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Freeing transdisciplinarity from the project straightjacket: reframing the problem

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A B S T R A C T

Confronting systemic problems in ecological and socio-technical systems requires transcending traditional reductionist approaches and disciplinary silos. Transdisciplinarity (TD) is frequently proposed and embraced as a way of organizing science so that it is better suited to approach wicked problems, and science funders are increasingly interested in investing in large scale integrated initiatives. Achieving effective coordination and cooperation in these types of initiatives, however, has proved notoriously challenging in practice. Here we put the focus on how TD initiatives are organized. We argue that the notions of "project" and "project management" create organizational and behavioral frameworks that are inadequate and ultimately deleterious for this kind of work. In fact, the project - understood as an institution - has permeated into many aspects of society, not just science, in a process that scholars have named "*projectification*". As a deliberate reframing exercise, we explore alternative logics of organizing transdisciplinary work. We offer four major examples from different domains, which we think can help imagine better ways for 'governing transdisciplinarity'. Transdisciplinary initiatives can contain projects, but not be projects, and, importantly, the need for these projects should emerge from transdisciplinary processes. Conceiving transdisciplinary initiatives as something other than projects would change how we run the initiatives themselves, but this cannot happen in a context where so much in science is organized around projects.

1. Introduction

It is well recognized that confronting systemic problems in socio-technical systems requires transcending traditional reductionist approaches and disciplinary silos. This means that multiple scientific disciplines need to integrate their knowledge, together with the knowledge and active participation of the stakeholders. These have been called "transdisciplinary" (TD) approaches and they are frequently proposed and embraced to tackle "*wicked problems*," such as climate change, public health crises, or resolving poverty (Rittel & Webber, 1973). But multiple narratives of what transdisciplinarity actually is have evolved since it first arose in the 1970's (Augsburg, 2014; Lawrence et al., 2022), and today, over fifteen widely varying definitions of transdisciplinarity are identified in the literature (Lattanzio et al., 2020; Lawrence et al., 2022). Here, we adopt the definition proposed by Jahn et al. (2012):

"*Transdisciplinarity is a critical and self-reflexive research approach that relates societal with scientific problems; it produces new knowledge by integrating different scientific and extra-scientific insights; its aim is to contribute to both societal and scientific progress; integration is the cognitive operation of establishing a novel, hitherto non-existent connection between the distinct epistemic, social–organizational, and communicative entities that make up the given problem context.*"

Despite the multiple definitions, and being an evolving paradigm (Davelaar, 2023), the general characteristics of transdisciplinarity that we consider relevant for our argumentation include:

● A focus on wicked problems, which are ill-defined, complex, and hard to disaggregate into smaller parts.
● Apparent presence of difficult dilemmas and tradeoffs.
● Relatively large numbers of participants.
● Incorporation of multiple dimensions such as ecological, social, economic, political, technological, psychological and anthropological.

- Participants coming from diverse backgrounds, including scientists, practitioners, and a variety of stakeholders, often with conflicting aims.
- Lack of vertical management structures (unless "forcefully" imposed).

In this article, we employ the term '*transdisciplinary work*' instead of '*transdisciplinary research*', and we use '*transdisciplinary initiative*' to denote the process within which such work takes place. This choice reflects the inclusion of various stakeholders, extending beyond the scientific community. Nonetheless, our analysis primarily addresses challenges stemming from the predominant organizational structures in science. The timeliness for this work is relevant, as funding bodies are increasingly encouraging scientists to create large integrated research projects (Gluckman & Kaiser, 2023; Hoffmann et al., 2017; International Science Council, 2021), covering multiple subprojects and involving many disciplines and stakeholders to focus complex societal problems, as opposed to small, individual projects (Kim & Yoo, 2019; Rölfer et al., 2021; e.g. van Kerkhoff, 2005).

Recognizing that defining success in TD work is a complex and debated issue, criteria such as those proposed by Zscheischler et al. (2018) are appropriate for our argumentation; these include societal relevance, practical solutions, mutual learning, science-practice cooperation, knowledge integration, broad stakeholder participation, team spirit, reflexivity, achieving a comprehensive synthesis, and the production of new scientific knowledge. Furthermore, one can add that the intuitive sense of success and satisfaction among participants is an intangible but significant indicator of success. Yet, those who have been involved in TD projects often testify how difficult they are to coordinate, how costly they are to run and how many times they fail to deliver on their promises (Simon et al., 2018; Stokols et al., 2008).

