.1002/smj.2750

Holm, A. B., Günzel, F., & Ulhøi, J. P. (2013). Openness in innovation and business models: Lessons from the newspaper industry. *International Journal of Technology Management*, *61*(3), 324–348. https://doi.org/10.1504/IJTM.2013.052674

Iansiti, M., & Levien, R. 2004. Strategy as ecology. *Harvard Business Review*, *82*(3), 68–78.

Jacobides, M. G., Cennamo, C., & Gawer, A. (2018). Towards a theory of ecosystems. *Strategic Management Journal, 39*(8), 2255-2276.. https://doi.org/10.1002/smj.2904

Jacobides, M. G., Knudsen, T., & Augier, M. (2006). Benefiting from innovation: Value creation, value appropriation and the role of industry architectures. *Research policy*, *35*(8), 1200–1221. https://doi.org/10.1016/j.respol.2006.09.005

John, K., & Ross, D. G. (2022). How a firm's value capture affects value creation in its ecosystem. *Academy of Management Review*, *47*(4), 646–667. https://doi.org/10.5465/amr.2019.0494

Kapoor, R., & Lee, J. M. (2013). Coordinating and competing in ecosystems: How organizational forms shape new technology investments. *Strategic Management Journal*, *34*(3), 274–296. https://doi.org/10.1002/smj.2010

Koutroumpis, P., Leiponen, A., & Thomas, L. D. (2017). *The (unfulfilled) potential of data marketplaces* (ETLA Working Papers No. 53). http://pub.etla.fi/ETLA-Working-Papers-53.pdf

Kretschmer, T., Leiponen, A., Schilling, M., & Vasudeva, G. (2022). Platform ecosystems as meta-organizations: Implications for platform strategies. *Strategic Management Journal*, *43*(3), 405–424. https://doi.org/10.1002/smj.3250

Leiponen, A., Thomas, L. D., & Wang, Q. (2022). The dApp economy: A new platform for distributed innovation? *Innovation*, *24*(1), 125–143. https://doi.org/10.1080/14479338.2021.1965887

Leminen, S., Rajahonka, M., Westerlund, M., & Wendelin, R. (2018). The future of the Internet of Things: Toward heterarchical ecosystems and service business models. *Journal of Business & Industrial Marketing*, *33*(6), 749–767. https://doi.org/10.1108/JBIM-10-2015-0206

Lovett, M., & Thomas, L. (2021). A fork in the road: Perspectives on sustainability and decentralised governance in digital institutions. *First Monday*, *26*(11). https://doi.org/10.5210/fm.v26i11.12357

Lumineau, F., Wang, W., & Schilke, O. (2021). Blockchain governance—A new way of organizing collaborations? *Organization Science*, *32*(2), 500–521. https://doi.org/10.1287/orsc.2020.1379

Massa, L., Tucci, C. L., & Afuah, A. (2017). A critical assessment of business model research. *Academy of Management Annals*, *11*(1), 73–104. https://doi.org/10.5465/annals.2014.0072

Massa, L., Viscusi, G., & Tucci, C. (2018). Business models and complexity. Journal of Business Models, 6(1), 59–71. https://doi.org/10.5278/ojs.jbm.v6i1.2579

McIntyre, D. P., & Srinivasan, A. (2017). Networks, platforms, and strategy: Emerging views and next steps. *Strategic Management Journal*, *38*(1), 141–160. https://doi.org/10.1002/smj.2596

Moore, J. F. (1993). Predators and prey: A new ecology of competition. *Harvard Business Review*, *71*(3), 75–83.

Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: A handbook for visionaries, game changers, and challengers*. John Wiley & Sons Ltd.

Pagani, M. (2013). Digital business strategy and value creation: Framing the dynamic cycle of control points. *MIS Quarterly*, *37*(2), 617–632. http://www.jstor.org/stable/43825925

Porter, M. E., & Heppelmann, J. E. (2014). How smart, connected products are transforming competition. *Harvard Business Review*, *92*(11), 11–64.

Ritala, P., Agouridas, V., Assimakopoulos, D., & Gies, O., (2013). Value creation and capture mechanisms in innovation ecosystems: A comparative case study. *International Journal of Technology Management*, *63*(3/4), 244–267. https://doi.org/10.1504/IJTM.2013.056900

Rohrbeck, R., Hölzle, K., & Gemünden, H. G. (2009). Opening up for competitive advantage – How Deutsche Telekom creates an open innovation ecosystem. *R&D Management*, *39*(4), 420–430. https://doi.org/10.1111/j.1467-9310.2009.00568.x

Rong, K., Li, B., Peng, W., Zhou, D., & Shi, X. (2021). Sharing economy platforms: Creating shared value at a business ecosystem level. *Technological Forecasting and Social Change*, *169*, Article 120804. https://doi.org/10.1016/j.techfore.2021.120804

Saurabh, K., Rani, N., & Upadhyay, P. (2023). Towards blockchain led decentralized autonomous organization (DAO) business model innovations. *Benchmarking: An International Journal*, *30*(2), 475–502. https://doi.org/10.1108/BIJ-10-2021-0606

Seidel, M. D. L. (2018). Questioning centralized organizations in a time of distributed trust. *Journal of Management Inquiry*, *27*(1), 40–44. https://doi.org/d0o.i.1o1rg7/71/01.10157674/19025614972276314797 4342

Teece, D. J. (2018). Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world. *Research Policy*, *47*(8), 1367–1387. https://doi.org/10.1016/j.respol.2017.01.015

Thomas, L. D. W., & Autio, E. (2012). Modeling the ecosystem: A meta-synthesis of ecosystem and related literatures. In *The DRUID Society Conference on Innovation and Competitiveness: Dynamics of organizations, industries, systems and regions*.

Thomas, L. D. W., & Autio, E. (2020). Innovation Ecosystems in Management: An Organizing Typology. In Oxford Research Encyclopedia of Business and Management. Oxford University Press. https://doi.org/10.1093/acrefore/9780190224851.013.203

Tripsas, M., & Gavetti, G. (2000). Capabilities, cognition, and inertia: Evidence from digital imaging. *Strategic Management Journal*, *21*, 1147–1161. https://doi.org/10.1002/9781405164054.ch23

Van der Borgh, M., Cloodt, M., & Romme, A. G. L. 2012. Value creation by knowledge-based ecosystems: evidence from a field study. *R&D Management, 42*(2), 150–169. https://doi.org/10.1111/j.1467-9310.2011.00673.x

Westerlund, M., Leminen, S., & Rajahonka, M. (2014). Designing Business models for the Internet of Things. *Technology Innovation Management Review*, *4*(7), 5–14.

Wirtz, B. W., Pistoia, A., Ullrich, S., & Göttel, V. (2016). Business models: Origin, development and future research perspectives. *Long Range Planning*, *49*(1), 36–54. https://doi.org/10.1016/j.lrp.2015.04.001

Yin, R. K. (2009). *Case study research: Design and methods* (4th ed., Vol. 5). SAGE.

Yunus, M., Moingeon, B., & Lehmann-Ortega, L. (2010). Building social business models: Lessons from the Grameen experience. *Long Range Planning*, *43*(2–3), 308–325. https://doi.org/10.1016/j.lrp.2009.12.005

Zott, C., & Amit, R. (2013). The business model: A theoretically anchored robust construct for strategic analysis. *Strategic Organization*, *11*(4), 403–411. https://doi.org/ 10.1177/1476127013510466

Zott, C., Amit, R., & Massa, L. (2011). The business model: Recent developments and future research. *Journal of Management*, *37*(4), 1019–1042. https://doi.org/ 10.1177/0149206311406265