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Unstructuring data, activating dialogue: How situated knowledges shape participatory Systemic Design practices

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Abstract: This paper explores the role of data within participatory systemic design, focusing on how structured and unstructured data influence participation, sensemaking, and representation. Through three interconnected applications, the research examines how systems' visual representations function as boundary objects that enable dialogue, trust, and shared understanding among diverse actors. Drawing on the concept of unstructuring data, the paper discusses how transforming data from fixed, expert-driven artefacts into open, evolving representations fosters inclusivity and reflexivity in design processes. The findings highlight that structured data support decision-making in well-defined contexts, whereas unstructured data stimulate exploration and collective learning in complex or fragile territories. Ultimately, the paper reframes mapping as a translational and ethical practice that enables designers and stakeholders to co-create a systemic understanding through dialogue, negotiation, and iterative reflection, supporting sustainability transitions grounded in participation and situated knowledge.

Keywords: systemic design; data-driven approach; participatory design; fragile territories

1. Introduction

Designers are increasingly confronted with vast amounts of data that inform the feasibility and direction of strategies and interventions. In many design contexts, access to and interpretation of data are integral components of the design process (Cain & Pino, 2023), particularly when defining effective and sustainable systemic interventions. Designers transform data into visual representations that facilitate communication and enable collective sensemaking. This visual mediation supports democratic and constructive dialogue, grounding discussions in tangible artefacts that make complex relations visible and actionable. Within systems that encompass territories, organisations, or communities, systemic designers operate as facilitators who build and sustain relationships among diverse actors, weaving together plural forms of knowledge (Aguirre, Agudelo & Romm, 2017; Vink, 2022). To explore this premise, the paper examines the role of critical data (Dalton et al.,

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2016), both structured in a map and unstructured, in shaping co-creation processes (Frow et al., 2015) for systemic interventions that foster trust, empathy, and shared understanding among stakeholders and professionals. While Sanders and Stappers (2008) argue that prototyping becomes relevant once a design opportunity has been identified, this paper suggests that prototyping may also occur earlier in the process, through the visualisation of data. Whether structured or unstructured, data visualisation can act as a form of information prototyping that activates participation and stimulates systemic reflection rather than merely representing pre-existing knowledge.

Data visualisation is a powerful tool for communication and decision-making (Hadjimichael et al., 2024). When effectively designed, it enables individuals to comprehend complexity and make informed choices. Visual narratives, constructed through careful planning of layout, colour, typography, and annotations (Lee & Spence, 2022), translate data into meaningful stories that guide users in processing information and recognising interconnections. The design of visual narratives requires deliberate attention to both form and storytelling (Morelli et al., 2021), ensuring that information is not only displayed but also interpreted as a coherent and purposeful narrative (Roth, 2021). This emphasis introduces the concept of data literacy (Wolff et al., 2016) within the framework of Complexity Maps, understood as the ability to interpret and use data effectively to produce shared knowledge. In systemic design, data literacy is cultivated through tangible artefacts that make systemic relations explicit and facilitate collaborative sensemaking.

Building upon this perspective, the paper addresses two research questions:

1. How does participation occur through artefacts such as Complexity Maps, and how do these artefacts shape participation in return?
2. How does unstructuring data reshape participation and representation in systemic design?

To contextualise the first question, the development of visualisations extends beyond data processing. It entails communicating narratives and actively engaging stakeholders through iterative processes of validation, reflection, and reinterpretation (Corrêa Cordeiro & Rupp Quaresma, 2024). These iterative steps help avoid biased readings (Dimara et al., 2016) and promote an incremental democratisation of design processes in which each cycle of visualisation and feedback refines content and meaning (Leoni et al., 2023).

Within this context, Complexity Maps (Padula & Barbero, 2023) play a central role in systemic design interventions. They are both representational artefacts and participatory devices that help designers and stakeholders make sense of systemic relations. Initially, data are visualised to translate information into maps, which are then used as tools for reflection and prioritisation. The iterative interaction with these maps supports the transition from data to information and ultimately to knowledge, following the Data-Information-Knowledge (DIK) continuum (Masud et al., 2010). As sensemaking evolves, the process becomes generative: new data are collected, hypotheses tested, and intervention concepts co-developed. In this phase, the map itself becomes an evolving artefact, continuously adapted through workshops, discussions, and revisions.

This leads to the second research question. The concept of unstructuring data visualisation emerges as a necessary step in transforming data from a fixed, expert-driven artefact into a

shared and evolving medium for collective sensemaking. Rather than representing static truth, unstructured data serve as catalysts for dialogue, enabling participants to contribute interpretations and question established assumptions (Caniglia, 2020; Griffiths, 2022). In this process, collections of pre-existing data visualisations, such as graphs or charts created by analysts, can act as boundary objects (Star, 2010): shared yet adaptable artefacts through which diverse perspectives intersect and negotiate meaning. Through collective acts of visualising, rearranging, and connecting data, participants co-construct a narrative of the system's complexity. The map becomes a site for externalising thought, making implicit knowledge visible and open to discussion. In this view, unstructuring data does not imply the absence of structure but the deliberate opening of representation to plurality, dialogue, and reflexivity. The resulting Complexity Map is a shared construct, a visual and conceptual synthesis of multiple voices built through iterative sensemaking. By reframing data as a relational medium rather than a descriptive output, systemic design repositions mapping as a participatory, translational, and ethical act that enables systems to be understood, discussed, and transformed collectively.

