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Harnessing Societal Innovativeness for Transformative Regional Development

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Harnessing Societal Innovativeness for Transformative Regional Development

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Abstract

In this discussion paper, we explore the concept of 'societal innovativeness' as a key driver of transformative regional development, particularly within the context of regions facing structural weaknesses. Our explorative study delves into the multifaceted nature of societal innovativeness, which encompasses a broad range of social, cultural, and institutional factors that collectively enable regions to address complex societal challenges. We propose a comprehensive conceptual framework that identifies six core components—values and norms, capabilities, power relations, system-level agency, narratives and imaginaries, and exogenous factors—as integral to fostering societal innovativeness. By establishing a theoretical foundation, we aim to bridge theoretical concepts with practical applications, offering pathways for regions to enhance their innovative capacities. Our hypotheses, grounded in this framework, emphasise the interplay between these components, aiming to encourage inclusive and sustainable regional development. Future research, through empirical testing across diverse regional contexts, will further validate and refine this framework, thereby enhancing its applicability and providing valuable insights into practical strategies that empower regions to navigate and thrive amidst societal challenges.

Keywords: *societal innovativeness, society, regional development, transformation, structural change, transformative regional development, grand societal challenges*

JEL classification: Z1, O10, O3, (O35)

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1 Introduction

> *"Societies progress by the influence of two forces: innovativeness and co-operativeness. A capacity for enabling these forces constitutes a society's transformative capacity."*
>
> (Redding & Drew, 2016, p. 107)

Innovations are crucial in shaping regional transformation processes, ensuring prosperity, enhancing the quality of life, and strengthening regional resilience (Bianchi et al., 2024; Trippl, 2020). When broadly understood, innovations extend beyond economic and technological advancements to include social, ecological, cultural, procedural, organisational, and institutional dimensions (Gault, 2020). These innovations offer potential solutions to pressing societal challenges, including climate change, socio-demographic shifts, and social inequality, providing opportunities for shared prosperity and sustainable development.

Structural and regional policies have long aimed to support regions with developmental deficits and enhance their (technological) innovation capacity. For example, Germany's *"Gemeinschaftsaufgabe Verbesserung der regionalen Wirtschaftsstruktur"* (engl. 'joint task boosting regional economy') program allocates funding to stimulate investment in disadvantaged areas to create sustainable, high-quality local employment. Similarly, the European Development Fund (ERDF) and the Cohesion Fund (CF) are pivotal in addressing territorial, social, and economic imbalances across EU regions (Calegari et al., 2023). Though these policy instruments are crucial in reducing regional disparities within and across countries and promoting balanced development, policymakers increasingly acknowledge that for innovation to deliver long-term societal benefits, it must be 'responsible' and sustainable while accounting for context-specifics.

Consequently, regional structural and innovation policies should consider the environmental, social, and economic implications of innovation while fostering inclusiveness, collaboration, and networking to ensure that the benefits of innovation are equitably distributed across society (Belussi et al., 2024). However, significant knowledge gaps remain concerning how regions can cultivate a broad, inclusive innovation capacity that engages the wider population (Benner et al., 2024).

Recent shifts in research and innovation policy highlight the growing importance of transformative innovation policies, i.e., challenge-oriented or mission-oriented approaches, where the societal value of innovations takes centre stage (Caetano et al., 2023; Hekkert et al., 2020; Mazzucato et al., 2020; Wanzenböck et al., 2020). This paradigm shift broadens the scope of stakeholders involved in and contributing to innovation, extending beyond the traditional boundaries of technology-oriented research (STI) and business to encompass social enterprises, welfare organisations, local and regional governments, intermediaries, and civil society actors in 'doing, using, interacting' (DUI) modes of innovation (Doloreux & Sheamur, 2023).

Innovation policies must be tailored to regional contexts, considering local societal needs and conditions to effectively address national and global challenges (Grillitsch, Coenen, & Morgan, 2023; Jeannerat, 2024; Jeannerat & Crevoisier, 2022; Wanzenböck et al., 2020). Thus, understanding the complex interactions between societal innovativeness and the regional context is crucial for effectively navigating structural change processes. New explanatory models are needed to understand the conditions and factors shaping societal innovativeness at local and regional levels.

In this context, we define regional societal innovativeness as *the collective capacity of a region to act as a fertile ground for innovative solutions to pressing societal challenges through the interactions of actors and institutions.* According to this understanding, societal innovativeness facilitates the initiation and implementation of new solutions, as well as the provision of more indirect support and the long-term anchoring of these solutions within the region. Through this process, regions can drive transformative (structural) change that strengthens resilience and adaptability in the face of evolving societal needs.

Infobox 1

Structural change in economics refers to shifts in the composition of sectors or regions within an economy, such as changes in GDP or employment distribution, highlighting that economic development varies across sectors and regions (Dahlbeck, Gärtner, et al., 2022)

Transformative change in regional development refers to a profound and systemic shift in a region's economic, social, and environmental structures (Schot & Steinmueller, 2018). It is characterised by being goal-oriented, long-term, and future-focused. Such change is systemic, involving widespread impacts and multiple intervention points across interconnected systems. It requires alternative paths of doing, thinking and organising (Avelino et al., 2024). It is path-dependent, reflecting the influence of historical trajectories and inherently uncertain, acknowledging the complexity and unpredictability of transformative processes.

In this regard, Scoones et al. (2020) identify three approaches to transformation in the scholarly discourse: structural, systemic, and enabling. While *structural approaches* involve fundamental shifts in governance, organisation, and production and consumption practices, *systemic approaches* target the interconnections among institutions, technologies, and actor networks to guide systems toward specific goals. *Enabling approaches* prioritise fostering human agency, values, and capacities crucial for managing uncertainty, promoting collective action, and charting pathways to desired futures. Adopting an analytical, conceptual lens, these approaches are complementary, providing different perspectives on transformative change. Achieving socially just and balanced change requires, in addition to structural and systemic alterations, the empowerment of regional actors to actively engage in joint actions towards their envisioned future, considering the specific regional context.

Although the terms 'societal innovativeness' and 'social innovation' are often used interchangeably, they differ in scope and focus. In our understanding, societal innovativeness extends beyond social innovation, as it is broader and more systemic, situated at the meso level of regional actors' collaborative efforts to initiate, implement, support, and sustain solutions to societal challenges, thereby engaging in transformative change processes. Echoing Redding and Drew (2016), we propose that the reciprocal dynamics between societal innovativeness and cooperativeness among diverse societal groups, organisations and institutions drive transformative regional change.

In what follows, this discussion paper establishes the theoretical foundation for developing an indicator-based measurement framework that captures regional specificities in societal innovativeness, from which regional actors can derive actionable strategies for enhancing and mobilising this capacity. Section 2 establishes the foundation by elucidating the German context. From an interdisciplinary perspective, Section 3 explores the theoretical frameworks employed to discern the key factors influencing societal innovativeness, followed by a detailed outline of the framework model in Section 4. Section 5 addresses the operationalisation of the included dimensions. The article concludes with a summary and prospects for future research.

2 The German Case – Why Societal Innovativeness Matters

Education, research, and innovation are widely acknowledged as key drivers of regional economic strength and quality of life. Nevertheless, considerable regional disparities persist in employment, income opportunities, access to essential services, and public infrastructure both within Germany and across Europe (Calegari et al., 2023; Dahlbeck, Gärtner, et al., 2022; MacKinnon et al., 2024; Madanipour et al., 2021). Economically strong regions, which account for a large share of measured innovation performance, contrast with regions particularly affected by structural changes, resulting in structural weakness (Hollanders & Es-Sadki, 2023). Additionally, demographic changes and socio-ecological transformations exacerbated challenges for these weaker areas.

To address these disparities, Germany's High-Tech Strategy 2025 embodies the vision of 'Living and Working Well Across the Country'. This strategy aims to foster an innovation-based, sustainable, and socially equitable structural transformation in structurally disadvantaged (rural) regions by building on local knowledge and experiences (BMBF, 2018). The Federal Ministry of Education and Research's (BMBF) 'Innovation & Structural Change' programme explicitly targets these structurally weak regions with tailored support.

Whereas innovation has traditionally been viewed primarily from an economic perspective, the 'Region.innovative' initiative expands this view by exploring the societal dimensions of innovation with its theme 'Researching Regional Factors for Innovation and Change – Strengthening Societal Innovativeness'. In its Annual Economic Report 2022, the Federal Ministry for Economic Affairs and Climate Action (BMWK) articulated a vision of transitioning from a 'social' to an 'ecological social market economy', aligning with its commitment to climate neutrality (BMWK, 2023). In doing so, the Ministry introduces a new dimension to structural change objectives, i.e., creating economic opportunities and providing social infrastructure aligned with the long-term objective of achieving climate neutrality. Likewise, the recently launched 'National Strategy for Social Innovation and Social Enterprises' (BMWK/BMBF, 2024) is distinctly oriented towards addressing societal concerns. In response to the grand challenges, it envisages *"to make the state, our economy and society more sustainable, effective and efficient"* (BMWK & BMBF, 2024, p. 2) by accelerating social innovations (often initiated by civil society actors) and social enterprises[3]. This strategy has a clear societal dimension.

Building on this, we address the overarching question of *how complex innovation processes manifest at the regional level, specifically examining how structurally weak regions can leverage societal innovativeness to manage structural change successfully and initiate sustainable transformation processes by harnessing societal innovation potential.*

Rooted in a systemic perspective on innovation, the research investigates economic development alongside the societal value generated by innovations. It considers enabling factors such as innovation ecosystems and institutional, political, and financial frameworks. The study incorporates often overlooked 'soft' factors within innovation dynamics, such as social cohesion, expressed through social interaction, civic engagement, and trust in institutions. These elements are integral to answering the research questions.

[3] Following the European Commission's definition, the ministries understand social enterprises as *"enterprises for which the social or ecological objective of the common good is the reason for the commercial activity, (…) where profits are mainly reinvested with a view to achieving this social objective, and where the method of organisation or ownership system reflects their mission, using democratic or participatory principles or focusing on social justice"* BMWK and BMBF (2024, p. 4)

Elaborating a *social science-based explanatory model of societal innovativeness* recognises that innovation is no longer the exclusive domain of traditional actors within the innovation ecosystem, such as businesses and academic institutions. Increasingly, civil society actors play a pivotal role (see, for example, Bode, 2024; Heinze, 2020). Consequently, this model is attuned to previously underexplored regional innovation potentials, focusing on operationalising and measuring societal innovativeness as a core component. It intends to establish a foundation for assessing regional societal innovativeness and developing tools through dialogue. By providing regions and regional stakeholders with instruments to enhance and leverage societal innovativeness, the aim is to enable them to contribute effectively to socially, ecologically, and economically sustainable regional development.

This paper represents a preliminary effort to develop an explanatory model for societal innovativeness. As such, it is exploratory in nature, endeavouring to establish a foundation for future research and the development of tools designed to enhance regional societal innovativeness.

3 Approaches To Explain Societal Innovativeness

Explaining societal innovativeness as a 'new' approach to transformative regional development necessitates an interdisciplinary perspective to grasp its multifaceted nature. From the literature review, six relevant components of social innovativeness have been identified: (1) values and norms, (2) capacities and capabilities, (3) power relations, (4) system-level agency, (5) narratives and imaginaries, and (6) exogenous factors.

3.1 Social Capital: Values & Norms

Societal innovativeness is a multifaceted concept that encompasses various interdisciplinary perspectives. The concept's core is 'values' and (cultural) 'norms' that shape the innovation landscape (Farinha Carmo et al., 2020; Millard & Fucci, 2023). Scholars such as Bourdieu (1986) and Granovetter (1985) have emphasised the role of social and cultural capital in driving innovation, highlighting how the accumulation and mobilisation of these resources facilitate the introduction and diffusion of novel ideas and practices (Foroudi et al., 2024; Millard & Fucci, 2023; Zheng, 2010). Similarly, Putnam's (2002) research on social capital has shed light on the role of networks, trust, and reciprocity in fostering collaborative innovation, where diverse stakeholders can pool their resources and expertise to tackle complex societal challenges. In this vein, Rutten (2019, p. 1213) claims knowledge creation is inseparably *"connected to the norms, values, habits, etc. of the social context from which it originates"*.

Similarly, neo-institutional scholars, including Scott (1989) and Geels and Schot (2010), have explored how shared values, institutional logic, and normative frameworks influence the direction, nature, and legitimacy of innovation processes. Reale (2022) points to cultural-cognitive conditions impacting innovation demand by shaping consumers' or, in a broader sense, citizens' ability to comprehend and process the novelty of innovations. Innovations that transcend established cultural categories or are perceived as ambiguous can evoke fear and rejection. Such cultural-cognitive ambiguity may render rational incentives and moral appeals largely ineffective but produce 'emotional polarisation' (ibid.). Instead, supportive social structures that offer reassurance and mitigate fears are essential for fostering the acceptance of innovations.

