

Innovation Intermediaries in Cross-Sector Partnerships: A Role-Phase Framework for Innovation in Wicked Problem Contexts

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Abstract: Cross-sector partnerships (CSPs) are increasingly mobilized to address wicked problems such as climate change, health inequalities, and energy transitions. While innovation intermediaries are widely recognized as critical actors in facilitating collaboration within such partnerships, existing research offers fragmented insights into how intermediary roles evolve over time and why particular forms of intermediation become salient at different moments in wicked problem innovation processes. Prior studies typically conceptualize intermediary roles as static or sector-specific, providing limited guidance for understanding their dynamic contribution across partnership phases. This paper addresses this gap by developing a role-phase framework that explains how innovation intermediary roles emerge, shift, and recombine throughout the lifecycle of cross-sector partnerships addressing wicked problems. Drawing on an integrative literature review, we synthesize insights from 20 empirical and conceptual studies examining innovation intermediaries operating within collaborations characterized by high knowledge uncertainty, value conflict, and dynamic complexity. These three dimensions of wickedness are used as analytical lenses to interpret how intermediary activities function as responses to changing collaboration challenges over time. Our analysis identifies seven recurring intermediary roles—convenor, mediator, learning catalyst, integrator, scoping leader, orchestrator, and policy advocate—and maps their associated mechanisms (e.g. trust building, sensemaking, alignment, coordination, and institutional influence) to distinct phases of the CSP lifecycle and the wicked problem innovation process. The framework shows that intermediary roles are not stable attributes but are enacted dynamically, with specific role configurations becoming more salient as partnerships move from problem-setting and direction-setting to implementation and review. By explicitly linking intermediary roles to phases of collaboration and dimensions of wickedness, this paper makes three contributions. First, it advances innovation intermediation research by introducing a processual, phase-sensitive perspective on intermediary roles. Second, it shifts analytical attention from intermediary activities to the underlying mechanisms through which intermediation enables collaboration under conditions of wickedness. Third, it provides a conceptual bridge between CSP lifecycle research and wicked problem innovation studies. The framework offers actionable insights for both scholars and practitioners seeking to design and govern intermediary support in collaborations addressing complex societal challenges.

Keywords: Innovation Intermediaries; Cross-Sector Partnerships; Wicked Problems; Literature Review

1. Introduction

Many of today's most pressing societal challenges such as climate change, biodiversity loss, and public health crises are widely characterized as wicked problems (Rittel and Webber, 1973; Danken, Dribbisch and Lange, 2016). These problems are persistent, interconnected, and resistant to definitive solutions, and are marked by high levels of knowledge uncertainty, value conflict, and dynamic complexity (Dentoni, Bitzer and Schouten, 2018; Van Tulder and Keen, 2018). As no single actor possesses the authority, knowledge, or resources to address such challenges alone, innovation increasingly depends on collective, cross-sector collaboration.

Cross-sector partnerships (CSPs) have emerged as a prominent organizational form for coordinating such collective innovation efforts (Selsky and Parker, 2005; Clarke and MacDonald, 2019). By bringing together actors from business, government, civil society, and academia, CSPs aim to integrate diverse resources and perspectives across multiple phases of problem exploration, solution development, and scaling (Gray and Purdy, 2018; Mair and Gegenhuber, 2021). However, despite their promise, many CSPs struggle to deliver timely or scalable innovation. Conflicting values, divergent incentives, ambiguous goals, and coordination challenges frequently undermine collaboration, particularly in early phases (Doh, Tashman and Benischke, 2019; Gray, Purdy and Ansari, 2022).

A growing body of literature suggests that innovation intermediaries can help CSPs overcome these challenges (Howells, 2006; Kivimaa *et al.*, 2019; van Hille *et al.*, 2021). Innovation intermediaries which are actors or organizations that connect, coordinate, and support collaboration among multiple parties, are argued to play a crucial role in facilitating learning, alignment, and orchestration across organizational boundaries. Yet, research on intermediaries in CSPs addressing wicked problems remains fragmented, sector-specific, and largely static

(Zhang and Liu, 2024). While individual studies identify intermediary functions such as convening, brokering, or orchestrating, they rarely examine how these roles evolve over time or how they relate to different phases of collaboration and problem-solving.