2. Methodology and research context

The methodological trajectory presented in this paper originates from the intersection of data-driven epistemologies and participatory design practices within systemic interventions. Our starting point lies in combining existing contextual information and local narratives to generate new, shareable understandings of the complexities of territorial systems. As pointed out in the previous section, through this approach, Complexity Maps become not merely visual artefacts, but narrative devices, representations that mediate among heterogeneous actors and enable the co-creation of meaning (Jones, 2018; Sevaldson, 2011, 2022).

In the following paragraphs, the evolution of the use of complexity maps will be examined, along with how it is shaped by the project's context and requirements. It is first necessary to distinguish between the two types of data. When the term 'structured data' is used, it refers to data that has already been interpreted, linked, and assimilated by the designer within a complexity map. In this context, the relationships among the elements have been processed and made visible coherently. In this paper, we propose a novel approach that departs from the conventional methodology. Our approach utilises unstructured data, comprising individual, isolated visualisations of data and raw elements that have not yet been interconnected. This approach entails the direct engagement of participants with the data itself, prior to its interpretation and structuring. In both cases, the artefact (structured data into a map or unstructured data) acts as boundary objects (Margolis et al., 2023), providing sufficient structure to support dialogue while remaining sufficiently open to multiple interpretations. Hence, the methodological path was developed through an iterative process, shown in Figure 1, combining empirical experimentation and theoretical reflection across two major design research projects and a self-reflective experimentation workshop within the authors' affiliated research group in Systemic Design. Each phase progressively reshaped our understanding of how data, mapping, and participation intertwine in systemic interventions.

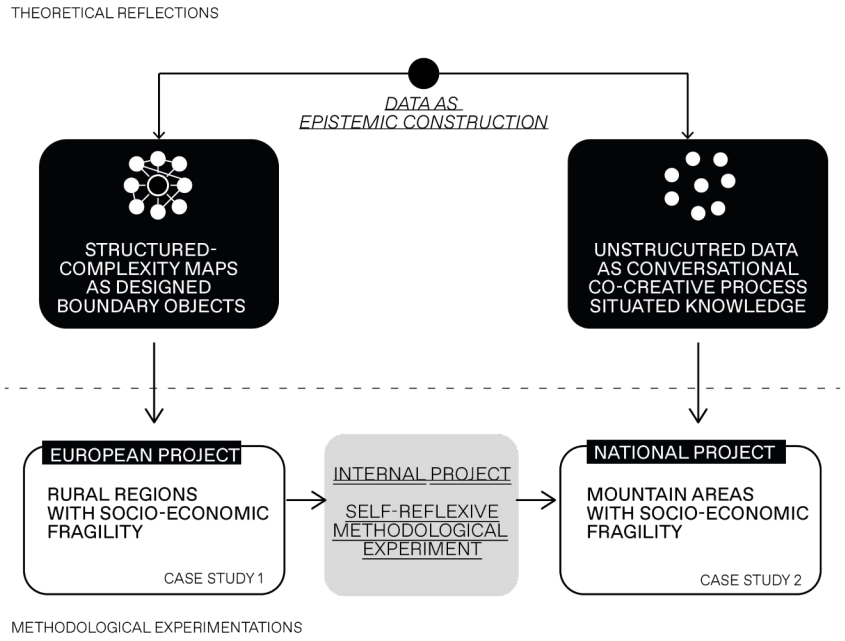

Figure 1 Visual representation of the research methodological path, integrating theoretical reflections and methodological experimentation in an inductive-deductive process.

2.1 From data-driven narratives to participatory sensemaking

The first application of methodological stance for designing systemic interventions was grounded in the idea that contextual and statistical data could be mobilised to articulate systemic narratives (Aulisio et al., 2024). In early applications, such as the European project SYSTOUR, data collection and mapping activities were designed to integrate heterogeneous information, as quantitative indicators, policy frameworks, and qualitative insights from regional partners, into a shared representation of the system. The project involved six countries but always operated on a local scale, focusing on interregional areas characterised by internal rural territories and socio-economic fragility. In this context, the design team collaborated with local partners to collect and visualise data, producing a set of six Complexity Maps, one per region involved within the project, to be used as boundary objects in one participatory workshop, applying the World Café didactic model (Brown & Isaacs, 2005) with twelve participants in total. Then, conducting several discussion sessions during the Complexity Map development process. The aim was to foster forward-looking dialogue, stimulate collective reflection, and make the territorial knowledge visible and actionable. These maps facilitated a structured restitution of local knowledge and were shared among a trans-regional network of stakeholders, including policymakers, researchers, and community representatives.

While these participatory mapping sessions proved effective in creating a common framework and vocabulary, they also revealed the limitations of structured data in contexts of fragility. As explored in the subsequent results section, the divergent perceptions of what was considered relevant and the heterogeneous interpretations of shared values often exposed the epistemic boundaries of the visualisation process. The complexity of local systems could not be fully captured by pre-structured datasets, leading us to question the neutrality of the maps and the role of designers as curators of representation.

2.2 Self-reflexive methodological experiment: co-creating with unstructured data

These reflections led the research team to design a self-reflexive experiment, aimed at rethinking how data could be used as a participatory material rather than as a fixed input. A workshop was organised with nine design researchers involved in various systemic design projects and doctoral research within the Piedmont region. The shared context provided a common territorial reference, yet each participant brought a distinct perspective and epistemic position. The objective of the workshop was not to analyse the territory itself, but to explore how unstructured data, an assemblage of report excerpts, impressions, and situated insights, could be collectively organised into a map. This exercise sought to simulate a participatory setting where data was co-constructed rather than predefined, allowing participants to negotiate categories, connections, and meanings as part of the mapping process. The outcomes of this self-reflexive experiment were twofold. On one hand, the process revealed methodological limitations, including the difficulty of maintaining coherence and traceability when data lacks structure. On the other hand, it uncovered potential advantages, including fostering divergent thinking, enabling a more open exchange of perspectives, and creating conditions for trust and co-creation. The act of mapping unstructured data became a reflective exercise on how designers construct knowledge and on how visualisation itself shapes participation.

