Understanding the Microfoundations of Entrepreneurial Ecosystems: Toward a Value-Based Method and Theory

Federico Cosenz, Guido Noto, and Angelo Cavallo

***Abstract*—Despite the progress made by scholars, empirically investigating entrepreneurial ecosystems (EEs) remains problematic because of the inherent complexities and nonlinearities of interactions among EE actors. The research to date has shown a tendency to focus on macrolevel ecosystem dynamics while neglecting the microfoundations of EEs. We contend that this negligence is due to a lack of appropriate methodologies that can capture EE microfoundations through a systemic value-based perspective. To fill this gap, in this article, we propose a novel methodological approach, the *value system method,* which enables framing EEs through critical causal interdependences between key actors' business models that foster value-exchange processes. Finally, the study provides a set of research and policy implications for fostering the understanding of EE microfoundations toward a value-based method and theory.**

***Index Terms*—Business model, entrepreneurial ecosystem (EE), microfoundations, systems design, value capture, value creation.**

I. Introduction

In A globalized world that has become increasingly interconnected through digital technologies, entrepreneurship does not happen in isolation but results from a collective process that involves several agents and systemic conditions [3], [67], [73]. In this context, the entrepreneurial ecosystem (EE) concept has become a popular topic among leading political institutions and prominent scholars [4], [6], [24], [76], [91], [108], because it captures a system view of entrepreneurship [87]. Early studies focused on defining, conceptualizing, and characterizing the distinctive elements of EEs, intended as peculiar systems of interdependent actors directly or indirectly aiming to create and grow new ventures [16]. For instance, Isenberg's [49] six-dimensional model of EE, Stam's [91] EE elements, and Roundy et al.'s [81] unified view of EEs as complex adaptive systems have been (among others) widely acknowledged conceptualizations in the literature [17], [94]. Then, scholars have also examined measurement issues. Great contributions exist in this regard (see, for instance, [6], [14], [59], [61], [93]). These studies have allowed for the comparison of EEs in a broad range of ecosystem performance indicators. However, despite the incredible progress made by scholars, to date, empirically investigating EEs has remained problematic because of the inherent complexities and nonlinearities of interactions among EE actors [1], [55]. Previous quantitative studies in the literature have used static cross-sectional data [19], [79], and "count-based metrics," which are not effective in capturing the dynamics of EEs [81, p. 103]. Recently, Roundy and Lyons [80, p. 2] went further by suggesting that "the ecosystem metaphor has created an implicit tendency in EE theory to focus on macro-, ecosystem-level dynamics and not explain the microfoundations of EEs." Focusing on ecosystem as the central unit of analysis has drawn attention away from the actor (or firm)-specific factors that are at the core of every ecosystem [38]. Most empirical studies have focused on ecosystem macrofactors, directly linking them to microlevel outcomes (e.g., the number of innovative startups created) while implicitly failing to capture the dynamics of the value exchange process in between [80]. This missing link has been at the center of discussions about microfoundations [11], [57], thus contributing to the undertheorization of EE research [15]. Following other scholars, we argue that this has been due to a lack of methodological advancement [1], [13], [44], [79], [81].

Because of their flexibility, qualitative methods have offered a valid alternative to analyzing the dynamics of the value exchange process among EE actors [81, p. 8]. However, the generalizability of the results of traditional qualitative approaches is limited [45]. This has prevented a much-needed "system perspective" in studying EE [106], and, therefore, to come up with actionable policy insights [79]. Overall, previous research has provided limited answers on a methodological level to study the microfoundations of EEs [80]. To fill this research gap, in this study, we examined a novel methodological approach to measuring the complex dynamics underpinning EEs. Specifically, building on system design principles and business model theories, we developed a structured *value system method* for examining EE value-exchange processes. In doing so, we answer to recent calls for research to provide new methods [16], [81] for studying EE microfoundations by borrowing from the strategy field [80] without renouncing a "system perspective" [106]. The underlying logic of our methodological proposal is that EE actors behave according to their own business models, the complexity

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of which forms the basis for implementing the overall strategic architecture of the ecosystem in action [9]. Therefore, in this study, we theorize that *EEs are systems of interconnected and interplaying business models of different organizations involved in value exchanges*. Our systemic approach contributes to this research direction grounding on a "theory of firms' value" to examine ecosystem initiation, unfolding, and emergence [38], [39]. We provide a method for framing EEs through critical causal interdependences between key actors' business models that foster value-exchange processes [18]. This enables a more comprehensive understanding of EE based on a *relationship-by-relationship* value-based analysis rather than its aggregate manifestation [38]. The systemic exploration of EE relationships and interdependences also involves a further methodological add through designing a set of key performance indicators (KPI). This promotes a participative overview of how value is generated and captured [54], as well as a shared consensus about future strategic directions. Overall, our methodological approach and its theoretical underpinnings enable to see ecosystem as means for realizing the actor-specific value, and to enhance the strategic collaboration of EE actors by mitigating the effects of asynchronous dynamics between value demand and supply.

The structure of this study is as follows. Section II provides a critical review of the EE literature. In Section III, we describe a novel methodological approach to studying and measuring the complex dynamics underpinning EEs. Section IV then provides an illustrative example to discuss the advantages and limitations of applying this method. Finally, Section V discusses the results and conclude the study, focusing on the value of our research and its implications for managers and policymakers.

II. Review of the Literature on Entrepreneurial Ecosystems

In recent years, there has been a shift in entrepreneurship research from a dominant focus on individual entrepreneurs and their actions to a much stronger focus on the systemic, contextual, and institutional enablers of entrepreneurial activity [32], [67]. In particular, the notion of EE has emerged as a key construct in academic debate. EEs are intended to be systems of interdependent actors and relationships that directly or indirectly support new venture creation and growth [16], [91]. Although the EE concept is rooted in the regional development and strategic management literature [23], [34], [97], [105], EEs differ from other related constructs, such as clusters, industrial districts, business, and innovation ecosystems (see [9] and [16] for details on the antecedents of EE). For example, in business ecosystems, the focus is on a firm that is willing to orchestrate its ecosystem to pursue a competitive advantage [70]. In contrast, in EE, the main aim is to create new ventures [33]. Also, in the regional development literature, industrial districts and other cluster forms are often considered industry-specific, while EE is not [9], [78], [89].

