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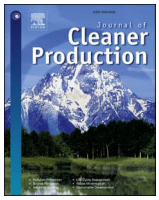

Eliciting the anchor link for building public-private collaboration in sustainable energy: insights from the Finnish context

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ABSTRACT

This article interrelates social, environmental, and technological aspects concerning public-private collaboration. The aim is to decipher the motivations and reluctance factors that prompt or limit building synergies between actors with divergent incentives and better understand the connection between the individual-level sensemaking and macro-level constructs regarding public-private collaboration in a specific socio-cultural context. Following the microfoundations movement in strategy and Organizational Theory, the study combines insights from sensemaking research and Social Exchange Theory to delve into how cultural context influences individuals' perception of public-private collaboration for the energy transition and ultimately defines its nature. Drawing from a case study in Finland based on 30 interviews, we identify six critical dimensions in the actors' discourse: 1) the role of trust in decision-making, 2) consensus and competition, 3) horizontality, 4) boosting innovations versus the challenges of public and private sectors, 5) acceptability of arrangements and public funding, and 6) the role of public-private collaboration in the decarbonization. These dimensions shed light on the influence of the socio-cultural context in enhancing trust and consensus as drivers of social exchange in public-private collaboration. Future studies should explore 1) enabling mechanisms for cross-context collaboration and 2) the roles and motivations in collaborative approaches.

1. Introduction

Transitioning to cleaner and sustainable systems requires Public-Private Collaboration (PPC) for directing efforts toward effective actions (Ndzibah et al., 2022; Pereno and Eriksson, 2020; Pinilla-De La Cruz, Rabetino and Kantola, 2022). PPC is a broad concept that is not limited to the Anglo-Saxon model of public-private partnerships (PPP) (Ferraris et al., 2018). For example, Klijn et al. (2021) presents a continuum of five paths of collaboration of public and private actors, including principal-agent and principal-principal type relationships with organizational forms ranging from tight to loosely coupled. Existing research suggests that PPC facilitates the development of public-oriented projects in complex environments (Kwak et al., 2009; Lassen et al., 2015; Satheesh, 2023) and the convergence of capacities, resources, and perspectives between public and private actors in co-creating innovative solutions (Asplund et al., 2021; Azagra-Caro et al., 2019; Guan and Zhao, 2013). Thus, understanding the motivations and mechanisms behind the collaboration is crucial, as socio-technical systems involve social structures at various levels, including public institutions representing a common voice and individual or private perspectives (Mossberg et al., 2018; Palm and Gustafsson, 2018).

Despite its relevance, current PPC initiatives often lack the necessary scale and effectiveness, hindered by a limited understanding of factors shaping connections between actors. Moreover, implementing PPC encounters obstacles in the form of disparities in sensemaking across diverse cultural contexts. The principles governing the public and private actors and their pursued interests, along with the cultural context in which the relationship operates, significantly affect the new collaborative endeavors sought (Autio and Thomas, 2014). Furthermore, collaboration has implications at the individual level of public and private actors that affect one's tendency to trust others or exert control to prevent opportunistic behavior. Yet, the academic literature in the field does not provide conclusive information about the factors that link the cultural context of actors in PPC. Indeed, the existing literature falls short in exploring the broad collaborative spectrum from different perspectives and its connection to the cultural context, with culture being overlooked in PPC studies (Starik and Kanashiro, 2020; Wang et al.,

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2022). Consequently, the lack of explicit distinctions of collaborative relationships in different cultural contexts emphasizes the need for a more nuanced approach to collaborative models in energy system decarbonization decisions.

Against this backdrop, this study aims to understand the relevance and influence of cultural context in building collaborative relationships between public and private actors, which is a crucial aspect to advance in the energy transition. Thus, our goals are twofold. First, we examine the collaborative relationships between actors with divergent incentives, as public and private actors, to decipher the motivations and reluctance factors that prompt or limit building synergies. Second, we study the connection between individual-level sensemaking and macro-level constructs regarding public-private collaboration in a specific socio-cultural context. We decided to use the logic from the micro-foundations movement (Felin and Foss, 2015) and using the theoretical lens of individual sensemaking (Fellows and Liu, 2016; Harris, 1994) and Social Exchange Theory (SET) (Blau, 2017; Malmström and Johansson, 2015) to analyze this phenomenon and addressing the following research questions: *How does cultural context at the country level influence individuals' perception of public-private collaboration? And, how does the cultural context define the nature of the prevalent type of public-private collaboration towards more sustainable energy systems?*

We conducted a case study at the country level in Finland to explore a context that exhibits similar geographic, cultural, institutional, and regulatory factors. Finland was chosen as a suitable case due to its remarkable evolution in recent decades towards an economy founded on promoting technological development with a social vision of equality and trust. The country is the top-ranked supporter of the global energy innovation system (Smith and Hart, 2021) and is considered one of the world's 'most cooperative' countries (Kuisma et al., 1999; OECD, 2017). Additionally, Finland is widely recognized for its strong commitment to carbon neutrality by 2035, showing significant reductions in CO_2 emissions from a strategic focus on public-private collaboration and innovative solutions (Business Finland, 2023).

As its main contributions, the paper spotlights the patterns of PPC sensemaking among individual actors, including the influence of cultural context, experiences, motivations, and reluctance factors. This paper also reveals the agency's key role in explaining social outcomes from the individual level. Furthermore, the article unveils the influence of the socio-cultural context in enhancing trust and consensus as drivers of social exchange in PPC. While the study underscores the difficulties related to 'importing' or transferring PPC frameworks from one context to another, it suggests that incorporating the specific nuances of the cultural context of implementation is essential to building successful public-private collaborations. Policymakers can use the findings to promote the emergence of PPC by activating public funding instruments. These insights may stimulate social learning and encourage stakeholder interaction to facilitate solid interventions.

2. Theoretical background

Viewing PPC as a social phenomenon underscores the relevance of understanding links between macro-level constructs, notably the impact of cultural context on such collaborative endeavors. Since PPC is socially constructed based on the values, practices, and norms individuals are embedded in, this shapes the understanding of reality (Quélin et al., 2017). Hence, the potential implications of socio-cultural context and power dynamics among parties in PPC are significant. This entails exploring the meanings and motivations driving individual and collective behaviors at the micro-level. In other words, relationships between macro-level constructs find their origin and functionality through the actions and interactions of individuals (Contractor et al., 2019). Following the logic from the microfoundations movement (Felin and Foss, 2015), scrutinizing such interactions provides insights into the dynamics of social exchange within PPC, constituting a social outcome in its own right.

