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Orchestration, multi-layered embeddedness, and value creation in organized innovation spaces

Viktória Buday

viktoria.buday@stud.uni-obuda.hu

Obuda University

Magnus Klofsten

Linköping University

György Eigner

Obuda University

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Abstract

This research examines the strategic transformation of Organized Innovation Spaces (OISs) within the Innovation 5.0 paradigm. Drawing on Systematic Qualitative Content Analysis of 96 analytical units from the IASP 2025 global discourse, the study investigates how OISs evolve from technocentric infrastructures into human-centric, resilient societal anchors. The findings reveal a multi-dimensional taxonomy of value creation, comprising seven distinct forms: economic, social, environmental, infrastructural, process-related, digital, and regulatory. A key contribution is the development of a Conceptual Framework for Value Creation Embedded in Contexts, which addresses gaps in innovation ecosystem and embeddedness literature. The framework demonstrates that value activation is non-linear and shaped strategically by four layers of embeddedness: local, regional, national, and global. Comparative analysis highlights a strategic divergence between contexts: mature economies emphasize socio-cultural integration, whereas Emerging Markets leverage digital and regulatory value to leapfrog traditional industrial stages. By positioning the OIS as a proactive orchestrator within the Quintuple Helix Model, the study provides both managers and scholars with a roadmap to navigate complex institutional environments and to foster inclusive, sustainable urban innovation.

1. Introduction

In the mid-2020s, the global landscape is defined by a polycrisis, where climate change, socio-economic instability, and post-pandemic recovery pressures converge (European Commission, Joint Research Center, Muench et al., 2024). Addressing these interconnected challenges requires innovation approaches that go beyond traditional industrial silos and align with the United Nations Sustainable Development Goals 2030 (United Nations, n.d.) and European Union policy frameworks (European Parliament, 2015). In this knowledge-driven context, innovation is no longer solely a driver of growth; it is essential for systemic resilience and societal survival (Etzkowitz, 2006).

OISs, encompassing Science Parks, Innovation Districts, and Living Labs, are undergoing a profound transformation in response to these dynamics. Historically, Science Parks served as policy instruments to catalyze regional development through physical infrastructure (Phillimore, 1999). Today, the knowledge economy emphasizes shifting locational preferences, density, and the integration of urban and industrial systems (Katz & Wagner, 2014). This evolution aligns with the paradigms of Society 5.0 and Industry 5.0, which emphasize human-centricity, sustainability, and organizational antifragility as drivers of continuous value creation (Carayannis & Morawska-Jancelewicz, 2022; Corvello, Cimino & Felicetti, 2023).

Despite the global spread of OISs, academic research remains heavily concentrated on advanced economies, creating a significant gap in our understanding of dynamics in Emerging Markets (EMs) (International Monetary Fund, 2021; Nielsen, Hannibal & Larsen, 2018). These markets are rapidly industrializing and integrating into global networks, often requiring alternative development strategies to achieve successful innovation outcomes (Radošević, 1999; Radošević & Myrzakhmet, 2009). Moreover,

existing evaluations of OIS-impact have largely relied on traditional economic metrics (Albahari, Klofsten & Rubio-Romero, 2018; Bigliardi et al., 2006), which often overlook the social, cultural, and environmental dimensions central to the Innovation 5.0 paradigm (Löfsten & Klofsten, 2024; Troisi, Visvizi & Grimaldi, 2023).

This research addresses these gaps by proposing a multi-dimensional Enhanced Value-Creation Framework for OISs. The framework advances the field from a Triple Helix perspective to a Quintuple Helix model (QHM), explicitly integrating civil society and the natural environment as core beneficiaries (Etzkowitz & Leydesdorff, 2000; Carayannis & Campbell, 2010). It emphasizes that value creation is not monolithic but emerges from the orchestrated interactions of multiple actors across overlapping contextual layers. Central to this approach is the principle of contextual embeddedness, which highlights how regional, institutional, and socio-political conditions shape OIS outcomes (Autio et al., 2014; Welter, Baker & Wirsching, 2019). While Science Parks may act as growth poles, their success depends on the interaction between internal agency and external environments (Birkner, Mészáros, & Szabó, 2022; Xie et al., 2018).

Methodologically, the study employs a systematic cross-national content analysis of proceedings from the 42nd International Association of Science Parks and Areas of Innovation (IASP) World Conference in Beijing (Bengtsson, 2016). This dataset provides an unfiltered view of managerial perspectives on high-quality development in both mature and emerging markets. The analysis focuses on value creation mechanisms and the strategic networking practices that enable OISs to function as hubs of continuous co-creation (Cadorin, Klofsten & Löfsten, 2021, 2023; Freeman, 2010; Mora-Valentín, Ortiz-de-Urbina-Criado, Nájera-Sánchez, 2018; Mahajan et al., 2023; Saad & Agogué, 2024).

The study offers theoretical and practical contributions. It advances theory by detailing how OISs are evolving into dynamic interorganizational hubs capable of managing multiple layers of value creation. It also provides actionable insights for managers seeking to design strategies that are sensitive to local, regional, national, and global contexts. By addressing both mature and emerging market contexts, the study highlights pathways for leapfrogging conventional industrial development stages through strategic prioritization of digital, governance, and process-oriented value.

The article is structured as follows. Section 2 establishes the theoretical foundation by reviewing literature on innovation ecosystems and Society 5.0. Section 3 identifies the research gap and formulates the core research questions. Section 4 outlines the research methodology and systematic qualitative content analysis of the Beijing 2025 dataset. Section 5 presents empirical results, illustrating the diversification of value forms and the role of strategic networks. Section 6 discusses these findings in relation to existing scholarship, emphasizing the implications for OIS design and management and offering strategic recommendations for future inquiry into the development of human-centric, sustainable, and contextually embedded OISs. Section 7 concludes by synthesizing the research contributions.

2. Literature review

2.1 The evolution of innovation ecosystems

The concept of Innovation Ecosystems (IESs) originates from ecological thinking, where interdependent actors contribute to collective survival and adaptation (Tansley, 1935). In management research, this metaphor was introduced to explain how firms co-evolve through collaboration beyond traditional industry boundaries (Moore, 1993). Early conceptualizations emphasized geographically concentrated clusters as engines of competitiveness (Porter, 1998), later expanded by national innovation systems stressing institutional and policy conditions for innovation (Furman, Porter & Stern, 2002). Contemporary IES research shifts attention from spatial concentration toward dynamic interaction and value co-creation among heterogeneous actors. Unlike clusters, which focus primarily on geographic proximity and localized spillovers, IESs emphasize complementary contributions organized around a shared value proposition (Kapoor, 2018; Autio et al., 2018). Actors maintain autonomy while interacting through modular structures and evolving roles (Adner, 2006; Granstrand & Holgersson, 2020). Digitalization further transforms ecosystem dynamics by enabling virtual collaboration and new forms of orchestration. Network structures, centrality, and brokerage positions become critical determinants of innovation performance regardless of physical location (Kang et al., 2022). Within this perspective, knowledge spillovers and entrepreneurship function as mechanisms through which new knowledge is transformed into economic and societal value (Acs et al., 2008; Audretsch, 1995). This study adopts the IES lens to conceptualize OISs as arenas that intentionally orchestrate knowledge flows among diverse actors. Rather than static infrastructures, OISs are understood as dynamic intermediaries shaping collective value creation across organizational and territorial boundaries.