2.3 Extending the approach: co-designing in fragile territories

Building on the insights from the experiences presented in sections 2.1 and 2.2, the methodology was further tested in a second empirical context: the national project SustAge, focused on territorial enhancement in the Alto Canavese area, an inner Alpine region characterised by demographic ageing and population decline. Although nationally coordinated, the project operated locally, engaging small municipalities and regional institutions in participatory systemic design processes (Brink et al., 2018). In this case, the first co-design session explicitly adopted the unstructured data approach developed in the self-reflexive experiment (Section 2.2). Eleven project partners with diverse disciplinary backgrounds took part in the session. The goal was to collectively develop an initial, co-disciplinary understanding of the territorial system and to identify the stakeholders to be involved in the next participatory phases. Instead of starting from a predefined data framework, participants were invited to contribute fragments of knowledge, documents, narratives, and informal observations, which were then assembled through facilitated dialogue into a shared, evolving map. This experiment confirmed that working with unstructured data can stimulate cross-disciplinary sensemaking and reveal hidden dimensions of systemic relations often overlooked in formal data collection. It also underscored the importance of facilitation and group dynamics: when data is unstructured, the process of making sense together becomes as critical as the visual output itself.

The reflections and results emerging from these three phases are further elaborated in the following sections, where we discuss the conceptual implications of designing data and unstructuring data (Section 3) and examine how these methodological shifts manifest in the two case studies (Section 4). Together, these discussions aim to frame the ethical and epistemic potential of unstructured mapping within participatory systemic design.

3. Systems Representations and Participatory Design: Learning from Two Case Studies

As illustrated in section 2, this research emerges from an inductive path rooted in a consolidated practice: the use of Complexity Maps as design tools for visualising systems and engaging stakeholders in shared reflection. Within systemic design, mapping has traditionally been used to create a big picture, a visual synthesis that makes interconnections visible, supports collaborative dialogue, and enables the identification of both criticalities and hidden potential within a process, an organisation, or a territory (Pereno & Barbero, 2020). Complexity Maps, also known as Gigamaps (Sevaldson, 2018), serve as boundary objects that enable diverse actors to externalise knowledge, negotiate meanings, and collectively explore the dynamics of a complex system. This approach has proven particularly effective at the micro (process) and meso (organisational) levels, where designers hold a recognised role and where the boundaries of complexity are relatively contained (Sanders & Stappers, 2014; Smith et al., 2017). In such contexts, the map provides a legible structure through which participants can reason together. The data, even when partially qualitative, can be curated and visualised coherently, supporting feedback loops that feed design iterations.

However, at the territorial level, mapping becomes more intricate. The system expands in scale and heterogeneity, involving numerous stakeholders with divergent perspectives, interests, and degrees of influence (Bijl-Brouwer & Malcolm, 2020). Conflicts and epistemic asymmetries become more visible (Haraway, 1988; Couldry & Mejias, 2019). In these contexts, the data itself risks reproducing pre-existing biases, reflecting institutional priorities, established narratives, or the limitations of data availability (Kitchin, 2014). The absence of data in fragile or peripheral territories is not a neutral technical gap (Dencik, et al.,2019; D'Ignazio & Klein, 2020), it is a structural and political condition, reflecting historical patterns of under-investment, institutional neglect, or the deliberate invisibilization of certain communities (Couldry & Mejias, 2019).

Nevertheless, structured and designed data retain value as boundary objects (Star & Griesemer, 1989), serving as shared references that can facilitate dialogue among heterogeneous actors. However, this potential is only realised where the system under study is sufficiently stable and legible to sustain such a function. In contexts characterised by fragility and ambiguity, structured data struggles to accommodate the partiality, incompleteness, and contested nature of territorial knowledge. This approach, therefore, necessitates adopting unstructured mapping practices that incorporate collective narrative and situated knowledge as valid epistemological sources. As posited by Haraway (1988), all knowledge is considered as partial and situated, rather than as a limitation to be surmounted. Instead, this partiality is conceived as a condition that can be transformed into a fertile source of knowledge. These practices align with participatory mapping traditions, which treat the map not as a pre-given representation of territory but as a collectively constructed site of meaning-making (Chambers, 2006; Perkins, 2004).