From an organisational perspective, Blokland and Reniers (2021) underscore that transitioning from individual to shared values and vision is essential for organisational alignment and sustainable performance. This transition necessitates strategies that foster collective understanding, open communication, joint

decision-making, and shared experiences to build stakeholder trust and consensus. The importance of shared values for organisational coherence aligns with findings contending that a shared culture reinforces collective behaviour and commitment, contributing to overall effectiveness. Such understanding implies that shared values help individuals feel part of a collective, fostering a sense of belonging and identity within the group (Imboden, 2024). In this regard, Meynhardt (2015, p. 149) posited earlier, *"[p]ublic value as a collectively shared value is not constructed of the sum of individual values, but their common and overlapping meaning about the quality of relationship involving the public"*. From an economic (market) perspective, Mazzucato (2024) views markets as the result of interactions between private and public actors alongside the participation of the third sector and civil society.

It follows that managing conflict is critical to developing a unified vision. From an urban development perspective, Sotarauta and Hansen (2024) argue that without overcoming divergent interests and determining innovative methods for collaboration across organisational and institutional boundaries, intended change is not likely to happen. While conflicts stemming from varied perspectives are inevitable in transition processes (Blokland & Reniers, 2021), they can drive growth and foster innovation when managed effectively (Rahim, 2023). Promoting a culture that frames conflict as an opportunity rather than an obstacle can strengthen collective capacity. Effective conflict resolution should include structured dialogue, active listening, and mutual respect to unfold its potential, facilitating discussions that lead to shared understanding and innovative solutions (Castro-Arce & Vanclay, 2020; Jehn & Bendersky, 2003).

The economic geography literature's focus on *tolerance* as it relates to creativity and innovation aligns with the broader sociological discourse on culture and economic development, notably the 'evolutionary modernisation theory' (Inglehart, 2017), which suggests that economic progress is linked to a shift from traditional to modernisation values such as rationality, trust, and participation (Inglehart & Baker, 2000). While tolerance and modernisation values foster openness and contribute to knowledge exchange and innovation, they differ in that tolerance explicitly reflects an appreciation of socio-cultural diversity. In contrast, modernisation values focus on the motivational drivers of individuals without necessarily requiring mutual acceptance. Rutten (2019) argues that 'openness values' promote regional innovation by exchanging knowledge and ideas within diverse communities. Tolerance contributes indirectly by broadening 'knowledge works' (here: regional actors) exposure to a broader range of ideas, enhancing the diversity of inputs for innovation. In contrast, self-expression directly drives innovation by motivating regional actors to engage in collaborative knowledge exchange with varied partners actively.

To effectively model societal innovativeness, it is crucial to transition from individual to shared values among regional actors, including government bodies, businesses, NGOs, and communities. This transition fosters a cohesive response to societal challenges by building trust, promoting openness, tolerance, and value alignment, thereby enhancing collaboration and creating a regional ecosystem conducive to innovation (Moulaert & MacCallum, 2019). The accumulation and mobilisation of social and cultural capital are essential for facilitating the exchange, acceptance of novel ideas and practices, and the ability to collectively imagine an alternative future. Constructive conflict management is also vital, as it enables regions to leverage diverse perspectives, thereby enhancing resilience and supporting sustainable development (Torfing, 2019). This collective capacity, grounded in trust and a shared vision, underpins adaptive and innovative strategies for addressing complex societal issues. Such societal innovativeness depends

on key stakeholders who drive progress and orchestrate processes by fostering a shared vision while effectively integrating and addressing opponents' concerns. Hence, social capital, manifested through reciprocity, trust, networks, shared values and visions and openness to change, constitutes the fundamental components of societal innovativeness.

3.2 Capacities & Capabilities

The capability approach (CA), pioneered by Amartya Sen and Martha Nussbaum (1993) and the broader theories of human development offer valuable insights for understanding societal innovativeness. By enhancing individual capabilities as proxies of freedom, the perspective suggests that expanding people's freedoms, skills, and opportunities can unleash their innovation potential (Nussbaum, 2011; Sen, 1999). CA redefines 'development' as expanding human freedoms—i.e., actual opportunities—rather than purely economic growth, with well-being encompassing life goals and aspirations beyond material wealth (Sen, 1985, 1992). That is what Sen (1985) referred to as 'agency'. Accordingly, CA suggests that societal innovativeness stems not solely from technological or economic advances but also from augmenting collective capacities and intentions (Leßmann, 2022), facilitating change processes. In this regard, Perrons (2012, p. 15) calls for widening economic development conceptualisation *"to highlight connections between economic change and social well-being*".

The CA encompasses three key concepts: functioning, capability, and agency (Kimhur, 2020). *Functioning* describes valued states of being or activity; *capability* denotes an individual's freedom or opportunities to experience these functionings, thus enhancing well-being; *agency* pertains to a person's capacity to pursue valued goals. It follows that capabilities reflect a person's 'actual' opportunities to choose from various valued options in life (Kimhur, 2020). Frediani et al. (2019) highlight that CA primarily concerns the processes shaping what people value and the factors enabling or restricting their freedom to pursue these values. In this regard, they refer to 'participatory capabilities' as people's choices, abilities and opportunities to engage in participation processes (ibid.). CA asserts that such empowerment equips individuals and communities to challenge systemic inequalities and envision fairer futures (ibid.).

Moreover, CA illuminates the importance of institutional and social structures in fostering an environment conducive to innovation. Nussbaum (2011) stresses the role of combined capabilities—where personal attributes interact with external conditions—and the significance of these synergies. Here, the focus is on heterogeneity, including personal traits, in social and environmental contexts, which make a difference (Ziegler, 2020). Integrating Putnam's (1993) ideas on civic engagement and social networks further underscores how capabilities are collectively cultivated and mobilised, with the quality of these networks influencing a region's innovative potential.

Recent scholarly contributions underline CA's relevance in the context of societal innovativeness. Jacobi et al. (2017), for instance, utilise this framework to analyse social innovation processes, while Ziegler (2020) examines its explanatory power in enabling or constraining regional responses to challenges. In urban development, Janssen et al. (2023) extend CA by introducing 'governing capacities' (e.g., collaborative governance) as a dimension critical to implementing social sustainability. It involves developing three levels of dynamic capabilities for the state: state capabilities to establish ambitious goals and build consensus, policy capabilities to coordinate actions and drive impact, and administrative capabilities to maintain long-term vision and ensure organisational support (Mazzucato et al., 2020). Hence, Avelino and Wittmayer (2016) call for fostering collaboration among diverse stakeholders through a multi-actor perspective, advancing shared goals and ensuring the equitable distribution of positive spillovers and

multipliers. Rauschmayer et al. (2018) analyse collective action through the capability approach using the example of community currencies.

In summary, the CA enhances our understanding of societal innovativeness by emphasising individual and collective capacities as drivers of social change. It suggests that many capabilities are best realised through collaborative action, or 'collective capabilities', enabling individuals to achieve shared outcomes otherwise unattainable. These collective capabilities are vital for fostering societal innovativeness, as they facilitate social learning through shared knowledge and experiences, generating new ideas and building 'cognitive capital' for tackling social challenges. Collaboration also bolsters individual agency, empowering communities to mobilise resources effectively and influence decision-making. Furthermore, CA underscores the importance of institutional support in nurturing collective capacities by providing opportunity spaces as fertile ground that encourages civic engagement and regional cooperation.

Infobox 2

Opportunity spaces are dynamic contexts that enable regional change, shaped by the interaction between structural conditions and human agency. The notion captures the possibilities for human intervention (agency). As defined by Grillitsch and Sotarauta (2020) and further developed by Grillitsch et al. (2024), these spaces are influenced by regional contexts and agents' efforts to perceive and exploit opportunities for development.

Finally, CA posits that societal innovativeness is fundamentally embedded within collective dynamics, wherein collaboration, shared agency, institutional support, and community engagement propel the development of novel solutions and practices whilst accounting for individual circumstances.

3.3 Power Relations

While power and power relations are rarely considered in economics (Rath et al., 2024) and regional development (Calignano & Nilsen, 2024), they are increasingly recognised as vital factors in innovation, transition, and transdisciplinary research (Avelino et al., 2024). Neglecting power dynamics can result in an incomplete understanding of innovation processes and their societal impacts (Avelino et al., 2024; Geels, 2022; Menge, 2018). Power permeates social experience (Arendt, 2002[1972]; Foucault, 1982) and conditions for action (Negura et al., 2018), making it critical in modelling societal innovativeness and understanding transformative regional development (Calignano & Nilsen, 2024).

Power theories provide frameworks for explaining social phenomena, such as the formation, maintenance, and change of social structures, the outcomes of social interactions, and individual behaviours (Haugaard, 2022; Avelino & Rotmans, 2009). Human actions and social coexistence are shaped by power relations, underpinning social structure formation (Anter, 2021; Hoffman, 2013). Power is inherently asymmetrical, temporal, and unequal, manifesting in dominant-subordinate roles within specific social relationships (Avelino & Wittmayer, 2016; Geels, 2022; Menge, 2018). This complexity has led to diverse interpretations across disciplines, including sociology, psychology, philosophy, and political science, resulting in diverse understandings of power (Lemke, 2001; Parietti, 2022).

Sociological discourse often refers to Weber (1980 [1922], p. 28), who defines power as the ability to assert one's will within a social relationship, even against resistance. Focusing on individual agency, he differentiates traditional, charismatic and legal-rational authority through which power is exercised. This understanding highlights power as a relational and conflictual phenomenon, deeply embedded in social hierarchies and institutions, as something that is possessed. Foucault (1982),

however, views power as exercised rather than possessed and inherently tied to knowledge and discourse, influencing how we comprehend and interact with the world. It follows that *"individuals are the vehicles of power, not the points of application"* (Foucault, 1980, p. 98). Bourdieu (1989) expands this perspective by framing power foremost at a symbolic level within distinct social 'fields' where power dynamics play out (Christensen, 2024; Schirato & Roberts, 2020). Distinct forms of capital influence an actor's position in a field, affecting their power. In this view, 'symbolic power'—as an invisible force—provides legitimacy, whereas power dynamics are historically and contextually shaped (Gadinger, 2023). Through 'habitus', Bourdieu explains how power structures are internalised and perpetuated through social practices. He highlights how power relations contribute to social inequalities, as those with more capital(s) can navigate fields more effectively, perpetuating their dominance. Arendt (1969: 44) offers a contrasting view, emphasising collective action and defining power as "*the human ability not just to act but to act in concert"*. So doing, Arendt favours the collective over the distributive model of power, the former indicating that actors can enhance their power by collaborating.

Avelino's (2021) theorising on power and social change resonates with this understanding of power, particularly relevant for modelling societal innovativeness. This view is most evident in the notion of *'power with',* posing the question of *"[h]ow actors collaborate in the exercise of power for/against change"* (Avelino, 2021, p. 429). She concludes that, broadly, one can think of power as "*the (in)capacity of actors to mobilise means to achieve ends"* (ibid., 2021, p. 440). Hence, 'power with' introduces a more horizontal perspective on power, emphasising the significance of social solidarities, alliances, and coalitions (Gaventa, 2021). Such understanding does not neglect other forms of power ('over', 'to'). It is multidimensional in that it acknowledges the diffusion of power (centralised vs diffused), relational dynamics (conflictual vs consensual), and structure (constraining vs enabling).

Power relations, particularly when viewed through lenses such as 'power with' or 'power to', are likely to affect societal innovativeness. Within this context, *participation* is critical; power dynamics often determine who can contribute to the innovation landscape and who remains on the periphery. When power is highly centralised, key actors may dominate decision-making, potentially overlooking or marginalising local needs and knowledge that could enrich regional capacity for novel solutions and practices. By contrast, a more distributed power structure—aligned with a 'power with' perspective—promotes inclusive, collaborative participation, which is essential for mobilising the full potential of regional actors and institutions and enhancing the legitimacy of innovation efforts. That, in turn, is contingent on peoples' capabilities (Frediani et al., 2019; Patrón, 2019). In the reading of Arendt (2002), power is conceptualised as a capacity—specifically, the capability to foster consensus and facilitate collaboration. Vice versa, Sen (2009) defines capability as a form of power, viewing it as an enabling mechanism that allows individuals to realise their potential and pursue the lives they value.

The *orchestration* of actors within a region is also shaped by power relations and their dynamics, influencing how institutions and individuals cooperate or compete in addressing societal challenges. Top-down orchestration, as delineated by Autio (2022), frequently embodies a hierarchical power paradigm, wherein central authorities establish priorities and allocate resources. This approach may facilitate streamlined responses to regional challenges; however, it potentially risks constraining grassroots initiatives' contributions and diminishing adaptability, given that decision-making authority remains concentrated. Conversely, bottom-up orchestration (ibid.), wherein authority is distributed amongst actors, fosters

diverse contributions from various stakeholders, thereby establishing a more adaptive and conducive environment for societal innovativeness (see, for example, Bours et al., 2022; Butzin & Terstriep, 2023; van Meerkerk et al., 2013). These dynamics resonate with Avelino's (2021) conceptualisation of 'power with', which promotes collective action across multiple levels and sectors, thereby enabling regional actors to co-create solutions that address localised needs and leverage indigenous knowledge.