The microfoundations approach suggests that macro-constructs originate and are activated by the actions and interactions of individuals (Contractor et al., 2019). The microfoundations approach is not a theory but a 'lens' to analyze the relationship between social phenomena at multiple levels, including the micro level (Felin and Foss, 2015). Consequently, the exploration of the trajectory from macro-level social facts, such as cultural context, to macro-level social outcomes, such as PPC, implies a first step in delving into the individual interpretations and meanings ascribed by both public and private actors (Felin and Foss, 2015; Palmié et al., 2023). Supported by the premise of microfoundations of finding an approximation to the causal root of the phenomenon in the meaning of the motivations of individual behavior, we then turn to the theoretical approach of individual sensemaking to approach the base layers of the phenomenon.

Here, we used individual sensemaking as a 'vehicle' to explore the distinct attitudes and behaviors around PPC. While adopting the above lens, we combined sensemaking research and Social Exchange Theory (SET) to understand PPC's complexity; given the interactive nature of the elements that intervene in socio-technical systems, culture influences sensemaking at different levels, including the individual level (Aguinis and Glavas, 2019; Clegg et al., 2017). SET explains how collaboration oriented to innovations occurs as interactions between organizations for exchanging knowledge and experiences, which are built on the foundations of values such as trust and reciprocity (Khalek and Chakraborty, 2023; Malmström and Johansson, 2015; Santos et al., 2023).

2.1. Individual perception to make sense of the socio-cultural context

From the micro-level, individual sensemaking is intricately linked to a mental dialogue between different motivations and reluctance factors, which is especially relevant to understanding the challenges behind PPC (Kudesia, 2017; Leung and Morris, 2015). Indeed, individuals' decisions result from a mental dialogue in which their attitudes are reconciled with the normative expectations perceived by the cultural context. Since the cultural context influences individual sensemaking, behavioral decisions tend to be congruent with the cultural dimensions of the society to which the members belong (Ivanova-Gongne and Törnroos, 2017).

It is, therefore, relevant to explore what underlies the actors' sensemaking at the individual level to understand the nature of future decisions and concrete actions around collaborative relationships between the public and private actors (Yström et al., 2019). Participants within a PPC 're-create' meanings based on their memories and reshape their sense of belonging to a community (Yström et al., 2019). This process encompasses the individual motivations and nuanced operational logics of the public and private entities represented by the actors involved, along with the preconceived notions regarding these organizations within the socio-cultural context. Consequently, these factors may engender tensions in creating value within the PPC.

2.2. Social action and interaction instigating public-private collaboration

PPC occurs when intricate interdependencies arise within social structures, influenced by each party's interests and influence (Quélin et al., 2017). In essence, PPCs are based on patterns of mutual interchanges that affect and are affected by the public and private partners involved in the relationship (Caldwell et al., 2017). Notably, the Theory of Social Exchange (SET) is valuable in delineating the key factors that instigate and preserve collaboration, such as trust and reciprocity (Santos et al., 2023). Indeed, trust and the expectation of reciprocity in collaborations positively relate to the cultural similarities between partners (Malmström and Johansson, 2015; Robson et al., 2019). Furthermore, commitment and power structures are also patterns of social exchange (Santos et al., 2023). In this vein, Wyleżałek (2021) posits that social exchange in collaborations is a dynamic process that triggers organizational and power-related social relationships.

The social exchange and features of the collaboration are shaped by the cultural context and cultural similarities between partners (Johnson & Pinilla-de La Cruz, 2024; Khalid and Ali, 2017). Culture acts as a framework for evaluating stimuli and endowing them meaningfully since it is built as a structure of shared knowledge schemes (Fellows and Liu, 2016).

2.3. PPC as a collective outcome

According to Vangen (2017), similarities and differences between individuals are recognized and articulated at a macro level regarding the cultures they belong to, such as the national culture. Different scholars suggest four key cultural dimensions that distinguish different national cultures and would provide insights into understanding how the cultural context influences the perception of PPC: individualism, masculinity, power distance, and uncertainty avoidance (Cui et al., 2019; Moonen, 2017).

Considering PPC as a collective outcome, according to the study by Klijn et al. (2021) based on the perceptions of professionals from Denmark, the Netherlands, and Canada, Dutch professionals showed a preference for horizontal collaboration between public and private partners, while Canadian professionals are more associated with relationships based on performance indicators and contractual compliance. Likewise, in a multiple-case study in six cities in Nordic countries, Leminen et al. (2021) explored the wide range of collaboration models supporting innovation for sustainability. The findings reveal a diversity of models ranging from dyadic to multifold-stakeholder relationships (Leminen et al., 2021).

3. Research strategy and method

The present paper follows a qualitative research strategy to explore how cultural context influences individuals' perception of public-private collaboration toward cleaner and more sustainable energy systems at the country level. Qualitative methods were chosen because we addressed unexplored topics, and the existing literature lacks consistent approaches to investigate the role of culture in PPC from the individual level to the social outcomes (Felin and Foss, 2015). Here, we conducted a single-case study as a research strategy to delve into the bottom layers of actors of the energy industry and sustainability at the country level (Piekkari and Welch, 2018; Welch and Piekkari, 2011; Yin, 1994). In particular, we used individual sensemaking and the principles of the Social Exchange Theory (SET) to build this case study addressing a relevant phenomenon whose characteristics are highly specific and hard to replicate (Dubois and Gadde, 2002; Eisenhardt and Graebner, 2007; Siggelkow, 2007).

3.1. Case selection and research context

Finland was selected as the research context and case study. The

Table 1
Data sources.