This paper addresses this gap by asking: What roles do innovation intermediaries play in facilitating cross-sector partnerships that address wicked problems, and through which mechanisms do these roles support collaboration across phases? To answer this question, we conduct an integrative literature review that synthesizes dispersed insights across innovation management, sustainability, and collaboration research. By linking intermediary roles to both CSP lifecycle phases (Stadtler and Probst, 2012) and the wicked problem innovation process (Elia and Margherita, 2018), we develop a role–phase framework that captures the dynamic nature of innovation intermediation.

2. Conceptual Background

2.1 Innovation Intermediaries

Innovation intermediaries are commonly defined as actors or organizations that support collaboration between multiple parties during different stages of the innovation process (Howells, 2006). They may take diverse organizational forms, including public agencies, non-profit organizations, research institutes, consultancies, networks, or temporary platforms (Winch and Courtney, 2007; Lee *et al.*, 2010). Prior research identifies a wide range of intermediary activities, such as knowledge brokering, network orchestration, facilitation, mediation, and support for experimentation (Howells, 2006; Caloffi *et al.*, 2023).

While recent reviews provide valuable overviews of intermediary types and functions, they tend to treat intermediary roles as relatively stable and context-independent (Kivimaa *et al.*, 2019; Noviaristanti, Acur and Mendibil, 2023). Moreover, much of this work focuses on sectoral innovation systems or sustainability transitions, paying limited attention to how intermediaries operate within CSPs explicitly aimed at addressing wicked problems. As a result, we still lack an integrative understanding of how intermediary roles vary over time and across different collaboration challenges.

2.2 Wicked Problems and Collective Innovation

Wicked problems are defined by ambiguous problem formulations, contested values, and evolving system dynamics (Rittel and Webber, 1973). Rather than treating wickedness as a general label for complexity, recent scholarship conceptualizes wickedness along three dimensions: knowledge uncertainty, value conflict, and dynamic complexity (Dentoni, Bitzer and Schouten, 2018). Knowledge uncertainty refers to fragmented and evolving understandings of both problems and solutions; value conflict captures divergent interests, priorities, and normative commitments among stakeholders; and dynamic complexity reflects feedback effects, interdependencies, and unintended consequences over time. This dimensional perspective clarifies why conventional innovation management approaches, often premised on stable problem definitions, clear objectives, and controllable solution pathways, frequently fail in wicked contexts. It also highlights why collaboration across organizational and sectoral boundaries is both necessary and inherently challenging, underscoring the critical role of innovation intermediation in enabling sensemaking, alignment, and adaptive coordination.

2.3 Cross-Sector Partnerships and Lifecycle Phases

CSPs typically unfold through recurring phases of problem setting, direction setting, implementation, and review (Gray, 1989; Stadtler and Probst, 2012). These phases align closely with the stages of the wicked problem innovation process, which include problem conceptualization, solution development, experimentation, implementation, and maintenance (Elia and Margherita, 2018). Understanding how intermediary roles relate to these phases is essential for explaining their contribution to collective innovation (Figure 1).

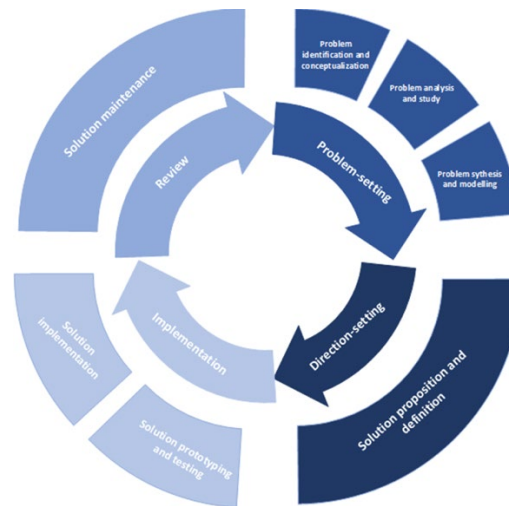


Figure 1: Integration of CSP life cycle (Stadtler and Probst, 2012) and wicked problem innovation process (Elia and Margherita, 2018)