The barriers to transdisciplinarity are numerous, as we expand on in Section 2. In this article, we focus on challenges in organizing coordination and cooperation in TD initiatives. Coordination involves jointly determining common goals, while cooperation refers to implementing those goals (Castañer & Oliveira, 2020). The inherent difficulties in organizing these aspects in TD initiatives stem from their general characteristics. However, these challenges are compounded by institutional arrangements and structures within universities, research agencies, and other organizations that have not evolved accordingly (Botha et al., 2014, 2017). One such constraining structure is "*the project*", which typically serves as the discourse, framework, and paradigm guiding how TD functions. Transdisciplinary initiatives are typically framed as projects, approached from a project-based viewpoint. Despite its convenience, integrating 'project' concepts with 'management' principles creates project management systems that often prove incompatible with transdisciplinarity. This is our central premise.

In this article, we address one set of challenges that arise when TD research initiatives are framed as projects. We explore alternative ways to govern transdisciplinarity by examining different framings and considering the implications of moving away from project management. Our intention is not to propose "*frameworks*," which denote structured guidelines and best practices, but rather "*framings*," which involve viewing problems from different perspectives (Dorst, 2015), exploring alternative approaches, and hopefully stimulating further research. First, we briefly describe the barriers that transdisciplinarity faces. Second, we argue why the project-based framing leads to ineffective governance and management mechanisms. Third, recognizing that researchers already find clever ways to circumvent barriers, we propose hypothetical alternative framings to offer new perspectives on the problem. We are guided by the question of why it is so difficult to work together when we frame TD initiatives as projects.

2. Background

2.1. Barriers to transdisciplinarity

Increasingly, researchers find themselves in large integrated projects. Integration is supposed to bring several benefits, including: synergies amongst workstreams, efficiency gains (e.g., avoidance of duplication), higher return on invested funds, and improved collaboration amongst researchers (Lattanzio et al., 2020). More generally, the whole is supposed to be **greater than the sum** of the individual parts, an emergent property that Gibbs (2022) contends occurs "*where outcomes cannot be generated by the additive pooling of the knowledge of the various disciplines concerned, and requires a whole integration, or genuine transdisciplinarity*". However, all too often, the whole is less than the sum, as participants in such large projects frequently express that simply distributing resources into multiple, independent research streams would be more effective. The expected advantages are not realized in practice and large-scale integrated programs instead incur high overhead costs, fail to realize substantial integration, frustrate researchers, and lead to outcomes for stakeholders that do not match expectations (Wever et al., 2023).

Paradoxically, as Hollaender et al. (2008) have noted, TD approaches derive their robustness from the diverse makeup of the teams and by integrating multiple knowledge sources. Yet, it is this very diversity that renders TD initiatives challenging to orchestrate (Simon et al., 2018). Gluckman and Kaiser (2023) also refer to a "conundrum" that arises in governing TD projects, with the need to combine strong leadership with bottom-up decision making. The myriad challenges and barriers to TD work are well-recognized by researchers, many of whom have studied transdisciplinary initiatives over the course of several decades (Aslin & Blackstock, 2010; Gluckman & Kaiser, 2023; M. G. Lawrence et al., 2022; Scholz & Steiner, 2015). For example, Stokols (2008, Table 1) provide a thorough summary of factors facilitating or constraining collaborative effectiveness of transdisciplinary teams.[1] Scholz and Steiner (2015) present a long list (a 4 page-long table) of obstacles, challenges, and constraints that must be addressed within the context of the work and on its different phases. Other researchers identified general themes of challenges including inherent, institutional, teamwork-related, and emergent challenges in TD research, and suggested specific strategies recommendations for making improvements (Gaziulusoy et al., 2016). More recently, Büttner et al. (2023), mention power imbalances, conflicts of interest, the inherent difficulties of representing all the views. Yet, the problems have not gone away. In a recent study, Cardona et al. (2024) describe the tensions inherent to transdisciplinarity in terms of the composition of the groups, the management of temporalities, ontological and epistemological barriers, and the adaptive nature of the approach. The literature on organizing transdisciplinarity and conducting transdisciplinary work reveals widespread agreement that it is not only a challenging endeavor, but that the scientific community has not yet figured out how to do it effectively. In the next section, we present what we think is one key reason why transdisciplinarity is made more difficult in the current context under which it is meant to function.

