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Metagovernance forms for enhancing sustainability-oriented innovation in a knowledge ecosystem

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Abstract

This study explores how different actors operating in a knowledge ecosystem catalyse sustainability-oriented innovation. Through collaborative practices among actors, knowledge ecosystems constitute a fertile ground for sustainability-oriented innovation to grow and flourish by creating value for businesses and society. The current literature on knowledge ecosystems is lacking in outlining governing mechanisms to foster collaborative practices aimed at advocating open innovation for sustainability transition. This study aims to close this literature gap. Through interview data collected in a knowledge ecosystem, we apply precepts of grounded theory to reveal four forms of metagovernance—network design, network framing, network management and network participation. This study proposes a conceptual framework of metagovernance forms as powering layers to foster sustainability-oriented innovation in a knowledge ecosystem. We further discuss potential weaknesses that may jeopardise the development of sustainability-oriented innovation in the knowledge ecosystem. This study contributes to the literature on sustainability-oriented innovation by acknowledging metagovernance as the appropriate governing mechanism that balances the activities and processes of sustainability-oriented innovations for becoming and being sustainable.

KEYWORDS
grounded theory, knowledge ecosystem, metagovernance, sustainability transition, sustainability-oriented innovations

1 | INTRODUCTION

The urgent need to tackle health and safety issues, protect human rights and humanitarian imperatives, and respond to climate change and biodiversity collapse calls for responsible behaviors that create value by addressing societal deficits (Crane & Matten, 2021). With this aim, organisations have started to address sustainability goals by using open innovation (Cano & Londoño-Pineda, 2020; Troise et al., 2021). Open innovation is 'rooted in the belief that the dissemination of knowledge and collaboration with stakeholders would lead to win-win outcomes for all parties' (Camilleri et al., 2023, p. 1). Therefore, open innovation has been acknowledged as a key component to enact transformative societal change (Urbinati et al., 2023).

In this context, research on open innovation has started to investigate how related practices such as co-creation platforms, open source and product development enhance sustainable development, leading to sustainability-oriented innovation (Camilleri et al., 2023;

Urbinati et al., 2023). The application of sustainability-oriented innovation not only refers to the activities and processes of becoming and being sustainable (Adams et al., 2016), with the aim to improve economic performance, but also to generate positive social and environmental impacts (Bos-Brouwers, 2010). To implement sustainability-oriented innovation, organisations need to expand their view beyond their business environment to include partners and stakeholders in a networked ecosystem (Chaurasia et al., 2020).

Ecosystems are fertile grounds where actors can enhance innovation for sustainability transition (Cobben et al., 2022; Stubbs et al., 2022; Williams & Blasberg, 2022) in an open innovation context (Demirel & Kesidou, 2019; Pustovrh et al., 2020; Radziwon & Bogers, 2019; Vlaisavljevic et al., 2020). They are defined as 'communities of associated actors within a network and configurations of activity defined by a value proposition with the aim to create and capture value from collaborative innovation activities' (Oskam et al., 2021 cited by Stubbs et al., 2022, p. 1099). Depending on the actors that contribute to the value proposition of the ecosystem, there are different ecosystem types: business ecosystem (Moore, 1993), innovation ecosystems (Adner, 2006), entrepreneurial ecosystem (Isenberg, 2010), and knowledge ecosystem (Van der Borgh et al., 2012). Among them, the knowledge ecosystem is characterised by a 'heterogeneous set of knowledge-intensive companies and other participants that depend on each other for their effectiveness and efficiency, and as such need to be located in close proximity' (Van der Borgh et al., 2012, p. 151).

Knowledge ecosystems are drivers of value creation at a systemic level (Cobben et al., 2022). They can favour systemic change with actions that lead to significant and substantial impacts (Clarke & Crane, 2018, p. 308). The variety and complementarity of organisations and actors in the knowledge ecosystem contribute to positive development (Tavassoli & Carbonara, 2014). Therefore, actors within a knowledge ecosystem can enhance activities of sustainability-oriented innovation through joint cooperation towards collaborative value creation (Stubbs et al., 2022). However, literature on knowledge ecosystems is lacking in understanding whether and how actors operating within this network collaborate and share efforts to drive sustainability-oriented innovation (Cobben et al., 2022). Furthermore, the literature on open innovation suggests that 'there is still a gap in the academic literature that links CSR/corporate sustainability with open collaborative approaches' (Camilleri et al., 2023, p. 15).

Considering these literature gaps, we aim to theoretically advance the debate on the development of sustainability-oriented innovation for collaborative value creation in the knowledge ecosystem. We have to recognise that, in a network of actors, high institutional complexity may favour 'substitution' rather than a 'partnership logic' (Yin & Jamali, 2021). To overcome these concerns, governing mechanisms that regulate collaborative actions are deemed important to resolve coordination problems that could not be achieved by an organisation acting alone (Doberstein, 2016). The institutionalisation of appropriate policy instruments and governing mechanisms make this cooperation effective (Sørensen & Torfing, 2017) and relevant for sustainable solutions to sustainability challenges (Christopoulos et al., 2012). Thus, governing mechanisms may facilitate the pursuit of sustainability-oriented innovation in the knowledge ecosystem.

Based on the above-mentioned arguments, the purpose of this research is to understand how different actors catalyse sustainability-oriented innovation in the knowledge ecosystem. This research question is timely and relevant because the literature calls for outlining the governing mechanisms of collaborative practices advocating open innovation for sustainability transition (Bogers et al., 2020; Camilleri et al., 2023; Cobben et al., 2022; Lopes et al., 2017). Thus, this study explicates the role of multiple actors within a knowledge ecosystem in letting sustainability-oriented innovation flourish and develop. We employ an exploratory qualitative research analysis based on interview data collected from different organisations operating in a knowledge ecosystem. The knowledge ecosystem under analysis is the city of Turin, in which innovation and local entrepreneurship are oriented towards innovation for sustainability transition (Startup Genome, 2022). To gather our primary and secondary data, we involved organisations that have a key role in enabling policymaking, strategy and actions to drive innovation and economic growth. To analyse our data, we apply precepts of grounded theory based on an inductive approach.

Our findings reveal four forms of metagovernance—network design, network framing, network management and network participation—that seek to favour sustainability-oriented innovation. We further discuss the potential weaknesses of the stand-alone application of different governance styles that may jeopardise sustainability transition. Overall, our research contributes to expanding metagovernance forms as powering layers to foster sustainability-oriented innovation in a knowledge ecosystem.

The research is structured as follows. Section 2 presents the theoretical background divided into three parts: A brief overview of research on knowledge ecosystems, a closer look at sustainability-oriented innovation and an outline on the governance layers for sustainable development. Section 3 presents the research methodology, which includes the analysis of the context, the data collection and the data analysis. Section 4 describes the findings related to the metagovernance forms and the weaknesses of the governance styles. Section 5 discusses the conceptual framework and Section 6 concludes with contributions, limitations and suggestions for further research avenues.