The choice between *top-down and bottom-up approaches* will likely affect a region's societal innovativeness. Top-down frameworks may impose external priorities that overlook local complexities, leading to resistance among those who feel excluded from the decision-making process. Conversely, bottom-up approaches empower local actors, leveraging their insights and adaptability, thereby enhancing the region's responsiveness to societal needs. Navigating these power dynamics is essential for fostering an environment where institutions and actors can collaboratively contribute to societal innovation, thus bolstering the region's capacity to tackle complex challenges.

3.4 System-level Agency

The ability of individuals and groups to act as change agents is essential for societal innovation. Giddens' (1984) structuration theory underscores the interplay between agency and structure, demonstrating that both individuals and collectives can shape and transform social structures through their actions. This theoretical lens suggests that while social systems constrain behaviour, they also provide the context for agency, enabling actors to instigate transformative change. Broadly speaking, system-level agency refers to the collective capacity of regional actors to facilitate innovative solutions and practices through the interactions of various actors and institutions influencing the trajectories of innovation systems and affecting the course and outcomes of path development (Isaksen et al., 2019). For Benner (2024), system-level agency is characterised along multiple dimensions, including the identity of actors (individual/organisational), the intention (change/stability), the immediacy (direct/indirect), the rationality (commercial/non-commercial), and the relation to structures (constructive/destructive).

Grillitsch, Sotarauta, et al. (2023) illustrate that regional innovation ecosystems are pivotal in fostering change agency by cultivating conducive environments and opportunity spaces. These ecosystems support actors through networks, resources, and policies, enabling them to engage in collaborative problem-solving and collective action. Their research underscores the importance of interconnected support systems that bridge public, private, and civic spheres, ensuring that innovation remains inclusive and holistic.

Strambach and Klement (2012) delve into the mechanisms of path dependency and path creation, demonstrating that new ideas and practices—when introduced strategically—can disrupt existing routines and structures. Reflecting on this enables regions to reorient their development trajectories towards more innovative and adaptive outcomes. Nilsen et al. (2022) contribute to this discourse by exploring how multi-level governance structures and the alignment of regional actors can facilitate or hinder path change, indicating that institutional flexibility is vital for adaptation and long-term innovation.

Tödtling et al. (2022) further examine how incremental and radical innovations impact regional development differently. They argue that transformative outcomes often emerge from a mix of both types of innovations, with the agency of local actors being vital to integrating and sustaining these changes. Moreover, the work by Moulaert et al. (2013) emphasises that social innovation is driven by 'collective agency' embedded within social networks. They contend that networks must be

strategically harnessed to build resilience and capacity within marginalised groups, thereby expanding the scope of societal impact. From a transition perspective, Suitner et al. (2023) point to a 'change agency' that envisages altering existing systems and giving leeway for transition pathways. Similarly, Grillitsch et al. (2024) distinguish between change agency, which aims to alter opportunity spaces, and reproductive agency, resulting in maintaining existing social structures

This body of literature collectively underscores that fostering effective system-level agency requires a nuanced understanding of the interactions between actors, institutions, and their broader socio-economic contexts. Empowering individuals and groups to challenge existing norms and practices can catalyse a sustainable and inclusive innovation cycle essential for societal progress. In this regard, Miörner (2022) introduces the concept of *"system selectivity"*, which describes the tendency of regional innovation systems to preferentially reinforce certain actions and strategies while inhibiting others. This concept enhances understanding of how factors, such as power dynamics or shared narratives and imaginaries, influence transformative change.

3.5 Narratives & Imaginaries

Recent research in regional development has been highly engaged in practices of "*changing the place by changing the story"* (Görmar, 2024, p. 16) as there is a growing focus on the role and effect of narratives and imaginaries (Davoudi & Machen, 2022; Görmar, 2024; Hassink et al., 2019; Lefstad et al., 2024; Pfotenhauer & Jasanoff, 2017b).

Regional actors can employ narratives to mobilise, create agency, and construct spatial imaginaries (Roessler, 2024; Roessler et al., 2024). These may include positive narratives and those highlighting challenges, such as being left behind. During periods of restructuring, diverse economic, political, and socio-cultural narratives often converge to interpret contemporary challenges. These narratives achieve this by situating present issues within a historical context and projecting potential future trajectories (Jessop & Oosterlynck, 2008). Thus, regional actors may mobilise selected perceptions of the past into coherent narratives that resonate with local actors' experiences, legitimising local development strategies and shaping a place's future (Görmar, 2024; Pugh & Andersson, 2024).

The efficacy of these narratives and their associated strategies is contingent upon their capacity to resonate with the personal and collective experiences of the social groups that are most directly affected. While a variety of narratives may appear credible, their effectiveness depends mainly on the communicative skills of the storytellers and their ability to garner support (Jessop & Oosterlynck, 2008). Different actor groups may foreground different stories to actively shape a place's identity and promote a specific image to the outside, which is why narratives may be contested (Görmar, 2024). So, while anchor actors may envision narratives and imaginaries, their success or effectiveness is closely connected to how these are embedded locally.

In this context, Pfotenhauer and Jasanoff (2017a) describe *imaginaries* as epistemic and political tools to define a community that envisions and strives for a common, improved socio-technical future through innovation. Though often implicit, these collective understandings are evident in the narratives about policy strategies or entrepreneurial efforts, regulations for new technologies or current socio-technical systems, and certain established routines for public interpretation and understanding (Pfotenhauer et al., 2023). Imaginaries, or envisioned futures, such as those articulated through roadmaps and regional strategies, provide a framework for integrating future-oriented perspectives to some extent. Imaginations may affect directionality by steering investments in assets, technology or personnel employed with certain tasks (Davoudi &

Machen, 2022; Hassink et al., 2019; Lefstad et al., 2024; Steen & Hansen, 2018) and thus have a performative function. Consequently, imaginaries can actively shape and influence reality rather than merely reflecting or describing it. Hence, they contribute to materialising those ideas, thereby, ideally, guiding actions and decisions in a tangible, impactful way.

Various strategies and policies exert significant influence on regional development and structural transformation. It is, however, a non-ergodic process whose outcome is not automatically determined from the onset but narrows down along the process (Sydow et al., 2012). Within this context, imaginaries and narratives serve as definitive blueprints for a potential future and actively shape ongoing processes. In this regard, research on participatory technology development and adaptive learning in agricultural systems can provide valuable insights into the role of imaginaries and narratives as 'relational myths' and 'plausible promises' that influence societal processes and, consequently, societal innovativeness.

A *rational myth* is defined as a discourse that allows actors to make sense of a given situation by formulating the problem and an account of the solutions that can be used to solve it (Bijon et al., 2022; Queste, 2016). The *plausible promise* refers to an incomplete innovation or 'promising prototype' (Douthwaite et al., 2002) that sufficiently appeals to interest groups, encouraging them to engage and further develop it (Bijon et al., 2022). The promise creates opportunities that motivate participants to enhance the technical solution through an adaptive learning process. Just as imaginaries, it has a performative effect, as its formulation influences actors' actions without its components necessarily manifesting (Austin, 1975). Plausible promises and rational myths may, thus, mobilise support, create legitimacy, and affect the trajectories of transformative change and regional development. Articulating plausible promises, constructing relational myths, and strategically using language and symbolism can generate enthusiasm, build momentum, and legitimise innovative approaches to addressing complex societal challenges.

Narratives, imaginaries, and discursive framing of a region's history, current challenges, local strengths (opportunity places), and societal innovation projects and initiatives can shape key stakeholders' perceptions, attitudes, and behaviours, influencing implementation processes. In this context, scenarios, roadmaps, strategies, and regional concepts may prove influential in providing direction, engaging, and including local actors in a discourse about the future. Taking a historical stance is essential for interpreting narratives and imaginaries as temporal trajectories, as past experiences profoundly shape present actors' perceptions (Martin & Sunley, 2022). For instance, dominant negative narratives rooted in earlier fundamental transformations—perceived as unfavourable—can foster scepticism and aversion towards ongoing change processes in the region, culminating in a development trap, primarily characterised by the prevalence of backward-looking narratives (Roessler, 2024).

In summary, narratives, imaginaries, and plausible promises shape societal innovativeness by influencing regional actors' perceptions, behaviours, and actions.

3.6 Exogenous Factors

While regional societal innovativeness is firmly anchored in local capacities and institutional frameworks, it is undeniably shaped by exogenous factors that are beyond the control of the local/regional community (Binz et al., 2020; Grillitsch & Nilsen, 2025; Trippl et al., 2018). These exogenous factors affect regional societal innovativeness by providing external stimuli and frameworks that significantly impact regional development and innovation processes. In this vein, Grillitsch and Nilsen (2025, p. 1) point to *'extra-regional"* relations influencing the *'rational and possibilities for local*

agency", which play a vital role in societal innovativeness (see Section 3.4).

Exogenous factors include global economic conditions, federal funding and structural programmes, regulatory landscapes, and environmental imperatives that emerge from outside the regional context. Such factors significantly influence the environment in which local actors operate, thereby affecting the region's ability to foster and sustain innovation. For instance, regulatory landscapes, shaped by national, EU, and international policies, delineate the operational parameters for innovation, enabling or constraining regional efforts. (Cowan et al., 2015).

A pertinent example is the German High-Tech Strategy (HTS), which, through its mission-oriented approach, sets a direction for change that necessitates the practice of 'regioning'. This practice involves co-constituting regions as active participants in innovation policy, creating a political space where diverse actors engage in collaborative activities that transcend geographic boundaries (Priebe & Herberg, 2024).

In addition to these regulatory and financial factors, regions are increasingly confronted with grand societal challenges—such as climate change, ageing society, inequality, and technological disruptions, operationalised in the SDGs—that transcend regional boundaries and require coordinated, multi-scalar responses (Hassink et al., 2022; Isaksen et al., 2022). In this regard, societal discourses at the local, regional, national, and supranational levels are not only a *"powerful mechanism to influence informal institutions"* (Chlebna et al., 2023, p. 229) but are likely to influence regional actors' perceptions of societal challenges and, thus, affect transformative regional development.

Addressing grand societal challenges demands regions not only to leverage their local strengths but also to strategically engage with exogenous factors, including global market dynamics, international regulatory frameworks, and cross-border environmental agreements. By recognising and responding to these multi-scalar forces, regions can enhance their societal innovativeness, ensuring innovation is locally driven and globally relevant.

3.7 Synthesis

The reviewed literature comprises works deemed pertinent by the authors for enhancing the understanding of societal innovativeness. These works draw upon various interdisciplinary perspectives exploring the underlying factors facilitating innovation within societies from different angles, including sociology, philosophy, political science, economics, economic geography, science and technology studies, and urban and regional planning.

The literature review sought to identify preliminary insights into the explanatory power of the initial dimensions—values and norms, capacities, power relations, system-level agency and narratives and imaginaries, and exogenous factors—collectively assumed to elucidate societal innovativeness's drivers. Through analysing scholarly contributions across various domains, this review seeks to integrate these diverse insights into a cohesive explanatory framework. By exploring how cultural values, institutional capacities, power dynamics, collective agency, and discursive constructs shape and propel innovative practices, the literature review underscores the complexity of the novel construct 'societal innovativeness' as a real-world phenomenon and analytical category.

The following table summarises the key findings from the literature review in six dimensions. It lists relevant authors for each dimension, summarises their key arguments, and outlines their contributions to understanding regional societal innovativeness.