2.2 The shift toward value 5.0 and the helix model

Recent innovation discourse reflects a transition from efficiency-driven innovation toward broader societal value creation. While Industry 4.0 emphasized automation and technological integration, emerging frameworks such as Society 5.0 and Industry 5.0 highlight human-centricity, sustainability, and resilience as core innovation outcomes (Keidanren, 2016; Ghobakhloo, 2020). In addition, in empirical researches run in emerging economies, human capital played definitive role in sustainable growth (Sheergujree & Khan, 2026), while transformational leadership had both direct and indirect effect on firm performance (Arundel et al., 2007). This shift redefines innovation value beyond economic performance alone. Environmental sustainability and social inclusion increasingly complement traditional indicators of competitiveness (Oslo Manual, 2018; Potocan, Mulej, & Nedelko, 2021). Consequently, IESs must accommodate multiple stakeholder interests and reconcile economic, social, and environmental objectives.

To conceptualize these interactions, helix models offer a structured framework: the Triple Helix describes collaboration between university, industry, and government, while the Quadruple Helix extends this by including civil society as an active actor in democratized knowledge production. (Carayannis &

Campbell, 2009). The Quintuple Helix, which explicitly integrates the natural environment, is particularly relevant for analysing sustainability-oriented innovation (Carayannis & Campbell, 2010).

In this study, the QHM is adopted as the primary analytical framework because it aligns with the Value 5.0 perspective and captures the ecological and societal dimensions increasingly shaping innovation strategies. Rather than treating helix models as competing alternatives, they are understood as cumulative extensions reflecting expanding conceptions of value creation. OISs are therefore examined as platforms where multi-helix interactions are deliberately orchestrated to balance technological progress with societal and environmental goals.

2.3 Embeddedness, context, and the divergence of markets

Embeddedness constitutes the central theoretical lens of this study. Embeddedness theory argues that economic actions are shaped by social, institutional, and spatial contexts rather than occurring in isolation (Welter, Baker & Wirsching, 2019). For OISs, success depends on how effectively activities align with local institutional structures, cultural norms, and market conditions (De Silva, Howells, & Meyer, 2018; Lundvall, 2010). The importance of context becomes particularly visible when comparing innovation environments across different developmental stages. In EMs, OISs frequently serve as policy instruments aimed at economic upgrading and industrial modernization, whereas in mature economies they often support specialization and knowledge-intensive urban development (García-Vidal et al., 2025; Radošević, 2022). These contextual differences influence governance models, actor roles, and innovation priorities.

Embeddedness also helps explain why identical innovation models yield divergent outcomes across regions. Institutional capacity, regulatory regimes, and socio-cultural conditions shape the ability of actors to collaborate and absorb knowledge. Urbanization trends further illustrate this contextual dependency, as innovation activity increasingly shifts toward integrated urban environments where multiple stakeholders co-exist (Esmaeilpoorarabi et al., 2020). However, with consumption rising and infrastructure pressures, urbanization also exerts downside-effects on ecological footprint (Sheergujree & Khan, 2026). Through positioning embeddedness as the core explanatory mechanism, this study moves beyond universalized innovation models and instead examines how OISs adapt to specific territorial and institutional contexts. The QHM serves as a complementary framework for analysing how these contextual differences influence stakeholder interactions and value priorities. See the study's conceptual model in Fig. 1.

2.4 Typologies and variations of OISs

OISs represent a diverse set of institutional configurations designed to facilitate collaboration and innovation. Early archetypes such as Science Parks emerged as purpose-built environments connecting research institutions and firms, often located in suburban settings (Löfsten & Lindelöf, 2003). Over time, new forms have developed, including urban Innovation Districts and Living Labs, reflecting shifts

towards open, user-centered, and urban innovation environments (Katz & Wagner, 2014; Schuurman, McPhee, & Leminen, 2025).

Despite structural variation, these spaces share a common function: acting as intermediaries that coordinate knowledge flows and reduce collaboration barriers among diverse actors (Howells, 2006). Differences primarily lie in governance structures, spatial integration, and strategic objectives. Science Parks typically rely on formal management teams, while Innovation Districts may operate through distributed governance arrangements (Sanz et al., 2023).

Recent research highlights a transition from purely economic evaluation toward broader measures of societal and environmental impact. This reflects growing expectations that OISs contribute not only to regional competitiveness but also to sustainability and social value creation (Berbegal-Mirabent et al., 2020). Rather than developing an exhaustive taxonomy, this study focuses on how different OIS configurations shape managerial practices and innovation outcomes across contexts. The comparison between mature and emerging markets is therefore interpreted through differences in embeddedness rather than through fixed typological categories. This synthesis identifies three key gaps: limited cross-national comparative research, insufficient theorization of non-economic dimensions of embeddedness, and a lack of frameworks linking managerial orchestration to Society 5.0-oriented value creation.

Table 1
Comparative context of key EMs in the study sample.

Sources: World Bank, 2025a, 2025b, 2025c, 2025d); WIPO, 2025; IASP Directory, 2025; TRT World, 2025. Compiled by Authors

Country	Economic Context (The World Bank, 2025)	Innovation Ranking (WIPO, 2025)	OIS Volume & Key Parks	Key TBL Challenges & OIS Mandate
China (Asia)	High-income; projected 4.5% Gross Domestic Product (GDP) growth (2025). Focus on technological self-reliance.	Global Top 10 (Leader in Asia). High output metrics (patents, scientific publications). Significant increase in electric vehicles, robots. 24 clusters in the world's top innovation clusters.	169 + State-level Science Parks E.g., Zhongguancun Science Park (Beijing).	Environmental: Severe air/water quality issues. Social: Regional wealth disparity, migrant integration. OIS mandate is *Industrial Strategy Implementation*.
Brasil (Americas)	Upper-middle income; moderate, volatile growth (2.2%) Large internal market complexity.	Global Top 52. Strength in creative outputs and Research & Development (R&D) expenditure relative to GDP. São Paulo (medical technology as top patent field), cluster in the world's top innovation clusters.	Approx. 100 + Technology Parks and Incubators. E.g. Porto Digital (Recife), São José dos Campos.	Environmental: Deforestation and biodiversity loss. Social: Chronic poverty and social exclusion. OIS mandate is *Regional Economic Diversification*.
Turkey (Europe/ Asia)	Upper-middle income; high structural inflation and volatility. Strong construction/ infrastructure sectors. Growth expected at 3.1%.	Global Top 43. Strength in business sophistication and knowledge diffusion. Istanbul (pharmaceuticals as top patent field) cluster in the world's top innovation clusters.	113 Active Technoparks E.g., METU Technopark (Ankara).	Environmental: Rapid, often unplanned urbanization and seismic resilience. Social: Youth unemployment and brain drain. OIS mandate is *Technology Transfer and Commercialization*.
Kenya (Africa)	Lower-middle income; strong service sector growth. Global leader in mobile money and fintech adoption.	Global Top 102 (Leader in East Africa). Strength in ICT services and market sophistication. Increase in R&D investments, 5G infrastructure.	Focus on large-scale infrastructure projects. E.g., Konza Technopolis (Smart City/ Techno-Hub).	Environmental: Climate change vulnerability (droughts/floods). Social: Digital divide and access to basic services. OIS mandate is *Digital Infrastructure and Skill Development*.