Source	Total	Characteristic				
Interviews	30	Energy segment	Interview code	Time (min.)	Gender (W: woman, M: man)	Age range
Public organizations: 9		Cooperatives	A1	59	M	55 <
Private companies: 11			A2	71	M	45–54
Hybrid organizations: 10		Energy authorities	B1	53	W	45–54
			B2	66	W	35–44
			B3	60	M	45–54
		Energy clusters	C1	55	M	55 <
			C2	56	M	45–54
		Energy offices at municipalities	D1	59	M	45–54
			D2	57	M	55 <
			D3	51	W	35–44
		Energy services companies	E1	58	M	45–54
			E2	51	M	25–34
			E3	54	M	45–54
		Engineering companies and project developers	F1	46	M	45–54
			F2	44	W	35–44
			F3	42	M	45–54
		Funding agencies in energy	G1	56	M	45–54
		Integrators and platforms	H1	50	W	35–44
			H2	47	W	35–44
			H3	59	M	45–54
		Renewable energy associations	I1	56	W	35–44
			I2	64	M	35–44
		Research, academia, and experts	J1	58	W	35–44
			J2	56	M	35–44
			J3	45	M	35–44
		Utility companies	K1	70	M	45–54
			K2	70	M	45–54
			K3	52	M	35–44
			K4	49	M	35–44
		Venture capital and financing companies	L1	62	M	45–54
Archival sources		Source titles				
10 documents		Ministry of Economy Affairs and Employment of Finland, 2022 Ministry of Economic Affairs and Employment of Finland, 2022 Finnish Government, 2021 Ministry of Education and Culture Finland, 2020 Ministry of Economic Affairs and Employment Finland, 2019 Koski et al. (2019) Ormala (2019) Ministry of Economy Affairs and Employment of Finland, 2018 Research and Innovation Council Finland, 2017 OECD (2017)				

decision to focus on one country relies on the conceptual framework of 'ecosystem architecture'(Z; Ma, Christensen, & JØrgesen, 2021; Z. Ma, 2019) to set the scope of territorial and cultural boundaries within a specific context. The country's history is marked by the strength of its collective efforts in developing and modernizing its industries. Furthermore, the country is currently recognized as a global testing ground for emerging energy technologies (Business Finland, 2021).

3.2. Data collection

The primary source was a set of 30 interviews with a selected group of public and private experts from the different edges of the PPC for the energy transition in Finland. Informants were identified in official publications of Finnish energy associations, authorities, and primary organizations (see Table 1).

The online semi-structured interviews were conducted between June and October 2021 and ranged from 42 to 71 min and were transcribed verbatim for analysis. Secondary data was also collected from publicly available sources, strengthening the study's validity. The conceptual model that emerged from the study was evaluated against updated country-level records to provide a realistic perspective.

3.3. Data analysis

We adopted a research framework that drew on the principles of previous sensemaking studies (Bien and Sassen, 2020; Weick et al., 2005). It included analyzing semi-structured interviews and archives as a triangulation strategy (Williams and Shepherd, 2016). Our first step was to employ an open coding approach, in vivo, to identify codes in the data (Gioia et al., 2013; Strauss, A., & Corbin, 1998). The NVivo 12 software package was used to assist with this process. Next, we mapped our findings according to the research framework presented in Fig. 1. We developed this approach based on Weick et al. (2005, p. 410), capturing sensemaking by answering four guiding questions: i) *How did it become important? (ii) What does it mean? iii) What is the story here?* Also, *(iv) what should I do*?

The first question, "*How did it become important?"* provided instructions for identifying sensemaking clues from an initial open coding. Then, we note parentheses and labels and categorize the distinctive features of the phenomenon's sense construction. Next, we analyze whether those categorized codes provide information to answer *"What does it mean?", "What is the story here?" and "What should I do?"* (Weick et al., 2005, p. 410). Concerning the question of *"What does it mean?",* we discerned similarities and discrepancies in how informants interpret the PPC for the transition towards sustainable energy systems. Additionally, we identified significant features of how these stakeholders perceive themselves.

When tackling the question, "*What is the story here?*", we followed a similar approach to the first question. Still, we emphasized exploring the interplay between past and present experiences in the sensemaking process of individual actors. We sought to uncover the key factors that either facilitate or hinder collaboration. As for the last question, "*What should I do?",* we used the same procedure as the previous questions. Still, we aimed to reveal how the actors comprehend and integrate the concept into their cognitive and behavioral decision-making processes. Ultimately, we used all the insights from the above analyses to interpret the patterns of meaning construction and individual sensemaking of the PPC for energy innovation in Finland.

After carefully analyzing similarities, we identified first-order concepts from the information gathered in the data and categorized them into second-order topics. This analysis was conducted until we reached a point where no new categories were identified. By grouping the second-order topics, we gained insights into component interdependencies, which aided us in interpreting meaning formation. We grouped the second-order themes into aggregated dimensions, involving an iterative process between the second-order and higher-order topics. By understanding these dimensions, we could put together the pieces of sensemaking. A visual representation of the aggregated dimensions of second-order topics and first-order concepts is presented in Fig. 2.

Subsequently, we analyzed how the empirical results fit into the Social Exchange Theory (SET) theoretical framework. We also reviewed the empirical results with the archival sources referring to the PPC for innovation in the Finnish context of sustainability, finding a match at the conceptual level.

3.4. Quality assessment

To ensure the validity and reliability of our study, we employed various strategies during the data collection and analysis. To establish construct validity, we used primary data from interviews with a diverse range of actors from the Finnish energy context and cross-checked it with secondary data from public records. We also ensured internal validity by thoroughly outlining our research process and using the individual sensemaking approach framework (Fig. 1). To bolster external validity, we conducted a comprehensive review of existing literature on PPC from the theoretical approach of the SET to support our work. Regarding reliability, we meticulously documented our research process and findings for future reference while triangulating primary and secondary data sources to validate our results. Additionally, we shared our research findings with some interviewees to confirm our main