Table 1. Overview of theoretical approaches and their explanatory contribution

Component	Author(s)	Key aspects	Contribution
Values & Norms	Bourdieu (1986), Farinha Carmo et al. (2020), Geels & Schot (2010), Granovetter (1985), Inglehart (2017), Millard & Fucci (2023), Putnam (2002), Reale (2022), Rutten (2019), Scott (1989), Sotarauta & Hansen (2024)	• Values and cultural norms shape societal innovativeness. • The accumulation and mobilisation of social and cultural capital, along with networks, trust, and reciprocity, facilitate the introduction and diffusion of novel ideas. • Shared values and institutional logic guide innovation processes' direction, nature, and legitimacy.	• Helps understand how cultural and social capital are crucial for innovation. • Clarifies the role of shared values in aligning regional coherence. • Explains the motivation for collaboration essential to initiate and sustain societal innovation.
Capabilities	Frediani et al. (2019), Jacobi et al. (2017), Janssen et al. (2023), Kimhur (2020), Leßmann (2022), Nussbaum (2011), Perrons (2012), Raushmayer et al. (2018), Sen (1985, 1992, 1999), Sen & Nussbaum (1993), Ziegler (2020)	• Personal, institutional, and social structures shape capabilities. • Expansion of skills and freedoms unlocks innovation potential. • Collective capacities are crucial for facilitating change processes. • Emphasises collaborative action for achieving shared outcomes. • Highlights institutional support as key to capability development	• Highlights how individual and collective capabilities drive social change. • Emphasises the need for institutional support to facilitate societal innovativeness. • Shows how collaboration nurtures environments that enhance societal innovativeness.
Power relations & dynamics	Arendt (1969, 2002), Avelino (2021), Avelino & Rotmans (2009), Avelino et al. (2024), Bourdieu (1989), Foucault (1982), Geels (2022), Menge (2018), Weber (1980)	• Power relations and dynamics are critical in understanding innovation processes and societal change. • Power is not only possessed but also exercised and can be an enabler of change through collaboration. • Models of 'power with' encourage collective action and inclusive participation. • Centralised power may marginalise voices; distributed power aids inclusiveness • Power relations influence who contributes to the innovation landscape.	• Allows for apprehending how power relations influence societal innovativeness, mainly through facilitating inclusive participation and collaborative problem-solving methods.
System-level Agency	Benner (2024), Gidden (1984), Grillitsch, Sotarauta et al. (2023), Isaksen et al. (2019), Miörner (2022), Moulaert et al. (2013), Nilsen et al. (2022), Strambach & Klement (2012), Suitner et al. (2023), Tödtling et al. (2022)	• System-level agency involves regional actors coordinating resources. • Agency and structure interplay influences societal innovation. • Collaborative problem-solving is key. • Collective agency through networks is essential for transformative regional development. • Multi-level governance and flexible institutions facilitate path change	• Examines the coordinated actions in regional innovation ecosystems. • Highlights collective agency as a vital component for facilitating transformative change. • Explains how structural interactions support adaptable innovation paths.
Narratives & Imaginaries	Austin (1975), Bijon et al. (2022), Davoudi & Machen (2022), Douthwaite et al. (2002), Görmar (2024), Hassink et al. (2019), Jessop & Oosterlynck (2008),	• Narratives and imaginaries are tools for creating agency and defining futures. • They integrate historical contexts and envisioned futures that influence	• Highlights the performative of narratives and imaginaries in shaping societal processes by influencing stakeholders' perceptions and actions

Component	Author(s)	Key aspects	Contribution
	Lefstad et al. (2024), Pfotenhauer & Jasanoff (2017a, 2017b), Reed et al. (2006), Roessler (2024), Roessler et al. (2024), Steen & Hansen (2018), Sydow et al. (2012), Pugh & Andersson (2024)	perceptions, behaviours, and regional development and thus have performative effects. • Relational myths and plausible promises guide actions and strategies.	• Points to the importance of narratives and imaginaries in fostering novel solutions and practices to societal challenges.
Exogenous Factors	Binz et al. (2020); Cowan et al. (2015); Chlebna et al. (2023); Grillitsch et al. (2025); Hassink et al. (2022); Isaksen et al. (2022); Priebe & Herberg (2024); Trippl et al. (2017)	• Exogenous factors are external stimuli impacting regional societal innovativeness and influencing agency. • Grand societal challenges necessitate multi-scalar responses • Regulatory frameworks, funding programmes, and the grand challenges themselves affect societal innovativeness	• Highlight the multi-scalar influences shaping regional societal innovativeness and transformative development • Emphasise how exogenous factors beyond local control affect societal innovativeness by delineating operational boundaries for innovation, either enabling or constraining regional effort • Points to coordinated responses to transboundary challenges, reinforcing regions in addressing societal challenges

Source: Own compilation

4 Synthesis: Towards an explanatory model of societal innovativeness

Based on the above literature review, an initial theory-informed explanatory framework model of societal innovativeness as an enabler and driver of transformative regional development integrates multiple dimensions of social and institutional interactions to address complex societal challenges effectively.

4.1 Constituent elements

The framework of societal innovativeness is grounded in the dynamic interplay among six core elements: social capital (values and norms), capacities and capabilities, power relations, system agency, narratives and imaginaries, and exogenous factors. These elements do not function independently; they are interdependent and collectively contribute to understanding societal innovativeness, thereby enabling transformative regional development.

4.1.1 Social Capital: Shared Values and Norms as a Foundation

The foundational layer of societal innovativeness is shared values and cultural norms, which mould a region's innovation environment by creating opportunity spaces and a fertile ground for novel solutions and practices. These elements shape the social fabric of a community, influencing how actors conceptualise and enact their roles within innovation processes. Regions with strong collaborative values may foster more effective partnerships among businesses, government, and civil society, enhancing societal innovativeness. That includes the accumulation and mobilisation of social and cultural capital, which enables the introduction and diffusion of novel ideas. Trust, networks, and reciprocity are crucial factors in fostering collaborative action. The transition from individual to shared values is essential for achieving alignment among regional actors, which aids in forming cohesive strategies for addressing societal issues. Effective conflict management techniques and open communication are assumed to further

enhance societal innovativeness by harmonising diverse interests and fostering participation.

Relation with other components: Shared values and cultural norms influence the development of capacities and capabilities by fostering an environment where innovation is culturally supported and actively pursued. They provide a normative framework that aids institutions and individuals in aligning their innovative activities with regional goals, thus forming the basis around which other components operate. That leads us to assume:

A1.1. Aligning shared values and cultural norms among regional stakeholders and mobilising social and cultural capital positively impacts societal innovativeness by fostering trust, networks, and reciprocity.

A1.2 Effective conflict management and inclusive participation moderate the relationship between shared values and societal innovativeness.

4.1.2 Capabilities as Enablers

Expanding the capabilities of individuals and groups is vital for unlocking societal innovation potential. Shifting the focus from economic development to enhancing human freedoms and capacities will likely facilitate engagement in regional innovation activities. Institutional and social support systems are vital in enhancing these capabilities by creating opportunity spaces that facilitate collaborative action and foster community engagement. This collective empowerment enables communities to leverage resources effectively and engage in knowledge-sharing activities that drive innovation and long-term sustainable development.

Relation with other components: The interplay between values and capabilities is evident as shared beliefs motivate the development of skills and competencies necessary for joint actions. Capabilities facilitate power distribution by enabling more actors to participate in decision-making processes. They enable system-level agency by cultivating conducive collaborative environments and empowering diverse groups, thereby providing the human capital necessary to implement innovative practices and solutions. Consequently, we assume:

A2.1. Expanding individuals' and groups' capabilities through empowerment positively affects societal innovativeness by enabling engagement in regional innovation activities.

A2.2 Institutional and social support moderate the relationship between capabilities and societal innovativeness by providing 'opportunities spaces' for collaborative action and community engagement.

4.1.3 Power Relations as a Structuring Force

A comprehensive understanding of power dynamics is vital in elucidating societal innovativeness. Power relations shape participation within change processes, often determining the inclusion or exclusion of stakeholders. A decentralised power structure fosters inclusive and collaborative involvement, which is necessary for mobilising regional assets' full potential and enhancing innovation initiatives' legitimacy. Navigating these dynamics is crucial for creating an environment where diverse institutions and actors can cooperatively contribute to initiating, realising, sustaining and perpetuating novel solutions, amplifying a process of transformative change, thereby strengthening the region's capacity to tackle multifaceted challenges.

Relation with other components: Power relations are intricately linked with capacities and capabilities, as those with greater capabilities often have more power to impact innovation outcomes. Equitable power relations promote inclusive participation and enable collective agency, whereas imbalances can hinder collaboration and stifle system agency. By managing power dynamics effectively, regions can create

environments where diverse perspectives contribute to shared narratives and imaginaries, ensuring that innovation reflects a wide range of local needs and aspirations. Therefore, we assume:

A3.1 Decentralised power structures increase stakeholder inclusion in challenge-oriented change processes, enhancing regional transitional initiatives' legitimacy and effectiveness.

A3.2 Effective navigation of power dynamics positively influences a region's societal innovativeness through inclusion and diversity.

4.1.4 System-level Agency as a Collective Driver

The collective capacity of regional actors to function as change agents is crucial for societal innovativeness. System-level agency is characterised by the capacity of regional actors to shape the trajectory of innovation systems through collaboration and interconnected networks of interaction. As such, it includes fostering environments that support collaborative problem-solving and adaptation. Regional innovation systems provide an infrastructure that bridges public, private, third and civic sectors, ensuring that innovative efforts are inclusive and comprehensive. Empowerment of collective agency within this framework allows for challenging existing norms and facilitating the creation of adaptive and sustainable innovation cycles.

Relation with other components: The ability of regional actors to act collaboratively is the vehicle through which innovation systems are influenced and transformed. System-level agency is realised when actors leverage their capacities and navigate power relations to coordinate actions toward common goals. This collective action is guided by shared values and reinforced by narratives that articulate a coherent vision for change. Effective system-level agency drives the emergence of a supportive ecosystem where innovation thrives, policies align with societal needs, and transformative change is strategically pursued. Based on the above, we assume:

A4.1 Regional actors' effective exercise of system agency aligns innovation system trajectories with societal needs, thereby increasing societal innovativeness.

A4.2 Enhanced collaboration among diverse regional actors within an innovation ecosystem increases the rate of adaptive and sustainable innovation cycles.

4.1.5 Narratives and Imaginaries as Guiding Visions

Narratives and imaginaries provide strategic direction and a motivational framework for innovation efforts. They serve as transformative tools that guide societal innovation by influencing perceptions and providing direction. Like missions, they can act as 'boundary objects', i.e. focal points around which diverse regional communities coalesce, collaboratively constructing shared imaginaries of the future, the essential pathways, and the evolving processes necessary for progression. Thus, imaginaries and narratives offer a compelling vision that contextualises current challenges from both historical and future-oriented perspectives. Imaginaries function as performative frameworks that steer decision-making processes by articulating rational myths and plausible promises that resonate with stakeholders. This strategic use of narratives supports the mobilisation of resources and the building of legitimacy, which are crucial for enacting transformative change and fostering regional development.

Relationship with other components: Narratives and imaginaries interrelate with values by encapsulating cultural norms into compelling future visions, offering a narrative logic that binds the model's elements together. By framing societal challenges and opportunities,

imaginaries inspire the development of capacities, guide power dynamics, and clarify system agency. They play a crucial role in mobilising regional actors and legitimising innovative actions, thus ensuring that the innovation process is purposeful and aligned with the collective aspirations of the region. In conclusion, the interplay between these elements creates a holistic and adaptive framework for societal innovativeness. The values provide foundational beliefs that guide behaviour; capabilities enable action; power relations structure participation; system agency coordinates efforts; and narratives and imaginaries offer a coherent vision. Together, these elements create a dynamic environment that enhances the region's ability to respond to complex challenges and drive transformative change collaboratively. Against this background, it is reasonable to assume:

A5.1 Articulating compelling narratives and imaginaries that interrelate with cultural values improves the alignment of innovation efforts with regional aspirations, fostering societal innovativeness.

A5.2 Integrating narratives and imaginaries into innovation strategies increases the mobilisation of resources and the legitimacy of transformative initiatives, thereby enhancing regions' transformative development.

4.1.6 Exogenous Factors as a Catalyst

While external to regional systems, exogenous factors play a pivotal role in shaping societal innovativeness by introducing external stimuli and frameworks that influence development and innovation processes. These factors extend beyond the direct control of regional actors, encompassing elements such as global economic conditions, national and supranational funding programmes, regulatory frameworks, and environmental imperatives. Their influence transcends regional boundaries, affecting local communities' operational environment and innovation capacity.

Regions are inherently embedded within broader economic and political structures, where exogenous forces can accelerate or constrain transformative change. Regulatory frameworks shaped by national, EU and international policies define the boundaries within which regional innovation systems function, simultaneously presenting opportunities and challenges. Likewise, this applies to public funding for the regional economy, research and infrastructure.

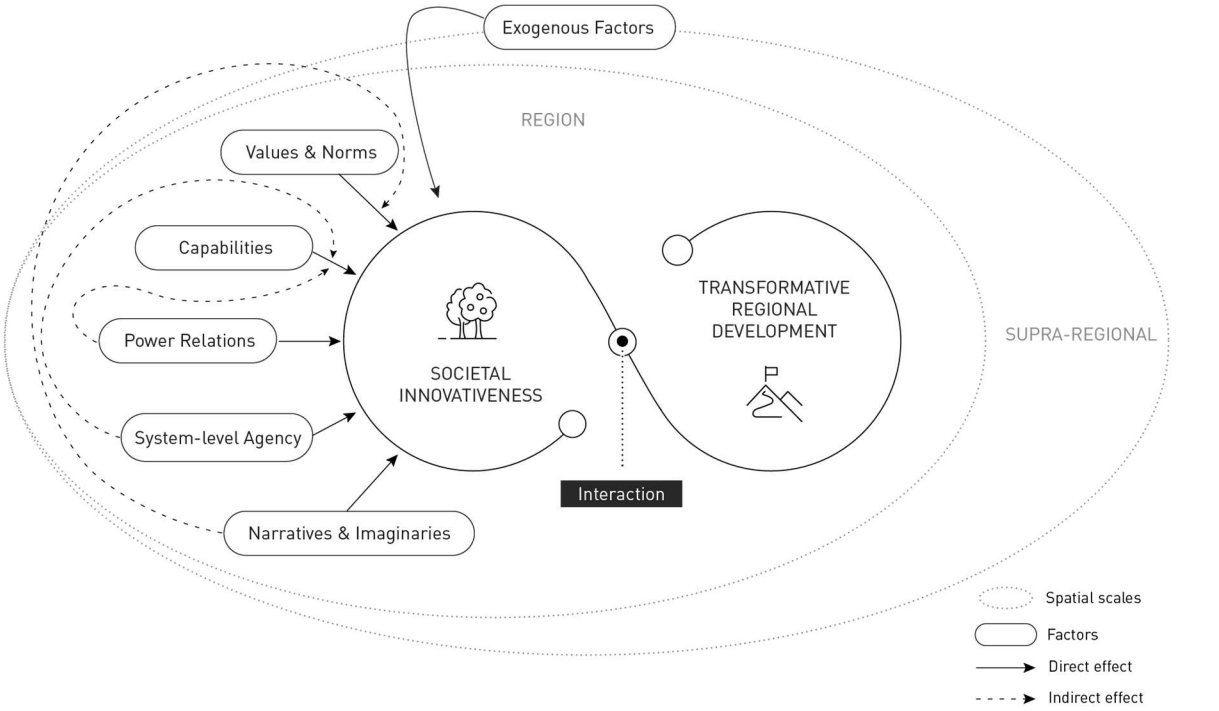
Relation with other components: Exogenous factors interact with all core elements of societal innovativeness. They shape values by influencing societal narratives surrounding global challenges, drive capacity-building by providing funding and opportunities for knowledge exchange and recalibrate power dynamics by introducing new actors and frameworks. Additionally, exogenous factors enhance system-level agency by fostering cross-regional collaborations and promoting shared imaginaries that align with global and national innovation agendas. Consequently, we assume:

A6.1 Engagement with exogenous factors, encompassing but not limited to national and international policies and funding programmes, positively impacts societal innovativeness by expanding regional development opportunities.