The first "wave" of research focused on the novel aspects of EE compared with antecedent constructs, including its constituent elements [21], [35], [49], [50], [65], [74], [90], [91], [102]. However, EE frameworks have been criticized. Scholars have argued that rather than descriptive and static frameworks, dynamics and connections among EE elements should be the focus of research [5], [81]. Since then, conceptual advancement has been extensive. According to Rocha et al. [79, p. 4], "a quarter of papers examined EEs from a conceptual perspective." Finally, a consensus was reached in conceptualizing EE as "a complex and adaptive or dynamic system" [16, p. 1310] because of the large number of interconnected and interdependent elements that could change over time [1], [43], [44], [81], [82]. However, empirically investigating EEs as complex and adaptive systems is not an easy task [13], [69], [106]. On the one hand, previous empirical studies using traditional statistical methods have important academic merit. For instance, Audretsch and Belitski [6] demonstrated the impact of local and regional contexts on startup rates in cities; Content et al. [25] showed how regions might be positively affected by EEs; Stam [92] focused on how the framework and systemic conditions are mediated by productive (i.e., innovative and ambitious) entrepreneurs to achieve regional development. On the other hand, most quantitative studies have been cross sectional [19] with few exceptions (e.g., [1]), and leveraged traditional datasets, failing to capture the complexities of "relationships amongst diverse organizations across space" [36, p. 1793], [79]. Roundy et al. [81, p. 7] called for new methods because traditional standard methods are often based on linearity assumptions and are not appropriate for capturing dynamics. Moreover, using top–down approaches, such as those used to build an "EE index" (e.g., [92], [93]), are instrumental in shedding light on EEs at the macrolevel (i.e., ecosystem emergence, elements, and outcomes). However, they do not offer particularly meaningful insights to policymakers regarding how they may intervene and act to improve their EEs [79], [101]. According to Roundy and Lyons [80], the ecosystem metaphor has increased the focus on macroecosystem-level dynamics while moving away from explaining the microfoundations of EEs. In other words, there is a need to complement macrolevel studies by examining what entrepreneurs and other actors actually do [55], [89]. As shown in Fig. 1, ecosystems can exist at multiple levels—macro, meso, and micro [81], [106]. At the microlevel, a one-to-one interorganizational perspective is adopted to assess outcomes emerging from the interaction of the business models implemented by two EE actors. Thus, the scope of inquiry is confined to the bidirectional connections between two specific EE actors, such as the value exchange between an academic incubator and a single startup firm [80]. In particular, at the microlevel, the focus is on the synergy between single organizations and on assessing how they create, deliver, and capture value in their one-to-one interactions. At the mesolevel, the interorganizational boundaries of one-to-one interactions are crossed by embracing a more system perspective of value exchange assessment [8], [57]. At this level, the focus is on exploring the value exchange processes between subsystems (or meso categories) operating in the same EE. Subsystems are defined as social structures (or meso categories) of EE actors that share business model commonalities in their interactions with other EE subsystems, such as a group of industry associations that exchange value with a network of venture capitalists. The business model constructs applied to EE subsystems identify a

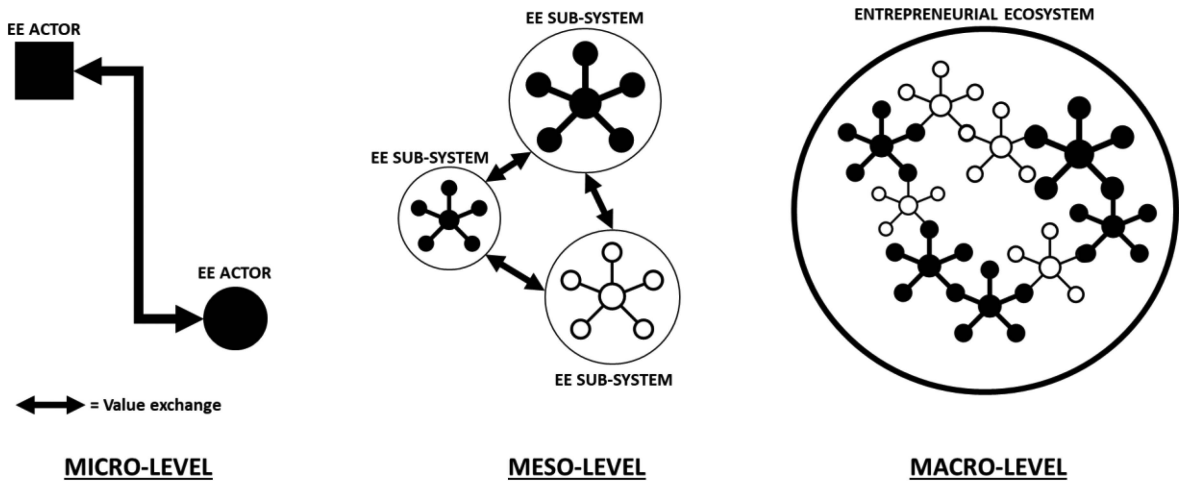

Fig. 1. Multilevel structure of EEs.

shared view of value creation, delivery, and capture among the actors in that specific subsystem, such as venture capitalists. In this case, the value exchange assessment depends on the multidirectional connections among the business models shared by the actors in the subsystem [8], [57].

The possibility of assessing value exchange at the micro- and mesolevels allows for providing a robust methodological groundwork for framing EE dynamics at the macrolevel. This groundwork may offer meaningful insights to policymakers regarding how to outline and implement more effective policies to improve EE performance [79], [101]. However, to date, research has usually failed to capture interactions between actors [7] and between meso categories of actors with shared interests, such as incubators, venture capitalists, and others [57]. Understanding the microfoundations of EEs and how value is generated by and for each actor in the ecosystem are important parts of the EE puzzle that have not been examined [80]. A systemic view of entrepreneurship should not overlook individual agency (microlevel), environmental factors (macrolevel), or other factors (mesolevel) in the micromacro link, that is microfoundations [11], [37].