3. Methodology

3.1 Identification of research gaps and problem statement

The existing body of knowledge on OISs reveals two central limitations. First, the literature shows a pronounced geographical imbalance. Empirical studies are predominantly situated in mature innovation systems (Hansson, Husted & Vestergaard, 2005; Hobbs, Link & Scott, 2017), which limits the transferability of existing theoretical insights to EMs. In EM contexts, OISs frequently operate within state-led paradigms and regional restructuring agendas that shape innovation processes differently (Klofsten et al., 2015; Kovács & Petruska, 2014; Pálmai, 2004; Radošević & Myrzakhmet, 2009; Tchalakov, Mitev & Petrov, 2010). Second, existing evaluations rely heavily on economic performance indicators (Siegel, Waldman, & Link, 2003). Such approaches insufficiently capture the systemic and multidimensional value creation emphasized in the QHM (Carayannis & Campbell, 2010). As OISs increasingly evolve from isolated Science Parks toward more integrated urban innovation environments, stakeholder relationships involving public actors and citizens become more central to strategic development. These limitations indicate a need for comparative research exploring how OISs articulate value and strategic priorities across diverse contexts and levels of embeddedness.

3.2 Research aim and questions

The overarching aim of this study is to provide a contemporary, cross-national interpretation of OIS impact by analysing the strategic discourse of global OIS leaders through the lens of contextual embeddedness (Welter, Baker & Wirsching, 2019). This objective responds directly to the identified research gaps by moving beyond economically centred evaluations and by comparing strategic orientations across mature and emerging innovation contexts.

To operationalize this objective, the study addresses the following research questions:

RQ1: What are the dominant thematic categories—economic, social, and public—used by global OIS actors to define value creation within their current operational and future transformative mandates?

RQ2: How are strategic linkages with Quintuple Helix stakeholders and global partners reported and justified across OISs in mature markets versus EMs?

RQ3: How does the external operating environment and contextual embeddedness influence the stated strategic priorities for both general and urban-specific value creation?

The focus on value creation within urban contexts is substantiated by the urbanization of 87.9% of global Science Parks (IASP, 2024). This shift necessitates structural density and new interpretations of proximity within the knowledge economy (Katz & Wagner, 2014). At the same time, the study acknowledges that OIS impact extends beyond spatial boundaries by integrating regional and global value propositions.

3.3 Research methodology: - systematic qualitative content analysis

Research on OISs employs diverse qualitative and quantitative approaches, with qualitative methods dominating due to the conceptual fluidity of OIS typologies. Exploratory qualitative research is particularly suitable for addressing complex “why” and “how” questions (Eisenhardt, 1989). Examples include stakeholder interviews and reflexive case studies (Katz & Wagner, 2014; Wamsler et al., 2024), observational studies of OIS transitions (Kalliomäki, Oinas & Salo, 2024), and semantic analyses of sustainability strategies (Dorrego-Viera et al., 2025). Content analysis has also been employed to typologize Science Parks and map societal roles (González-Martínez, García-Pérez-De-Lema & Castillo-Vergara, 2025; Klofsten, Löfsten & Albahari, 2025).

Building on this methodological foundation, this study applies Systematic Qualitative Content Analysis (SQCA) to generate categories from textual data (Bengtsson, 2016; Erlingsson & Brysiewicz, 2017; Krippendorff, 2022). SQCA enables systematic interpretation of managerial discourse while remaining sensitive to contextual meaning structures. The approach aligns with critical research traditions by providing insights into how value propositions are articulated beyond reductive economic metrics (Alvesson & Deetz, 2021; Gehman et al., 2017).

The study followed a structured research protocol using relationship maps to ensure transparency and analytical rigor (Watson & Webster, 2020). This provided a clear audit trail connecting data conceptualization to theoretical contribution and clarified how context shapes forms of value creation within IESs.

The empirical material consists of strategic discourse presented at the 42nd IASP Global Annual Conference in Beijing (September, 2025). Conferences function as primary arenas for discussing emerging innovation strategies beyond retrospective analyses (Strijbos et al., 2006). The sample includes 96 analytical units from five continents (IASP, 2025), representing both mature markets and EMs in transition.

The unit of analysis was defined as a meaning unit conveying a specific strategic intention. The analytical process combined manifest analysis, capturing explicit themes, with latent analysis aimed at identifying underlying strategic intentions. Deductive codes were derived from the research questions and established conceptual models, while inductive coding captured emerging patterns. The coding process was anchored in the QHM and contextual embeddedness.

Researcher bias was addressed through a dual-coder system. One researcher conducted on-site observations at the conference, combining doctoral training with professional management experience, while co-authors contributed established academic expertise in entrepreneurial research and informatics. Observations were triangulated with official conference proceedings to reduce subjective

interpretation. Ethical standards were maintained through formal consent from IASP regarding the use of disclosed data.

Intercoder Reliability was applied to ensure research reliability (O'Connor & Joffe, 2020). A digital text-analytics assistant functioned as a secondary coding instrument to challenge category boundaries and reduce interpretive inertia. The code list was refined to clarify distinctions between activity, context, linkage, and value codes. Remaining disagreements primarily related to segment selection or secondary coding decisions and were resolved through consensus, prioritizing value-creation outcomes when coding economic statements.

Intercoder agreement reached approximately 78%, indicating substantial reliability (Campbell et al., 2013). The Krippendorff alpha coefficient was not applied because the data did not satisfy assumptions of equal code usage probability (Krippendorff, 2004). An exclusivity rule was applied to overlapping meaning units to prioritize the primary thematic focus. The finalized coding structure is presented in Table 3, while Appendix Tables 4–6 document raw data, coding evolution, and geographical distribution of sources.

Table 2
Coding framework applied, along with academic references. Compiled by Authors

RQ Focus	Code	Academic Justification
Value Creation	VAL_ECO, VAL_SOC, VAL_PUB/ENV	Triple Bottom Line (Elkington, 1994); Stakeholder expectations (Berbegal-Mirabent et al., 2020); The need to move beyond reductive economic metrics (Siegel, Waldman & Link, 2003); Social innovation value creation, new innovation paradigm (Howaldt, 2019).
Linkage & Orchestration	LINK_HEI, GOV, IND, CIV, GLOB	QHM (Carayannis & Campbell, 2010, Carayannis, Barth, & Campbell, 2012); Helix Trilogy – overview of Triple, Quadruple and Quintuple Helix from theory and practice (Carayannis & Morawska-Jancelewicz, 2022); Success factors of technology parks in Triple Helix Model (Ferreira de F., de O. Ramos & Castro, 2018); Societal needs (Saad, Tremblay & Agogué, 2024), Stakeholder-management (Cadorin et al., 2021; Germain et al., 2023)
Contextual Embeddedness	CON_POL, URB, CHALL, ECO	National Systems of Innovation (Lundvall, 2010); Institutional embeddedness of entrepreneurial behaviour (Welter, Baker & Wirsching, 2019); Entrepreneurial contexts (Autio et al., 2014); Urban re-integration (Esmaeilpoorarabi et al., 2020); Open innovation and policy regulations (Silva et al., 2020).
Temporal Action	ACT_PRES, ACT_FUT	Future research avenues on strategic re-orientation (Lecluyse, Knockaert & Spithoven,, 2019; Troisi, Visvizi & Grimaldi., 2023; Wright, Link & Amoroso, 2019).