A6.2 Addressing grand societal challenges through coordinated multi-scalar approaches enhances the regional capacity to drive transformative change, reinforcing the relationship between exogenous factors and societal innovativeness.

Figure 1 summarises the initial framework model of societal innovativeness.

Figure 1. Initial Framework Model of Societal Innovativeness



Source: Own illustration

4.2 From Assumptions to Hypothesis

The elaborated theoretical framework on societal innovativeness is envisaged to be validated by formulating and empirically testing hypotheses across distinct regions. The foundational assumptions (A1–A5) delineate how societal innovativeness develops and matures within various regions, offering a conceptual grounding for the subsequent hypotheses (H0–H5). These assumptions identify crucial drivers that act as catalysts for fostering societal innovativeness. By extending these assumptions, the hypotheses propose specific, testable assertions regarding the manifestation of these drivers in diverse regional contexts, particularly in structurally weak areas.

Thus, the empirical approach not only tests the validity of the proposed framework but also captures the nuanced interactions between endogenous and exogenous factors that influence societal innovativeness. It provides critical insights into the model's applicability and robustness under real-world conditions.

The diversity of regional settings allows for comparative analysis, enhancing the generalisability of the findings and providing a comprehensive understanding of how societal innovativeness unfolds across varying socio-economic and institutional landscapes, leading to assume that in structurally weak regions, societal innovativeness preliminary aims to compensate for the deficits in social ('soft') and technical ('hard') infrastructure.

Social capital, embodied through shared values and cultural norms (A1.1), provides the foundational layer for societal innovativeness by shaping a region's innovation environment.

By fostering trust, networks, and reciprocity, social capital catalyses collaboration among businesses, government, and civil society, which is essential for effective partnerships and disseminating novel ideas. Thus, we hypothesise that:

H1. Actor diversity (AD), encompassing sectoral, professional, and demographic representation, enhances societal innovativeness by fostering trust, networks, and knowledge exchange.

However, the extent to which this relationship flourishes depends upon the presence of conflict management and inclusive participation mechanisms (A1.2), which moderate the interaction between shared values and societal innovativeness. This leads us to hypothesise as follows:

H2. The availability of 'meeting spaces' (space of encounter) that foster cross-professional, cross-sectoral, and cross-community interactions moderates the relationship between social capital/shared values and societal innovativeness.

H3. Aggregated personality traits affect regional actors' interactions and moderate the relationship between social capital/shared values and societal innovativeness.

Enhancing the capabilities (A2.1) of individuals and groups is pivotal for unlocking the potential of societal innovativeness. Applying the CA to the study of participation makes it possible to assess regional actors' choices, abilities, and opportunities to achieve common goals. Doing so shifts the focus from purely economic development to enhancing human freedoms and capabilities. Empowerment, in particular, facilitates the cultivation of change agents, vital in driving societal innovation, by enhancing actors' participatory capabilities. This gives rise to the following hypothesis:

H4. The presence of change agents, defined by their influence and measurable community activities, positively influences societal innovativeness.

Institutional and social support systems indirectly affect regions' societal innovativeness by establishing opportunity spaces that foster collaborative action and community engagement. Empowerment for change agency facilitates communities in effectively leveraging resources to drive innovation. It follows to hypothesise:

H5. Interventions designed to stimulate change agency moderate the relationship between the presence of change agents and societal innovativeness.

This intersection between empowerment and opportunity spaces underscores the critical role of inclusive structures (A2.2) in fostering broad-based participation in regional innovation processes.

H6. Empowering previously underrepresented actors, defined by demographic or sectoral representation, moderates the relationship between the availability of change agents and societal innovativeness through their increased participation.

The *distribution of power* and the nature of *decentralised governance* (A3.1) posit that inclusive governance structures directly enhance transitional processes. Moving from structural conditions (decentralisation) to cognitive and procedural outcomes (enhanced perception and action) leads to hypotheses:

H7. Shared understanding (problem framing) enhances societal innovativeness by facilitating cross-sectoral collaboration and exchange.

H8. The joint recognition or formulation of problems by actors from the public, private,

third, and civic sectors facilitates an enhanced collective understanding (problem framing), thus moderating the relationship between shared understanding and societal innovativeness

H9. The alignment of cultural trajectories with region-specific societal challenges enhances the effectiveness of cross-sectoral collaboration in driving societal innovativeness.

Regional actors' *system-level agency,* characterised by collaborative problem-solving and interconnected networks, is vital for societal innovativeness (A4.1). It follows that:

H10. The established institutional framework influences a region's societal innovativeness, as manifested in the region's system-level agency.

Regions with open and adaptable structures gain from heightened innovation through collective support or opposition to proposed solutions. Despite this, empowering collective agency challenges existing norms and facilitates the emergence of sustainable innovation cycles. In light of this, it is hypothesised that:

H11. The openness of regional structures and actors to change contributes to social innovation by supporting or opposing solutions.

Moreover, power distribution among diverse actors, as reflected in participatory/collaborative governance models, bolsters collaborative efforts, emphasising the link between shared authority and the emergence of societal innovativeness.

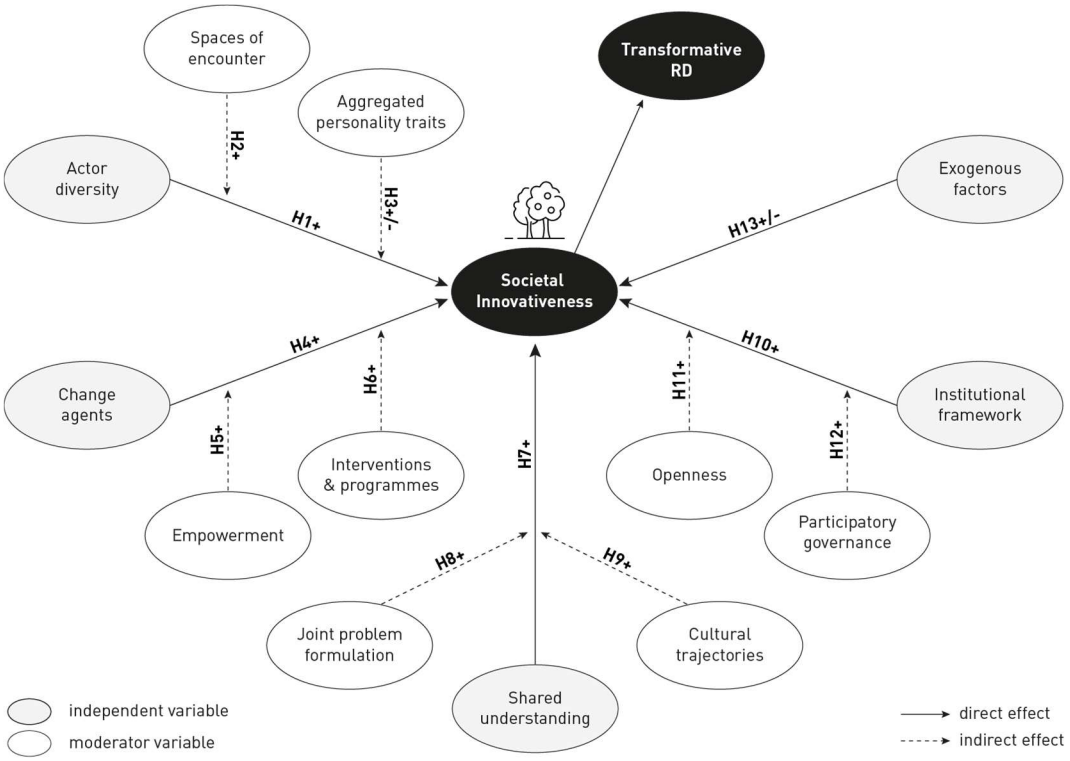
H12. Cross-sectoral power distribution and decision-making authority among actors increase willingness to collaborate, positively affecting societal innovativeness.

Narratives and imaginaries (A5.1, A5.2) offer strategic guidance and a motivational framework for innovation initiatives, serving as 'boundary objects' that unify diverse communities within the region. In contrast, exogenous factors, which establish the broader context for regional action (A6.1, A6.2), are likely to shape actors' perceptions and regional discourses. Consequently, it follows that:

H13. Exogenous factors, encompassing climate change, demographic shifts, digitalisation, and political frameworks (such as regulatory decisions and funding programmes), indirectly impact societal innovation capacity by rescaling global challenges, reshaping perceptions and values and providing frameworks for action.

Figure 2 summarises the hypotheses.

Figure 2. Summary of Hypotheses



Source: Own illustration

4.3 Operationalisation

Operationalising the components of the novel concept of societal innovativeness necessitates an exploratory approach that acknowledges the complexities inherent in this multifaceted phenomenon. Given its intricate nature, operationalising the model's components—values and norms, capabilities, power relations and dynamics, system-level agency, narratives and imaginaries, and exogenous factors—demands a multifaceted mixed-method approach that combines quantitative and qualitative methods to capture this complexity.

These components, or constructs, represent abstract elements or multidimensional phenomena that a single indicator cannot directly measure. Instead, they are operationalised through combinations of multiple indicators, providing a comprehensive representation of the underlying construct. The authors aim to investigate and elucidate the constructs' effects on societal innovativeness by systematically identifying relevant indicators. The exploratory framework serves as a foundational model intended to guide subsequent research and enhance its applicability across varied regional contexts.

Established constructs and indicators are utilised to the greatest extent possible to enable cross-regional comparisons and ensure alignment with the international discourse. Consequently, the novelty of the measurement approach arises primarily from the innovative recombination of existing constructs and indicators.

4.3.1 Social Capital

Social capital is a multidimensional construct in various social science fields. As a result, scholars in these fields have yet to agree on variable selection, weighting schemes, and the adaptation of measurements to cultural and geographical contexts. Scholars often draw on social survey databases, such as the World Value Survey (WVS), the European Social Survey (ESS), or the German Socio-Economic Panel (SOEP) (Gannon & Roberts, 2020; Hartung, 2022).

They differentiate between structural, cognitive and relational dimensions in operationalising social capital (Carmen et al., 2022; R. Lee et al., 2019). The *structural* dimension refers to the scope of networks and social systems. It is more tangible than the other dimensions and can be, for example, measured by people's association membership as a proxy. The *cognitive* or socio-cultural dimension points to factors that foster shared representations, interpretations, and systems of meaning among individuals or groups. These systems of 'meaning' manifest, for example, in shared values and norms, joint narratives and language, and shared goals and visions (Inkpen & Tsang, 2005). In this regard, Carmen et al. (2022) refer to the socio-cultural dimension of social capital. In this regard, Ahn and Davis (2020) utilise 'sense of belonging' as a proxy for social capital. The *relational* dimension relates to the quality aspects of relationships. These encompass reciprocity, trust and norms embedded in the relationships (Bartolini et al., 2023; Carmen et al., 2022; Gannon & Roberts, 2020). To operationalise these aspects, established items from the German Socio-Economic Panel are used (see

Table 2).