2 | THEORETICAL BACKGROUND

We frame our theoretical background joining three streams of literature for the first time together. First, we outline knowledge ecosystems as a 'community of actors within a network' and 'configurations of activity defined by a value proposition' (Oskam et al., 2021). Second, we describe sustainability-oriented innovation for collaborative value creation based on the premise that collaboration within a network of actors is pivotal for enhancing sustainability transition (Mariani et al., 2022; Stubbs et al., 2022). Third, and ultimately,

we illustrate governing mechanisms which support the design and implementation phases of interventions for sustainable development (Christopoulos et al., 2012). With this literature framing, our theoretical objective is to understand how to catalyse sustainability-oriented innovation for systemic change in knowledge ecosystems.

2.1 | Contextualising knowledge ecosystems

An ecosystem can be defined as 'a multilateral structure of organisations that materialises a joint value proposition characterised by the jointness of complementarities and interdependencies' (Cobben et al., 2022, p. 139), and it is not hierarchically controlled (Jacobides et al., 2018). Ecosystem research is based on a large body of literature in the streams of innovation studies, entrepreneurship and strategy research (Cobben et al., 2022). Academic scholars have identified different typologies of ecosystems: business ecosystem (Moore, 1993), innovation ecosystem (Adner, 2006), entrepreneurial ecosystem (Isenberg, 2010) and knowledge ecosystem (Van der Borgh et al., 2012). According to Cobben et al. (2022), an ecosystem type differs from the others based on the following main characteristics: competitive advantage, geographical, temporal scope, orchestration, value creation and capture. The business ecosystem has a focal firm focus; the local specialised knowledge should be complemented with global market and expertise, with emphasis on the value capture partner level. The innovation ecosystem is similar to the business ecosystem because it also has a focal firm focus, although it moves beyond the single-partner orientation towards the realisation of a shared value proposition. The entrepreneurial ecosystem has no focal firm but there are several businesses focused on a specific industry or technology-related knowledge base with a spatially confined character. When the objectives refer to economic, social and ecological sustainability outcomes, entrepreneurial ecosystems provide entrepreneurial activities to foster sustainability-focused transformation (Chaudhary et al., 2023). Ultimately, the knowledge ecosystem is characterised by heterogeneity of the participants and geographical proximity, and addresses network externalities at both the ecosystem and partner levels such as shared knowledge generation (Cobben et al., 2022).

Knowledge ecosystems are 'emerging collectives in which actors such as universities, public research institutions, and for-profit companies collaborate to create knowledge in a pre-competitive setting' (Järvi et al., 2018, p. 1523). These actors are geographically co-located and work in complementarity fields (Van der Borgh et al., 2012). In other words, the orchestrator is not necessarily identifiable; instead, it can be an independent management team, a research organisation or a university (Clarysse et al., 2014). These entities accomplish the development of knowledge capabilities and content-related knowledge (Öberg & Lundberg, 2022). In fact, the aim of the knowledge ecosystem is to purposefully solve technological or societal challenges (Järvi et al., 2018). The knowledge ecosystem creates value through innovation process facilitation and innovation community creation (Van der Borgh et al., 2012). This means that the knowledge ecosystem addresses value creation and value capture by creating a community for knowledge generation and innovation at the system level (Cobben et al., 2022). To achieve these objectives, the implementation of collaborative practices in which knowledge exploration is at the core is deemed necessary (Dougherty & Dunne, 2011; Valkokari, 2015). First, co-location is crucial for coordinating knowledge creation because new technologies are shared easily at short distances. Second, different actors, universities, innovation hubs, non-profits and for-profit organisations make significant inputs to knowledge exploration with an interdisciplinary perspective (Van der Borgh et al., 2012). Third, the knowledge domain has a common goal, which is outlined in the innovation agenda and derived from dialogue and discussion among the actors. The process of knowledge generation allows each ecosystem partner to capture value from jointly developed knowledge (Clarysse et al., 2014; Van der Borgh et al., 2012). Therefore, actors result in a more effective search for new knowledge than any individual actor alone (Järvi et al., 2018).

Research on knowledge ecosystems thus tends to focus on the business potential of the actors, the organising mechanisms of knowledge development (Öberg & Lundberg, 2022), and for value creation at the system level (Van der Borgh et al., 2012). There is limited attention to the role of the knowledge ecosystem for the achievement of sustainable and/or social value (Cobben et al., 2022). Therefore, in the next section, we illustrate the pursuit of sustainability-oriented innovation in collaborative networks of actors.

2.2 | Enhancing sustainability-oriented innovation for collaborative value creation

During the last years, to tackle sustainability challenges, the concept of innovation has been linked to the concept of sustainability to pursue environmental and social objectives beyond the organisation's economic purposes (Urbinati et al., 2023). Thus, scholars in the innovation field have started to discuss the role of open innovation, defined as 'a distributed innovation process based on purposively managed knowledge flows across organisational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organisation's business model' (Chesbrough & Bogers, 2014), to sustain sustainability transition pathways (Chaurasia et al., 2020). Therefore, the concept of sustainability-oriented innovation has gained prominence, to explicate processes towards sustainability, which calls organisations for developing innovations that reconcile economic, environmental and social goals (Urbinati et al., 2023). This means that sustainability-oriented innovation addresses the specific purpose of generating social and environmental values, as well as economic returns (Adams et al., 2016).

Sustainability-oriented innovation is theoretically conceptualised as 'intentional changes to an organisation's philosophy and values, as well as to its products, processes, or practices, to serve the specific purpose of creating and realising social and environmental value in addition to economic returns' (Adams et al., 2016, p. 181).

This means that sustainability-oriented innovation comprehends the activities and processes of becoming and being sustainable (Adams et al., 2016). Bos-Brouwers (2010) defines sustainable innovations as 'innovations in which the renewal or improvement of products, services, technological or organisational processes not only delivers an improved economic performance, but also an enhanced environmental and social performance, both in the short and long term have the capacity to generate positive social and environmental impacts' (p. 422).

Sustainability-oriented innovation fosters a sustainability transition (Bocken et al., 2018) by driving innovation and economic growth (Camilleri, 2017). Furthermore, sustainability-oriented innovation helps to 'reconcile uncertainties associated with the complex and systemic nature of societal challenges while striving for social impact' (Mair et al., 2023, p. 2) to achieve radical change at the large-scale systems level (Adams et al., 2016). In practice, sustainability-oriented innovation reshapes value-based business models (Chatain & Mindruta, 2017) by conducting experimentation that generates engagement among internal and external stakeholders (Bocken et al., 2018) and open developments to wider stakeholder participation, including citizens and local communities (Seyfang & Smith, 2007). Sustainability-oriented innovation can address operational optimisation by doing more with less, organisational transformation by doing good by doing new things, and systems building by doing good by doing new things with others (Adams et al., 2016).

To implement such actions, sustainability-oriented innovation requires that organisations expand their view beyond their surrounding environment, to include their partners and stakeholders for more inclusivity to co-create value for sustainability innovation (Chaurasia et al., 2020). Chaurasia et al. (2020) suggest that the creation of shared value for open innovation requires active participation, interaction, and collaboration with stakeholders, to develop insights for sustainability problem-solving issues. In fact, sustainability is enhanced collaboratively with an 'interconnected set[s] of innovations, where each influences the other, with innovation both in the parts of the system and in the ways in which they interconnect' involving many actors and institutions (Mulgan & Leadbeater, 2013, p. 4). Therefore, collaborative partnerships across social, institutional, and regulatory levels (Adams et al., 2016) are deemed important to enact sustainability-oriented innovation and further develop collaborative value creation.