Table 3
Final coding structure applied after ICR and completed with the „discriminant capability of the coding scheme" (Campbell et al., 2013). "D" refers to Deductive codes, and "I" refers to Inductive codes. Compiled by Authors

RQ Focus	Code	D/I	Definition and Decision Rule
RQ1: Value Creation	VAL_ECO	D	Economic value, Financial/Market Impact: Metrics related to job creation, investment attraction, and corporate profitability.
	VAL_SOC	D	Social, societal value, Human/Community Impact: Focus on talent development, social inclusivity, and public health outcomes.
	VAL_PUB/ENV	I	Public or environmental value, Systemic Urban Impact: Influence on urban governance, infrastructure resilience, and territorial reputation.
RQ2: Linkage & Orchestration	LINK_HEI	D	High Education Institutional link, Academic Partners: Collaboration with High Education Institutions (HEIs), R&D centers, and research institutes.
	LINK_GOV	D	Governmental link, Institutional Partners: Interaction with municipal, state, or supranational regulatory bodies.
	LINK_IND	D	Industry link, Market Partners: Engagement with corporations, Small and Medium Enterprises (SMEs), and entrepreneurs.
	LINK_CIV	D	Civic link, Social Partners: Involvement of community groups, local residents, and Non-Governmental Organizations (NGOs).
	LINK_GLOB	I	Global link, International Partners: Strategic exchange with international entities and OISs in foreign jurisdictions.
RQ3: Contextual Embeddedness	CON_POL	D	Political Context: Mentions of political stability, legislative frameworks, or specific governance models.
	CON_URB	D	Urban context, Geographical Context: Focus on density, growth, or specific urban scenes and settings.
	CON_CHALL	I	Challenges, Complexity/Crisis: References to climate change, equity gaps, or systemic digital shifts (Polycrisis).
	CON_ECO	D	Economic Context: Regional/national economic base or global competitiveness indicators.
General: Temporal Orientation	ACT_PRES	D	Present activities, Current Strategy: Descriptions of ongoing operations, existing governance, or established tactical plans.

RQ Focus	Code	D/I	Definition and Decision Rule
	ACT_FUT	I	Future activities, Strategic Vision: Expression of long-term goals or explicit transformative intentions (identified by future tense).

4. Results – strategic priorities and value creation in global OIS discourse

This chapter presents findings from the SQDA of 96 analytical data sources (ds) derived from the IASP 2025 conference, complemented by a documentary audit of official OIS platforms. The results are structured explicitly around the three research questions to ensure analytical alignment between findings and study objectives.

4.1 Global distribution and strategic projects

The dataset reflects a strong representation of EMs, with Asia accounting for 42,7% of the discourse. EMs primarily frame OISs as instruments for industrial upgrading and state-led economic transformation, whereas mature markets emphasize the renewal and specialization of existing innovation clusters.

Examples include the Zhongguancun (ZGC) Global Digital Economy City in China, which integrates 5G infrastructure and digital twins to support urban industrial development (ZGC Official Site, 2025), and Norrköping Science Park in Sweden, which highlights participation in global IoT collaborations through the MindSphere World Collaboration (Norrköping SP Official Site, 2025). These examples illustrate variation in strategic orientation while confirming the global spread of OIS models across differing institutional contexts.

4.2 Research findings - the multi-dimensional taxonomy of value

RQ1 examines how OIS actors define value creation across economic, social, and public dimensions. The analysis identifies three dominant thematic categories corresponding to the value taxonomy.

4.2.1 Economic, digitization, and regulatory value (VAL_ECO)

Economic value remains the most frequently articulated dimension across cases. Strategic discourse emphasizes bridging Technology Readiness Levels and Business Readiness Levels to enable commercialization (UTSTP Official Site, ds2.8.4). EM examples include Chinese innovation corridors and co-funded plasma technology initiatives in Thailand (ds1.3.4; ds1.3.5; ds2.5.2), while mature market examples focus on high-quality employment and specialized incubator ecosystems (ds1.1.5; Norrköping

SP, 2025). Digitization appears as a supporting mechanism for economic value, particularly through data infrastructures and digital platforms such as the Shuzhi Artificial Intelligence Industry Alliance (ds1.1.2; ds1.4.1). Regulatory frameworks and intellectual property systems are frequently referenced as enabling mechanisms (ds1.3.1; ds2.1.4; ds2.5.1; ds2.9.2). Across contexts, OISs are positioned as intermediaries reducing financial and commercialization risk through venture partnerships and co-funding schemes.

4.2.2 Social, cultural, and human well-being value (VAL_SOC)

Social value themes reflect the transition toward Innovation 5.0, emphasizing human capital development, upskilling, and inclusivity. EM cases highlight workforce development and digital training programs such as the Talent Bridge initiative (ds1.1; ds2.2.2), while mature markets emphasize well-being through urban design and environmental integration (ds2.9). Additional themes include preservation of architectural heritage (ds2.4.1), community engagement initiatives, and mechanisms promoting risk tolerance and social interaction. These findings indicate that OISs increasingly frame social cohesion and talent retention as core strategic outcomes.

4.2.3 Public, civic, and environmental value (VAL_PUB/ENV): Resilience and shared assets

Public and environmental value is framed through resilience and sustainability agendas. Examples include carbon monitoring initiatives such as the K-Red program in Kilometro Rosso Science Park in Italy (Kilometro Rosso Official Site, 2025), and investments in shared green infrastructure (ds2.4). Environmental discourse emphasizes carbon reduction, water-efficient production, and adaptive urban reuse (ds2.10.1; ds2.3.1; ds1.13; ds6.3). OISs are presented as facilitators of shared infrastructural assets that combine physical and digital functions, supporting broader community and environmental objectives.

4.3 RQ2: Strategic Linkage (LINK_) and Internal Governance Mechanisms

RQ2 focuses on how strategic linkages with Quintuple Helix actors and global partners are articulated and justified across contexts.

The analysis shows that OISs are positioned as intermediaries facilitating collaboration between academia, industry, government, and civil society. International collaborations such as ECONUTRI (ds2.8.2) and networked ecosystems like the Empire State Development system (NY ESD, 2025; ds2.14.2) illustrate how global partnerships extend local innovation capacity.

Internal governance mechanisms support these linkages through structured orchestration practices. Venture studio models, ISO 56000 standards, and co-governance processes are frequently referenced as tools for coordinating collaboration (ds2.5.1; ds2.5.4; ds2.6.3). Semantic clusters such as “orchestration”

and “co-creation” indicate that managerial discourse increasingly emphasizes facilitation rather than centralized control.