Some scholars have argued that qualitative research is sufficiently flexible and suitable for understanding that entrepreneurship is a complex social phenomenon characterized by the interplay between actors, processes, and contexts [27], [56], [81]. Indeed, qualitative empirical studies have (partially) served the scope. For example, Theodoraki et al. [98] shed light on sustainable university-based EEs; Hernández-Chea et al. [48] analyzed the value exchange process in EEs with specific reference to the intermediary organization role; Shi and Shi [88] analyzed the process of resource allocation in Shenzhen's EE; and Kapturkiewicz [55] conducted a comparative analysis of Tokyo and Bangalore ecosystems. Other scholars have employed mixed methods [85] approaches or fuzzy set qualitative comparative analyses (e.g., [100]). However, by the authors' own admission, these studies have been limited in their generalizability and in their application of a system perspective [106]. Several scholars have called for new and complementary methods to advance EE theory [1], [13], [44], [79], [81], with particular emphasis on methods for studying EE microfoundations [80]. In the following section, we describe how we answered such calls by proposing an original method based on the principles of strategic management and systems design.

III. A Value-Based Method for Assessing Entrepreneurial Ecosystems

In response to the above call, we framed EEs as complex systems of interconnected and interplaying business models of different actors involved in value exchanges.[1] Their systemic complexity relies not only on fragmented and nonlinear interactions between EE actors [53] but also on the foundational levels through which value is created and exchanged, i.e., micro versus meso upholding the macrolevel.

Drawing on these premises, systems design principles and the business model construct of EE actors may serve as a scientific basis for designing suitable EE value assessment approaches. In this domain, systemic approaches enhance shared understanding and decision-making processes in making participatory entrepreneurial plans for better coordination, collaboration, and strategic dialogue among EE actors at the micro-, meso-, and macrolevels. Systems design aims to foster a broad understanding of the complex causal relationships between seemingly isolated organizational components—be they inputs, outputs, resources, actors, processes, and so on [28], [71], [72]. Exploring complex social structures through these methodological lenses improves the cognition of how value exchanges and underlying causal relationships give rise to performances at multiple interconnected levels (e.g., organizational/micro, interorganizational/meso, and political/macro). According to this rationale, systems design approaches are used to explore complex societal problems [2] that, as argued by Da Costa Junior et al. [31, p. 8], refer to "real-world problems, mostly ill-defined, involving multiple stakeholders in an intertwined and dynamic network

[1]The term "value exchange" includes a broad view of how value is developed and exchanged within the ecosystem; thus, it incorporates value demand, creation, delivery, and capture mechanisms as interdependent processes originating in the business models of EE participants in action [107].

TABLE I
STRUCTURING THE *VALUE MATRIX*

	EE ACTORS ➡	ACTOR 1		ACTOR 2		ACTOR 3		ACTOR 4	
EE ACTORS ⬇	REQUIREMENTS i.e. Value demanded ⬇	VALUE ADDED	VALUE CAPTURED	VALUE ADDED	VALUE CAPTURED	VALUE ADDED	VALUE CAPTURED	VALUE ADDED	VALUE CAPTURED
ACTOR 1	1.								
	2.								
	3.								
	4.								
ACTOR 2	1.								
	2.								
	3.								
	4.								
ACTOR 3	1.								
	2.								
	3.								
	4.								
ACTOR 4	1.								
	2.								
	3.								
	4.								

that may change over time, and that affects multiple aggregation levels of society." This definition may be applied to EEs, the critical interdependent strategic aspects of which could derive more effective methodological support from the adoption of a holistic approach [1]. Drawing on system design principles, we developed a novel methodological approach—the *value system method*—to explore inherent complexities characterizing causal interdependences among the business models of EE actors and their corresponding subsystems. The proposed method enabled the design of a set of KPIs to measure the effectiveness of the ecosystem in matching the demands and corresponding supplies formulated by each actor. Thus, this method allowed for the shift from a qualitative perspective (i.e., visual representation of actors' interdependencies) to a quantitative perspective (i.e., measurement through KPIs) by finding a consistent methodological baseline for quantifying causal relationships and KPIs.

The *value system method* is based on two complementary strategy tools: the *value matrix* and the *dynamic value model.* These tools support the inclusion of EE actors in the implementation of a methodological pathway for assessing value exchange in EEs [52]. This methodological pathway encompasses two main phases related to the design of the above strategy tools. The pathway begins with a structured preliminary phase, which includes the following: 1) the identification of the EE's actors; and 2) the value they demand, add, and capture within the ecosystem. In this context, the term "value added" incorporates value creation and delivery [96]. Value consists of the specific outputs (e.g., products, services, information, and knowledge) requested and offered by each actor in pursuing entrepreneurial goals [93]. Matching EE actors' requirements with the corresponding value added and value captured is instrumental in framing the interdependencies among their business models and establishing a methodological ground for outlining a dynamic exploration of the value exchange processes within the EE [63]. Unlike traditional supply chain settings characterized by a linear sequence of activities and roles, this preliminary phase highlights the complex and nonlinear intertwining of interactions that underlie the multiactor operation of the ecosystem. To better structure the preliminary phase, we proposed the adoption of a *value matrix*, the structure of which is presented in Table I. In this example, the matrix assumes the presence of four main actors in the EE. By employing the *value matrix*, it is possible to distinguish the diverse roles and responsibilities of EE actors in the development of the ecosystem, regardless of their specific customer segments and reference markets. For example, at the meso level, the subsystem of venture capitalists conventionally searches for a portfolio of new startups (i.e., requirements) to fund by providing financial resources (i.e., value added). In return, they expect to receive a payoff for taking the related entrepreneurial risk (i.e., the value captured). In this value exchange, their counterparts are startups in a subsystem that searches for funds (i.e., requirements) by offering new business opportunities (i.e., value added). Funding received by startups represents the value captured by venture capitalists.

The *value matrix* enables the detection of the potential needs of resources that determine a range of requirements in terms of the value demanded by a single actor to another actor within the ecosystem [47]. Each actor may have one or more requirements that are addressed to different EE partners. Meeting these requirements implies that the specific actor provides the corresponding output resulting from its activities, thus adding value to the ecosystem's operations [20]. This addition entails the capture of a monetary or nonmonetary value for each provider, which forms the key motivation for contributing to the ecosystem [60]. Specifically, nonmonetary value includes other types of payoffs, such as new contacts, potential customers, knowledge transfer, increased reputation, and so on [99].