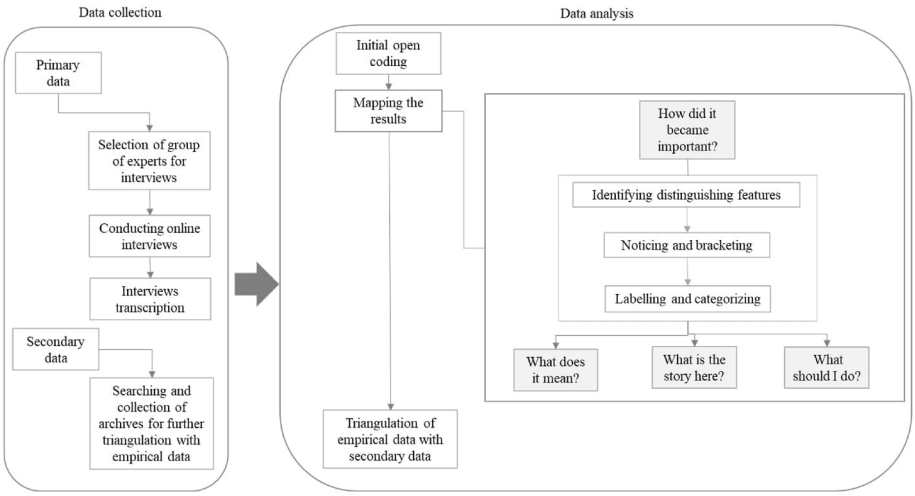

Fig. 1. Research framework.

Fig. 2. Data structure.

conclusions.

4. Findings

From the data, six dimensions of individual sensemaking emerged regarding the concept of PPC for migration towards cleaner and sustainable energy systems. They were categorized into two significant moments: from the socio-cultural context to the *Introspection* (which gives rise to individual sensemaking) and *Behavioral decisions* on the role of PPC as a social outcome. The disaggregation of each dimension is presented below and supported by powerful quotes and proof quotes in Appendix A following the guidance of Pratt (2008, 2009).

4.1. From the socio-cultural context to an individual introspection

The process of introspection provides insights into how individuals make sense of the concept of PPC based on their personal experiences and internal simulations of potential responses from the relevant actors in the cultural context. Individuals construct mental frameworks from their recollections of past events and their understanding of the community's values and norms.

> *'Yes, it is because it is so everyone understands it, and then when we talk about the partnership, it means that both parties must gain something. But if you think about buyer and seller, but someone is selling something to another, the other party does not care if the other one is gaining or not'.* [F3]

4.1.1. Perception of the cultural context by the individual: the role of trust

Stakeholders revealed distinct aspects of their self-conception as Finnish individuals, significantly impacting collaboration-building efforts. Interviewees refer to most people in the energy sector, whether in the public or private domains, knowing one another due to Finland's relatively 'sparsely populated country'. Consequently, there is a sense of

comfort in establishing collaborative relationships with individuals already known or referenced.

> *'We are a small country with quite a high degree of transparency. Even if people complain about our regulations, they are still pretty good and solid, so we have this kind of nice small circle of people and institutions who know each other and can talk to each other. There is a low threshold to going and talking to each other. '* [G1]

Within the energy sector in Finland, the actors recognize themselves as individuals who hold trust as a key value in establishing collaborative relationships. Trust emerged as a central factor in Finnish society, contributing to forming personal connections and enduring business relationships informally. Stakeholders associate trust in their partners with the critical element that enables them to take risks, make challenging decisions, or tackle complex issues. Trust as a value is essential in building new frameworks with risks and uncertainty, such as transitioning to sustainable energy systems.

> *'I really think it starts with trust because without trust, you cannot share the risk, and without trust, you are not willing to take the same risk as if you trust each other'. [K3]*

4.1.2. Experiences: the role of consensus and competition in innovation

Informants indicate that the most successful collaborations result in developing and demonstrating something new. Remarkably, the parties involved have shown a greater interest in collaboration than competition, which has emerged as a crucial factor in facilitating effective partnerships between actors of different natures.

> *'History here is a good teacher. If you think that we are now in the middle of a revolution and you are thinking that, or you are taking from the past, the previous revolution that was the IT revolution, when the IT revolution, companies there were willing to do their stuff. (…). Then so that, there was no need for the competition. There was absolutely no need for the competition. It was rather like, let's collaborate and, you know, build up this revolution together because that will benefit us all, and some people will make money, and those technologies that are worth surviving, they will survive. [C2]*

Informants underscore the significance of joint efforts by public and private actors in introducing new energy technologies to the market. For instance, some interviewees referred to the lessons from introducing wind power technology in Finland, which has transformed the energy sector and educated stakeholders in collaboration. Another example cited is the case of the electric vehicle, which necessitated the concerted efforts of actors from the public and private domains and is gradually gaining momentum.

> *'(…) I think there are so many levels of collaboration, and taking wind power now as an example, so what was done in Finland back in maybe it was 2008 when we have this feed-in tariff system for wind power, back then wind power was not economically viable, so you need it. Yeah, you need to have feed-in tariffs, and the government sets this feed-in tariff. But then, for these projects to actually wind power investments to start, they would be up to the municipalities. [J2]*

Representatives from the private sector contend that PPC facilitates the resolution of issues through dialogue without the interference of emotions or political debates. Private representatives also argue that consensus is necessary to have greater flexibility on the part of public partners in collaborative relationships.

4.1.3. Meaning creation: public-private collaboration arrangements and degree of horizontality

Stakeholders generally linked the concept of PPC for energy innovation with an interactive mechanism between public and private actors that yields mutual benefits. Interestingly, some stakeholders drew analogies between the relationship dynamics of family members to illustrate how collaboration differs from other types of relationships.

> *'I take an example from family life. The parents are partners, but kids, children, and parents are not kind of partners because they have all the power and responsibilities for them; yes, they are on a different level. '* [F3]

Informants perceive the PPC for innovation in energy as a multifaceted process that lacks uniformity or a unified approach. Instead, it encompasses a broad spectrum of nuances where public and private actors converge in collaborative ventures. Among the diverse range of PPC arrangements mentioned by stakeholders, we observed local and international schemes with a long-standing tradition. Of interest, we discovered some overlap and divergence in the perspectives of various stakeholders on PPCs. We have summarized the key themes of the PPC arrangements in Table 2.

As previously mentioned, diverse viewpoints on public-private collaboration are evident, linked to various mechanisms and institutionalized instruments by governmental entities. Specifically, from a private standpoint, it is acknowledged that major energy companies remain under public ownership in the energy market. Consequently, collaboration with the public sector plays a strategic role in energy transition, influencing policy and operational aspects.