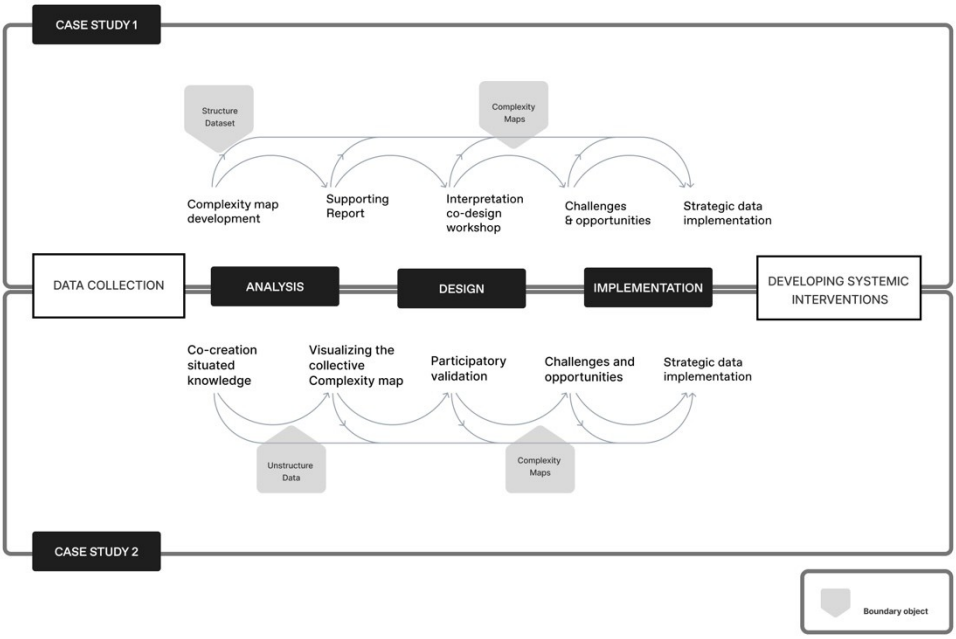

Figure 2 Visual representation of the two-case studies process with boundary objects phases

3.1 Learning about structured data use from SYSTOUR

The SYSTOUR project (2023-2027) involved six European regions collaborating to explore territorial development strategies of regenerative tourism through systemic design methods. It was funded under the Interreg Europe[1] project, which aims to support regions in developing and delivering better policies. The single "*unit of analysis*" (Yin, 2017) encompasses six different geographic areas across the European Union, spanning six countries. Despite the transnational framework, the work was anchored locally, focusing on rural and peripheral areas often described as 'inner regions', territories that experience the social and economic consequences of underrepresentation in regional planning (Ferretti et al., 2022). In SYSTOUR, the design team engaged with project partners from public administrations and regional clusters (Figure 3). Specifically, there were four tourism regional departments, one government foundation responsible for Tourism and Culture, and a technological centre for services related to transitions. In addition to the project partners, each of them involved at least two local stakeholders, from local businesses in tourism, tourism offices, associations, NGOs or universities. The project aims to develop a comprehensive understanding of the opportunities and constraints within the territorial context, with a particular focus on rural areas. It delineates the elements that define the tourism value chain within the participating regions and map both explicit and latent relationships that may disclose opportunities for enhancement through targeted policy strategies. To this end, the research design includes field-based enquiry, comprising site visits, and the systematic assessment of good practice across the regions involved in the project. The participatory process collected and organised data to construct Complexity Maps as visual platforms for reflection (Aulisio et al., 2024). Once the stakeholders have fully populated the dataset, the designer reorganises and analyses the collected data and indicators to create graphs, geospatial analyses, and infographics that follow a structured

[1] https://www.interregeurope.eu/what-is-interreg-europe

logic, referring to their expertise. The maps synthesised data from reports, local policy frameworks, and interviews, providing a shared overview to guide discussion across trans-regional workshops. These maps proved effective in enabling dialogue and in generating a shared systemic understanding; they allowed stakeholders to “see” the system and articulate opportunities for collaboration. The Complexity Maps here helped to identify and recognise patterns and similarities, drawing inspiration from diverse, unrelated fields and bridging new concepts with familiar ones.

Figure 3 Co-design workshop sessions in the SYSTOUR project, using Complexity Maps by a World Cafè didactic method

This participatory process facilitated mutual learning and exchange between local actors (decision-makers and stakeholders) and technical experts (systemic designers and other researchers from disciplines that support achieving the project's objectives), while enhancing the identification and implementation of interventions (Aulisio & Barbero, 2025). The level of engagement among the participating actors was significant during the phase of defining the analytical themes and collecting the data. This was particularly evident in the activation of structured dialogues between technical experts and local stakeholders. The presentation of the first visualisation outputs proved to be a turning point, as it further amplified interest and participation, integrating Complexity Maps as boundary objects to co-design a plural perspective on the territorial identity. However, a limitation remains in having developed Complexity Maps with different levels of completeness because the access to databases for creating data visualisations was compromised, depending on the updated data and available data.

Yet, as the project unfolded, it became evident that structured mapping had limitations in contexts of territorial fragility. The process of designing a map, which involves selecting data

to include, representing it, and highlighting certain relationships, implicitly establishes a specific perspective. In the SYSTOUR experience, the Maps inherently conveyed interpretations by experts external to the context under analysis; this may be perceived as a form of "colonisation" of the context (Vink, 2022). Understanding and mapping a fragile territory cannot be based solely on empirical data: it is necessary to integrate the situated knowledge (Haraway, 1988) of those who live there. Hence, the need to conceive of the Map as an open, constantly evolving tool, generated by dialogue and sharing, going beyond the data itself, to integrate personal experiences and informal narratives into the process. The designer's mediation influences what is perceived as objective knowledge. The experience prompted an internal reflection: how might we approach mapping in ways that unbias data and open up representational space for plurality?

3.2 Experimenting with unstructured data

This question gave rise to a methodological experiment on data deconstruction, an attempt to challenge the rigidity of conventional, structured visualisation systems. Through deconstruction, we sought to open up possibilities for dialogue and co-creation, exploring participation as a form of systemic intervention and a space for care and attention towards collective vision; and to reflect on the act of "approaching" others as an intrinsically relational gesture.