Collaborative value is defined as 'the transitory and enduring benefits relative to the costs that are generated due to the interaction of the collaborators and that accrue to organisations, individuals, and society' (Austin & Seitanidi, 2012a, p. 728). Fait et al. (2023) addressed the central role of collaboration and knowledge sharing for social innovation, based on the ability of a firm to innovate and the ability to share objectives and ideas, generate new knowledge and acquire specific skills. Fait et al. (2023) recommend the creation of a team-based work environment to favour an efficient process of social innovation. With these practices, companies collaborate with others and join different backgrounds and perspectives of innovation assets (Malodia et al., 2023).

Therefore, the ability of an organisation to adopt sharing strategies also depends on the existence of an environment in which individuals are willing to exchange knowledge realising mutual benefits (Fait et al., 2023). The knowledge ecosystem is a fertile ground in which sustainability-oriented innovation can flourish because of its primary aim to drive systemic change (Cobben et al., 2022). However, the literature has not explored enhancing strategies of sustainability-oriented innovation for collaborative value creation yet (Cobben et al., 2022; Mariani et al., 2022). Therefore, we aim to theoretically advance the debate on the development of sustainability-oriented innovation in the knowledge ecosystem. We have to acknowledge that, in a network of actors, high institutional complexity may favour 'substitution' rather than a 'partnership logic' (Yin & Jamali, 2021). To overcome these concerns, governing mechanisms that regulate collaborative actions are deemed important (Doberstein, 2016). We argue that governing mechanisms may facilitate the pursuit of sustainability-oriented innovation in the knowledge ecosystem; thus, in the next section, we frame layers of governance that enhance sustainable development.

2.3 | Depicting layers of governance for sustainable development

The stream of public policy research tends to agree that policy instruments with the aim to ensure sustainable development face with 'wicked problems' that are ill-defined, require specialised knowledge, involve a large number of stakeholders and carry a high potential for conflicts (Koppenjan & Klijn, 2004; Sørensen & Torfing, 2011). In the realm of sustainable development, there are complex or 'wicked problems' related to situations where there is no consensus on either values or knowledge, and where there are no criteria as to whether all solutions have been considered (Julio et al., 2022). These wicked problems cannot be solved simply by financing or throwing more money and eventually by addressing standard solutions (Sørensen & Torfing, 2011), but they require innovative policy solutions through the implementation of adaptive approaches to sustainable development (Fiandrino et al., 2022). Furthermore, to cope with wicked problems, the coordination of objectives, interests and practices among different stakeholders requires the institutionalisation of appropriate policy games (La Cour & Andersen, 2016). Rules, relationships, systems and processes for holding actors accountable for their work refer to governance mechanisms (Unterhitzenberger et al., 2023). Governance is the framework that outlines the boundaries for management's execution of their tasks and what managers will be held accountable for (Unterhitzenberger et al., 2023, p. 89 from Müller, 2019). In a context of networked organisations, composed of public and private actors, governance might help solve wicked problems and enhance democratic participation in public policymaking (Sørensen & Torfing, 2017).

Literature has developed various layers of governance referred to as governance networks, collaborative governance, public/private partnerships also known as metagovernance. Metagovernance is widely perceived as 'a policy that departs from previous traditional

forms of government such as bureaucracy and contracts, simultaneously making governmental steering more efficient and democratic, by inviting stakeholders into the process of concrete political decisions' (Sørensen & Torfing, 2009). There are various definitions of metagovernance (Christopoulos et al., 2012). Sørensen & Torfing (2009) describes metagovernance as a way of enhancing coordination of governance in a fragmented political system based on a high degree of autonomy for networks and institutions. Damgaard and Torfing (2011) conceive of metagovernance as an array of tools consciously designed and deliberately applied to influence the way in which a governance network contributes to the governing of society (p. 295). Metagovernance addresses efficiency, effectiveness and democratic legitimacy (Sørensen & Torfing, 2017). Furthermore, metagovernance combines the focus on network management with a broader political steering perspective concerned with the question of when and how networks can contribute to interest mediation and the achievement of overall political goals (Peters, 2010).

Prior studies have investigated multilevel governance model for interorganisational project networks (Unterhitzenberger et al., 2023) and addressed the metagovernance for sustainable solutions to several sustainability challenges such as energy efficiency (Christopoulos et al., 2016), to climate change (Charnock & Hoskin, 2020), to water scarcity (Julio et al., 2022), to fair trade and sustainable forestry production (Murphy-Gregory & Gale, 2019). This means that metagovernance 'enables customised approaches based on endogenous knowledge, equally important for all three pillars of sustainability' (Christopoulos et al., 2012, p. 310); therefore, metagovernance can support and enhance the flourishing of sustainability-oriented innovation in the knowledge ecosystem.

Based on the above-mentioned argumentations, Figure 1 shows the theoretical background which conceptually depicts the context of our investigation—the knowledge ecosystem described in Section 2.1, the objective of this research—the enhancement of sustainability-oriented innovation for collaborative value creation illustrated in Section 2.2. and the governing mechanisms which facilitate the achievement of such an objective—the metagovernance framed in Section 2.3.

3 | METHODS

The objective of this study is to explore how different actors operating in a knowledge ecosystem catalyse sustainability-oriented innovation. Therefore, to achieve this objective, a single case study is the most suitable design. A single case study is appropriate when the study addresses contemporary issues (Yin, 2011), and the investigation analyses the interactions between different actors to 'deliberately [...] cover contextual conditions' (Yin, 2011). This is the case in addressing mechanisms that collaborating actors may enact to facilitate the pursuit of sustainability-oriented innovation within a knowledge ecosystem. Furthermore, precepts of grounded theory were applied (Glaser & Strauss, 1967; Strauss & Corbin, 1998, 1990) in the data collection and the data analysis because the inductive perspective raises under-developed information about actors' perceptions and interpretations in addressing sustainability-oriented innovation. Indeed, the grounded theory approach does not begin with constructs and interlinkages; instead, it starts from the area of study; therefore, logics and interrelationships are not predefined but emerge from the data and their analysis (Strauss & Corbin, 1990). This inductive perspective is particularly suitable for the under-theorised research setting of knowledge ecosystems, which lacks an understanding of interrelated mechanisms occurring among actors, even more important, for the pursuit of sustainability-oriented innovation. Hereafter, the research setting of the knowledge ecosystem in Turin is described, and then the data collection and data analysis following a grounded theory approach are presented.