3. Methodology

We adopted an integrative literature review methodology (Torraco, 2005) to synthesize existing research on innovation intermediaries in CSPs addressing wicked problems. A systematic database search (Web of Science, Scopus, ProQuest One Business) combined intermediary-related terms (e.g. intermediary, broker, boundary spanner, orchestrator) with keywords related to cross-sector collaboration and societal challenges. Following title, abstract, and full-text screening, 20 peer-reviewed studies were retained for in-depth analysis.

Data were coded iteratively, distinguishing between intermediary roles, activities, and underlying mechanisms. We mapped roles to CSP lifecycle phases and analysed how intermediary mechanisms respond to dominant dimensions of wickedness. An interpretive synthesis (Suddaby, Bitektine and Haack, 2017) was used to integrate findings into a coherent role–phase framework.

4. Findings: a Role-Phase Framework

The analysis identifies seven intermediary roles: convenor, mediator, learning catalyst, integrator, scoping leader, orchestrator, and policy advocate (Table 1).

Table 1: Roles of innovation intermediaries in cross-sector partnerships

Role	Definition	Category emerged In
Convenor	Brings together diverse stakeholders, facilitating discussions and establishing collaboration platforms	Assan and Gupta (2019); Calzada (2020); Hamann and April (2013); Jha, Gold and Dubé (2021); Kilelu, Klerkx and Leeuwis (2013); Kolovou et al. (2024); Loosemore, Higgon and Osborne (2020); Manning and Roessler (2014); Mariani et al. (2022); Masuda et al. (2022); Mitra (2018); Moreno-Serna et al. (2020); Reypens, Lievens and Blazevic (2021); Sonday and Wilson-Prangley (2018); Stadtler and Probst (2012); Van Hille et al. (2021); Yan, Lin and Clarke (2018)
Mediator	Helps resolve conflicts, align interests, and maintain communication	Assan and Gupta (2019); Calzada (2020); Eitan and Fischhendler (2023); Harris and Lyon (2013); Jha, Gold and Dubé (2021); Kilelu, Klerkx and Leeuwis (2013); Loosemore, Higgon and Osborne (2020); Manning and Roessler (2014); Mariani et al. (2022); Moreno-Serna et al. (2020); Sonday and Wilson-Prangley (2018); Stadtler and Karakulak (2020); Stadtler and Probst (2012); Van Hille et al. (2020)
Learning Catalyst	Enables collective learning by translating knowledge, building capability, and supporting joint sensemaking	Assan and Gupta (2019); Calzada (2020); Hamann and April (2013); Jha, Gold and Dubé (2021); Kilelu, Klerkx and Leeuwis (2013); Loosemore, Higgon and Osborne (2020); Manning and Roessler (2014); Mariani et al. (2022); Masuda et al. (2022); Mitra (2018); Moreno-Serna et al. (2020); Reypens, Lievens and Blazevic (2021); Sonday and Wilson-Prangley (2018);

Role	Definition	Category emerged in
		Stadtler and Karakulak (2020); Stadtler and Probst (2012); Van Hille et al. (2020); Yan, Lin and Clarke (2018)
Integrator	Synthesizes information, coordinates activities, and aligns all aspects of the partnership	Assan and Gupta (2019); Kilelu, Klerkx and Leeuwis (2013); Stadtler and Probst (2012); Van Hille et al. (2020); Yan, Lin and Clarke (2018)
Scoping Leader	Leads in identifying and prioritizing key issues for the partnership to address	Mitra (2018); Van Hille et al. (2020)
Orchestrator	Manages the implementation of initiatives, coordinates resources, and oversees project execution	Assan and Gupta (2019); Kilelu, Klerkx and Leeuwis (2013); Masuda et al. (2022); Moreno-Serna et al. (2020); Reypens, Lievens and Blazevic (2021); Stadtler and Karakulak (2020)
Policy Advocate	Works to influence policy changes that support the partnership's objectives	Masuda et al. (2022); Van Hille et al. (2020)

These roles are distributed unevenly across CSP lifecycle phases and respond to shifting collaboration challenges. Instead, the findings show that intermediary roles shift in prominence over time and are enacted in response to phase-specific collaboration challenges associated with changing dimensions of wickedness.