Examples such as Inova Unicamp (Inova Unicamp, 2025) and PIT São José dos Campos (ds2.12.8) demonstrate how governance structures mediate stakeholder relationships and support collaborative innovation across institutional boundaries.

4.4 RQ3: Contextual influence, embeddedness, and antifragility

RQ3 examines how contextual embeddedness influences strategic priorities and value creation narratives.

Findings show that external institutional environments strongly shape OIS strategic orientation. In EMs, national policy frameworks such as China’s 14th Five-Year Plan directly influence OIS priorities and integration with urban development agendas (ds1.1). In mature markets, strategies emphasize inclusivity and resilience through localized governance approaches, as seen in the GCID Venture Studio in Glasgow (ds2.12.1).

Embeddedness also emerges through industry specialization and regional constraints. OISs focused on sectors such as robotics develop integrated service systems to manage long R&D cycles and investment demands (ds2.12.8). Cases such as Tecnopuc in Brasil demonstrate adaptive responses to shocks, highlighting resilience through strategic reconfiguration (UNDRR Report, 2025).

Across contexts, OISs function as nodes connecting local ecosystems with global networks, while aligning strategic priorities with regional institutional conditions. The findings demonstrate that contextual embeddedness shapes both strategic narratives and operational priorities.

4.5 General: synthesis of emerging themes - digital transformation, future industries, and OIS evolution

The qualitative analysis identified several cross-cutting themes that indicate a shift in the strategic orientation of OISs. These inductively derived categories — digital infrastructure, future-industry specialization, and cultural ecosystem development — demonstrate how OISs are adapting to increasingly complex and dynamic innovation environments.

4.5.1 The digital and data imperative

Digital transformation emerges as a central enabling mechanism for connectivity and coordination within OISs. Strategic discourse emphasizes the creation of virtual innovation arenas that extend collaboration beyond physical spatial boundaries. Data platforms function as key linkage infrastructures, supporting the exchange of ideas, prototypes, and knowledge across actors and locations. OISs increasingly integrate digital tools with renovated physical spaces, thereby connecting legacy

infrastructure to contemporary industrial demands. In addition, digital environments are positioned as testbeds for technologies addressing urban and societal challenges.

4.5.2 Future industries and specialized ecosystems

A strong orientation toward future industries — such as AI, robotics, and smart mobility — appears as a defining feature of contemporary OIS strategies. In EMs, this orientation is often reinforced by national policy agendas, including China's 14th Five-Year Plan, which prioritizes advanced industrial development and integrated value chains. These industry specializations require OISs to provide one-stop support systems covering the full innovation lifecycle, particularly for technologies characterized by long development cycles and high capital intensity. As a result, many OISs adopt multi-sector configurations to respond to rapidly changing market demands.

4.5.3 Cultural fertilization and OIS diversification

The findings also highlight the increasing importance of cultural and social mechanisms within OIS development. Initiatives such as community-oriented innovation programs and interactive platforms foster communication and collaboration among actors. This cultural dimension supports OISs in reducing barriers related to trust, collaboration, and intellectual property concerns, strengthening their role as intermediaries within open innovation ecosystems.

Across these themes, the findings indicate a broader evolution in OIS identity. OISs are increasingly positioned as orchestrated, knowledge-based environments rather than primarily real-estate developments. This transition is reflected in three recurring characteristics: proactive orchestration of diverse stakeholders, increased emphasis on systemic resilience, and more complex place-branding strategies integrating technological, social, and environmental narratives.

4.5.4 Comparative landscape of OIS development

The comparative analysis reveals a common trajectory toward knowledge-based ecosystem models, but with distinct contextual emphases. EMs primarily emphasize integration through the development of full-stack industrial chains and infrastructure expansion. Mature markets place greater emphasis on quality-of-life enhancement and sustainability compliance. Despite these differences, both contexts converge around the use of digital infrastructures to connect legacy physical environments with the requirements of the digital economy.

A summary of these comparative findings is presented in Table 4.

Table 4
Summary of findings compared in emerging versus mature economies. Compiled by Authors

Feature	EMs	Mature Economies
Value Priority	VAL_ECO & VAL_PUB: Driving national industrial catch-up and large-scale infrastructure (TRL to BRL).	VAL_SOC & VAL_PUB: Social inclusion, cultural empowerment, and ISO sustainability compliance.
Linkage Focus	LINK_IND & LINK_GLOB: Vertical integration and technology acquisition via global networks (e.g., ECONUTRI).	LINK_CIV & LINK_GOV: Horizontal integration with local communities and TBL urban renewal.
Contextual Driver	CON_POL: Alignment with national mandates (e.g., Five-Year Plans). Focus on scaling.	CON_CHALL: Focus on micro-urban issues (affordable housing, heritage) and integration.
OIS Typology	Science Park Clusters: Peri-urban corridors connected by policy (e.g., Yangtze River Delta).	Innovation Districts: Embedded urban cores focusing on high-quality daily life.
Similarities	Co-creation: Both reject transactional utility for co-management. Digital: Both leverage 5G/AI for borderless ecosystems.	
Key Difference	Leapfrogging: EMs bypass stages through digital/governance value.	Refinement: Mature markets focus on optimization of existing social/urban fabrics.
OIS Typology	Science Park Clusters/Corridors: Often located peri-urban, but connected by policy/infrastructure (e.g. Yangtze River Delta).	Innovation Districts: Embedded within the urban core, focusing on integrated, high-quality urban life.

6 Discussion – a conceptual framework for value creation

This chapter integrates global strategic discourse with the theoretical foundations of the QHM and embeddedness. The combined analysis demonstrates that OISs are moving away from narrow technocentric logics toward an expanded form of orchestration that brings technological, human, social, and environmental dimensions into the same strategic arena.

6.1 Aligning strategic discourse with the evolving OIS paradigm

The systematic analysis confirms a pronounced shift toward the QHM as a guiding structure for contemporary innovation spaces, reflecting the increasing need to respond to complex urban and societal challenges (Hallin, Karrbom-Gustavsson & Dobers, 2020). The findings indicate that the traditional Triple Bottom Line no longer captures the breadth of outcomes associated with modern OIS activity. In response, this study identifies seven distinct value dimensions that form a multi-level taxonomy capable of explaining the diverse forms of agency exercised within OIS contexts.