3.1 | Research context: A knowledge ecosystem in Turin

Our case study focuses on Turin, an Italian city with more than 890,000 inhabitants situated in northeast Italy. There are numerous institutions that develop local entrepreneurship and enhance a sustainable living. In more detail, there are three foundations that financially support business development and contribute to

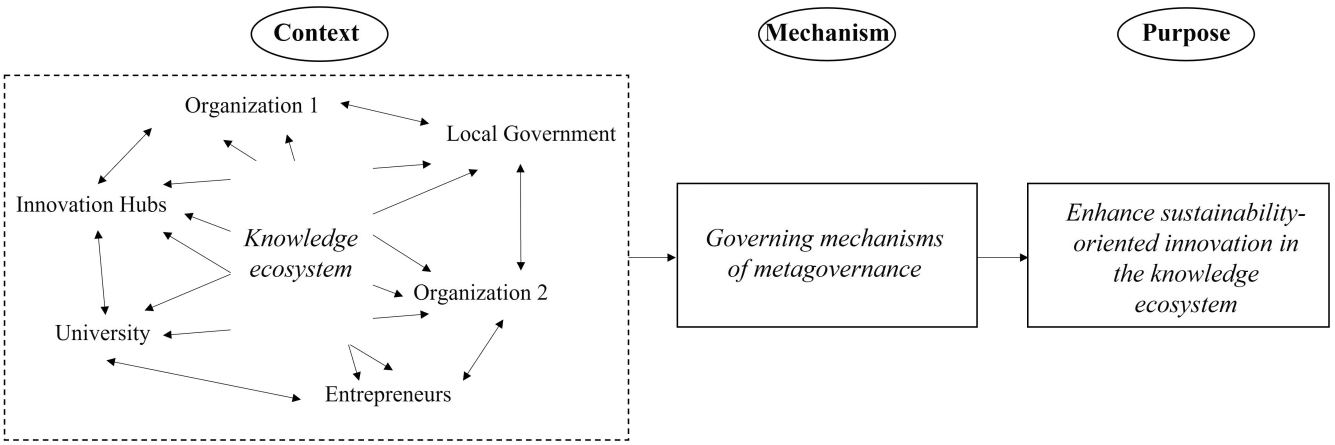

FIGURE 1 Theoretical background. *Source*: Authors' elaboration.

enhancing innovation for sustainability transition: Compagnia di San Paolo, CRT Foundation and Agnelli Foundation Talent Garden. The city has three incubators: SocialFare (the first Italian social innovation centre certified by the Ministry of Economic Development), 2i3t (University of Turin) and I3p (Politecnico of Turin). There are also numerous business accelerators, such as Open Icet, Impact Hub Torino and Torino Social Innovation. Within this network of actors, including local governments, other banking foundations, universities and private and non-private organisations, innovative activities facilitate the enhancement of sustainable business ideas that translate economic, social and environmental objectives into concrete projects aimed at supporting the sustainability transition. In the Global Startup Ecosystem Report 2022, Turin is ranked in the top 40 in the European Ecosystem in Funding and in the top 35 in the European Ecosystem in Affordable Talent. This report focuses on start-ups and suggests that Turin is an open-air laboratory for accessing talent (110 K+ students) because of its suitable infrastructures and the presence of international start-up programmes (world-class acceleration, incubation and venture building initiatives).

Furthermore, in 2021, Turin was the first city to be financed by the Italian government for an innovative social housing project through the Social Innovation Fund. It was also the only city in Italy to be selected to participate in the international learning programme promoted by the RRR—Respond Rebuild Reinvent project on the theme of solidarity and social economy ecosystems. The European Commission assigned to the City of Turin the task of leading one of the seven Social Innovation Competence Centres that will be created in Europe, the only one at the national level, in the framework of the EU-EaSi programme for employment and social innovation. During the work of defining the EU Action Plan for the Social Economy, which was approved in 2021, the EU Commission Expert Group on Social Economy and Social Enterprises has indicated Torino Social Impact as a virtuous model, suggesting that 'an alliance among companies, public, and private institutions aimed at making Turin one of the best places in the world to do business and finance pursuing goals of economic viability along with objectives of social impact. A cluster of skills, activities, services strengthens and promotes the local ecosystem in the pursuit of the framework of Agenda 2030' (Torino Social Impact; https://www.torinosocialimpact.it/en/). In May 2021, Harvard Alumni Entrepreneurs selected Turin as an urban laboratory model for the first appointment of 'Smart Cities', a series of online events on smart cities.

3.2 | Data collection

We collected primary data from interviews with organisations' managers and experts in Turin and secondary data and information (institutions' documents, press releases and other reports) 'to build a phenomenological triangulation research approach' (Robertson & Samy, 2015, p. 190).

As a primary source of data, we conducted face-to-face semi-structured interviews and follow-up telephone interviews with organisations' representatives to gather experiences and perspectives in advancing sustainability-oriented innovation in a knowledge ecosystem setting. The complexity of the knowledge ecosystem requires a holistic and multidimensional analysis involving different categories of organisations and institutions. This approach favours the understanding of the knowledge ecosystem itself and the related practices and mechanisms that may enact sustainability-oriented innovation towards a sustainability transition. In selecting our interviewees, we adopted a purposive sampling approach (Gioia et al., 2013) because it is suitable for the selection of information-rich cases to support an in-depth understanding of a specific phenomenon. Interviews were scheduled in 2021 and 2022 and involved organisations that have a key role in enabling policymaking, strategy and actions to drive innovation and economic growth in Turin. Therefore, we included 11 organisations. Table 1 shows the list of organisations involved in our research. In more details, Table 1 describes the organisations' activities, the role of the interviewees within the organisation and provides examples of sustainability-oriented innovations implemented by the organisations involved in the study. In line with the grounded theory approach, an iterative process was used to determine the sample size (Glaser & Strauss, 1967; Thomson, 2010; Wasserman et al., 2009). New cases were analysed until no new and significant data were found, that is, until theoretical saturation (Strauss & Corbin, 1998).

The interviews were semi-structured and open-ended. The interview protocol addressed the following areas: description of the organisation and their engagement activities in the city of Turin, view of entrepreneurial skills, organisational attitudes and institutional mechanisms favouring sustainability-oriented innovation in the knowledge ecosystem and description of the governing mechanisms which contribute to foster innovations with social impact in the knowledge ecosystem. Appendix A provides the list of the interview guideline. We sent a list of the interview questions via e-mail 2 weeks before the interview date. Interviews were conducted online and/or in presence, depending on the availability of interviewees, and lasted, on average, 40 min. The interviewees authorised the recording of the interviews and the disclosure of their identities, as well as authorised them to combine their identities with the information provided. The research process was interactive between interviewers and interviewees in the form of dyadic relationships through discourse (Qu & Dumay, 2011). To preserve the quality of the interviews, attention was paid to maintaining the flow of the interviewee's story without interfering in his/her discourse to avoid interviewer bias (Schensul et al., 1999, p. 141). As a secondary source of data, the authors extracted secondary data and information from different sources such as technical reports and slides that interviewees shared with us, organisations' websites and LinkedIn posts, among others. This facilitates data triangulation for the data analysis phase, which is explained in detail below.

TABLE 1 Summary of primary data and secondary data.