4.1.4. Tensions between motivations and reluctance factors: boosting innovations versus the challenges of public and private sectors

Informants emphasized the relevance of complementarity between the public and private sectors to achieve common goals. In particular, interviewees emphasized the significance of collaboration among companies, universities, and research centers to drive innovation in the energy sector.

Table 2
Public-private collaboration arrangements.

PPC arrangements	Key themes: cues of sensemaking
Co-creation and co-innovation schemes	Most actors identified PPC with collaborative projects oriented toward energy innovation, where European and Finnish public institutions provide public funding involving companies, research centers, and universities.
Ecosystems and clusters	Ecosystems work as open innovation platforms to build collaboration with different partners in co-creation. Ecosystems also support building further closer PPC. Clusters also appear as a form of PPC that works in a similar technical area; these relationships are closer to the business than ecosystems.
Mankala principle	Typical arrangements in the Finnish energy field aimed at public or private utility companies sharing resources and responsibilities. Here, all the involved utility companies can buy energy at cost.
Energy cooperatives	Local communities with a significant role in the decision-making process for energy projects.
Energy Services Companies ESCO projects	Informants related ESCO with projects where a private company offers energy services to public institutions. However, according to the actors, ESCO is not commonly applied in the Finnish context.
Public-private partnership	Five different ideas of PPP were found: - PPP is associated with PPC as a collaborative and horizontal relationship where partners create value for each other. - PPP is identified holistically, including soft versions based on relationships without rigid agreements and hard versions of formalized PPPs. - PPP is associated with the Anglo-Saxon approach, highlighting that it is unsuitable for the Finnish context. - PPP appears as a mechanism for high-scale investment projects. - PPP is related to the so-called people-public-private partnerships. Here, stakeholders provide services or public infrastructure with citizens' participation.

(…) So when all these are together, with funding from the Finnish government, the research institutions, and the private sector, I think we have great opportunities to develop new technologies there. [B1]

Informants also highlighted that all parties may not fully understand technical and commercial complexities, further hindering collaboration. Working with public entities is mainly seen as a challenge for private actors due to the need to disclose private company information.

'The parties are not necessarily very comfortable opening up the full structures and full way of working and full financing set up in the projects because that contains a lot of confidential information and strategical choices'. [F1]

From the public sector standpoint, collaboration with the private sector serves as a means to foster the development of new technologies. Furthermore, they acknowledge that partnering with the public sector promote the presence of companies in international markets. Private sector representatives assert that energy innovation need local or regional government entities as initial leaders. Regarding the reluctance factors to collaborate, the private representatives stated that the public sector may be a bit rigid and some offices work in silos. Representatives of hybrid organizations believe that the public sector's involvement facilitates innovation development. However, the intensity of the role of the public sector in collaboration drops when energy technologies reach maturity.

4.1.5. Acceptability and individual sensemaking: acceptability of arrangements and public funding

The stakeholders acknowledged the current application of PPC in the energy industry in Finland for research and development, emphasizing the relevance of communication and mutual understanding. They also noted the unique characteristics of the energy sector in Finland, such as its high level of regulation, which needs specific collaboration agreements. While a diverse range of PPC arrangements was identified, stakeholders perceive their acceptance differently. Divergent interpretations of these arrangements among the interested parties suggest that the operationalization of PPC for innovation in practice is not entirely clear to them.

'I think it is a, there are many different ways [to collaborate between public and private actors], but one is to have these dialogues to creating common visions and understandings where to go (…) [D3].

As previously mentioned, accepting a PPC agreement is contingent on the meaning ascribed to it by interested parties. Specifically, related to public-private partnerships (PPP) within the PPC spectrum, acceptance appears lessened in cases where stakeholders associate PPPs with the traditional PFI model, or what some refer to as 'hard versions of PPPs'. Conversely, acceptance increases when actors associate PPPs with implicit, informal, and spontaneous versions of PPPs.

'So that is why I think the public-private partnership has been very popular in Finland for a long time. But now, even more, because the aim is that the small and medium-sized companies will go to the international market and be active there, they also need support from the universities and research organizations'. [H1]

The primary motivation for establishing PPCs is the potential for developing and scaling energy innovation. However, private actors denote concerns about collaborating with public actors, as it may limit their ability to maneuver within projects. Collaboration with public actors is seen as potentially slowing decision-making, increasing uncertainty around obtaining public funding, and adding rigidity and formality. Consequently, PPC arrangements based on horizontal relationships with a certain level of formality, such as 'co-creation' and 'co-innovation' schemes with public funding, ecosystems, and clusters, are the most widely accepted by actors. The Mankala principle framework is also commonly accepted in the Finnish energy sector.

'The collaboration structure is called the Mankala structure, as I mentioned. It can be done so that there is a mix of private players and community or state and players. So there, the ownership structure between the players does not matter. You can do it independently of the ownership structure'. [F1]

In contrast, 'hard versions of PPPs', such as the traditional PFI model, are not widely accepted in Finland. Some actors argue that this type of PPP is more easily applied in other sectors and possibly in countries where public finances require it. Some actors have considered the ESCO model a version of PPP, but its application is still limited in the Finnish context.

The acceptability of some of the most popular mechanisms found suggests the presence of public funding as a catalyst for PPC in the context of national energy innovation. In this regard, private sector perspectives indicate that solutions not yet fully established in the market benefit from public support, with public funding being crucial. Public funding is vital in making projects related to new energy technologies feasible. Nevertheless, accessing public funding instruments is perceived as complex for private actors. Similarly, representatives of hybrid organizations view public funding as a risk buffer for emerging technologies in power-to-x, hydrogen, and similar fields, where the payback time is long.

The sensemaking about the concept of PPC for energy innovation gains traction based on how convincing and acceptable the idea is for stakeholders in their contexts. This begins with stakeholders' introspection and is also shaped by the cultural context surrounding them. Stakeholders' motivations for engaging in collaborative energy transition efforts balance possible factors of reluctance as they reflect on past experiences to support or refute the idea of PPCs. Moreover, stakeholders evaluate the different PPC arrangements according to the current application in the context and compatibility with their collaborative sense.

4.2. Behavioral decisions: public-private collaboration as a social outcome

The informants perceived that PPC is aligned with the transition to sustainable energy systems. Still, they also highlight inconsistencies between daily activities and the decarbonization goals. Informants emphasized the relevance of establishing a clear vision of Finland's role in the global energy transition and developing collaboration strategies.