Building on this matrix, the second phase of the approach introduces the *dynamic value model,* which enabled us to move from a static value matrix toward a more dynamic visual representation of how the EE works and exchanges value. This process supports a holistic approach to modeling complex social systems [1] and assessing strategies for management, innovation, and change [72], [86], [95]. The *dynamic value model* identifies and

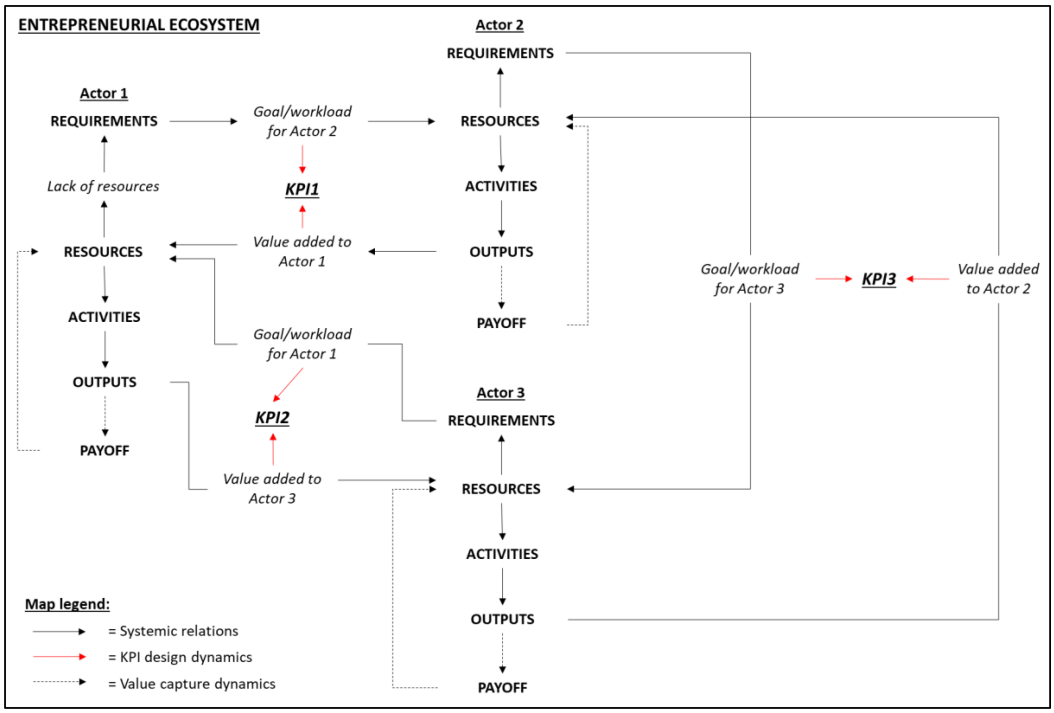

Fig. 2. Envisioning the *dynamic value model*.

maps not only the causal interdependencies among key business model value mechanisms of every single actor [29], [58], [107] but also interorganizational relationships that depict the value demand and corresponding additions among the EE actors [60], [62]. Outlining these causal relationships and characterizing the EE's value exchanges enabled us to find consistencies between the micro- and mesolevels, as well as to design KPIs for assessing potential gaps in value exchanges. These KPIs could foster policymaking at the macrolevel by providing insights into where to intervene to improve the EE's performance.

Based on the above example of a four-actor EE, the associated *dynamic value model* is shown in Fig. 1. Therefore, the value creation process of each actor focuses on the consumption of resources as input factors influencing specific activities and operations (e.g., production), leading to the generation of outputs (e.g., products and services), which then affects the associated payoff (e.g., sales revenues). The systems design perspective highlights that value is captured by outlining the causal connections between outputs and payoffs, the result of which is expected to feed back into an actor's resources over time [81].

Moreover, the *dynamic value model* includes an evaluation of the availability of the resources aimed at detecting potential gaps in identifying the actor's organizational requirements (e.g., goods, services, knowledge, and skills). These requirements flow into the value demand to be addressed to another partner–actor. Collecting these requirements results in an increased workload for the partner–actor. Following systems design principles, such workloads are akin to a stock of resources that is depleted over time (e.g., order backlog) by virtue of the activities and operations conducted by the partner–actor [72]. The value addition process implies that the outputs from the execution of these activities are then provided to the actor who demanded them, thus filling the gaps in its resources by fueling the stocks lacking input factors [47].

Modeling value demand and the corresponding addition processes according to the above systems design approach supports a dynamic and holistic perspective on how EE actors collaborate and interact within the ecosystem's boundaries [1], [81]. This perspective allowed us to design a set of KPIs to be applied with reference to each interaction between EE actors. The KPIs are designed to assess how the value additions provided by an actor comply with the requirements shown by its specific ecosystem interlocutor. In other words, KPIs can be intended as measures of ecosystem performance, focusing on the effectiveness of multi-actor collaboration. Our *dynamic value model* offers a visual cognitive framework for detecting bottlenecks, value wastes, and dysfunctions in operationalizing an EE's interorganizational value exchange processes. Hence, the regular use of this *dynamic value model* may foster the active engagement of EE actors in improving the alignment of their individual strategies with a consistent and participatory consensus [83]. This strategic alignment concerns the actions to be taken to generate and maintain the shared competitive advantages of the ecosystem [47].

Interestingly, as shown in Fig. 2, the tool neglects traditional supply chain logics by which roles and corresponding activities are sequentially arranged, as it adopts a systems approach tailored to the nonlinear interactions between the requirements of one actor and the associated value additions provided by another partner in the ecosystem [71], [95]. In this causal map, the use of KPIs to assess value exchanges provides decisional support at each level. In particular, the measurement of value exchanges between two single actors necessitates an organizational perspective that facilitates corrective actions in their corresponding business models at the microlevel. A wider view of the value

exchanges between an EE's subsystems includes an interorganizational assessment to establish collaborative strategies at the mesolevel. Eventually, the analysis of the overall model through KPIs supports an even broader and more timely identification of weak value exchanges (e.g., value wastes and bottlenecks) throughout the ecosystem, thus supporting policymakers in designing effective policies at the macrolevel. The implementation of these policies also takes advantage of the *dynamic value model,* the collaborative and participatory approach of which may enhance shared understanding and orientation toward common goals, such as settling conflicts in resource negotiation and allocation between an EE's actors and/or among its subsystems. In Section IV, an illustrative example is analyzed to show how to apply the *value system method*, thus providing additional insights into our study's contributions to the research.