Table 2. Operationalisation of Social Capital

Construct	Item(s)	Scale	(Data) Source
Relational social capital	reciprocity_1: Willingness to return favours ("If someone does me a favour, I am prepared to return it.")	Likert-scale from 1 = does not apply to me at all to 7 = applies to me perfectly	German Socio-Economic Panel 2020 (Kantar Public, 2021)
	reciprocity_2: Special effort to return help ("I go out of my way to help somebody who has been kind to me before.")		
	reciprocity_3: Personal costs to return help ("I am ready to undergo personal costs to help somebody who helped me before.")		
	trust_1: "People can generally be trusted."	Likert scale: 1 = fully agree to 4 = refuse completely	German Socio-Economic Panel 2018 (SOEP Group, 2020)
	trust_2: "Nowadays, one can't rely on anyone."		
	trust_3: "If one is dealing with strangers, it is better to be careful before trusting them."		
	identity: "How strongly do you feel connected to your place of residence?"	Likert scale: 1 = very strong to 5 = not at all	Sociality Index (SIX) 2023
Structural social capital	network_1: Leisure time ("Volunteer work in clubs or social services")	Likert scale: 1 = daily to 5 = never	German Socio-Economic Panel 2021(infas, 2022)
	network_2: Leisure time ("Visiting or being visited by neighbours, friends, or acquaintances", "Visiting or being visited by family members or relatives.")		
	network_3. Membership in associations ("Are you a member of one of the following organisations or unions?") —» trade union, professional body, work or staff council at your place of work, club or similar organisation	Yes/no	German Socio-Economic Panel 2019 (Kantar Public, 2020)
	participation: public participation ("My place of residence involves citizens in municipal planning.")	Likert-scale: 1 = fully applicable to 5 = not applicable at all	Sociality Index (SIX) 2023
Socio-cultural social capital	joint_action_plans (collaboratively elaborated regional action plans, strategy documents, etc.)	Yes/no	Quantitative via interviews
	belonging: "I feel connected to the people who live in my city."	Likert scale: 1 = fully agree to 5 = refuse completely	German Socio-Economic Panel 2018 (SOEP Group, 2020)

4.3.2 Capabilities

Like social capital, capabilities, as conceptualised within the CA, are inherently multidimensional (Robeyns, 2017). While prominent indices informed by the CA, such as the Human Development Index and the World Happiness Index, are widely recognised, Ziegler (2020, p. 37) argues that *"[w]hile functioning can be measured, capability freedom [opportunities] is much more difficult to be captured quantitatively"* (emphasis in brackets added). As Robeyns (2017) asserted, the CA remains an

underspecified framework that requires further elaboration to achieve effectiveness within a specific context. Accordingly, no unique set of indicators exists for capability analysis. Here, the focus is on conceptualising societal innovativeness as an enabler and driver for transformative regional development in structurally weak regions. Hence, functioning indicators relating to what is achieved in terms of standards of living include—but are not limited to—education, health, housing, and quality of life (Dahlbeck, Flögel, et al., 2022). Within the scope of societal innovativeness' role in facilitating transformative regional development in structurally weak areas, these indicators serve as criteria for categorising regions.

As outlined in Section 3.2, the academic discourse on collective capabilities highlights the critical role of engaging diverse actors to facilitate the attainment of shared objectives that would otherwise remain out of reach for individual actors. Building on Doloreux et al. (2024), *actor diversity* can be operationalised through sectoral affiliation (e.g., public, private, civic, third sector) and roles. Concerning the latter, Haan and Rotmans (2018, 279f.) distinguish four types of actors: (1) *frontrunners,* making alternative solutions known and available early; (2) *connectors,* embedding or anchoring solutions within the system and linking diverse actors; (3) *topplers,* introducing, altering or phasing out institutions; and (4) *supporters,* who play a pivotal role in institutionalising transformative change. Additionally, *opponents* can be identified as actors resisting or obstructing change, often due to vested interests, conflicting values, or a perceived threat to the existing order.

In addition to sectoral and functional diversity, his study further incorporates cultural and social diversity, encompassing the representation of individuals from varied cultural, ethnic, and social backgrounds. Network diversity, i.e. bringing together various actors, including formal partnerships and informal collaborations (e.g., user communities (virtual or physical), advocacy groups, movements, etc.), is considered (ibid.).

Spaces of encounter are context-specific and, therefore, lack a universally agreed definition and standardised operationalisation. Moreover, social interaction within these spaces is not always deliberate but can occur incidentally, including short-term situational (everyday) interaction (Spenger et al., 2023). In their methodological approach, the authors analyse places of encounter across four dimensions: (1) level of institutionalisation, (2) level of intentionality, (3) level of inclusion, and (4) scale (horizontal (radius) and vertical: one-to-many, one-to-one, many-to-many encounters). Drawing on qualitative data, the authors propose a three-point Likert scale (high, medium, low) to assess these places along the identified dimensions. For example, concerning the level of intentionality, the following criteria are applied (Spenger et al., 2023, p. 7): *"The aim and purpose of using this place is encounter."* (high), *"Encounters at this place are of secondary concern"* (medium) and *"The place is not explicitly sought for encounters"* (low).

Table 3. Operationalisation "Capabilities I – Actor Diversity and Space of Encounter"

Construct	Item(s)	Scale	(Data) Source
Actor diversity	sec_div (sectoral diversity)	numeric	Interviews (own data)
	func_div (functional diversity)		
	cult_div (cultural/social diversity)		
	net_div (network diversity)		
	network_div_assoc (number of (new) associations)	numeric	Association register
Spaces of encounter	level_ins	3-point Likert-scale: 1= low, 2 = medium, 3 = high	Interviews; scale adopted from Spenger et al. (2023)
	level_int		
	level_inc		
	scale_horz		

In addition, from a spatial perspective, recent research has provided evidence of regional variations in specific personality traits within populations. These regional differences in key behavioural characteristics partly explain regional development dynamics (N. Lee, 2017; Mewes et al., 2022; Reher et al., 2024). In this context, the Big Five model[4]—devised initially as a universally applicable and cross-culturally validated taxonomy of individual personality traits—has also been employed to theorise personality patterns aggregated at the regional level, including its application in the geography of innovation. Mewes et al. (2022), for example, investigate the interplay between openness, a core dimension of the Big Five personality traits, and regional innovation within US metropolitan areas. Their findings demonstrate a strong positive relationship between openness and the development of breakthrough innovations. Acknowledging the varying patterns of learning and knowledge sharing, Reher et al. (2024) add to this by accounting for the type of region, distinguishing leading and lagging regions, assuming that the latter are more reliant on public R&D and softer innovation factors (e.g. tolerance, inclusion, collaboration). The authors find support for a positive relationship between extravision and patenting, particularly pronounced in lagging regions. Hence, it seems reasonable to include aggregated personality traits as a proxy for capabilities.

Table 4. Operationalisation "Capabilities II – Aggregated Personality Traits"

Construct	Item(s)	Scale	(Data) Source
Extravision	extra_1: "I see myself as someone who is reserved."	Likert scale from 1 = does not apply at all to 5 = fully applies	Rammstedt et al. (2014); German Socio-Economic Panel
	extra_2: "I see myself as someone who is outgoing and sociable."		

[4] The model is based on the empirically validated assumption that the dispositional core structure of an individual's personality can be adequately captured using five traits across nearly all cultures worldwide (extravision, openness, conscientiousness, agreeableness, neuroticism) Huggins et al. (2018).

Construct	Item(s)	Scale	(Data) Source
Openness	open_1: "I see myself as someone who has few artistic interests."		
	open_2: "I see myself as someone who has an active imagination."		
Conscientiousness	con_1: "I see myself as someone who tends to be lazy."		
	con_2: "I see myself as someone who does a thorough job."		
Agreeableness	agree_1: "I see myself as someone who is generally trusting."		
	agree_2: "I see myself as someone who tends to find fault with others.		
Neuroticism	neuro_1: "I see myself as someone who is relaxed and handles stress well."		
	neuro_2: "I see myself as someone who gets nervous easily."		

4.3.3 System-level Agency

Operationalising system-level agency in regional development requires a careful conceptual and empirical translation of the collective capacity to influence systemic change. At its core, system-level agency denotes the ability of constellations of actors—comprising firms, public bodies, research institutions, and intermediary organisations—to intentionally steer, transform, or reconfigure regional structures beyond the actions of individual entities. Capturing this phenomenon empirically necessitates its disaggregation into distinct, observable dimensions.

Key dimensions of system-level agency include a shared strategic vision, coordination capacity across heterogeneous actors, the ability to mobilise and allocate resources, the establishment or transformation of governance structures, and the system's reflexive learning and adaptive capabilities. These dimensions are reflected in empirical indicators such as the existence and implementation of regional development strategies, the density and diversity of collaborative initiatives, the emergence of new governance mechanisms, and the capacity to attract external investments or adapt policy frameworks.

Transformative regional development, however, hinges critically on the presence of change agents within a region. To identify these agents, Píša (2023) distinguishes economic, social, and spatial dimensions, each associated with distinct fields of change agency. For instance, in the economic dimension, the author identifies promoting innovation, enhancing economic diversity, and creating qualified jobs as key areas of change. Recognising and operationalising these specific arenas of agency serves to further refine the understanding of system-level change processes, whilst anchoring them within concrete regional dynamics.

A further essential element of system-level agency involves empowering regional actors. Empowerment can be operationalised as strengthening actors' capacities to influence decision-making processes, access and mobilise resources, form strategic alliances, and collectively develop visions for regional futures. Indicators of empowerment may include the proliferation of leadership development initiatives, the formation of cross-sectoral partnerships, the establishment of participatory governance arrangements, and the increased legitimacy and visibility of historically

marginalised groups within regional decision-making arenas.

Finally, interventions and programmes are pivotal in enabling and amplifying system-level agency. Interventions may include policy initiatives, capacity-building programmes, cluster development efforts, and innovation support schemes designed to activate local resources and foster collaboration across sectors. Thus, evaluating system-level agency entails examining such interventions' design, implementation, and outcomes, including their contribution to actor empowerment, institutional change, and the initiation of new regional development trajectories.

The operationalisation further gains analytical depth when linked to regional development outcomes such as path creation, diversification, structural transformation, or enhanced regional resilience. For instance, in regions undergoing post-industrial transition, such as the Ruhr area, system-level agency becomes visible in the coordinated emergence of new innovation networks and governance arrangements that facilitate economic diversification beyond historically dominant industries.

Table 5. Operationalisation System-level Agency

Construct	Item(s)	Scale	(Data) Source
Shared vision	Existence of regional development strategies	binary (yes/no)	Own indicator
	Degree of implementation of strategic vision	Likert scale from 1 = does not apply at all to 5 = fully applies	
Coordination capacity	Density and diversity of collaborative initiatives	numeric	Own indicator
	Cross-sectoral partnerships	qualitative	
Resource mobilisation	Ability to mobilise and allocate financial resources	Likert scale from 1 = does not apply at all to 5 = fully applies	Own indicator
	Ability to mobilise and allocate human resources		
	Ability to mobilise and allocate organisational resources		
Governance structures	Establishment of governance mechanisms	Likert scale from 1 = not at all to 5 = fully applies	Own indicator
	Adaptation governance arrangements		
	Participatory governance arrangements		
Reflexive learning and adaptation	Capacity to adapt policy frameworks • Existence of feedback mechanisms • Flexibility of governance structures • Frequency of policy updates • Ability to realign priorities • Introduction of experimental policy measures	Likert scale from 1 = does not apply at all to 5 = fully applies	Own indicator
	Learning from previous interventions • Institutional learning capacity (e.g. learning workshops, evaluations)	Likert scale from 1 = does not apply at all to 5 = fully applies	Own indicator

Construct	Item(s)	Scale	(Data) Source
	• Actor perception of responsiveness ("To what extent do you perceive that regional institutions adjust strategies when needed?")		
Presence of change agents	ch_spatial_1: Revitalisation of declining public spaces	numeric	Píša (2023), Grillitsch and Sotarauta (2020)
	ch_spatial_2: Creation of new places for informal networking and community building	numeric	
	ch_economic_1: Creation of qualified jobs	numeric	
	ch_economic_2: Enhancement of economic diversity	numeric	
	ch_social_1: Improvement of social cohesion	numeric	
	ch_social_1: Improvement of participation level	numeric	
Empowerment	Leadership development initiatives	numeric	Own indicator
	Formation of strategic alliances	numeric	

4.3.4 Narratives and Imaginaries

Empirically identifying imaginaries and narratives, particularly in the context of societal innovativeness and regional development, requires a systematic approach to uncovering how actors envision and articulate the future, meaning, and direction of social and/or economic change. As outlined in Section 3.5, imaginaries are deeply held collective understandings shared by a large group of regional actors. Narratives, in contrast, operate on a smaller scale than imaginaries, identifying storylines that actors use to convey certain messages.

Grasping regional actors' shared understanding, as well as joint problem formulation and cultural trajectories, as moderator variables, calls for a qualitative approach, which allows for critical narrative analysis (Görmar, 2024; Roessler, 2024) and necessary condition analysis[5] (Dul, 2024). It follows that related variables are qualitative rather than quantitative.

The operationalisation of *narratives* draws on the multidimensional approach proposed by Roessler (2024), distinguishing between 'narrative relation' (dominant, contra-narrative), 'narrative dimension' (time-based, place-based, actors-based), 'narrative orientation' (forward-, backwards-orientation) and 'narrative origin' (exogenous, endogenous).