'But then I am all quite often thinking of a higher level of this public-private collaboration in energy transition, not just those mainstream investment activities, but also how to steer the whole sector to some desired direction, for example, towards cleaner investments from fossil fuels, etc. [G1]

4.2.1. Connection with forthcoming actions: public-private collaboration in decarbonizing energy systems

Informants related the concept of PPC with a broader goal of decarbonizing energy systems on a global scale and underscored its relevance in this endeavour.

'I think that is key [collaboration] to all of this. Because I think in Finland but globally as well, or if you think about Europe or any other country, what we are trying to achieve now as humans is that we will, we are trying to in, well, we have to, if we want to reach these targets in 30 years, we will have to decarbonize the whole global economy, we have to decarbonize the energy sector, of course. (…)'. [J2]

Given the relevance of the energy transition, stakeholders recognize the potential of the PPC on multiple levels, not only at a local level but also on a European and global scale.

'(…) I think it is very important that they were able to develop something that others can then use, that it is not just the one project and over. But

they have developed something very useful in the future for the whole energy system so that we can also use it in other places. ' [B1]

5. Discussion

This study uses the case of Finland to explore *how cultural context at the country level influences individuals' perception of public-private collaboration and how the cultural context defines the nature of the prevalent type of public-private collaboration towards more sustainable energy systems*. The findings reveal the anchor link by exploring the microfoundations and trajectory's bottom layers from the socio-cultural context to the PPC as a social outcome. The specific national cultural context encourages the bonds of trust (Ybarra and Wiersema, 1999). Trust is the link to building collaboration between public, private, and hybrid organizations (Klijn et al., 2021). Thus, the perception of closeness, trust, and consensus promotes the social exchange between actors of heterogeneous nature (Malmström and Johansson, 2015; Santos et al., 2023). The public sector appears as a relevant figure as it provides multiple financial instruments to support the private sector in developing innovation (Tan et al., 2020). Likewise, the public sector plays a substantial role in the national energy landscape, encompassing purely public entities and hybrid structures unique to the country (Kivimaa, 2023). The private sector perceives the public sector as a key stakeholder, especially in promoting emerging energy technologies (Tan et al., 2020). The reluctance factors are generally related to the apprehension towards sharing confidential information, lack of understanding, and delays in decisions (Oskam et al., 2021).

Overall, the cultural context influences the PPC, the type of relationships in which horizontality prevails, and the absence of rigid formats or templates (Podrug, 2011). The social exchange of knowledge, support, and resources for PPC for energy innovation is fostered here, possibly due to the closeness between the institutions and the niches where innovation is generated (Malmström and Johansson, 2015). Individual sensemaking has been used to explore the social facts as the cultural context from the individual level to the social outcomes as PPC (Contractor et al., 2019; Felin and Foss, 2015; Ivanova-Gongne and Törnroos, 2017). We formulated a conceptual model from the data structure, elucidating the interdependencies between the aggregate dimensions and the second-order themes (Fig. 3). Subsequently, this model was examined under the Social Exchange Theory (SET) to determine its theoretical fit. Our model offers a dynamic framework that unveils the cultural context's influence on PPC in energy innovation.

The process begins when individuals use mental schemas to review collaboration-related experiences (Harris, 1994). The perception of the cultural context and experiences interconnect with the meaning creation and the initial categorization regarding PPC (Tukiainen, 2015). The outcome of creating individual meaning is the concept of PPC as a horizontal relationship (Lotfi et al., 2022). Similarly, the individual engages in an internal dialogue emphasizing the motivation and reluctance factors. Here, the individual goes from a tension between these opposing forces towards a state of reconciliation, eventually leading to a unique understanding of their stance on PPC for energy innovation (Ystrom et al., 2019). Furthermore, individual sensemaking is closely linked to behavioral decision-making (Fellows and Liu, 2016). Drawing upon the insights gained from our case study, we have formulated a series of propositions that explain the interrelationships among the aggregated dimensions.

Proposition 1a. *the higher the level of trust in a given cultural context, the higher the degree of consensus.*

In a socio-cultural context, trust facilitates collaborative relationships among both public and private entities. Trust enables open dialogue and negotiation and the emergence of mechanisms based on relational ties. Furthermore, a strong level of trust among parties involved in collaboration facilitates consensual decision-making, reducing the risk of opportunistic behavior. Drawing from the SET framework, trust bonds foster collaboration surpassing the capabilities of individual entities. Connected to the influence of trust, we propose the following.

Proposition 1b. *the higher levels of trust in a given cultural context, the lower the need for competition in promoting innovation.*

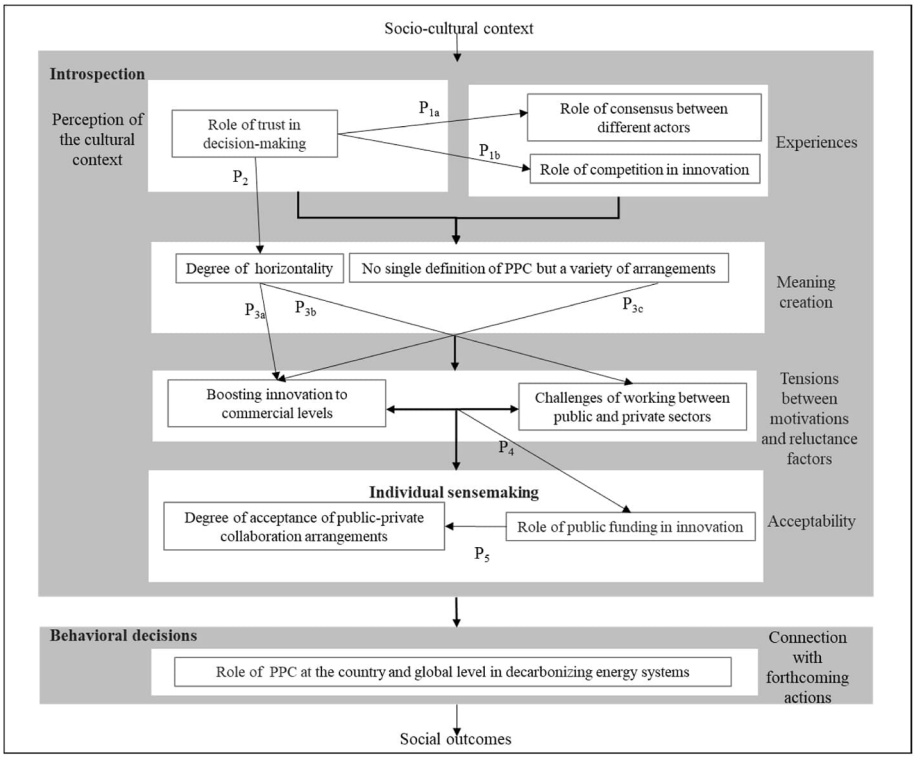

Fig. 3. Conceptual model of individual sensemaking of public-private collaboration towards cleaner and sustainable energy systems.