It was from this emergent necessity that a workshop was organised with nine designers, each involved in different systemic design projects or doctoral research within the Piedmont region (Figure 4). The shared territorial familiarity provided a common reference, but participants brought diverse experiences and disciplinary orientations. Rather than analysing a specific context, the workshop focused on experimenting with unstructured data to co-create a shared map of the region. The material included various forms of information: extracted schemes from existing reports, aggregated datasets, qualitative insights, and spontaneous inputs from participants' prior projects. The task was to collectively build a map starting from these fragments, without pre-defined categories or hierarchies. The collective reasoning process was directed by the group's domain of expertise. The presentation of data representing this territory from multiple perspectives was followed by an invitation for participants to reflect on which aspects of the territory were most relevant to their own research. In a subsequent phase, a collective discussion ensued, with a focus on interpreting and assessing the value and significance of the data. This included an examination of the types of data utilised, the extent to which data was shared across projects, and the circumstances under which there was a perceived need to expand beyond existing datasets.

Several observations emerged from the experimentation. First, working with a limited number of unstructured data points required a more deliberate and dialogical process of interpretation. The absence of coherence in the visual language increased the effort needed to decode the information, but this effort also stimulated deeper engagement and reasoning. Participants found themselves discussing meanings, testing connections, and negotiating categories, rather than merely populating predefined frameworks. The map became a conversational space, a shared construct rather than a finished artefact. At the same time, this openness introduced new challenges: real-time synthesis proved difficult, and the lack of formal structure made it harder to ensure the traceability of insights.

Despite its exploratory value, this experiment had inherent limitations. The participants were all trained designers familiar with systemic mapping, which reduced the diversity of perspectives. Moreover, as a methodological trial, it was not embedded within a real participatory process, thus limiting the social validation of its outcomes.

Figure 4 Self-reflective workshop session, experimenting with unstructured data visualisations

3.3 Applying unstructured mapping in SustAge

To further test the approach in a real-world setting, the methodology was subsequently implemented in SustAge, a national three-year research project (2025–2027) funded by the National Funds for Academic Research, involving multiple academic and institutional partners. The project addresses systemic innovation in marginal Alpine regions, focusing on the intersection between the green and grey transitions: environmental sustainability and demographic ageing. The project aims to explore how systemic interventions can enhance the resilience and quality of life of ageing rural communities through new institutional tools such as renewable energy communities and distributed care models. The ultimate objective is not only to promote active ageing but to foster active communities, enabling people and institutions to co-create sustainable and caring local systems. SustAge's methodology includes two main phases: an initial stage involving academic and institutional partners, followed by a participatory phase with local communities. The unstructured data approach was applied in the first co-creation workshop (Figure 5), which aimed to construct an initial systemic overview of the case-study territory based on desk analyses and preliminary interviews. Eleven participants from law, engineering, systemic design, social services, and local governance worked together to map key dynamics and identify the stakeholders to involve in the next participatory phase.

The workshop unfolded in two steps. First, participants analysed a small but meaningful set of destructured data, including tables, narratives, qualitative notes, and cross-sectoral insights. They were invited to connect pieces of information, suggest new data to be explored, and share reflections drawn from their own disciplinary perspectives. In the second step, participants engaged in a collaborative stakeholder mapping activity, identifying individuals and organisations for inclusion in subsequent community sessions.

The use of unstructured data during this session produced distinct effects. The reduced number of data elements helped participants to focus without feeling overwhelmed by the system's complexity. The map's minimal visual coherence facilitated comprehension while preserving the cognitive effort necessary for critical reflection. This balance encouraged participants to articulate reasoning more explicitly and to form unexpected connections between disparate elements. For example, participants noticed the widespread presence of post offices compared to the closure of public libraries: this observation led to the proposal of involving Postal Service Provider as a partner in the next design phase, leveraging its territorial presence to deliver new community services.

At the same time, the process demanded a longer facilitation period and relied on participants with advanced professional and academic backgrounds. This condition likely supported the success of the activity but also highlights a limitation in terms of scalability and inclusivity.

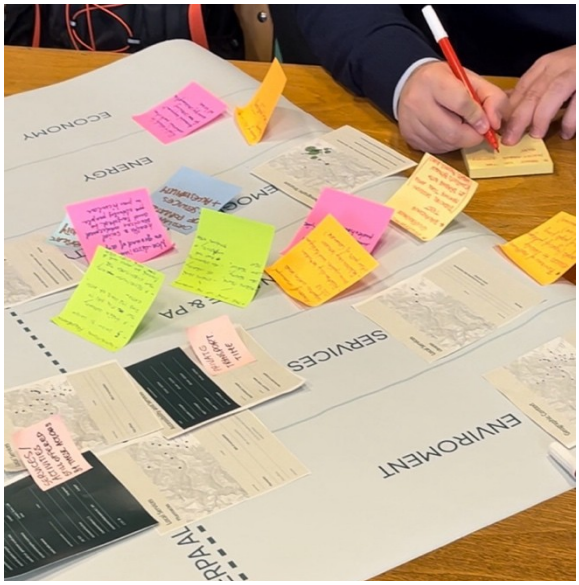

Figure 5 Workshop session with stakeholders and SustAge project partners by adopting unstructured mapping in a real-world environment.