Joint problem formulation, as a participatory and collaborative approach, can be operationalised through several indicators: the number and diversity of actors actively involved in problem-formulation processes; the frequency and quality of established participatory mechanisms (e.g., citizen panels, workshops, real-world laboratories, public consultations); and/or the extent to which the ideas of citizens and other regional stakeholders are textually reflected in policy documents.

Cultural trajectories denote the evolving patterns of meaning-making, values, norms, behaviours, and identities within a region over

[5] Necessity causality informs about what will *not happen* in the majority of cases if the necessary condition is absent Dul (2024).

time. They reflect how culture develops, transforms, and shapes social and institutional change (Nunn, 2012). Shaped by historical experiences, socio-economic structures, identity formations, and external influences, they signal continuity or change in regional narratives. Cultural heterogeneity, by contrast, refers to the coexistence of diverse cultural values, worldviews, and practices within a given region.

As a latent construct, cultural values are not directly observable but must be inferred from shared expressions and practices within a social group (Messner, 2022; Schwartz, 2014). Indices such as Schwartz's (2014) Value Inventory (SVI)[6] and Hofstede's Value Survey Module (VSM)[7] aim to capture these values at a particular moment, reflecting what individuals or societies deem important. While these indices have been applied in regional contexts (Hofstede et al., 2023; Weckroth & Kemppainen, 2023), their transferability from national to regional levels remains a contested issue. Critics argue that such indices may neglect intra-national variation and regional specificities, thus limiting their validity and explanatory power at sub-national scales. For example, the German sample of the European Social Survey, which integrates Schwartz's SVI, is neither designed nor weighted to ensure representativeness at subnational levels such as NUTS-1 (federal states), NUTS-2 (governmental districts), or NUTS-3 (counties). Although regional identifiers may be included, the sample sizes at these spatial levels are generally insufficient to support robust or representative analyses. It follows that such data are not suitable for reliably measuring cultural orientations at the county level.

Given the limitations above and the context-sensitivity of cultural value orientations, it appears methodologically appropriate to approximate regional cultural trajectories through content analysis of policy documents, strategic plans, action programmes, and similar materials, using culture.

Table 6. Operationalisation Narratives, Joint Problem Formulation & Cultural Trajectories

Construct	Subconstructs	Item(s)	Description	(Data) Source
Narratives	Narrative relation	Dominant narrative	Dominant within a geographic area, economic/societal field or community, covering and (re-)produced by the majority of actors	Roessler (2024, 410f.)
		Counter/contra narrative	Utilised by actors, proponents, opponents or leaders to change the dominant narrative or add another notion	
	Narrative dimension	Time-based	Developments and actions across the past, present, and future, enabling the reconstruction of processes and highlighting the relevance of the temporal dimension	
		Place-based	Grounded in locally specific features and a defined geographical scale, facilitating the analysis of locational conditions and spatial factors	

[6] The SVI is utilised in the European Social Survey (ESS); the seven cultural values (e.g. embeddedness vs autonomy, hierarchy vs egalitarianism) are measured by 21 items Duelmer et al. (2023).

[7] The VSM distinguishes six cultural dimensions, that is individualism (vs collectivism), power distance (high vs slow), masculinity (vs femininity), uncertainty avoidance (high vs low), long-term orientation (vs short-term orientation) and indulgence (vs self-restraint) Gerlach and Eriksson (2021).

Construct	Subconstructs	Item(s)	Description	(Data) Source
		Actor-based	Focuses on particular stakeholders and their interrelations and activities, providing insight into network constellations and local leadership structures	
	Narrative orientation	Forward orientation	Conveys aspirations, expectations, or anxieties associated with the imagined future	
		Backward orientation	Anchored in historical events or actions, reflecting on the legacy of the past	
	Narrative origin	Endogenous	Emerging primarily from within the local setting, either disseminated internally or projected outward from the community	
		Exogeneous	Originating primarily from outside the local context, introduced externally and often perceived as externally imposed or intrusive	
Joint Problem Formulation	Actor involvement		Number and diversity of actors (e.g., citizens, civil society, private sector, public institutions) actively engaged in defining regional problems	Attendance lists, stakeholder mapping
	Participatory mechanisms		Frequency and quality of participatory formats such as citizen panels, workshops, real-world laboratories, and public consultations	Event records, meeting protocols, and evaluation reports
	Integration of stakeholder input		Degree to which citizens' and other stakeholders' contributions are reflected in official policy texts and strategic documents	Content analysis of policy documents, strategic/action plans
Cultural trajectories	Population diversity	Populations with a migration background or foreign citizenship		Population statistics
		Patterns of in-/out-migration		Population statistics
		Frequency and diversity of cultural events		Self-collected
	Value articulation in policy		Traces of cultural values and orientations reflected in regional policy discourse over time	Regional policy documents, strategies, action plans, etc.
	Value-related keyword frequency		Systematic content analysis of documents using predefined cultural value-related keywords (e.g. autonomy, creativity, adventure, change, stability, heritage, cultural roots, etc.) as proxies for cultural orientation.	

4.3.5 Power

To examine the role of power in shaping regional societal innovativeness, we adopt a multidimensional approach to its operationalisation, drawing upon both political sociology and governance literature. Power is conceptualised relationally, encompassing the capacity to influence decision-making processes ('power over'), the collective ability to act in concert ('power with'), and the institutional arrangements that enable or constrain such actions.

This approach aligns with recent scholarly calls within regional innovation and governance studies to move beyond resource-based understandings of power and consider its embeddedness within structures, perceptions, and interactions.

'Power over' is operationalised through individual-level perceptions of institutional trust, measured via European Social Survey (ESS) indicators including trust in politicians, parliaments, and scientists. These serve as proxies for the perceived legitimacy and authority of formal decision-making bodies, where high institutional trust suggests legitimate power concentration, whilst declining trust indicates contested or fragmented authority.

'Power with' captures political efficacy, participatory behaviour, and perceived influence on governance processes through ESS indicators such as electoral participation, petition signing, and confidence in political engagement. This dimension reflects individuals' perceived capacity to shape collective decisions and is critical for understanding distributed agency in decentralised governance systems.

'Structural Power Arrangements' are assessed using the Participatory Governance Index (PGI) to evaluate formal mechanisms for co-decision, cross-sectoral collaboration, and citizen engagement. These indicators reflect both procedural and systemic power facets across sectors.

Finally, we acknowledge the influence of the regional institutional framework as a proxy for *historically embedded power relations*. Following Rutten's (2019) qualitative comparative analysis, we incorporate indicators of institutional openness, economic diversity, and cultural inclusion, utilising data from Eurostat, the European Social Progress Index (EU-SPI), and the European Values Study (EVS). These structural and normative dimensions provide the broader context within which power is enacted and negotiated. For example, the relevance of *'openness'* values, such as tolerance, inclusion, personal freedom, and choice, in innovation and regional development is largely undisputed. Surveys such as the European Community Innovation Survey or the EU-SPI (Annoni & Bolsi, 2020) use these values. Infobox 3 provides an example of applying openness values in the context of regional innovation. Through this multi-scalar and cross-dimensional operationalisation, we aim to capture both the distributive and relational aspects of power in regional development, thus enabling a more nuanced understanding of its role in enabling or constraining societal innovativeness.

Infobox 3

Rutten's (2019) Openness Value Framework: Rutten's qualitative comparative analysis demonstrates that openness values function as bridges linking diverse local and non-local social spaces, thereby unlocking greater innovation potential. The framework incorporates five analytical conditions—analytical knowledge creation, synthetic knowledge creation, economic diversity, melting pot, and self-expression—each measured using one to three indicators from public statistics. Economic diversity is assessed via the Herfindahl-Hirschman Index (HHI) of employment distribution across sectors, whilst the "melting pot" condition combines nationality diversity (HHI) with tolerance measures including attitudes towards minorities and gender equality. Drawing on data from Eurostat, the European Social Progress Index, European Values Study, and Regional Innovation Scoreboard, this methodology identified four cross-case explanatory mechanisms for regional innovation dynamics.

Drawing upon Haesevoets et al.'s (2024) analysis of participatory governance mechanisms and Hendrik's (2022) framework of democratic innovation, whilst building on Scharpf's (1999) actor-centred institutionalism, participatory governance is operationalised as a multidimensional construct that bridges institutional design and democratic outcomes through structured citizen engagement

processes. With participatory governance as a moderator variable the focus is on regional actors perceived legitimacy by the regional actors is operationalised by a composed indicator

Table 7. Operationalisation of Openness, Power and Participatory Governance

Construct	Subconstruct	Item(s)	Scale	(Data) Source
Openness		Attitudes towards minorities	Score 0 to 100	European Social Progress Index
		Attitudes towards gender equality		
		imueclt – "would you say that [country]'s cultural life is generally undermined or enriched by people coming to live here from other countries?"	Likert-scale 0 = cultural life undermined to 10 = cultural life enriched	European Social Survey
Power	Power over	trstplt – Trust in politicians trstsci – Trust in scientists trstprl – Trust in the national parliament	Likert-scale 1 = no trust at all to10 = completely trust	European Social Survey
	Power with	vote – "Did you vote in the last [country] national election in [month/year]?"	Yes/no	
		actrolga – "How able do you think you are to take an active role in a group involved with political issues?"	Likert-scale 1 = not at all able to 5 = completely able	
Continued		psppsgva – Political system allows people to have a say in what the government does	Likert-scale 1 = not at all to 5 = a great deal	
		psppipla – "And how much would you say that the political system in [country] allows people like you to have an influence on politics?"		
		cptppola – "And how confident are you in your own ability to participate in politics?"	Likert-scale 1=not at all confident to-5 = completely confident	
		sgnptit- signed petition in the last 12 months	Yes/no	
	Engagement opportunities	Structures (e.g., councils, committees and/or digital platforms) that allow government and citizens to collaboratively shape decisions, process information, and listen to each other.	Yes/no	Participatory Governance Index
		Infrastructure for collaboration: "Are the engagement opportunities in your system interconnected or centrally organised?"	Open question	
		Cross-sector collaboration: "Do your government structures intersect with, or work alongside, citizen action networks, civil society or nonprofit organizations and community-based or neighbourhood associations to support engagement efforts?"	Open question	

Construct	Subconstruct	Item(s)	Scale	(Data) Source
	Representation	Representation of diverse stakeholders in regional decision-making bodies		Own indicator
Legitimacy of Participatory Governance	Input legitimacy	*This way of deciding (…):* "Allows as many points of view and interests as possible to be taken into account." (In1)	Likert-scale 0 = completely disagree to 10 = completely agree	(Haesevoets et al., 2024)
		"Gives citizens from all walks of life the opportunity to be heard." (In2)		
	Throughput legitimacy	"Gives everyone a clear view on how the decision is made (Tr1)		
		"Is a fair way of decision-making." (Tr2)		
	Output legitimacy	"Provides solutions that will work out." (Ou1)		
		"Provides an efficient solution." (Ou2)		

4.3.6 Exogenous Factors

Understanding the development of regional innovation dynamics requires identifying and assessing exogenous factors and their impact. These external influences may support regional innovation policy, conflict with regional objectives, or prioritise specific approaches, measures, or thematic areas aligned with broader national or international agendas, such as strategic policy frameworks or funding schemes.

Exogenous factors encompass a wide range of developments, including international crises and global economic shifts; national economic trends such as recessions; sectoral transformations—whether or not directly relevant to the region in question (e.g. structural change in key industries); and national political responses to these developments, such as targeted technology funding. Given the complexity and specificity of these influences, identifying which external factors are relevant for a particular region requires a tailored and in-depth desktop analysis.

One method of identifying such exogenous factors is through systematic screening of national policy documents that either directly reference the region or relate to sectors potentially significant for its development (e.g. energy, infrastructure). From another angle, many exogenous influences can be traced indirectly through regional development and investment strategies, often emerging in response to national or international priorities. These strategies may be designed to secure funding, such as climate action plans underpinning the financing of local or regional climate protection officers, or to fulfil reporting obligations tied to national targets. A further example is regional investment concepts (see Infobox 3), which serve as the foundation for financing structural and infrastructural interventions in the ongoing transitioning of lignite regions or as they are necessary to fulfil national obligations that require them to report on specific issues or topics.

Infobox 3

The Regional Investment Concept (RIK) Lausitz, for example, aims to cushion the structural transformation at both societal and economic levels through targeted small-scale initiatives and larger collaborative projects. The programme is legally based on the directive for promoting structural adjustment measures in lignite mining regions under the federal model

initiative 'Unternehmen Revier' of 1 November 2017. Its overarching objective is to enhance the region's integration into global competition, foster rapid responsiveness to emerging developments, promote the efficient utilisation of technological innovations, and support the advancement of existing skills and capabilities—building on the region's traditional development pathways. The Lausitz region views the federal support instruments as a significant opportunity to drive forward this transformation (RIK Lausitz, 2018).

Public funding as a further exogenous factor can be captured utilising public databases such as INKAR - indicators and maps for spatial and urban development provided by the Federal Institute for Research on Building, Urban Affairs and Spatial Development. The database contains data under the categories 'Spatially Relevant Funds' and 'Public Finances', data such as allocations for investment support measures (per capita), higher education (long-/short-term), GRW and urban development funding (long-/short-term). Unfortunately, the database does not provide further breakdowns or qualitative information regarding the type of funding, thematic priorities, or specific focus areas. Accordingly, we prioritise the use of qualitative indicators, as previously discussed.