N.	Code	Organisation	Description	Primary data	Secondary data	Examples of sustainability-oriented innovations
1	AC	Acus	A company that designs and develops proprietary and innovative software, provides organisational and process consulting and advanced business services. In 2021, Acus was registered in the special section of the Business Register as an Innovative SME	CEO	Website, social networks	Optimisation of core business processes for energy and utilities companies
2	CG	National Government	Department for Technological Innovation and Digital Transformation	Former minister of Technological Innovation and Digitalisation	Website, social networks	Digitalisation of processes and procedures for the PA
3	CI	Club degli Investitori	Community of entrepreneurs, managers and practitioners investing in start-up, scale-up, innovative SMEs	President	Website, reports	Financial commitment and involvement in the ecosystem
4	CSP	Compagnia di Sanpaolo	Foundation with the aim of fostering cultural, civil and economic development	Planning, research and evaluation department manager	Website, social networks	Supporting projects in line with the SDGs (e.g. harnessing the value of research, educating for collective development and encouraging active participation)
5	FCRT	Fondazione CRT	Foundation pursuing purposes of social utility and promoting economic development, towards scientific research, education, art etc.	Secretary general	Website, social networks	• Promoting projects in the fields of culture, research, welfare and territory • Activation of strategic synergies with key partners around the world • Developing pathways for capacity building and actively engage stakeholders in capacity empowerment
6	INC	2i3t	Incubator of the University of Turin	Operation manager	Website, social networks, reports	• Encouraging business idea and sustainable business model for value creation • Addressing mentoring on specific projects and develop management training projects
7	LG	Local Government	Department of Innovation of Turin	Alderman of innovation	Website, reports	• Digitalisation of processes and procedures • Support sustainable initiatives for the local community
8	OGR	OGR (Officine Grandi Riparazioni) Torino	Hub of innovation and art in Turin. From former train repair facility to a cultural centre for contemporary culture and business acceleration with hi-tech solutions, with a marked international stance	CEO	Website, social networks	Support innovation and business acceleration, with innovative projects oriented towards a positive and measurable social and environmental impact (e.g. Impact Deal, the first acceleration, training and networking programme for businesses and impact enterprises support an entrepreneurial impulse towards the construction of companies that pursue impact objectives according to the SDGs)

(Continues)

TABLE 1 (Continued)

N.	Code	Organisation	Description	Primary data	Secondary data	Examples of sustainability-oriented innovations
9	RG	Reply	Consulting company specialised in system integration, digital services	CEO	Website, social networks	Develop standard project management methodologies to address sustainability issues. A concrete example is 'The Matcha Reply' which guides the development of software projects to address sustainability targets. The aim is to reduce emissions from software execution and to define architectures and solutions that support sustainable processes
10	SF	SocialFare	Social innovation hub. SocialFare is the first impact accelerator in Italy, from 2012 offer accelerating path for best impact start-ups. From 2022, SocialFare has an accelerating path dedicated to welfare tech start-ups	Deputy operations officer	Website, social networks, reports	• Designing capacity building programmes and advanced consultancy to build strategic interventions for the development of sustainable ecosystems, enterprises and communities • Promoting research, business planning, networking, modelling impact partnerships, investment readiness to develop relevant innovation for the improvement of people and communities' lives
11	UT	University of Turin	Public university	Rector of the University of Turin	Website, reports	• Promoting education empowering students to become active actors towards a sustainable future • Promoting scientific research and innovation

Source: Authors' elaboration.

3.3 | Data analysis

The inductive approach of grounded theory was applied in the data analysis process to develop concepts grounded in data rather than based on pre-established hypotheses. We chose this inductive approach, which is suitable for this exploratory study focused on a knowledge ecosystem setting in which sustainability-oriented innovation can be established by collaborating actors.

The data analysis was constructed around the contextualisation of the conceptual interpretation of the information gathered with a qualitative content analysis (Krippendorff, 2004). The content analysis was based on a systematic and objective examination of the empirical data and is an applicable tool for arranging various types of written documents. The aim was to obtain a condensed and broad description of the phenomenon by organising and classifying the data by condensing words and phrases into fewer content-related categories and, further, forming themes and patterns (Krippendorff, 2004; Unerman, 2000). To this end, we transcribed the interviews verbatim to gather an overview of their roles and perspectives. Each author analysed the passages of written texts to make the data interpretation as objective as possible. A comparison of each individual interpretation was then made. Then, the authors computed a categorisation of the quotes collected with an iterated process that facilitated the identification of common elements while attempting to reveal common perspectives.

Since our coding process was inductive, we coded all the units of data that captured every possible nuance referring to how actors operate in a knowledge ecosystem setting to favour sustainability-oriented innovation. The authors coded the data independently to identify all relevant contents for common and recurring patterns. To ensure the validity and reliability of the results, all codes were reviewed by the entire research team. In more detail, the coding was done per actor, next per perspective therefore the cross-actor and cross-perspective analyses supported the identification of similarities and differences among interviewees' statements while maintaining the overall perspective of the knowledge ecosystem (Öberg & Lundberg, 2022). At the end of this phase, we obtained the first-order coding, which includes 34 codes in total, each of which relates to our research questions. Then, we move to the second phase, which groups codes into themes. A theme is 'a broad category incorporating several codes that appear to be related to one another which indicates an idea that is important to the research question' (Saunders et al., 2016, p. 585). In defining this second-order coding, the grounded theory approach suggests combining the codes already outlined in the literature. Based on this precept, we observe the themes that have this recurring link in common. The themes represent broad areas of governing mechanisms of metagovernance as well as weaknesses of the different governance styles. Table 2 shows the first-order coding, the second-order coding and the third-order coding, which were framed following Gioia et al. (2013). This resulting grounded theory model shows the relationships among the emergent concepts that describe the phenomenon of interest, providing a comprehensive framework of all relevant data-to-theory connections. The next section describes the findings revealed by this inductive data analysis.

4 | FINDINGS

In this section, we present the findings on the metagovernance forms and the weaknesses of the governance styles resulting in the knowledge ecosystem under analysis. The findings are organised by these aggregate dimensions:

1. Network design and network framing for strategising sustainability-oriented innovation.
2. Network management and network participation for managing sustainability-oriented innovation.
3. Weaknesses of governance styles.

4.1 | Network design and network framing for strategising sustainability-oriented innovation

The genesis of an ecosystem aims to 'design a framework in which everyone can create value' (CG) with 'a specific mission that should be clear, simple, and measurable' (FCRT and OGR). In particular, considering the recent sustainable challenges, it has become important to enhance and support entrepreneurial activities with social impact. In this context, sustainability-oriented innovations represent new responses to pressing social demands and environmental problems. For instance, SocialFare is committed to development and implementation of new ideas (products, services and models) to meet social needs and create new social relationships or collaborations. 'Social innovations are innovations that are social in both their ends and their means. They are innovations that are not only good for society but also enhance an individual's capacity to act' (SF). Therefore, to support sustainability-oriented innovation, it is important to define a clear strategy based on knowledge sharing. As a matter of fact, 'know-how (or knowledge) is at the core of the network and refers to the strong will to share expertise in different fields (e.g., smart mobility, smart tech, metaverse). For instance, acceleration models, especially those in which mentorship is provided, aim at sharing know-how, making it available so that others can grow' (FCRT and OGR).

Knowledge (and its sharing) is the driver, but it is not enough. 'Knowledge ecosystems include actors who develop new ideas and translate them into business practices' (INC). Furthermore, 'there are different categories of knowledge that can be shared. For instance, information on the markets (already owned by other participants) is often more relevant than scientific knowledge or know-how to guarantee organisations' going-concern' (AC). Nevertheless, the incentive should be clear: 'all the players involved will obtain a return from this cooperation' (CG). 'A model only based on altruism does not work' (RG).