In the problem-setting phase, intermediaries primarily enact convenor, mediator, learning catalyst, and scoping leader roles. At this stage, collaboration is characterized by high levels of knowledge uncertainty and the early emergence of value conflict, as actors enter with divergent problem framings, expectations, and sector-specific logics. Convenors play a central role by bringing together heterogeneous stakeholders and creating protected spaces for interaction. Mediators and learning catalysts complement this role by facilitating joint sensemaking, translating across knowledge domains, and supporting the development of shared language and understanding. Scoping leaders further contribute by narrowing the problem space, prioritizing issues, and helping partners distinguish between broadly shared concerns and tractable focal points for collective action. Together, these roles enable CSPs to move from loosely connected participation toward a minimally coherent problem definition.

During the direction-setting phase, intermediary emphasis shifts toward mediator, orchestrator, and learning catalyst roles. As partners move from exploration to commitment, value conflict becomes more explicit, requiring active alignment and negotiation. Mediators are especially salient in managing tensions around priorities, resource allocation, and governance arrangements. Orchestrators gain prominence by translating emerging agreements into concrete structures, such as work programs, governance mechanisms, and coordination routines. Learning catalysts remain important, but their focus shifts from exploratory sensemaking to feasibility assessment, capacity building, and the integration of lessons from prior initiatives. This phase marks a transition from open-ended problem exploration to the stabilization of a shared innovation direction.

The implementation phase is dominated by orchestrator, mediator, and learning catalyst roles, reflecting heightened dynamic complexity as proposed solutions interact with existing systems, institutional constraints, and evolving stakeholder configurations. Orchestrators coordinate resources, manage interdependencies between activities, and adapt structures as conditions change. Mediators address emerging conflicts, partner turnover, and misalignments that arise during execution. Learning catalysts support experimentation, facilitate feedback loops, and enable partners to adjust practices in response to unanticipated effects, underscoring the non-linear nature of innovation in wicked problem contexts.

Finally, in the review phase, intermediaries primarily act as convenors, learning catalysts, and policy advocates. In the absence of clear end states or definitive success criteria, intermediaries support evaluation, collective reflection, and decisions about continuation, adaptation, or scaling. Convenors reconnect partners and external stakeholders, learning catalysts facilitate performance assessment and knowledge transfer, and policy advocates work to embed collaboration outcomes in broader institutional or regulatory contexts. This phase highlights how intermediary roles extend beyond project completion toward longer-term system alignment and institutional change.

5. Discussion

This study advances research on innovation intermediaries and cross-sector partnerships in three interrelated ways by explicitly positioning intermediary roles as dynamic, mechanism-based, and responsive to wickedness across collaboration phases.

First, the study contributes a processual understanding of innovation intermediation. Foundational work on innovation intermediaries has established their importance and identified a wide range of roles such as brokering, convening, and orchestration (Van Lente *et al.*, 2003; Howells, 2006). More recent reviews have further systematized intermediary types, activities, and value creation mechanisms across sectors and innovation systems (Kivimaa *et al.*, 2019; Caloffi *et al.*, 2023; Noviaristanti, Acur and Mendibil, 2023). While this work provides important descriptive clarity, it largely treats intermediary roles as stable attributes or generalized functions. In contrast, our findings show that intermediary roles are phase-contingent and dynamically reconfigured as CSPs move through problem setting, direction setting, implementation, and review. By explicitly linking roles to CSP lifecycle phases (Stadtler and Probst, 2012), this study extends existing typologies with a temporal and processual perspective that helps explain when and why particular forms of intermediation become salient.