2.2. The transdisciplinary project

People tend to frame problems in the context of the tool they are used to working with (Euchner, 2019). Transdisciplinary initiatives are most

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[1] A complementary strand of literature termed "*Team Science*", or "*Transdisciplinary Team Science*" over the last couple of decades (Stokols et al., 2008; Vogel et al., 2013). It is out of the scope of this article to review this literature, but we point the interested readers to the "The Team Science Toolkit", a collection of articles and resources developed by the National Cancer Institute's SciTS Team (www.teamsciencetoolkit.cancer.gov).

commonly framed as "projects" (and under contract with funders). A project is commonly understood as a planned piece of work or activity aimed toward a specific aim and that is completed over a fixed period of time. This is a logical outcome, given the omnipresence of the project in almost every aspect of human life, including science, as we discuss in the next section.

Three of the central elements of project management frameworks, namely, an **aim**, a **plan**, and rigid **temporality** are important for our argument. Below, we discuss each of these elements in terms of misalignments with the nature of the problems commonly at the core of transdisciplinary work.

Aim: The assumption of a clear, agreed-upon goal in projects is often unmet in transdisciplinary collaborations. Dealing with wicked problems means goals are not specified at the outset and are open to interpretation and debate. Goals cannot and should not be imposed by a leader, as participants are not obedient workers following a chain-of-command. Imposing goals contradicts the knowledge co-production objective of transdisciplinary work (Simon et al., 2018). Goals should be co-generated through collaboration, dialogue, and negotiation among all participants (Lawrence et al., 2022). Participants bring different worldviews and normative drivers, leading to divergent ideas of goals (Stokols et al., 2008). Transdisciplinarity is self-reflective, with participants discovering and elaborating their motivations and goals during the enquiry process (Montuori, 2005). As Andersson and Palmer (2023) state, "*it is not possible to predict the inputs of the group members, nor what they will choose to explore, discard, or transform to jointly developed synthesis. This means that process designs may have to adapt along the way to match evolving needs and trajectories.*" Therefore, the "rational" view of project management as the accomplishment of a clearly defined goal is mismatched (Lenfle, 2016).

Planning. For effective and detailed planning and execution of projects, while adhering to budget constraints and meeting the expectations of traditional management and accounting systems, we need a clear *a priori* understanding of the problem. However, wicked problems, as described by Lawrence et al. (2022), defy simple characterization: their solutions are neither true nor false, cannot be easily tested, and are not amenable to trial-and-error approaches (Rittel & Webber, 1973). Given that wicked problems can be interpreted through various lenses, any chosen explanatory frame critically shapes different ways of approaching the problems. Traditional project management models struggle to accommodate the dynamic nature of TD work. These problems cannot be fully decomposed into subproblems (Ethiraj & Levinthal, 2004), making it difficult to modularize tasks with clear interfaces[2] and apply conventional work-organization tools like Gantt charts and timesheets. The continuous need for trade-offs and negotiations among stakeholders, coupled with inherent uncertainties, complicates project planning logics that center around management tools including predefined (by contract) milestones, deliverables, and distinct performance indicators. A stated by Lawrence (2024): "*the fair and just consideration of the diverse perhaps conflicting interests of all participants in specific projects should be a fundamental objective of an ethical and just transdisciplinarity*".

Temporality. Project time is strictly regulated, under the presumption that work can have specific boundaries (Dollinger, 2020) and can be sequenced in a predefined order. The project mode, with its focus on short-term milestones and deliverables, does not align with the long-term outlook needed for TD processes nor the mismatching timeframes of the different participants (Cardona et al., 2024). Ylijoki (2016) characterized "project time" by contrasting it with "process time". Project time always moves forward towards contracted goals, and it is both predictable and fast. In contrast, process time does not have strict time limits, the work takes as much time as needed, it may go in circles, it is open to emergence and allows full immersion in the work. Crucially,

this mismatch does not only affect "the project" *per se*, but it has a whole host of implications in how transdisciplinary initiatives fit within the larger science management systems (Gaziulusoy et al., 2016; Wever et al., 2023). Researchers' time is commodified through projects. The traditional model of "project time," which assumes a linear progression and clear end points, does not fit the fluid and iterative nature of TD work.