IV. Illustrative Application of the Value System Method

This section provides an illustrative application of the proposed *value system method* through the elaboration of its tools (i.e., the *value matrix* and the *dynamic value model*). For this purpose, we drew on the empirical work developed by Stam [92] and Johnson et al. [53]. These scholars analyzed case studies of EEs located in different geographical areas: The Netherlands and across the USA. Their analysis made it possible to identify conventional features of EEs in terms of their actors, roles, requirements, subsystems, and other value exchange attributes. Hence, we used this deductive technique in our theory-building research to show the working principles of the approach in a conventional EE setting [104].

As Roundy et al. [81, p. 5] suggested, new ventures "*are the motivating force in an ecosystem and contribute to the EE emergence*." Ensuring the creation and growth of new ventures is the main aim of an ecosystem [16]. Therefore, drawing on the extensive conceptual literature, we considered that new ventures were at the center of our ecosystem. However, new ventures do not emerge in isolation from individual entrepreneurial actions alone; rather, they are the result of interactions with other EE actors, which are examples of microlevel dynamics. Moreover, because some actors may have shared interests and values, they enhance mesolevel dynamics among different social groups [57], which gives rise to an EE's subsystems. In this illustrative example, borrowing from the above EE literature, we used the following key actors as subsystems of a conventional EE:

1) incubators and accelerators (often embedded in university settings);
2) government (at the local, regional, and national levels);
3) industry associations and leading entrepreneurs;
4) financial partners (e.g., venture capitalists, business angels, and banks);
5) business professionals.

These actors were selected because they are commonly recognized in the literature as having a direct and immediate effect on new venture creation and the growth process, in contrast to other macrofactors, such as national and local governments. Connecting to the original biological notion of an ecosystem, these subsystems were considered the biotic component, while the macrofactors represented the abiotic component of an ecosystem.

These subsystems of EE actors participated in the ecosystem by providing their contribution in terms of value added to the actors in another ecosystem or its subsystems, with the aim of obtaining a corresponding payoff—that is, their value captured. Overall, the value exchange between an EE's actors identifies a system of interactions underpinning the multiactor operation of the EE toward the creation of new ventures. Hence, the complexity inherent in this network was worth exploring and managing through a *value system method,* as described in Section III.

Table II provides an example of a *value matrix*, highlighting the value added and captured by all of the EE's subsystems applied in the example.

As shown in the value matrix presented in Table II, startups, which are core engines that fuel EEs, have a large set of requirements that stem from the initial lack of experience and financial resources, which usually characterize them [30], [68]. Therefore, startup demands can be synthesized into the following requests: easy-term loans and capital, mentoring and guidance, favorable tax treatment, and professional services.

The demand for easy-term loans and capital can be fulfilled by financial partners that are willing to allocate their financial resources to invest in new and promising nascent businesses with the aim of capturing value from interests, stocks (in the case of exit strategies), and dividends. In addition, the financial resources provided allow startups to develop their business ideas. This is also achieved through the support of other key actors who are able to address startups' requirements. For example, incubators and accelerators are strategic in providing startups with key resources, such as professional skills and competencies (e.g., legal advice, accounting, real estate, insurance, and consulting) [84]. Through these resources, they offer mentoring services and guidance to nascent entrepreneurs, thus increasing the likelihood of the success of new business ventures.

A similar process is involved in the demand for adequate professional services that business professionals deliver according to the requirements of startup firms. Through the provision of these services, business professionals can capture value from EEs in terms of increased revenues and profits. Business professionals operating in an EE are interested in expanding their professional support to the overall business network. This requirement can be fulfilled through the support of industry associations and leading entrepreneurs, which, through active collaboration (e.g., the organization of specific events and workshops) with incubators and accelerators, may engage and involve new businesses operating in the same local area. The creation of new businesses that participate in local area development is also key in guaranteeing tax income for governments at various levels (i.e., national, regional, and local). The increased tax flow from new successful firms may support the growth of new startups by establishing favorable tax treatment, as well as by increasing the effectiveness of public services (e.g., transportation, infrastructures, etc.).

Fig. 3 shows the corresponding *dynamic value model,* which frames the EE's structure described above by outlining the

TABLE II
ILLUSTRATIVE EXAMPLE OF A *VALUE MATRIX*[2]

	EE ACTORS ➡	STARTUPS (OR STARTUPPERS)		INCUBATORS & ACCELERATORS		GOVERNMENT (LOCAL, REGIONAL, NATIONAL)		INDUSTRY ASSOCIATIONS & LEADING ENTREPRENEURS		FINANCIAL PARTNERS (VENTURE CAPITALISTS, ANGELS, BANKS)		BUSINESS PROFESSIONALS	
EE ACTORS ⬇	**REQUIREMENTS** ⬇	**VALUE ADDED**	**VALUE CAPTURED**	**VALUE ADDED**	**VALUE CAPTURED**	**VALUE ADDED**	**VALUE CAPTURED**	**VALUE ADDED**	**VALUE CAPTURED**	**VALUE ADDED**	**VALUE CAPTURED**	**VALUE ADDED**	**VALUE CAPTURED**
STARTUPS (OR STARTUPPERS)	*Demand for easy-term loans and capital*									Capital & grants	Interests, stocks & dividends		
	Demand for mentoring and guidance			Mentoring services and supportive assets (e.g., temporary headquarters)	Networking with well-established companies								
	Demand for favorable tax treatment					Tax benefits for new business ventures (e.g., fiscal exemptions)	Economic development of the local area						
	Demand for professional services											Professional services (e.g., legal, accounting, real estate, insurance and consulting)	Increased professional service revenues
INCUBATORS and ACCELERATORS	*Demand for new talents and business ideas*	New business ideas	Reliable supportive interlocutors to start a new business										
GOVERNMENT (LOCAL, REGIONAL, and NATIONAL)	*Demand for increased tax collection to foster public spending*							Additional corporate tax payers	Increased public services				
INDUSTRY ASSOCIATIONS and LEADING ENTREPRENEURS	*Demand for cooperation to strenghten the local business community*			Organization of meet-ups, pitch days, start-up weekends, boot camps, hackathons and competitions	Business community engagement and networking								
FINANCIAL PARTNERS (VENTURE CAPITALISTS, ANGELS, and BANKS)	*Demand for new business opportunities to invest in*	New business ideas to be funded	Capital and grants										
BUSINESS PROFESSIONALS	*Demand for expanding professional support to local businesses*							Increased local entrepreneurial ecosystem requiring professional services	High quality professional support				

[2] The content of this table is for illustrative purposes; it is not intended to be exhaustive in explaining the complexity of the EEs' dynamics. Illustrative examples are used to present methodologies and approaches for assessing complex systems, such as EEs [22], [75], [102].

process of its value exchange derived from the interaction of various actors.