TABLE 2 Coding structure.

First-order coding	Second-order coding	Third-order coding
• Holistic decision-making for sustainability • Keep a clear focus on objectives and innovative capacities • Share a purpose as meaningful vision of sustainability-oriented innovation • Pragmatism in decision-taking for sustainability-oriented innovation • Co-construction of a shared strategic vision • Scoping the change and imagine impacts • Definition of clear deadlines related to short-, mid-, long-term policy outputs	Network design	Metagovernance forms
• Acknowledging interconnectedness among knowing-that and knowing-how • Transferability of knowledge and skills across actors • Ensuring reciprocity and multidisciplinary in project planning • Care of the territory • Creation and maintenance of relational co-participation in a network of actors • Building transparency and clarity of communication	Network framing	
• Balancing expertise • Measuring impact of policies • Monitoring targeted results • Promoting mentorships for accelerating scalability • Training, learning by doing and delegating tasks • - Sharing projects to the network in a proactive way	Network management	
• Top-down and bottom-up open-minded partnerships • Specific role of actors within the ecosystem • Increasing number of actors with sustainability-oriented innovation capabilities within the ecosystem • Strategic relevance of specific actors with dedicated skills • Inclusive horizontal and vertical cooperation among actors • Involving stakeholders with inclusivity to get better results • Sustain cooperation by sharing effectiveness gains from joint projects	Network participation	
• Insufficient capacity to share knowledge • Predominance of competition • Top-down approach for governing the ecosystem • Information asymmetry • Institutional mechanisms delay • Cultural and local boundaries against innovation • Lack and misuse of financial resources • - Lack of trust among actors	Weaknesses of governance styles	Hierarchical, network, and market governance as stand-alone logics

Source: Authors' elaboration.

Concepts such as reciprocity and complementarity characterise this strategic phase, and they can produce a multiplier effect as a consequence of synergies. A correct mix of entities involved in different fields is the key to enhancing value creation through the sharing of knowledge (FCRT and OGR). 'This mix cannot take into account only for-profit entities but also public entities, non-profit entities, and others' (LG). This mix is affected by conditions related to the context and type of initiative. In some cases, some stakeholders (or participants) are more relevant than others (FCRT and OGR). At the base of an ecosystem there are relationships (FCRT, OGR and INC). 'Knowledge between the parties involved is the channel that allows minimising information asymmetry, reducing transaction costs, and favouring actions' (LG).

Cooperation and the attitude to act as an aggregate entity are seen as competitive advantages. This allows participants to combine skills and reduce weaknesses. 'The surrounding context now is not only an exogenous variable, but we experienced it as an element of competitive advantage as a rare and sought-after raw material. The evolution in recent years has led to this consideration: You have to collaborate!' (LG). A variety of skills is crucial and is at the base of cooperation in a local context (FCRT and OGR). For instance, the researcher does not have to fill the gap from start (idea) to finish (products), but support is needed. 'There is a clear distinction between the researcher's idea of innovation and the business model' (INC). Start-ups probably have a lot of innovation, but many times, their business models are fragile. 'When an idea is born it is easier to embed it into a company which then allows the entrepreneur (and the researcher) to capitalise that knowledge' (INC). Furthermore, there are projects (e.g. artificial intelligence) that need a plurality of components for their development, such as data and know-how. It is difficult for a company to provide all of them by itself; for this reason, ambitious initiatives require joint ventures or partnerships in which the 'currency of exchange' is the know-how (RG). Knowledge sharing means trading resources (assets, data, etc.) and related time of the people involved (this means relevant expenses).

An ecosystem not only requires a common language but also transparent and shared targets when the perspectives are different. For correct framing, 'it is necessary to establish a common language' (LG). In fact, 'participants aim to speak a common language in the ecosystem. And they require equal times and equal engagement mechanisms' (LG). Time is necessary: 'a common forward-looking perspective based on specific deadlines must be defined' (AC). This means that it becomes important to share common medium- and long-term targets that require specific and practical strategies for the short term and the long term. These targets are 'transparently shared and they should be achieved with constancy over time' (INC). Therefore, strategic planning fosters cooperation as suggested hereafter: 'If everything is shared, networks and its participants understand faster' (SF) and 'if you are faster, when there are opportunities, you are more ready to seize their benefits' (LG). 'Being on time is the only way to achieve satisfactory returns for all network participants' (AC). They are the consequence of a common purpose, and 'this purpose is essential for the survival of the ecosystem' (LG). In the end, this approach induces local communities to focus their efforts on certain specific industries, improving their specialisation (FCRT and OGR).

The relationship between ecosystems and sustainability is strong. Both cooperation and dialogue are crucial. They are vital not only in properly addressing the commitments for sustainability but also to co-construct a shared strategic vision towards sustainable development (Devalle et al., 2021). Cooperation and dialogue are at the base of the definition of a common purpose, and they address 'higher quality of life for the local communities as the consequence of a proliferation of the entities involved in the system' (CI). The focus is on the value created for the community. This attitude is strengthened by new generations (FCRT, OGR and INC). 'When young people think about new businesses, they only take into account sustainable business models' (FCRT and OGR). 'It is deemed necessary to recognize that economic value is generated from social value' (SF).

In summary, the initial phase of impact designing and framing starts from the acknowledgment of some social and environmental challenges which can turn into social impact and change through the development of strategies on social innovation.

4.2 | Network management and network participation for managing sustainability-oriented innovations

Once the impact strategy is designed and framed, it is important to implement appropriate models, products, services and processes to accelerate sustainability-oriented innovation. In so doing, actors within the ecosystem should manage tools and methodologies by balancing scientific knowledge with entrepreneurial skills (INC). Both technical and business skills need to be 'jointly included in a single process in which all the actors define specific commitments' (CG). Therefore, management procedures address an experimental approach that hybridises competencies and practices as a system and combines in a collaborative and open way experts with different backgrounds, professionality, competencies with a common goal: to develop relevant innovation for supporting the improvement of people and communities' lives by generating social progress (SF). In other words, 'an inclusive approach is recommended' (FCRT and OGR) to favour an interdisciplinary interaction between actors in different fields (LG). Institutions are very important, as well as local businesses and accelerators, to create a proper puzzle (FCRT and OGR). 'Accelerators and innovation centers can play the role of intermediate functioning bodies of the ecosystem by spreading and conveying culture and information' (SF). This network needs facilitators that favour relationships and exchanges between players (UT) 'introducing a matrix approach (also multidimensional) with a cross cut' (CSP). For this reason, 'education and training are crucial' (UT). 'In this context, after the promotion of basic concepts regarding sustainable development, a very practical and tangible approach is needed to stimulate sustainability-oriented innovation' (SF).

'Knowledge is the glue, but then execution is needed. Definitely being pragmatic and practical is essential' (CG). An example is mentorship, which links senior and skilled professionals (or entities) with those who have just landed in that field. 'A continuous turnover of collaborators and employees does not create continuity' (FCRT and OGR). Today, there is no longer a person who teaches another person to work. This similarity is applicable to ecosystems. Thus, it is necessary to choose the right participants who are able to dialogue with each other and to provide support as mentors in their respective fields (FCRT and OGR). 'Cooperation means sharing of information, but also a support for its interpretation and use in a specific context' (AC). It is also necessary to avoid everyone doing everything (FCRT and OGR); otherwise, the 'roles and responsibilities of the subjects are not clear, and this generates misleading and overlays' (LG).