Doing so also allows for integration into the analysis of further policy documents, such as climate protection strategies and regional innovation concepts. Further topics originating from the respective federal state may be added depending on the region. Almost all federal states in Germany have now developed their strategies in areas of innovation, transformation, and/or climate policy. However, the names, formats, and thematic priorities of these strategies vary significantly depending on the regional context, economic structure, and political agenda. Table 8 exemplifies related policy documents.

Table 8. Examples of Federal-State Strategies

Topic	Federal State	Strategy	Summary
Innovation	Bavaria	Hightech Agenda Bayern	Identifies key technological domains (e.g. AI, biotech, digitalisation), supports innovation clusters and strengthens public–private R&D collaboration.
	Saarland	SaarInnovationsLand – Strategy for Research and Innovation (2024–2030)	Focuses on smart specialisation in areas such as clean energy, digital transformation and healthcare technologies, aligned with EU S3 objectives.
	Berlin	Future of the Berlin Economy – Innovation Strategy 2022–2030	Establishes policies to foster entrepreneurial growth, technological advancement and enhanced R&D activity within the region.
	Lower Saxony	Innovation Strategy of Lower Saxony 2022–2027	Emphasises start-up support, advanced R&D, green tech, and digital infrastructure to foster entrepreneurship and competitiveness.
Transformation	North-Rhine Westphalia	NRW 2030 – Transformation Strategy of the Ministry for Economic Affairs	Concentrates on digitalisation, green economy, skilled labour, and climate-compatible economic models, guiding sustainable regional development

	Brandenburg, Saxony, Saxony-Anhalt	Regional Investment Concepts (RIK) within "Unternehmen Revier"[8]	Targets lignite phase-out through infrastructure renewal, economic diversification, urban regeneration and sustainable energy transitions.
	Baden-Württemberg	Strategic Dialogue on the Automotive Industry BW	Directs sector-wide transition to e-mobility, sustainable production, supplier integration and skills development in automotive value chains.
Climate/Sustainability	Hamburg	Hamburg Climate Plan	Focuses on greenhouse gas reduction, coastal defences, urban greening, renewable energy deployment and adaptation for a resilient metropolitan area.
	Thuringia	Thuringia Climate Strategy 2040	Sets sector-specific targets in energy, transport and land use, with major emphasis on energy efficiency, renewables and community engagement.
	Schleswig-Holstein	State Strategy for Climate Adaptation	Prioritises coastal and flood protection, agricultural resilience, communal preparedness and ecosystem-based adaptation measures

[8] "Unternehmen Revier" is a national programme initiated by the Federal Ministry for Economic Affairs and Climate Action (BMWK) in Germany. It plays a central role in the structural transformation of lignite (brown coal) mining regions as part of Germany's broader energy and climate transition ("Energiewende").

5 Conclusion & Future Outlook

In response to the overarching research question on how structurally weak regions can leverage societies' innovation capacity to manage structural change successfully and initiate sustainable transformation processes by harnessing societal innovation potential, this study explores 'societal innovativeness' as a catalyst for transformative regional development. It illuminates the complex interplay between social, institutional, and economic dimensions that underpin innovation processes at the regional level. Through this interdisciplinary inquiry, we have elucidated how collective capacities and collaborative actions foster environments conducive to sustainable and inclusive innovation. The proposed framework bridges theoretical concepts with practical applications, guiding regions towards enhanced innovativeness.

In so doing, we posit that societal innovativeness is fundamentally rooted in shared values and cultural norms that foster trust and cooperation. The framework demonstrates how complex innovation processes emerge from social foundations rather than being driven solely by technological or economic factors. Expanding individual and collective capabilities amplifies this foundation, highlighting the critical role of empowerment in enabling structurally weak regions to transcend limitations through enhanced collective agency. Increased participation capacity enables regions to navigate power dynamics more effectively, fostering inclusive innovation ecosystems that systematically address the challenges of transformative structural change.

Through collaborative networks and strategic narratives, system-level agency emerges as a crucial driver, revealing how regions orchestrate complex transformation processes. The alignment and mobilisation of diverse actors' efforts, guided by coherent narratives and imaginaries, provide strategic direction for change. This demonstrates how structurally disadvantaged regions can harness their societal innovation potential to initiate sustainable transformation. Regions that actively engage with endogenous and exogenous factors—including regulatory frameworks and grand societal challenges—enhance adaptive capacity, thereby reinforcing societal innovativeness and providing insights into how regional innovation potential can overcome structural constraints.

5.1 Implications for Theory & Practice

The conceptualisation of societal innovativeness as presented in this study has substantial implications across multiple domains of academic inquiry and practical implementation.

5.1.1 Implications for Research

From a theoretical perspective, this study advances innovation studies by introducing a multidimensional construct that transcends traditional economic-centric approaches to regional development. The proposed framework contributes to the literature by establishing societal innovativeness as a distinct analytical lens that integrates social capital theory, institutional economics, and participatory governance models. This interdisciplinary synthesis addresses existing lacunae in innovation research, particularly the limited understanding of how collective capacities and collaborative mechanisms interact to generate transformative outcomes at the regional level.

The operationalisation of societal innovativeness through empirically measurable dimensions provides researchers with novel analytical tools for investigating regional innovation dynamics. The framework's emphasis on shared values, cultural norms, and collective agency offers new avenues for examining the social foundations of innovation ecosystems, complementing existing research that predominantly focuses on technological and economic indicators. Furthermore, the study's attention

to power dynamics and inclusive participation mechanisms contributes to critical innovation studies by highlighting how innovation processes can either perpetuate or challenge existing inequalities within regional contexts.

Methodologically, the study's proposed application of Qualitative Comparative Analysis (see Section 5.3) to regional innovation research demonstrates the potential for configurational approaches to address causal complexity in territorial development studies. This methodological contribution is particularly significant for economic geography and regional studies, as it provides researchers with analytical tools capable of capturing the nuanced interplay between multiple contextual factors that influence innovation outcomes.

The framework also advances sustainability transitions research by positioning societal innovativeness as a crucial mechanism for addressing grand societal challenges. By emphasising the role of collective action and system-level agency in driving transformative change, the study contributes to understanding how regions can navigate sustainability transitions through endogenous capacity building and inclusive innovation processes.

5.2 Implications for Practice

For policymakers, the societal innovativeness framework offers a comprehensive diagnostic tool for assessing regional innovation capacities beyond traditional metrics such as R&D expenditure or patent applications. The framework enables policy practitioners to identify structural weaknesses in regional innovation ecosystems, particularly those related to social capital deficits, institutional barriers to collaboration, or inadequate mechanisms for inclusive participation. This diagnostic capability facilitates the development of more targeted and contextually appropriate policy interventions. Additionally, the study's emphasis on endogenous capacity building provides policymakers with evidence-based justification for investing in social infrastructure, community engagement mechanisms, and participatory governance structures. Rather than relying solely on external interventions or top-down innovation policies, the framework demonstrates how regions can enhance their transformative capacity through strengthening internal collaborative networks and fostering collective agency.

Regional development practitioners and innovation intermediaries benefit from the framework's attention to power dynamics and inclusive participation. The conceptualisation of 'power with' rather than 'power over' provides practical guidance for designing intervention strategies that empower diverse stakeholders whilst avoiding the marginalisation of grassroots initiatives. Such an approach is particularly relevant for structurally weak regions seeking to build innovation capacity through community-driven processes.

For business leaders and private sector actors, the framework illuminates the importance of engaging with broader regional innovation ecosystems through collaborative networks and shared value creation. The framework suggests that firms operating within regions characterised by high societal innovativeness benefit from enhanced adaptive capacity, access to diverse knowledge sources, and stronger social licence for innovation activities.

Civil society organisations and community groups gain insights into their potential roles as innovation actors within regional ecosystems, positioning themselves as change agents who actively shape both their own futures and the broader regional trajectory through collective problem-solving and system transformation. This perspective validates community-based innovation initiatives whilst providing theoretical grounding for their scaling and integration within broader regional strategies.

5.3 Future Research Directions: The Methodological Approach

To advance this theoretical foundation empirically, the subsequent phase will involve refining these constructs through empirical validation across diverse regional contexts, thereby enhancing the model's applicability. The empirical analysis will employ quantitative data from public statistics and qualitative data collected through a population survey, supplemented by interview data and desk-based research. From a methodological perspective, we consider a set-based analysis, specifically Qualitative Comparative Analysis (QCA), as the most promising approach to shed light on the most influential factors of societal innovativeness and their impact on regional development.

5.3.1 Qualitative Comparative Analysis (QCA)

QCA represents a particularly promising methodological approach for several reasons, most notably its capacity to accommodate multiple potentially interconnected and interrelated factors or conditions, as elaborated above. As a case-based, set-theoretic method, QCA enables the examination of *"wholes as configurations of parts"* (Ragin, 1987, p. 84), rendering it well-suited for exploring the complex interplay of conditions within regional innovation systems. By treating cases as combinations of conditions (Mello, 2021), QCA facilitates a nuanced understanding of factors contributing to innovation across regions, thereby emphasising the exploration of 'how' innovation processes unfold (Rutten, 2019).

QCA is particularly well-equipped to account for causal complexity, allowing outcomes to emerge from multiple combinations of conditions or causal *"recipes"* (Ragin, 2008, p. 124). Its methodological foundations encompass three key principles: conjunctural causation, equifinality, and causal asymmetry. Conjunctural causation emphasises outcomes that result from specific combinations of conditions, reflecting Ruttten's (2019) perspective on innovation as deriving from relational knowledge creation. Equifinality acknowledges that multiple pathways may lead to the same outcome, which is particularly relevant given the diversity of regional contexts and mechanisms. Causal asymmetry reveals that the presence and absence of conditions exert differential effects on outcomes, thereby illuminating complex regional dynamics (Rutten, 2020).

5.3.2 Application to Regional Societal Innovativeness

In this study, conditions such as openness, tolerance, and economic diversity characterise regional attributes that prove crucial for regional societal innovativeness. Whilst small-n QCA constrains the inclusion of conditions, the combination of indicators remains methodologically feasible. Given QCA's iterative nature, initial analyses may reveal non-contributory conditions that can subsequently be excluded from further examination. Our analytical focus centres on regional development dynamics that result from integrating these conditions to foster innovation. Rutten's work emphasises openness values as fundamental to regional societal innovativeness, and QCA's analytical strength in examining condition configurations renders it particularly appropriate for investigating value interactions with other regional factors. A case population comprising twenty diverse regions was selected, capitalising on QCA's advantage in economic geography through its focus on causal mechanisms rather than isolated variables (Rutten, 2020). Unlike conventional analytical methods, QCA acknowledges the interconnectedness of factors, which proves essential for comprehending complex regional dynamics.

Consequently, QCA provides a robust analytical framework for examining regional societal innovativeness. By addressing causal complexity through a case-based, comparative approach, QCA offers valuable insights into the conditions that either enhance or impede

innovation in structurally disadvantaged regions, thereby advancing theoretical understanding whilst informing policy interventions designed to promote regional growth.

5.4 Outlook: Implementation Pathways

The implementation of the societal innovativeness framework demands contextually sensitive approaches that prioritise stakeholder capacity development and long-term collaborative commitment. Regions must systematically invest in trust-building mechanisms, inclusive governance structures, and participatory innovation platforms that enable diverse stakeholder engagement. This transformative process requires sustained dedication, recognising that meaningful change emerges through continuous collaborative effort rather than episodic interventions.

Effective implementation necessitates comprehensive monitoring systems that capture both quantitative outcomes and qualitative shifts in regional innovation culture. Traditional metrics must be supplemented with indicators that measure social capital accumulation, institutional effectiveness, and the quality of participatory governance. This multidimensional measurement framework enables regions to track progress whilst identifying capacity gaps that necessitate targeted intervention. Critical to success is the development of multi-stakeholder capabilities encompassing technical competencies, social skills, systems thinking, and collaborative leadership. This capacity enhancement extends beyond conventional skill development to cultivate the collaborative competencies essential for effective participation in complex innovation ecosystems.

The transition from theoretical framework to practical application hinges upon genuine participatory approaches that position regional stakeholders as active co-creators rather than passive policy recipients. This collaborative orientation represents a paradigmatic shift towards democratic, inclusive models of regional transformation. Hence, future development will centre on collaborative tool development through sustained researcher-practitioner partnerships. This co-development process integrates regional actors as active contributors throughout the tool lifecycle, ensuring instruments that combine theoretical rigour with contextual applicability. Through participatory design methodologies, including co-design workshops and iterative feedback mechanisms, these tools will evolve through genuine academic-practitioner dialogue, translating theoretical concepts into actionable frameworks for regional societal innovativeness.

This partnership-based approach will bridge the theory-practice divide, empowering regions to harness their societal innovativeness potential fully whilst fostering resilient, adaptive ecosystems capable of addressing contemporary societal challenges through genuinely collaborative innovation.

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