The dynamic value model shown in Fig. 3 also highlights the resource requirements of each actor in the ecosystem. These requirements are addressed to specific ecosystem partners who, in turn, implement activities that will lead to their fulfillment. Specifically, requirements flow into the workload of one or more partners whose production outputs will be oriented to address them, thereby coping with the value demand. By comparing the resulting workload with the value additions of each actor, it was possible to formulate a set of KPIs to measure the effectiveness of the interdependencies identified in the ecosystem structure. For example, the first KPI compared the capital and grants provided by financial partners based on startups' demands for easy-term loans and capital. A result showed that this ratio was equal to 1, which indicated that the financial partners were able to effectively support the creation of new businesses in the EE by satisfying their financial needs. Another example was related to KPI 5, in which the demand for business cooperation, measured, for instance, by the number of events and workshops on business and innovation topics, was benchmarked by the supply of events and workshops organized by the incubators and accelerators operating in the local area.

Nine KPIs were designed by applying the dynamic value model to the illustrative example. These KPIs are described in Table III.

The overall set of KPIs given in Table III was used to measure, monitor, and manage the value exchange of the entire ecosystem. The illustrative example and the emerging measures were not aimed at providing a generalization of EE KPIs, but rather at understanding how to apply the systems design perspective to frame and assess an EE's value exchange as the groundwork for supporting decision-making. In particular, the *dynamic value model* and its KPIs can be used at different levels for decisional support purposes. At the microlevel, the model can support the adjustment of a one-to-one value exchange between two specific EE actors according to an organizational perspective. For example, a gap in KPIs 1 and 2 could lead a financial partner to analyze and reconsider the actual financial need of a funded startup, which then modify its current revenue model to better satisfy the financial partner's profit expectation. At the mesolevel, assessing value exchanges through KPIs could foster interorganizational coordination between EE's subsystems. For instance, regarding KPI 5, in the subsystem of incubators and accelerators, industry associations, and leading entrepreneurs, their cooperation could be enhanced by planning additional startup events and workshops. Then, the macrolevel could build on the overall *dynamic value model* to identify the weakest value exchanges and related subsystems, thus providing policymakers with specific "hotspots" on which to act through the implementation of more effective policies. Based on the illustrative example, policymakers may compare the results of the multiple KPIs (e.g., KPIs 1–9) and detect a severe setback in starting a new business because of the current fiscal regime (KPI 8). In this case, they could remove such bottlenecks by introducing tax exemptions for new startups.

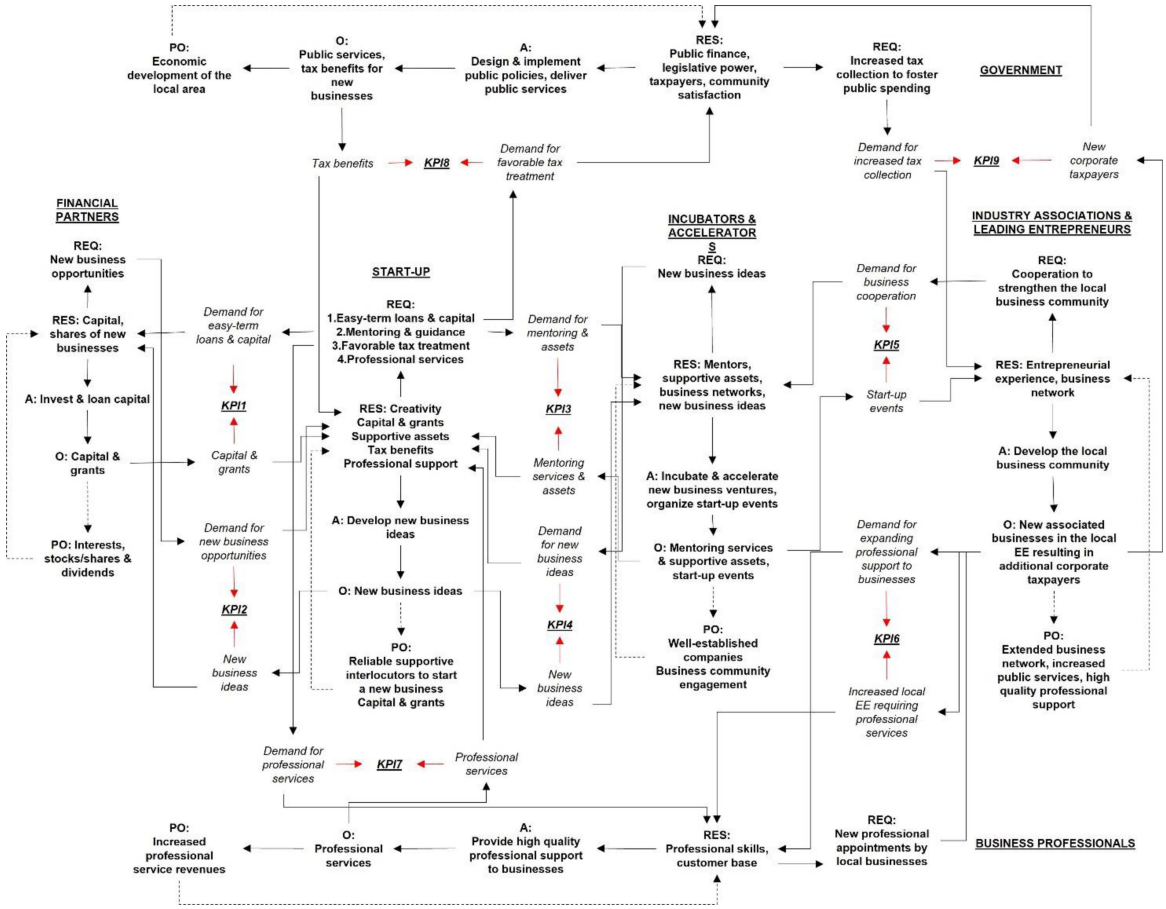

Fig. 3. *Dynamic value model* applied to an illustrative example of an EE.