6.1.1 Enhanced value-creation framework for innovation 5.0

Building on the empirical patterns, the study advances an Enhanced Value-Creation Framework in which OISs operate as active coordinators of seven strategic value dimensions:

- Addresses the transition from TRL to BRL and supports sustainable commercialisation. It strengthens regional economic performance through targeted job creation, illustrated in China's innovation corridors (ds1.3.4; ds1.3.5) and the University of Tehran Science and Technology Park, Iran (ds2.8.4).
- Supports human capital development and a balanced relationship between people and urban environments. This includes upskilling initiatives and investments in well-being, demonstrated at the Beijing Satellite Manufacturing Factory SP, China (ds2.4.1) and within Singapore's Garden Industrial Town (JTC Official Site, 2025).
- Focuses on low-carbon strategies, water efficiency, and adaptive reuse of industrial structures. Initiatives such as carbon monitoring at Kilometro Rosso, Italy (ds2.10.1) and Colombia's Ruta-N FutuMed 2035 vision (ds1.1.3) strengthen the environmental helix.
- Extends beyond real estate through the creation of phygital assets, community anchors, and the revitalisation of historically significant industrial districts, illustrated in Buenos Aires, Argentina (ds2.9.2) and Konza Technopolis in Kenya (ds2.2.2).
- Involves co-governance structures, venture studio models, and adherence to established standards such as ISO 56000 (ds2.5.1), enhancing organisational learning and process efficiency, shown at Technopuc, Brasil (ds2.5.4).
- Converts data resources into digital capital through integrated platforms and distributed data infrastructures, as seen in the ZGC Shuzhi AI Industry Alliance, China (ds1.1.2) and the North Rift Green Industrial Park, Kenya (ds1.3.3).
- Encompasses frameworks that support fair value allocation, intellectual property stewardship, and confidence-building reforms, illustrated within the Basque Country Technology Park, Spain (ds1.3.1) and Z-Park Changping Park, China (ds2.9.2).

These seven dimensions illustrate how OISs are evolving into societal anchors. Their success is increasingly defined not through economic output alone, but through their capacity to integrate multiple value layers into robust, future-oriented ecosystems.

6.2 Embeddedness as a multi-layered strategic determinant

This research extends the application of embeddedness theory to OIS contexts (Hernández-Chea et al., 2021). While previous work emphasises context as an inherent part of the innovation process (Autio et al., 2014; Welter, Baker, & Wirsching, 2019), the findings indicate that OISs operate within – and

strategically navigate – four interconnected layers of embeddedness. Each of the seven value dimensions outlined in Section 6.1 emerges within these layers:

- Involves micro-urban integration, such as heritage conservation, mobility improvements, and neighbourhood renewal, exemplified at Shouchuang-Langyuan Station (ds2.14.4).
- Aligns OIS strategies with specialised clusters and regional economic conditions, demonstrated in Norrköping (ds2.10.3).
- Reflects national mandates, industrial strategies, and long-term policy frameworks, as seen in ZGC's strategic configuration (ds1.1.2).
- Engages with transnational innovation networks, digital capital flows, and cross-continental research collaborations, illustrated in the ECONUTRI initiative (ds2.8.2).

6.2.1 Strategic divergence and synergy - mature versus emerging economies

The comparative analysis addresses long-standing concerns about the transferability of OIS models across economic stages (Radošević & Myrzakhmet, 2009). The dataset points to clear differences in how value is prioritised. EMs, particularly in Asia and Latin America, operate under high-pressure national imperatives that promote accelerated industrial upgrading while maintaining connections with local communities through adaptive reuse projects. Mature economies place stronger emphasis on local and regional dynamics, focusing on socio-cultural quality, urban refinement, and stringent sustainability standards. The divergence stems from the dual demands placed on EMs: rapid national development on one hand and local social stabilisation on the other.

6.3 The new conceptual framework - value activation matrix

Table 5 summarises the core theoretical contribution of this study by mapping the seven identified value dimensions across two economic contexts. The matrix illustrates the activation potential of each value form and demonstrates that value creation is context dependent rather than universally distributed. While digital and data related value dimensions appear as strategic priorities across all contexts, the activation of social, regulatory, and infrastructural value varies according to institutional conditions and levels of embeddedness.

This finding suggests that IESs should not be assessed through fixed performance criteria. Instead, value creation emerges through context specific combinations of priorities shaped by local and national environments.

Table 5
Value-Creation Importance/Potential by Economic Context. Configured by Authors, based on research findings

Value Dimension	EMs	Mature Economies	Strategic Focus Difference
Economic Value	High	Medium	EM: Industrial catch-up; Mature: Niche optimization.
Social Value	Medium	High	EM: Upskilling/Reskilling; Mature: Wellness/Inclusion.
Environmental Value	Medium	High	EM: Dual carbon strategy; Mature: ISO compliance/Circular.
Infrastructural Value	High	Medium	EM: New city-scale assets; Mature: Adaptive reuse/Heritage.
Process & Governance	Medium	High	EM: Co-building; Mature: ISO 56000/Standardization.
Digitization & Data	High	High	Synergy: Both prioritize 5G/AI as borderless hubs.
Regulatory Value	High	Medium	EM: Policy-led mandates; Mature: IP/Co-creation protocols.

6.4 Non-linearity and the leapfrogging potential in EMs

One of the most significant findings concerns the non-linear nature of value creation in OISs. Contrary to assumptions that innovation systems evolve progressively from economic growth toward social and environmental maturity, the results indicate that Organized Innovation Spaces in Emerging Markets may bypass intermediate stages by combining digital transformation with governance innovation. Ruta N in Colombia (ds1.1.3) illustrates how digital infrastructure and public private collaboration can accelerate regional transformation without following traditional industrial pathways. Such leapfrogging strategies depend on alignment between local needs and national policy frameworks. When institutional conditions are supportive, OISs function as societal anchors that integrate economic, social, and environmental objectives simultaneously. This finding reinforces the QHM by demonstrating that innovation outcomes emerge from systemic coordination rather than isolated economic activity.

6.5 Implications for theory and practice

6.5.1 Practical implications for OIS managers

The transition toward Innovation 5.0 implies that management must move beyond technocentric optimization toward broader socio-economic resilience. Managers increasingly act as orchestrators of heterogeneous stakeholders rather than administrators of physical infrastructure. This requires balancing digital transformation with concerns related to ethics, data security, and societal impact (Troisi, Visvizi & Grimaldi, 2023). Governance emerges as a strategic capability rather than an

administrative function. Co-building models and collaborative orchestration strengthen adaptability and competitive advantage, particularly in environments characterised by uncertainty and policy volatility (Löfsten & Klofsten, 2024).

6.5.2 Theoretical implications

This research bridges several critical gaps identified in the literature review, moving beyond the traditional view.

The study shifts attention from static configurations of actors toward dynamic orchestration processes. Ecosystem performance depends not only on actor composition, but also on how collaboration is framed and coordinated (Nambisan & Sawhney, 2011).

- Rather than viewing OISs as real estate-based innovation infrastructures, the findings position them as societal intermediaries capable of aligning local needs with broader innovation agendas.
- Empirical evidence supports the transition toward the Quintuple Helix perspective, where environmental and societal dimensions function as strategic variables integrated into core innovation processes rather than external constraints.
- The principal theoretical advancement lies in demonstrating that value is contextually activated. By linking value forms to multiple layers of embeddedness such as local, regional, national, and global levels, the study shows how institutional positioning shapes strategic priorities (Welter, Baker & Wirsching, 2019). This extends the traditional Triple Bottom Line toward a seven-dimensional understanding of value within contemporary innovation ecosystems.

6.6 Limitations and future research

This study draws primarily on strategic discourse from conference proceedings, which reflects intended strategies rather than long term performance outcomes. The material therefore captures forward looking narratives rather than operational realities. Self-representations by OIS managers may also overemphasise successes and understate challenges. The geographic concentration of cases from Asia may amplify state-led perspectives.