Second, this study shifts analytical attention from activities to mechanisms. Prior research has richly documented intermediary activities such as organizing meetings, facilitating learning, or coordinating experimentation (Howells, 2006; Kivimaa *et al.*, 2019). However, the mechanisms through which these activities support collaboration such as sensemaking, trust building, alignment, and adaptive learning, have often remained implicit. By distinguishing activities from mechanisms, our framework provides greater explanatory depth and responds to calls for theory development that moves beyond role catalogues toward understanding how intermediaries enable coordination under conditions of complexity (Caloffi *et al.*, 2023; Zhang and Liu, 2024).

Third, the study makes wickedness analytically consequential for innovation intermediation research. While innovation intermediaries are increasingly studied in the context of societal challenges and sustainability transitions (Kivimaa, 2014; Kivimaa *et al.*, 2019), much of this work implicitly assumes problem complexity without theorizing how different dimensions of wickedness shape intermediary roles. Building on Dentoni *et al.*'s (2018) conceptualization of wickedness as knowledge uncertainty, value conflict, and dynamic complexity, we show that intermediary roles can be understood as context-sensitive responses to dominant wickedness challenges at different points in the collaboration process. This perspective complements and extends CSP research that emphasizes lifecycle dynamics (Stadtler and Probst, 2012; Van Tulder and Keen, 2018) by clarifying why certain intermediary mechanisms are particularly critical in specific phases.

Together, these contributions reposition innovation intermediaries not as static brokers or neutral facilitators, but as dynamic enablers of coordination, learning, and adaptation whose relevance unfolds over time. The role-phase framework developed here provides a foundation for future longitudinal and comparative studies examining how intermediary role configurations influence collaboration durability, innovation outcomes, and scaling trajectories in wicked problem contexts.

6. Conclusion

This paper develops a role-phase framework that clarifies how innovation intermediaries dynamically support cross-sector partnerships addressing wicked problems. By integrating insights across fragmented literatures on innovation intermediation, cross-sector collaboration, and wicked problem innovation, the framework highlights why intermediary roles shift over time and how these shifts are shaped by changing collaboration challenges. Rather than treating intermediary roles as static or universally applicable, the framework shows that effective intermediation depends on the alignment between roles, underlying mechanisms, and the dominant dimensions of wickedness (knowledge uncertainty, value conflict, and dynamic complexity) across different phases of the CSP lifecycle.

The central contribution of this study lies in making the temporal and contextual nature of innovation intermediation explicit. By linking roles to phases of problem setting, direction setting, implementation, and review, the framework provides a structured yet flexible lens for understanding how intermediaries sustain collaboration when problems resist definitive formulation and linear solutions. This perspective helps explain why CSPs often struggle when intermediary support is misaligned with phase-specific needs, such as emphasizing orchestration too early or underinvesting in learning and mediation during implementation.

Beyond its theoretical contributions, the framework offers practical guidance for policymakers, funders, and intermediary organizations involved in societal transition initiatives. It suggests that intermediary capacity should be designed as a portfolio of roles that can be activated and reconfigured over time, rather than as a fixed mandate or organizational function. For practitioners, this implies paying closer attention to when particular forms of intermediation are most valuable and investing in adaptive capabilities that support reflection, learning, and realignment.

Overall, this study positions innovation intermediaries as dynamic enablers of collective action whose value lies not only in what they do, but in when and how they do it throughout the lifecycle of wicked problem innovation.

Ethics Declaration

This study is based solely on a review and analysis of existing literature. As it did not involve the collection of primary data, human participants, animals, or personal data, ethical clearance was not required.

AI Declaration

An AI-based language tool was used to support the improvement of writing style, clarity, and readability of the manuscript. The tool was employed to rephrase sentences, enhance flow, and correct language issues. All substantive content, interpretations, and conclusions are the sole responsibility of the author, and the final text was reviewed and edited by the author to ensure accuracy and integrity.

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