Section V provides further insights and discusses the implications for research and practice related to the use of the *value system method* as a new approach to assessing and orchestrating EEs at different levels.

V. Discussion

We began by inquiring about the methods and measures of EE and how to complement them to gain comprehensive (i.e., multilevel) knowledge about these ecosystems. While previous studies have shed light on the influence of macrolevel dynamics on the creation and growth of new ventures, the applicability is disconnected from what entrepreneurs and other stakeholders really do [55], [89]. In essence, we have limited knowledge about methods that focus on the microfoundations of EEs. In this study, we aimed to develop a novel *value system method* that could be used across levels to help fill this methodological gap, which has hindered new theorizing in the EE debate [15], [80]. To do so, we grounded the *value system method* in system design and business model theories to capture the microfoundations of EEs. Specifically, the *value system method* allowed us to efficiently assess EEs across levels, as no study has done before. The method first focuses on microlevel value exchange dynamics of individual EE actors before capturing value dynamics among EE actors at the mesolevel. Finally, the method may inform about dynamics at the macrolevel. In the following, we discuss the research and practical implications for advancing the current body of knowledge of EEs.

A. "Actor-Specific Value at the Core": Measuring the Microfoundations of EEs

In line with the core aim of our study, we provided a detailed analysis of how scholars and practitioners could deploy a novel methodological approach to yield actionable and practicable insights into EEs. Our *value system method* complements existing methods and measures by extending EEs' dynamics across levels. In EE research, predominant methods and measures are based on top–down approaches that directly link the macrolevel dimensions of EEs to outcome measures of new venture creation and growth [79], [80], [101]. Current knowledge is limited regarding how microlevel actor-specific factors impact macrolevel dimensions as well as how the interactions of microlevel actors lead to emergent and collective outcomes [77]. We need to deepen our understanding of microlevel dynamics, macrolevel dynamics, and the link between them by truly embracing a system perspective [106]. That is microfoundations [11], [57]. Our methodological proposal lies in this direction, responding to recent calls for new methods to increase theorizing in the EE debate [81]. Specifically, our value system method

TABLE III
KPIs USED TO ASSESS EE VALUE EXCHANGE THROUGH THE *DYNAMIC VALUE MODEL*

KPI	Formulation	Description
KPI 1	Total amount of financial resources provided by financial partners/Total amount of financial resources required by startups	It provides insights on the availability and accessibility of financial resources to new businesses.
KPI 2	New business ideas/Demand for new business opportunities	It measures the financial partners' opportunities to invest their liquidity in new businesses growing in the local area.
KPI 3	Mentoring services and assets (e.g., training hours or software)/ Demand for mentoring services and assets	It measures the ability of incubators and accelerators to provide an adequate level of mentoring and assets to support the development of new business ideas.
KPI 4	New business ideas/Demand for new business ideas	It compares the ability of entrepreneurs to develop new business ideas with the expectation of incubators and accelerators operating in the local area.
KPI 5	Startup events and workshops/ Desired number of events and workshops required by industry associations and leading entrepreneurs	It measures the networking activities through the number of events (and/or participants) organized on relevant topics.
KPI 6	Number and typology of professional services available to new business/Number and typology of professional services required	It provides insights on the ability to match professional needs and the possibility of business professionals expanding their activity.
KPI 7	Professional services income/ Professional services desired income	It measures the satisfaction of business professionals by assessing the effective demand for their services.
KPI 8	Tax benefits (e.g., tax rate)/ Demand for favorable tax treatment (e.g., desired tax rate)	It assesses the ability of governments to match new business expectations and requirements.
KPI 9	Actual tax collection/Desired tax collection	It measures the ability to collect new financial resources for public spending from the born and growth of new successful and viable businesses.

included two strategy tools: the *value matrix* and the *dynamic value model*. The *value matrix* enables the analysis of value exchanges and eventual value gaps in dyadic relationships between individual EE actors at the microlevel. By applying the same matrix, we derived insights into value exchange and its gaps with regard to a social group of EE actors with a shared vision and business model [57]. For example, the analysis of a value matrix may show that all startups that require substantial financial resources to scale up their businesses [18] do not find venture capitalists who are willing to support them. In this study, we derived insights into the relationships among the meso category of startups and venture capitalists. These insights could inform policy actions to address macrolevel issues, such as creating a new public fund or a pension fund that will act as a limited partnership of private venture capital funds.

The value matrix helped organize the collected data about the value exchanges and gaps in EEs. It not only has offered valuable insights but also represents a static snapshot that needed to be complemented through another tool: the *dynamic visual model*. Scholars and policymakers could apply this model to investigate the processes that characterize value exchanges between EE actors and obtain a strategic and operational view of such processes in terms of the resources employed, activities conducted, and outputs produced. Furthermore, by comparing resources with the related outputs, it was possible to create a set of KPIs that informed EE actors about their performances at the micro-, meso-, and macrolevels. This finding advances the scientific debate about performance measurement and management in EEs, which, as highlighted in Section I, is complex and has been neglected at the micro- and mesolevels of EEs [1], [6], [14], [55], [59], [61], [93]. Overall, our value-based method places at the "core" of ecosystems the actor-specific value exchange, providing a new way to assess EE starting from the microfoundations. We believe that our value-based method can complement extant valuable methods and approaches to gain a comprehensive understanding of EE, and it may serve as a ground for further methodological advancements.