Instead of competing, stakeholders would join efforts when there is a high level of mutual trust. Indeed, trust helps share risks among parties when there is high uncertainty about the innovative solution. Here, the role of trust in the SET appears as the basis of collaboration to accelerate learning and promote innovation (Malmström and Johansson, 2015; Malmström and Wincent, 2012; Malmström et al., 2013). *Likewise, high trust enhance the exchange of information, knowledge and capabilities for value creation, leaving aside the need to compete in innovation* (Malmström and Johansson, 2015; Santos et al., 2023). Additionally, Antunes et al. (2022) *stated that collaboration is appreciated more than competition in sustainability transitions. Concerning the influence of trust in PPC, we propose the following.*

Proposition 2. *the higher levels of trust in a specific cultural context, the more positively it influences the horizontal nature of public-private collaboration*

A high level of trust facilitates the organic strengthening of ties between actors, thereby reducing power distance and promoting horizontal collaboration. In line with the SET perspective, trust is a multifaceted concept encompassing reliability and predictability (Khalid and Ali, 2017; Robson et al., 2019). *Scholars have articulated trust as a continual anticipation held by one partner regarding the predictable and mutually agreeable conduct of another. This understanding of trust prevents the intentional imposition of one partner's will on others or the development of uneven power dynamics* (Blau, 2017; Wyleżałek, 2021). *Remarkably, one of the strengths of the Finnish innovation system, according to the document 'Review of Innovation Policy Finland' was the sense of being "all in one boat"* (OECD, 2017, *p*. 22). *Considering the implications of horizontality in collaboration, we propose the following.*

Proposition 3a. *the more horizontally structured public-private collaboration, the more positively it enhances innovation scaling to commercial levels.*

A high degree of horizontality could lead to less power distance among partners. Here, stakeholders could feel more comfortable assuming higher risks of innovative processes. Furthermore, stakeholders can increase the intensity of resources for activities to reduce technical and commercial barriers to innovative solutions. Within collaboration, power dynamics play a crucial role in shaping how exchanges of knowledge or resources are conducted (Wyleżałek, 2021). *To continue deepening the influence of horizontality in PPC, we propose the following.*

Proposition 3b. *the more horizontally structured public-private collaboration is, the more positively it influences the mitigation of challenges between public and private actors.*

According to the SET, power relationships could determine the dynamics of interaction and influence among partners in collaboration (Khalid and Ali, 2017). Notably, increasing the level of horizontality in collaboration may aid in reducing power distance between partners and promoting better alignment. Moreover, a horizontal structure facilitates a better understanding of diverse partner perspectives and realities, enabling more efficient conflict resolution. When actors cannot collaborate on an equal footing, the governance process could be susceptible to being controlled by stronger actors (Douglas et al., 2020; Pinilla-De La Cruz et al., 2022).

Proposition 3c. *varied configurations within PPC positively contribute to tailoring relationship-building to meet the demand of scaling innovation to commercial levels.*

The dichotomy between public and private dimensions does not cover the rich variation of organizational forms within PPC (Quélin et al., 2017). Indeed, a standardized definition might not capture the multidimensional nature of the phenomenon; instead, it is the adaptable nature of collaboration that facilitates essential conditions for co-creation and the scaling of new energy technologies. In this case, SET is a pertinent conceptual framework for elucidating diverse intersections manifest at various levels (Wyleżałek, 2021). SET enables a nuanced understanding of how relationships and contexts shape the diverse ways organizations engage in innovation, contingent upon drivers and nature (Can Saglam, Yildiz Çankaya, Golgeci, Sezen, & Zaim, 2022). The reconciliation of motivations and reluctance factors is connected to the role of public funding in PPC. Thus, we propose the following.

Proposition 4. *aligning motivations and overcoming reluctance factors in public-private collaboration has a positive influence on the role of public funding.*

Local, national, and even regional public policies articulate public funds *for innovation. Consequently, public authorities actively advocate for and promote programs and policies that foster collaboration. Here, public and private actors should be willing to align on expectations and motivations to work on innovation. Hence, alignment between public and private actors can increase the impact of public* funding *on the development of innovation* (O'Kane et al., 2020). *Specifically, a motivation for private entities to engage in collaborative innovation is the availability of public* funding, *underscoring its significance. To further analyze the role of public* funding, *we propose the following.*

Proposition 5. *Public funding influences the acceptance of public-private collaboration arrangements characterized by equal standing and a defined level of formality.*

Public funding *can influence the acceptance of the type of* PPC *arrangements on a relational base but with some formality and equal standing, as it serves as an incentive to establish collaboration.* Furthermore, *public funding is critical in shaping multi-stakeholder collaborations and their alignment with sustainability objectives. Also, it facilitates tailored linkages with academia and research centers. In particular, European programs and national agencies, such as* Business Finland, *highlight the role of public funding for ecosystems and partnerships in energy innovation* (Ministry of Economic Affairs *and Employment Finland*, 2019; Ministry of Economy *Affairs and Employment of* Finland, 2018; 2022). *However, some informants stated that handling public* funding i*mplies strict rules for using taxpayers' money and long waiting times for public decisions. Notably, the type of arrangements where the tightness of the collaborative structure is less would rely more on public* funding *or co-*funding *to keep stakeholders engaged. Indeed, according to* Brostro (2012), *the pressure of international competition and rapid technological advances push the industry to connect research efforts to networks and then public co-*funding *works by strengthening the incentives to build collaborations for research and development.*