Future studies should combine qualitative and quantitative approaches to connect discourse with measurable outcomes (Klofsten, Jones-Evans & Schärberg, 1999). Interview based studies could further explore how contextual embeddedness influences managerial decisions, while multi-level research incorporating public perceptions and regulatory perspectives would deepen understanding of how value is activated across scales. Additional attention should be directed toward data sovereignty and digital ethics as central dimensions of innovation governance (Calzada & Almirall 2019; Hunter et al., 2024).

7 Conclusions

7.1 Review of research objectives and questions

The overarching aim of this study was to provide a contemporary, cross-national interpretation of the impact of OISs in urban environments. Through a systematic analysis of the strategic discourse of global OIS leaders, the study addressed three central questions. First, it identified the dominant thematic categories used to define value creation, namely economic, social, and public dimensions. Second, it examined strategic linkages within the QHM, revealing a shift from transactional relationships toward co evolutionary networks. Third, it explored how contextual embeddedness shapes strategic priorities for urban value creation.

The findings demonstrate that modern Innovation Districts and Living Labs are deeply integrated into the urban fabric and operate through multi scalar forms of coordination. This integration requires increasingly sophisticated approaches to value orchestration that combine economic objectives with social and environmental considerations.

7.2 Integration of research contributions

The chapters collectively build toward a coherent conceptual synthesis. The literature review established the transition toward human centric and sustainability-oriented Innovation 5.0 and identified a significant research gap regarding the role of OISs in EMs. The methodology ensured analytical rigor through SQCA of 96 analytical units. The results revealed clear differences between mature and emerging contexts, including contrasts between state led development agendas and urban integrated venture models. The discussion subsequently interpreted these findings through the lens of embeddedness, highlighting multiple layers of contextual influence on strategic behavior.

Together, these stages provide an integrated explanation of how value creation within OISs is shaped by both internal agency and external institutional environments.

7.3 Primary research contribution: a context-embedded framework of value creation

The principal contribution of this research is the development of a conceptual framework that explains value creation in OISs as context embedded and multidimensional. The framework identifies seven interconnected value forms, including economic maturity, social symbiosis, environmental stewardship, infrastructural assets, process-oriented co-creation, digital capital, and regulatory governance.

Unlike previous approaches, the framework explicitly links these value forms to four layers of embeddedness. The findings show that institutional positioning functions as a strategic lever that determines which value dimensions are activated and prioritised. Furthermore, the framework demonstrates that value creation is non-linear. By emphasising digital and governance related value, OISs in EMs may leapfrog traditional development stages. The success of these spaces therefore depends on their capacity to navigate overlapping contexts, while aligning strategic action with national and local conditions.

7.4 Final reflections and practical path forward

This study suggests that evaluating OISs through purely economic metrics is no longer sufficient. Strategic development requires an embedded perspective that recognises the interaction between external policy environments and internal strategic agency. While external frameworks shape opportunities and constraints, long term success depends on organisational clarity regarding purpose, value priorities, stakeholder engagement, and networking strategies (Klofsten, Löfsten, & Albahari, 2025).

To strengthen their role as integrated urban anchors, OIS managers should conduct systematic audits of their multi layered embeddedness at local, regional, national, and global levels. Based on this assessment, organisations can develop coherent value creation roadmaps spanning short term, medium term, and long term horizons. Such strategic alignment enables OISs to address complex societal challenges while supporting more inclusive and sustainable innovation trajectories.

Declarations

Author Contribution

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Viktória Buday. The first draft of the manuscript was written by Viktória Buday. The conceptualization and manuscript development were performed by Viktória Buday and Magnus Klofsten. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Data Availability

The authors confirm that all data generated or analysed during this study are included in this published article.

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Figures

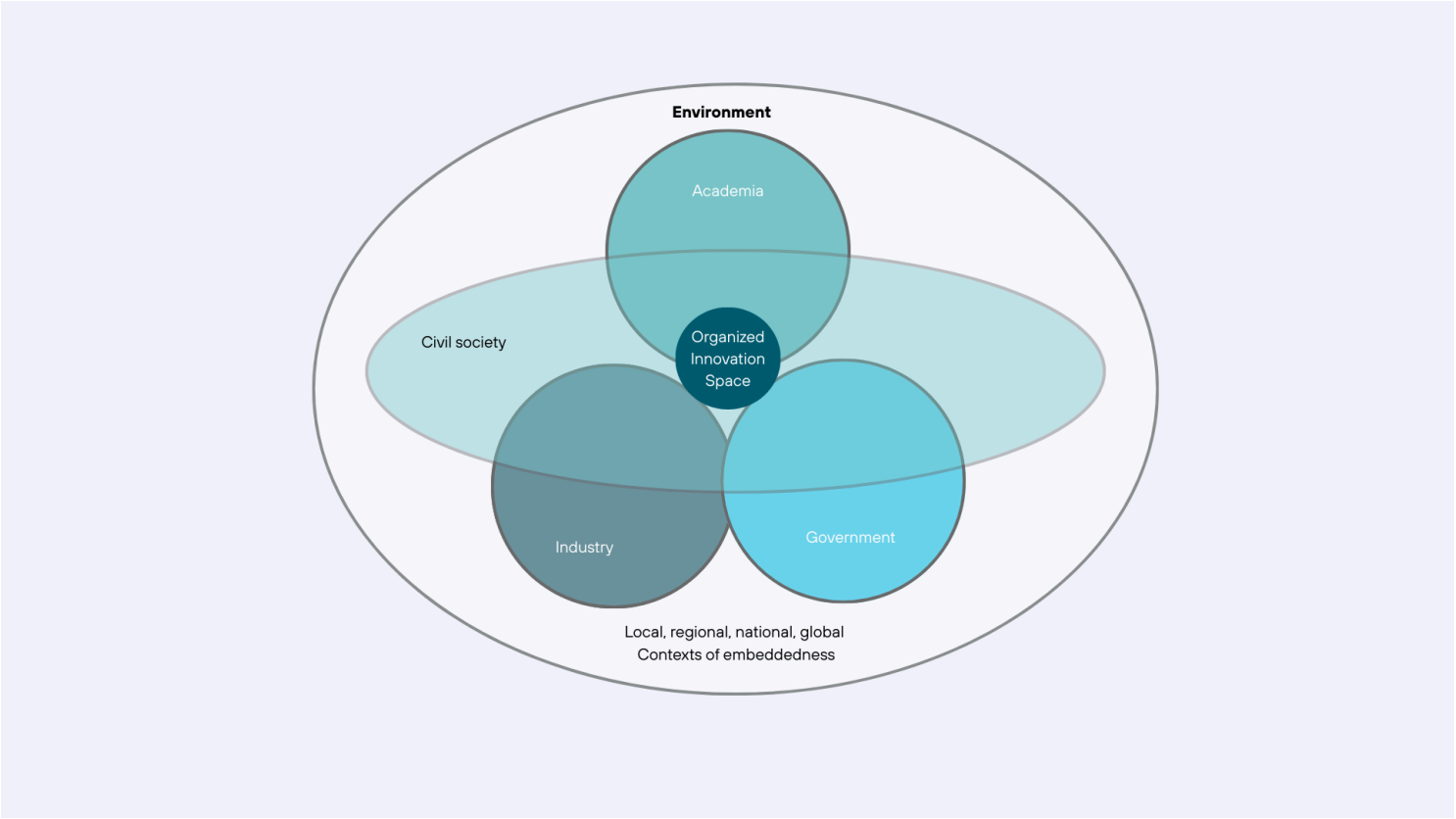


Figure 1

Visualisation of QHM, adapted from Carayannis & Campbell (2010), embedded in local and global contexts (illustrated with an overlay of „Environment"), adapted from Welter, Baker, & Wirsching (2019). Compiled by Authors, using Canva graphics program