B. Toward a Value-Based Theory of EE

By focusing on value exchanges, we provide a method that assumes EEs as system of actors' business models interaction and interdependence. The current EE debate focused mainly on macrodimensions, but ecosystems are made by actors that behave, collaborate, and compete according to their business models [12], [51]. This leads to another contribution to the current discussion in EE research. In particular, on a more theoretical level, our work contributes to shifting the locus of research on microfoundations through a new way of conceiving EEs. Building on Roundy and Lyons [80], we contended that gaining a comprehensive understanding of EEs requires that scholars and practitioners begin their investigations from the bottom [79]. In other words, we should first focus on what *startups and other EE stakeholders actually do* [16], [55], [89]. The challenge is, then, how, starting from the bottom, we can connect with the macrodimension. The debate is open and based on limited knowledge. We argue that one reason for this is linked to prevailing methods in EE research that have been inherited from the regional development literature. In accordance with Roundy and Lyons [80], we deem that EE dynamics can be studied by leveraging the strategic management literature. Our method is the first to conceptually draw from the strategic management literature, which enabled us to study EEs across levels to connect micro- and macrodynamics. Specifically, our method owes much to the business model construct and to the firms' value-based theories [18], [96]. According to scholars, the logic of the functioning of organizations (i.e., *what they actually do*) rests on three main interrelated value mechanisms: value creation, delivery, and capture [41], [58], [66], [96]. The analysis of these value mechanisms in an ecosystem context is complex because they are intertwined not only with each other but also with the value mechanisms of other organizations operating in the same ecosystem. Therefore, we contend that *EEs should be intended as systems of interconnected and interplaying business models of different organizations involved in value exchanges*.

Based on the above arguments, we suggest that embracing a value-based perspective to study the microfoundations of EEs will help advance our theoretical and empirical knowledge [38]. We especially contribute to this by proposing a way (and not the only way) to theorize, and then, operationalize the microfoundations of EEs as no study has done before. In our work, we assumed that the microlevel dimension of EEs consisted of the dyadic relationship between two individual EE actors. In our view, this is the lowest level of a collective and systemic view of entrepreneurship [87]. This should not be taken as the only view of EEs' microfoundations. Other scholars may assume a different microlevel, such as individual entrepreneurs, which is not theoretically incorrect [81]. Most strategy scholars have analyzed microfoundations by placing individuals (e.g., managers and employees) at the microlevel and firms at the macrolevel. However, as suggested in a recent systematic review of microfoundations, the microlevel of the microfoundations paradigm should not be restricted to individuals [77]. The microfoundation is fundamentally "an analytical levels argument" [40, p. 3]. For instance, business units can be considered a microlevel dimension in studying the effects of their actions and interactions on their parent firms (i.e., the macrolevel dimension) [77]. Finally, we believe that the study of microfoundations is central to EE research in explaining "anything that is supraindividual (e.g., all the way from dyadic relations between individuals to nations)" [26, p. 6]. The present study was the first step in facing this broad and complex challenge by developing an original conceptualization of the microfoundations of EE, toward a value-based theory of EE.

C. Implications for Practice

The practical implications of our study are pertinent to several EE stakeholders and their business models. Our study can provide macrolevel information regarding the policy and governance of EEs [17]. For instance, our assessment model could show that incubators nationwide do not have sustainable business models because although they provide value to startups, they are not able to capture value from them. This has implications for the overall meso category of incubators, which will inevitably be reflected on the microlevel, thus suggesting that single incubator officers search for business models. On the macrolevel, based on this insight, policymakers may be induced to find a measure that supports incubators' search for new business models. Our value system method and visual strategy tools may nurture a more participative overview in identifying strategy levers and critical action points to intervene in EE performance gaps, missed targets, and asynchronous coordination in value-exchange processes. Hence, the value system method may enable EE actors to strengthen a shared long-term entrepreneurial vision and enhance their strategic collaboration, thus preventing potential conflicts and dysfunctions in EE developmental patterns by mitigating the effects of asynchronous dynamics between value demand and supply [86], [95].

Our proposed methodology could also serve to build an appropriate governance system by developing performance measures as an essential precondition. As a measure of EE performance, the number of gazelles, unicorns, or innovative and growth-oriented startups [4], [46], [93] is relevant for research, but it does not help practitioners to act. We consider that EE performance should refer to actionable EE value-exchange processes that inform and guide EE management. We cannot govern and intervene in outcomes, but we can intervene in processes by identifying critical action points in the case of EE performance gaps, missed targets, and asynchronous coordination in value exchange. A system can be governed only when a performance measurement model exists. Our value system method aims to assess EE performance measurement based on value exchange processes. Therefore, it may result in a valuable contribution to the practice of the governance of EEs [24], [42].

Finally, the application of the value system method to multiple EEs may allow benchmarking practices that compare the structure and performance of different ecosystems. This could support various stakeholders in reforming the EE structure to foster both their performance and that of all EEs.

D. Limitations and Future Research

Although it may overcome some of the methodological issues in EE research, the proposed approach is not free of limitations. First, the application of the value system method requires the collection of data (both qualitative and quantitative) from several sources because EE actors are many and fragmented. This requires significant effort, which can prevent the applications and/or undermine the reliability of this approach. Moreover, the conditions in which EEs operate may rapidly change over time. This limitation may be overcome by adopting simulation techniques, such as system dynamics [16], [71], [95], which can be combined with the value system method following Cosenz and Noto's [30] dynamic business modeling. Other limitations include the empirical evidence of the article. Admittedly, this is an unconventional paper. We have not provided a detailed set of empirical findings, followed by a discussion of their relevance to policymaking. Instead, the core aim of our study was to provide a novel methodological approach for scholars and practitioners to help them gain practical and actionable insights into EEs. Although illustrative examples may be effective in explaining our method and generalizing its concepts, its empirical application to real cases of multiple EEs could reveal both the shortcomings and the advantages of the method. Therefore, we encourage future studies to further advance and improve the value system method through its application to successful and nonsuccessful empirical cases.

Concluding, this article does not provide any all-round (value-based) theory of EE. Rather, in this study, we argue that an EE needs microfoundations that start by putting more attention to actor-specific value exchange analysis, relationship by relationship. Overall, we hope that our novel perspective to conceive EE—grounded in strategic management—may serve as a theoretical baseline for future studies willing to disentangle microanalytic and actor-specific value exchanges associated with EE genesis and development over time.

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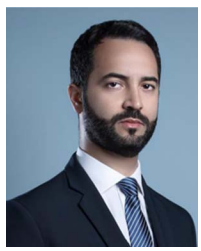

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