Network participation addresses top-down and bottom-up open-minded partnerships, in the sense that actors have a mentality oriented to the dialogue, exchange and debate to get into a discussion that is open towards different and new perspectives (FCRT and OGR). 'A conservative approach does not address innovation and cooperation' (AC). Furthermore, 'a collaborative and peer-to-peer vision based on tuning activities to learn from others' (SF). In a knowledge ecosystem, participants are equal, and everyone cooperates. 'A change in perspective from an ego-system to an eco-system is needed' (CSP). Another characteristic of network participation relates to cooperation by sharing effectiveness gains from joint projects. If a business is green but alone, its efforts are relevant, but its comprehensive impact is limited. On the contrary, 'if it also involves its stakeholders (at least) the supply chain, the impact is greater and the efforts can be mitigated' (SF). On the other side, 'sustainability is a big challenge and cooperation is the most natural approach to address it' (AC).

4.3 | Weaknesses of governance styles

Our findings reveal some concerns in governing a knowledge ecosystem that limit the development of knowledge sharing and sustainability-oriented innovations. 'Sustainability commonly refers to ESG, but bearing in mind that governance (G) supports environmental (E) and social (S) challenges' (FCRT and OGR). Therefore, 'overcoming these limitations means improving governance mechanisms' (INC). The first drawback refers to competition against collaboration. 'Sometimes, current rules and policies favour competition and not collaboration' (SF, CSP and UT). 'If the competition is pushed to the highest levels, it compromises sharing activities' (UT). 'If competition is seen as a stimulus to improve business, that is positive, but we do not have to exacerbate it. We have to address both cooperation and competition joining co-opetition' (SF and CSP). An equilibrium between competition and cooperation fosters knowledge sharing improving the value created among stakeholders. 'Cooperation allows us to create a system of links and incentives that stimulate the actors to work together, not going to change the mechanisms with which these subjects implement decisions but creating interdependencies' (CSP).

Another concern related to stand-alone applications of governance style is the top-down approach to governing the ecosystem. 'Weak forms of collaboration, with low barriers to entry, cannot encourage knowledge sharing or lead to lasting results in value creation' (RG). 'Coordination can come from below or from above' (INC). 'A decision maker has a vision to identify priorities and the capacity to translate it into strategic planning. The banking foundations already opted to introduce all the stakeholders represented in light of the size of the bodies' (FCRT and CSP). Territorial committees can better understand the needs of different stakeholders (e.g. banks with local advisory boards). However, these bodies have non-homogeneous governance rules, so finding third-party bodies that make them dialogue can be an advantage. A council ad hoc that assigns to the various actors the activities is important for the ecosystem. Public administration can play a fundamental role 'because if you are going to accelerate innovation, you have to facilitate the companies with a key role' (LG). For this reason, another option is a decentralised organisation without a central body in charge of the ecosystem's management. To make this option available 'the individual participants in the ecosystem must operate considering shared rules that combine the different interests' (RG). It is possible if the ecosystem sets specific targets and it moves towards the achievement of specific results (FCRT, OGR and AC). With hierarchical or market governance, the risk is a lack of trust which undermines relationships. 'Cooperation is based on relationships, and those depend on trust' (SF). Another weakness of this setting is the need to be specialised and not generalist, 'without a balanced governance the risk is the loss of concreteness in the execution phase' (AC). It is also necessary to have a vision of which sectors best support the generation of a critical mass (CSP). Furthermore, there is a fundamental problem with resource allocation (UT). 'Banks have not developed a specific credit system for start-ups yet' (INC). However, there are non-profit entities that decided to limit subsidies to companies but intervene in the context, for instance, infrastructures that allow start-ups to obtain resources (CSP).

5 | DISCUSSION

In this article, building inductively from data on the governing mechanisms, strategic visions and managerial practices of actors operating in a knowledge ecosystem, we identify a metagovernance approach for sustainability-oriented innovation that drives collaborative value creation and systemic change within this specific setting. We frame the conditions for governance based on metagovernance forms in a knowledge ecosystem, where there are fragmented political systems based on a degree of autonomy for actors within a network (Cobben et al., 2022). Figure 2 shows the conceptual framework of metagovernance forms as powering layers to foster sustainability-oriented innovation in a knowledge ecosystem.

Overall, this framework identifies governing forms of metagovernance that contribute to sustainability-oriented innovation for collaborative value creation bounded in a knowledge ecosystem that

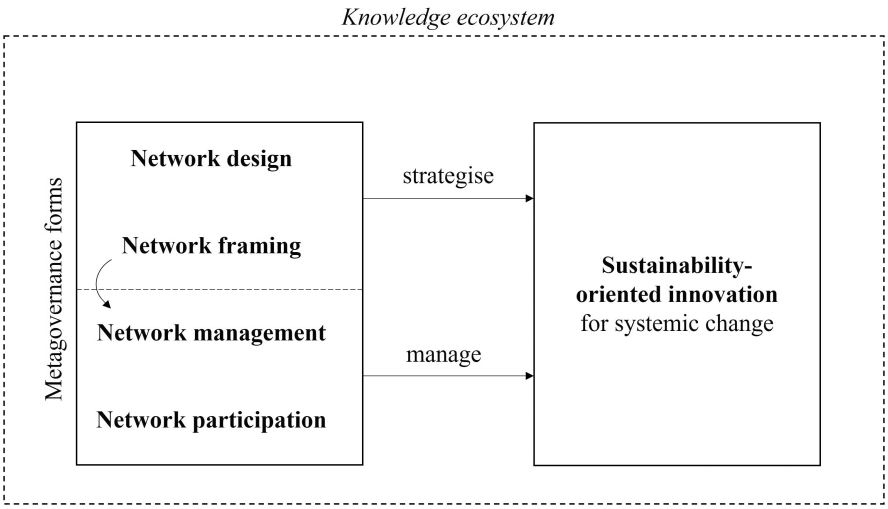

FIGURE 2 Theoretical framework.

favours systemic change. Our framework also explicates how actors within a knowledge ecosystem elucidate strategies and operationalise managerial procedures for enhancing sustainability-oriented innovation in a logic of collaborative value creation. The framework of these governing forms supports the conceptualisation provided by Sørensen (2005), which addresses 'metagovernance' as the channels and tools used by public authorities and other actors to govern various forms of collaborative arrangements, without excessive reliance on traditional forms of command and control (Sørensen & Torfing, 2017).

Within the context of the knowledge ecosystem, metagovernance is the governing approach of designing and managing a set of situational preferences and enhancing coordination among actors, which consequently drives systemic change. Metagovernance is the governing approach that regulates the network of actors through both hands-off and hands-on strategies (Mariani et al., 2022). As a matter of fact, our findings demonstrate that metagovernance addresses a situational view based on a range of factors resulting from the different governance styles of diverse actors and organisations in the knowledge ecosystem. The knowledge ecosystem addresses a balanced combination of managerial strengths, institutional capabilities and relational approaches to enhance sustainability-oriented innovation through equitable service delivery, improved transparency and accountability (Chaurasia et al., 2020). This means that metagovernance addresses opportunities related to sustainability-oriented innovation implementations within the knowledge ecosystem and therefore integrates different governance styles with the aim of improving proactive decision-making, collaborative participation and collective actions. Thus, balanced coordinated actions at the local, national and global levels (Sørensen & Torfing, 2011) enable sustainability with an open innovation logic (Urbinati et al., 2023).