6. Conclusions

This study underscores the crucial role of PPC in advancing cleaner and more sustainable energy systems. To address the research questions, we developed a case study using the SET framework and individual sensemaking to explore culture's impact on PPC in energy innovation at national level in Finland. Our findings indicated six main dimensions in the actors' discourse: 1) perception of the cultural context, *the role of trust in decision-making*; 2) experiences, *consensus, and the role of competition in innovation;* 3) meaning creation, *the role of horizontality, arrangements*; 4) tensions between motivations and reluctance factors, *boosting innovations to commercial levels versus the challenges of working between public and private sectors*; 5) acceptability and individual sensemaking: *acceptability of public-private collaboration arrangements and the role of public* funding; and 6) connection with future actions: *the role of public-private collaboration in decarbonizing energy systems.*

6.1. Theoretical contributions

The findings of this study provide insights into several contributions to the literature. Firstly, our study explores the impact of cultural context on the ability of both public and private actors to engage in social exchanges and collaboration for energy innovation. In this sense, those interviewed emphasized the relevance of complementarity between the public and private sectors to achieve common goals.

Moreover, the study underlines the need for collaboration to foster innovations and instigate socio-technical change. Second, in line with the microfundations approach and the Social Exchange Theory (SET), our study reveals that factors such as trust and consensus enhance the connection between public and private actors. These factors are further strengthened by the common foundation provided by the cultural context (Khalid and Ali, 2017). Here, informants emphasized that trust is a key value in collaborative efforts within Finnish society. Similarly, horizontality stemming from the cultural context, reflects the power distance among actors and influences the social exchange in PPC (Can Saglam et al., 2022). This paper elucidates the relevant role of the agency in offering explanations for social outcomes at the individual level.

6.2. Policy implications

Based on the findings, our study provides valuable contributions for policymakers in driving actions toward more sustainable energy systems. Firstly, it presents an updated understanding of the motivations of public and private actors to build PPC in the Finnish energy context, which informants indicated as the opportunity to develop and scale energy solutions. These insights could encourage social learning and stakeholder interactions to foster relevant interventions (Köhler et al., 2019).

Secondly, our study highlights the significance of trust, consensus, and horizontality for decision-making in the Finnish context and the relevant role of public funding in helping energy innovation gain full traction in the market. Therefore, policymakers can leverage these context-specific features to promote the emergence of solid grassroots PPC by activating public funding mechanisms. Third, this study emphasizes the challenges of 'importing' or transferring PPC frameworks from one context to another. Successful instruments in specific cultural settings may not yield the desired outcomes if the nuances of the cultural context of implementation are not considered.

6.3. Limitations and future research opportunities

As with any research endeavor, our study has its limitations. Specifically, using a single case study may restrict the generalizability of the findings. Nonetheless, the decision to employ the single case study was informed by the case's relevance and its value. Future research efforts should focus on two key areas: (1) enabling mechanisms for fostering cross-context public-private collaboration and 2) the roles and motivations of public and private actors in collaboration toward cleaner and sustainable energy systems.

CRediT authorship contribution statement

Giovanna Andrea Pinilla-De La Cruz: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Rodrigo Rabetino:** Writing – review & editing, Validation, Supervision, Project administration, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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Appendix A

Table A1
Representative proof quotations

Aggregate dimension second-order theme	Representative quotes
Socio-cultural context Introspection	
Perception of the cultural context: *the role of trust in decision-making*	- *It [trust] is key in our culture. It is key'.* [B2] - *'(…) But to my understanding, it is informal and easy-going, and, of course, there are. They make contracts and sign understandings under responsibilities, etc. So, of course, they take care of the legal basis. But, as a small country, and I said, everybody knows everybody in the kind of sector'.* [J3]
Experiences: *consensus and the role of competition in innovation*	- *'Well, if I think about those projects with whom I have worked, these energy support projects, I would say that the most successful are those they have been able to develop and demonstrate something new'.* [B1] - *'Well, I think we should try to make them discuss with each other so that they can tell us how they normally work and compare their working methods and issues. And maybe bring some new ideas to the discussion and decide how to collaborate. '* [H1]
Meaning creation: *the role of horizontality, variety of arrangements*	- *'But I would say, it [decision-making] is horizontal, but it is also formal'* [B2] - *'So there are various ways to create this relationship, and they are all tailor-made more or less; there is no one size fits all'.* [E3]
Tensions between motivations and reluctance factors: *boosting innovations to commercial levels versus the challenges of working between public and private sectors*	- *'How much more powerful you are if you do things together* [B2] - *'I think if we would be better at cooperation, then we create it much more. Always says that 1 + 1 is more than two; it is three or four (…)'* [D2] - *'I think it is very fruitful if this kind of network and collaboration exists, so I think we can do more quickly good things'* [H1] - *'(…) If you have a political interest in and want to steer it in a certain way, the companies have their interests, which might differ. And I noticed that these different parties have difficulties understanding each other's position.'* [F2]
Acceptability and individual sensemaking: *acceptability of public-private collaboration arrangements and the role of public funding*	- *'EU horizon projects are a good example where these energy transition innovations or demonstrations in Finland (…)'.* [J1]

(*continued on next page*)

Table A1 (*continued*)

Aggregate dimension second-order theme	Representative quotes
Behavioral Decisions and social outcomes Connection with forthcoming actions: *the role of public-private collaboration in decarbonizing energy systems*	- *'ESCO model, I would say. It is part of this partnership. It is a wider viewpoint from the ESCO model (…)'.* [E3] - *'Yeah, we can contribute something big at the European or even global level, but it needs more collaboration and common understanding (…)'.* [B3] - *'(…)all the collaboration between the public sector and research, like universities and research centers and the private sector, is very efficient because if the universities only study something by themselves, maybe they are not developing something too important for the companies. So, where all these are funded by the Finnish government, research institutions, and the private sector, we have great opportunities to develop new technologies. '* [B1] - *'(…) then they all could collaborate instead of trying to be good in everything and then competing, and then there is kind of overlapping because there are so few resources for this kind of research that it would be better to kind of focus in a better way and coordinate this'.* [B3]

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