3.4 Reflections Emerging from Practice

Across these experiences, mapping emerges not as a mere technique of representation but as a systemic and transdisciplinary practice that materialises relations and mediates between perspectives. It relies on plural disciplines and situated forms of knowledge (Haraway, 1988) to interpret and give meaning to data, transforming raw information into a map of complexity that reflects the heterogeneity of the systems it engages. The structured map remains valuable where systems are institutionally stable, and the designer's role ensures

coherence and legibility. Yet, in contexts marked by fragility and diversity, unstructured and collectively constructed mapping reveals its potential as a practice that embraces uncertainty, enables cross-disciplinary dialogue, and fosters collective sensemaking. Such approaches sustain an ongoing negotiation of meaning across disciplinary and institutional boundaries. These empirical reflections inform the following discussion, which examines the broader ethical and epistemic implications of unstructuring data in participatory systemic design,specifically, how this shift reconfigures the role of the designer, the nature of participation, and the forms of knowledge that emerge within systemic interventions.

4. From Data to Dialogue: Towards Unstructured Epistemologies

Discussing the deconstruction of data epistemologies entails questioning processes that, over time, have been developed through methodologically rigorous and sequential steps, intended, for instance, to provide methodological robustness to design research and to enable the comparison of results across case studies. The in-depth examination of the two selected case studies has allowed us to open a broader discussion on the continuous adaptation of methodology according to the specific context and research objectives, on the actors that need to be involved in the design process through the use of data, and on their capacity and disposition to engage with data. John and Page (2019) argue that the intersection of design practice and research is essentially a “translational activity”. Translational design, in this sense, can be understood as the effort to transfer, reinterpret, and mediate knowledge among diverse domains, ensuring that insights generated in one sphere, be it scientific, institutional, or community-based, can meaningfully inform decision-making in another. Norman (2010) emphasises that translational designers play a crucial role in transforming the challenges and concerns of practice into clear, need-based statements. These statements can inspire researchers to develop new insights (Holmes et al., 2024). This approach shifts the focus from merely using and exploiting data to creating systematic interventions. It encourages conversations that acknowledge and enhance the system's emergent and hidden properties, all guided by a translational attitude in research.

Both case studies presented are driven by this translational attitude; however, they demonstrate different methodological potentials and limitations in practice.

In the first project, where the exploratory framework was clearly defined and the design goals aligned with existing policy structures, data served to inform and direct decisions regarding potential interventions. The maps functioned as stable boundary objects, enabling participants to orient themselves within the system and to identify leverage points for change. The structured nature of the data and its visual representation enabled stakeholders to make informed decisions and coordinate their actions across institutional boundaries. However, in the second project, where the system itself was still being explored, the use of unstructured data served a different purpose. It became a conversational catalyst, allowing actors from diverse disciplines and institutions to engage with the complexity of the territory, articulate their perspectives, and collectively construct an understanding of its dynamics. Here, data was not simply a means of decision-making but a medium through which knowledge and relationships were co-created.

These contrasting conditions demonstrate that the relationship between data and participation is contingent on the maturity and definition of the exploratory context. When boundaries and goals are clearly established, structured data provides the clarity necessary for operational decision-making. Conversely, when the system remains ambiguous and evolving, opening dialogue through unstructured data fosters a deeper understanding of the domain, its actors, and its emergent properties. Rather than a methodological weakness, this openness represents a reflexive capacity that allows systemic design to adjust its own tools and procedures in response to the relational and political specificities of each context. The experiences discussed here have also prompted an autoethnographic reflection (Bofylatos & Perez, 2024) within the research team. Engaging directly in these processes revealed how every systemic intervention requires some degree of methodological reconfiguration. The structured models of systemic design, though grounded in rigour, must be flexible enough to accommodate uncertainty, partial knowledge, and local complexity. This becomes particularly evident in rural and fragile contexts, where data accessibility is limited and official datasets are often outdated or incomplete. In such circumstances, insisting on standardised procedures risks reinforcing existing knowledge gaps. Instead, embracing the partial and situated nature of available data opens the way for participatory sensemaking processes that value lived experience and tacit knowledge as legitimate forms of systemic insight.

Ultimately, the deconstruction of data epistemologies discussed here does not imply the rejection of rigour but its redefinition. Rigour in systemic design emerges not from methodological uniformity but from attentive translation: the designer's capacity to mediate between the abstract and the concrete, the quantitative and the qualitative, the institutional and the everyday. By adopting a translational attitude, designers cultivate an ethical form of engagement with data that recognises its relational, interpretive, and political dimensions. In this sense, data becomes a medium through which collective reflection and informed action can be continuously generated.

5. Limitations, future directions and conclusions

This research is inherently situated within an ongoing process. The reflections presented here stem from a methodological trajectory still in development, particularly within the second project, where the unstructured data approach is being further tested. The findings should therefore be regarded as provisional: they capture a moment of transition rather than a definitive methodological framework. This condition of in-progress knowledge is consistent with systemic design research, which advances through iterative adaptation and reflexive learning.

Some limitations emerge from this early stage of experimentation. The first concerns the composition of the participant group involved in the initial tests. The workshops primarily engaged academic and high-profile figures, thus restricting the breadth of perspectives represented. Future applications should extend to broader stakeholder groups and explore how unstructured mapping functions in participatory settings involving non-expert or community actors. A second limitation relates to facilitating group dynamics. Working with unstructured data requires specific skills in mediation and dialogue management, as participants must navigate uncertainty, negotiate meanings, and collectively construct

coherence from fragmented inputs. These relational challenges suggest the need for closer collaboration with sociologists and anthropologists, as well as the acquisition of new competencies by designers themselves. The systemic designer's role increasingly entails social sensitivity and ethical awareness, complementing technical and visual skills with the ability to hold and guide complex collective processes.