Our findings show that network design and network framing strategise sustainability-oriented innovation because these forms frame the overall strategic vision related to a holistic decision-making approach. Among the main network design and network framing forms sorted out from our findings, we have a co-construction of a shared vision by acknowledging interconnectedness among knowing-that and knowing-how, reciprocity and transdisciplinary project planning, inclusive horizontal and vertical cooperation among actors with innovative skills within the ecosystem and a clear focus on objectives and innovative capacities. Further, network management and network participation contribute to operationally managing sustainability-oriented innovation because these forms set the managerial procedures necessary to turn visions into concrete actions. Among the main network management and network framing forms sorted out from our findings, we have top-down and bottom-up open-minded partnerships, transferability of knowledge and skills across actors, training and learning by doing, including tasks related to measuring the impact of policies, and monitoring targeted results.

Furthermore, our findings also show the weaknesses of governance modes, which are sorted out from the mere application of a standalone approach to hierarchical, market and network governance separately and not in balance. In other words, weaknesses arise from the application of pure stand-alone styles of hierarchical governance, market governance and network governance (Meuleman, 2018) in the knowledge ecosystem. Shortcomings result from lack of trust among actors, excessive competition, cultural and local boundaries against innovation, lack, misuse of financial resources and a top-down approach for governing the ecosystem, among others. These issues represent the main characteristics of the main modes of hierarchical, market and network governance, if applied as standalone (Meuleman, 2018). To overcome these concerns resulting from stand-alone modes of governance, it is important to find an appropriate balance of coopetition, calibrated policies and appropriate tools and instruments that can integrate different perspectives in favour of sustainability-oriented innovation. This means that actors do not have to lose their sustainability-oriented innovation priorities, and more importantly, they have to align the sustainability-oriented innovation with concrete needs to find supporting and context-specific solutions. In synthesis, through our exploratory qualitative research, we find that metagovernance forms drive sustainability-oriented innovation leading to collaborative value creation and systemic change. Furthermore, these revealed weaknesses confirm that metagovernance is the appropriate governing mechanism for the knowledge ecosystem, which combines and balances elements from the main modes of hierarchical, market and network governance.

6 | CONCLUSIONS

6.1 | Theoretical contributions

Our research contributes to the literature in several ways. The research covers the literature gap on the limited attention to the role of the knowledge ecosystem for the achievement of sustainable and/or social value (Cobben et al., 2022). Furthermore, prior literature on knowledge ecosystem calls to delineate governance mechanisms to align partners, prevent opportunistic behaviour and realise the joint value proposition (Cobben et al., 2022).

Our study advances this debate by theorising metagovernance as the governing mechanism that simultaneously addresses economic, social and ecological outcomes in the knowledge ecosystem. We theoretically inform the pursuit of sustainability-oriented innovation in the knowledge ecosystem by revealing the governing mechanisms which facilitate this achievement. We frame the following metagovernance forms: network design, network framing, network management and network participation. In detail, network design and network framing constitute the strategy for the pursuit of sustainability-oriented innovation. Network management and network participation are managerial mechanisms leading to sustainability-oriented innovation. Together, these metagovernance forms support the pursuit of sustainability-oriented innovation.

This study contributes to the literature on sustainability-oriented innovation by acknowledging metagovernance as the appropriate governing mechanism that balances the activities and processes

of sustainability-oriented innovation for becoming and being sustainable. Indeed, each metagovernance form has a precise role in supporting the definition of the strategy or managing the sustainability-oriented innovation.

Ultimately, the theoretical novelty of this research lies in addressing the literature of knowledge ecosystems and the one of sustainability-oriented innovation for the first time by addressing governance mechanisms that balance conflicting social, environmental and financial objectives among all relevant actors in the ecosystem.

6.2 | Practical implications

This study has practical implications for actors (e.g. businesses, banking foundations, start-ups, public administration, universities, and innovation hubs) within a knowledge ecosystem because it addresses their role in the development of sustainability-oriented innovation. As such, our study shows which forms of metagovernance could be exploited by actors pertaining to knowledge ecosystem aiming to define and catalyse sustainability-oriented innovation for system change. Furthermore, this study also discusses the strengths of metagovernance forms and weaknesses of the stand-alone governance mechanism implementation, that actors can adopt and avoid to catalyse sustainability oriented innovation. This practical knowledge has implications for discussion about 'the degree to which regulation of self-regulation is at all possible, and whether metagovernance enables and qualifies actors to undertake the task of governing in a fruitful way or rather to limit and constrain local actors' (Damgaard & Torfing, 2011, p. 306). Our study suggests that metagovernance supports the development of sustainability-oriented innovation in the knowledge ecosystem for positive contributions to societal steering.

Furthermore, this study provides examples of sustainability-oriented innovations for actors within a knowledge ecosystem. Developing pathways for capacity building and capacity empowerment, encouraging business ideas and sustainable business models for value creation, promoting projects in the fields of art, culture, education and research, welfare and territory and supporting research, business planning, networking, modelling impact partnerships, investment readiness to develop relevant innovation for social progress may be framed as tools for strengthening entrepreneurship. These examples of sustainability-oriented innovations related to stakeholder engagement activities and sustainable business models for value creation are at the interplay between open innovation and sustainability-oriented innovation as suggested by Urbinati et al. (2023).

6.3 | Limitations and further research

This study is surely not without limitations. First, this study has been applied to the context of Turin, and it is not certain that it can be applied to other research settings. The findings do not explain new sustainability-oriented innovation; our research focuses on the drivers that lead to sustainability-oriented innovation. Moreover, an increase in the number of interviews may positively enhance the generalisability of the results. In addition, due to the heterogeneity of the actors, further research could replicate the same study by narrowing down a particular category of actors (e.g. start-ups and SMEs or institutions).

Since our research is exploratory in nature, future research can analyse new metagovernance forms to enhance the current stream of research on governance for sustainable development. We hope that future research will further investigate sustainability-oriented innovation in other novel ecosystem settings, such as the purpose ecosystem, in order to suggest how actors can further scale sustainability-oriented innovation towards sustainable development.

AUTHOR CONTRIBUTIONS

The authors contributed equally to the development of the article.

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Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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APPENDIX A

A.1 | Interview protocol.

1. Can you briefly describe your organisation?
2. Which entrepreneurial skills can foster sustainability-oriented innovation in the knowledge ecosystem?
3. Which organisational attitudes can favour sustainability-oriented innovation in the knowledge ecosystem?
4. Which institutional mechanisms (if any) can favour sustainability-oriented innovation in the knowledge ecosystem?
5. How does the city of Turin foster innovations with social and environmental impact?
6. Which could be the governing mechanisms to enhance sustainability-oriented innovation in the knowledge ecosystem?