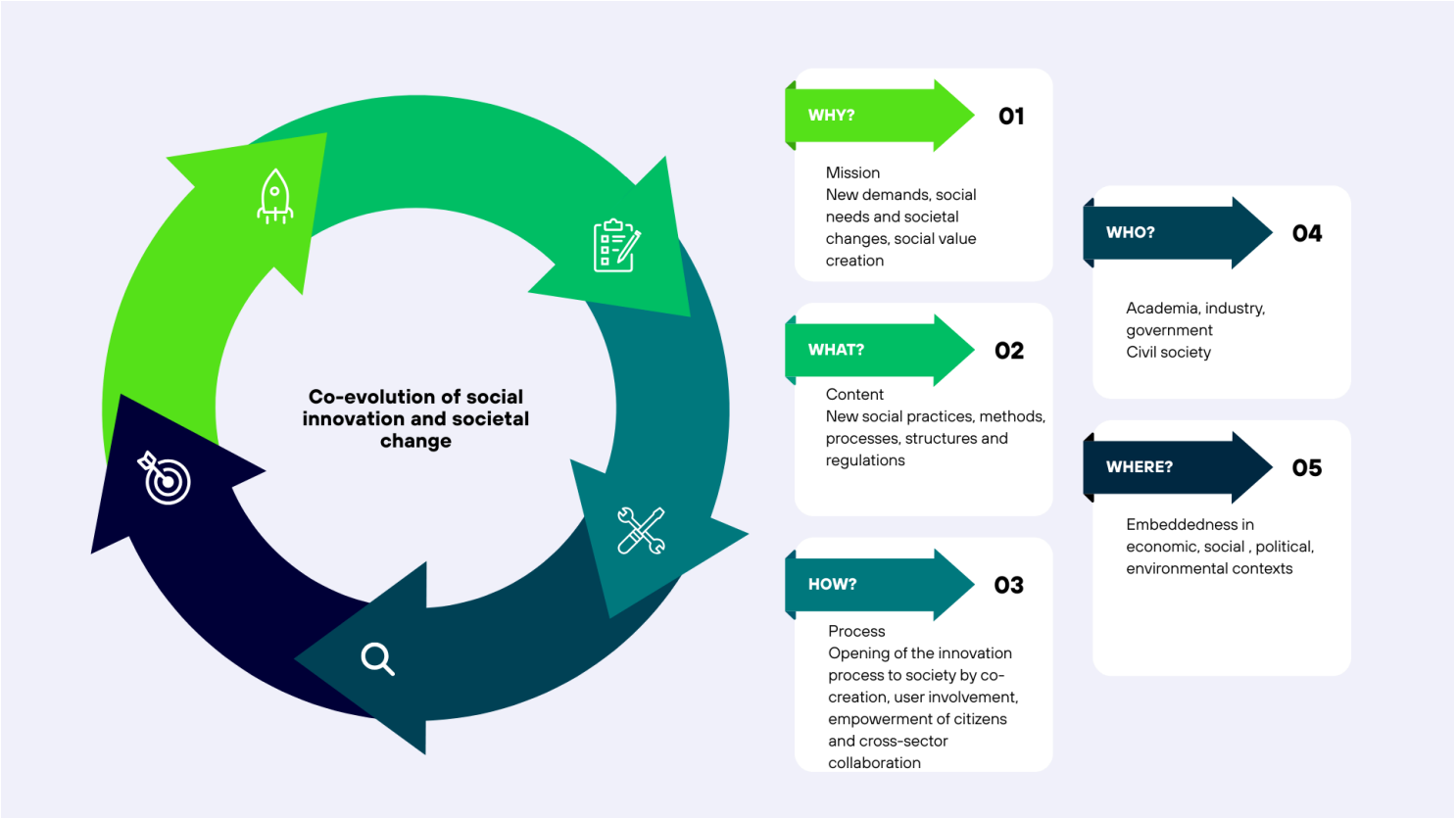


Figure 2

Forms of value creation, adapted from Howaldt (2019). Compiled by Authors, using Canva graphics software

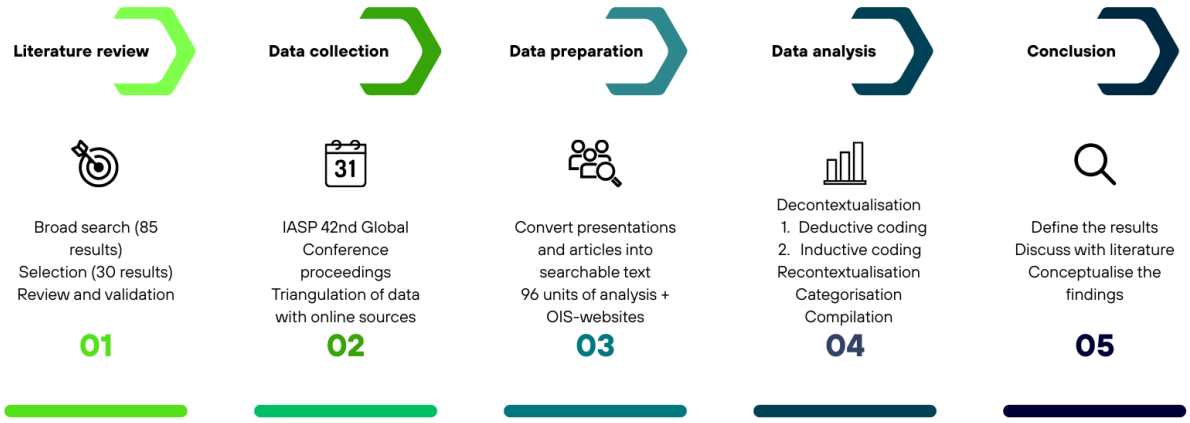


Figure 3

Systematic Qualitative Content Analysis Design adapted from Bengtsson (2016) In Phase 1. search query string 1. applied: „(TITLE-ABS-KEY(science park) AND TITLE-ABS-KEY(urban) AND TITLE-ABS-KEY(develop*) AND TITLE-ABS-KEY(innov*)) AND PUBYEAR > 1999 AND PUBYEAR < 2026". Search query string 2. applied: „(TITLE-ABS-KEY(science park) AND TITLE-ABS-KEY(urban) AND TITLE-ABS-KEY(develop*) AND TITLE-ABS-KEY(innov*) AND TITLE-ABS-KEY(policy)) AND PUBYEAR > 1999 AND PUBYEAR < 2026". Compiled by Authors, using Canva graphics software

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