A further consideration concerns the contextual adaptability of systemic design methodologies. The comparison between the two projects shows that methodological robustness lies not in the standardisation of tools but in their responsiveness to context. Depending on the project's aims and degree of definition, designers may alternate between structured data for decision-oriented processes and unstructured data for exploratory or sensemaking phases. Recognising this flexibility enables systemic design to evolve through situated experimentation, where each project becomes both an inquiry and an opportunity for methodological growth. From this perspective, unstructuring data is not merely a technical exercise but a way of rethinking rigour and participation in systemic design. Rigour arises from attentiveness to context and from the designer's ability to translate between different forms of knowledge. Participation, in turn, becomes an evolving dialogue through which systems, designers, and stakeholders learn together. In conclusion, while the unstructured data approach remains under development, its early application reveals significant potential for generating inclusive, reflective, and context-sensitive systemic interventions. Future work will deepen this experimentation within the SustAge project, integrating expertise from the social sciences and expanding designers' capacities for facilitation and collective learning. Ultimately, systemic design's strength lies not in mastering complexity through representation but in cultivating the conditions under which complexity can be collectively understood, discussed, and reimagined.

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6. References

Aguirre, M., Agudelo, N., & Romm, J. (2017). Design Facilitation as Emerging Practice: Analyzing How Designers Support Multi-stakeholder Co-creation. She Ji, 3(3), 198–209. https://doi.org/10.1016/j.sheji.2017.11.003

Aulisio, A., Barbero, S., Barreca, A., Malavasi, G., & Rolando, D. (2024). From Data Collection to a Cross-Cutting Analysis Visualisation: Territorial Complexity Overview to Foster Responsible Tourism in Rural Areas (pp. 33–50). https://doi.org/10.1007/978-3-031-65282-0_3

Aulisio, A., Barbero S. (2025). Fostering Democratic Data-Driven Policy Interventions. A Collaborative Approach to Systemic Design for Sustainable Tourism. In the 14th Proceedings of the Relating Systems Thinking and Design Symposium, 15-18 October 2025, Toronto, Canada.

Bijl-Brouwer, M. van der, & Malcolm, B. (2020). Systemic Design Principles in Social Innovation: A Study of Expert Practices and Design Rationales. She Ji: The Journal of Design, Economics, and Innovation, 6(3), 386–407. https://doi.org/10.1016/j.sheji.2020.06.001Bofylatos, S., & Perez, D. (2024, June 23). Reflective Narratives in Social Design: towards an Autoethnographic Approach. https://doi.org/10.21606/drs.2024.1694

Brink, E., Wamsler, C., Adolfsson, M., Axelsson, M., Beery, T., Björn, H., Bramryd, T., Ekelund, N., Jephson, T., Narvelo, W., Ness, B., Jönsson, K. I., Palo, T., Sjeldrup, M., Stålhammar, S., & Thiere, G. (2018). On the road to 'research municipalities': analysing transdisciplinarity in municipal ecosystem services and adaptation planning. Sustainability Science, 13(3), 765–784. https://doi.org/10.1007/s11625-017-0499-0

Brown, J., & Isaacs, D. (2005). The World Café: Shaping Our Future through Conversations that Matter. Berrett-Koehler Publishers.

Cain, J., & Pino, Z. (2023). Navigating Design, Data, and Decision in an Age of Uncertainty. She Ji: The Journal of Design, Economics, and Innovation, 9(2), 197–212. https://doi.org/10.1016/j.sheji.2023.07.002

Caniglia, G., Luederitz, C., von Wirth, T., Fazey, I., Martín-López, B., Hondrila, K., König, A., von Wehrden, H., Schäpke, N. A., Laubichler, M. D., & Lang, D. J. (2020). A pluralistic and integrated approach to action-oriented knowledge for sustainability. Nature Sustainability, 4(2), 93–100. https://doi.org/10.1038/s41893-020-00616-z

Chambers, R. (2006). Participatory mapping and geographic information systems: Whose map? Who is empowered and who disempowered? Who gains and who loses? The Electronic Journal of Information Systems in Developing Countries, 25(1), 1–11. http://orcid.org/0000-0003-1650-9103

Corrêa Cordeiro, R., & Rupp Quaresma, M. (2024, June 23). Bridging the Gap: Data-Driven Design for Smart Cities. https://doi.org/10.21606/drs.2024.456

Couldry, N., & Mejias, U. A. (2019). The costs of connection: How data is colonizing human life and appropriating it for capitalism. Stanford University Press. https://doi.org/10.1515/9781503609754

Dalton, C. M., Taylor, L., & Thatcher, J. (2016). Critical Data Studies: A dialog on data and space. Big Data and Society, 3(1). https://doi.org/10.1177/2053951716648346

Dimara, E., Dragicevic, P., & Bezerianos, A. (2016). Accounting for Availability Biases in Information Visualization.

D'Ignazio, C., & Klein, L. F. (2020). Data feminism. MIT Press. https://doi.org/10.7551/mitpress/11805.001.0001

Dencik, L., Hintz, A., Redden, J., & Treré, E. (2019). Exploring data justice: Conceptions, applications and directions. Information, Communication & Society, 22(7), 873–881. https://doi.org/10.1080/1369118X.2019.1606268

Ferretti, M., Favargiotti, S., Lino, B., & Rolando, D. (2022). Branding4Resilience: Explorative and Collaborative Approaches for Inner Territories. Sustainability, 14(18), 11235. https://doi.org/10.3390/su141811235

Frow, P., Nenonen, S., Payne, A., & Storbacka, K. (2015). Managing Co-creation Design: A Strategic Approach to Innovation. British Journal of Management, 26(3), 463–483. https://doi.org/10.1111/1467-8551.12087

Griffiths, C. (2022). Situatedness: A critical data visualisation practice. Prospectives: The Bartlett School of Architecture Journal, 2.

Hadjimichael, A., Schlumberger, J., & Haasnoot, M. (2024). Data visualisation for decision making under deep uncertainty: current challenges and opportunities. Environmental Research Letters, 19(11), 111011. https://doi.org/10.1088/1748-9326/ad858b

Haraway, D. (1988). Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. Feminist Studies, 14(3), 575–599.

Holmes, J., Blanco, M., Linkner, T., Ciliotta Chehade, E., & Ciuccarelli, P. (2024, June 16). Harnessing information visualization as a vehicle for translational design. DRS2024: Boston. https://doi.org/10.21606/drs.2024.664

Jones, P. (2018). Contexts of Co-creation: Designing with System Stakeholders (pp. 3–52). https://doi.org/10.1007/978-4-431-55639-8_1

Lee, B. P., & Spence, C. (2022). Crossmodal correspondences between basic tastes and visual design features: A narrative historical review. I-Perception, 13(5), 204166952211273. https://doi.org/10.1177/20416695221127325

Leoni, F., Carraro, M., McAuliffe, E., & Maffei, S. (2023). Data-centric public services as potential source of policy knowledge. Can “design for policy” help? Transforming Government: People, Process and Policy, 17(3), 399–411. https://doi.org/10.1108/TG-06-2022-0088

Margolis, A., & Blomsma, F. (2023). The boundary object as a prescriptive framework: designing and evaluating science-based tools in cross-sectoral collaboration. Relating Systems Thinking and Design, RSD12.

Masud, L., Valsecchi, F., Ciuccarelli, P., Ricci, D., & Caviglia, G. (2010). From Data to Knowledge - Visualizations as Transformation Processes within the Data-Information-Knowledge Continuum. 2010 14th International Conference Information Visualisation, 445–449. https://doi.org/10.1109/IV.2010.68

Morelli, A., Johansen, T. G., Pidcock, R., Harold, J., Pirani, A., Gomis, M., Lorenzoni, I., Haughey, E., & Coventry, K. (2021). Co-designing engaging and accessible data visualisations: a case study of the IPCC reports. Climatic Change, 168(3–4), 26. https://doi.org/10.1007/s10584-021-03171-4

Norman, D. A. (2010). The research-practice gap. Interactions, 17(4), 9–12. https://doi.org/10.1145/1806491.1806494

Padula, C., & Barbero, S. (2023). Gigamaps as enabling tools for envisioning futures. Academic Quarter | Akademisk Kvarter, 26, 77–95. https://doi.org/10.54337/academicquarter.vi26.8251

Page, R., & John, K. (2019). Commercializing Academic Medical Research: The Role of the Translational Designer. The Design Journal, 22(5), 687–705. https://doi.org/10.1080/14606925.2019.1629776

Pereno, A., & Barbero, S. (2020). View of Systemic design for territorial enhancement: An overview on design tools supporting socio-technical system innovation. https://revistas.unisinos.br/index.php/sdrj/article/view/sdrj.2020.132.02/60748077

Perkins, C. (2004). Cartography — cultures of mapping: Power in practice. Progress in Human Geography, 28(3), 381–391. https://doi.org/10.1191/0309132504ph504pr

Roth, R. E. (2021). Cartographic Design as Visual Storytelling: Synthesis and Review of Map-Based Narratives, Genres, and Tropes. Cartographic Journal, 58(1). https://doi.org/10.1080/00087041.2019.1633103

Sanders, E. B.-N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. CoDesign, 4(1), 5–18. https://doi.org/10.1080/15710880701875068

Sanders, L., & Stappers, P. J. (2014). From designing to co-designing to collective dreaming: Three slices in time. Interactions, 21(6), 24–33. https://doi.org/10.1145/2670616

Sevaldson, B. (2011). Giga-mapping: Visualisation for complexity and systems thinking on design. www.nordes.org

Sevaldson, B. (2018). Visualizing Complex Design: The Evolution of Gigamaps (pp. 243–269). https://doi.org/10.1007/978-4-431-55639-8_8

Sevaldson, B. (2022). Designing Complexity: The Methodology and Practice of Systems Oriented Design. Common Ground Research Networks. https://doi.org/10.18848/978-1-86335-262-8/CGPhttps://doi.org/10.18848/978-1-86335-262-8/CGP

Smith, R. C., Bossen, C., & Kanstrup, A. M. (2017). Participatory design in an era of participation. CoDesign, 13(2), 65–69. https://doi.org/10.1080/15710882.2017.1310466

Star, S. L. (2010). This is Not a Boundary Object: Reflections on the Origin of a Concept. Science, Technology, & Human Values, 35(5), 601–617.

Star, S. L., & Griesemer, J. R. (1989). Institutional Ecology, `Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. Social Studies of Science, 19(3), 387–420. https://doi.org/10.1177/030631289019003001

Vink, J. (2022). Designing for Plurality in Democracy by Building Reflexivity. The Pluralist, 17(1), 52–76. https://doi.org/10.5406/19446489.17.1.06

Wolff, A., Gooch, D., Cavero Montaner, J. J., Rashid, U., & Kortuem, G. (2016). Creating an Understanding of Data Literacy for a Data-driven Society. The Journal of Community Informatics, 12(3). https://doi.org/10.15353/joci.v12i3.3275

Yin, R. K. (2017). Case Study Research: Design and Methods (6th ed.). Sage Publications Ltd.

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