These problems affect the classic waterfall methodologies for project management, as well as more modern ones (e.g., PRINCE2, PMBOK). They also plague "program management"[3] approaches, which Lycett et al. (2004) sees as "scaled-up forms of project management".[4] These approaches tend to be linear and sequential. More iterative approaches have been developed, "Agile" being one of the most highly promoted. However, Agile is basically a product development approach, with '*a*' product being developed (something well defined and concrete) and '*a*' customer (whose satisfaction can be assessed) (agilemanifesto.org, 2001). In the case of wicked problems in TD work, there isn't one customer, but multiple stakeholders with conflicting needs, and there isn't one product that can be tested, but a wicked problem that we seek to understand and mitigate.

Lang et al. (2012) present a useful description of the ideal–typical transdisciplinary process in the context of research projects, which they conceptualize into three phases: a) framing the problem, b) co-production of knowledge, and c) applying the knowledge produced in both scientific and societal practice. However, crucially for our argumentation, as Lang et al. explain (as other like Gluckman & Kaiser, 2023), these are not linear processes, and they often require multiple iterative or recursive cycles.

Accepting that we cannot rely on rigid plans, budgeted time, and predefined goals means that the classic project management must be replaced by more adaptive and reflexive alternatives. However, as we will argue in section 2.3, projectification is ubiquitous across Western societies, with their focus on pragmatism and efficiency (Max-Neef, 2005). This marks a stark contrast with the holistic transdisciplinary worldview, proposed by authors like Jantsch (1972), Max-Neef (2005) or Rigolot (2022) which extends beyond research projects. Projectification, with all that it entails, stands in the way of such visions.

2.3. Ubiquitous projectification

Projects have become a central way to organize almost every aspect of our life, so much so that several authors have referred to this phenomenon as "projectification" (Karrbom Gustavsson, 2016). This can be understood as "*the institutionalization of projects in society*" (Jacobsson and Jałocha, 2021; Midler, 1995). Projects are so omnipresent as a form of coordination of activities that some author consider them "a new societal form" (Jensen et al., 2016; Ylijoki, 2016). While widely recognized as the instrument being used for managing transdisciplinarity, scholars have noted four major concerns with this way of organizing transdisciplinary work. First, project overload for workers in project-based organizations (PBOs), who typically participate in parallel projects, with multiple interdependencies under tight time pressures and face inadequate routines, putting them at risk of overburden, performance anxiety, and burnout (Asquin et al., 2010; Zika-Viktorsson et al., 2006). Second, the destabilization of disciplinary identities, lack of mutual understanding, and diminished solidarity arise as problematic, given that affiliations are only temporary in project-based work. Third, Asquin et al. (2010) highlight that workers experience strong feelings of career precariousness, given the organizational form. Fourth, Human

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[2] Interface refers to the list of inputs and outputs to be produced by each task, and their attributes.

[3] Programs management defined as the "integration and management of a group of related projects" LYCETT, M., RASSAU, A. & DANSON, J. 2004. Programme management: a critical review. International Journal of Project Management, 22, 289-299.

[4] Programs are seen as collections of projects.

resources implications for project-based work dovetail with managerial efficiency priorities, which necessitate that planning, scheduling, and allocating resources occurs for projects running in parallel. The organizational form of projects meets this efficiency logic in detrimental ways in the workplace, as participants experience more disruptions, competing deadlines, and information overload, are reported outcomes, which occur alongside the adoption of counterproductive narrowing strategies (Karrbom Gustavsson, 2016; Keegan et al., 2018). Projectification has advantages when conducting solution-focused on well-defined problems, one-off work in transitory teams, but it is certainly not unproblematic (Ylijoki, 2016).

Development aid is a sector particularly illustrative of both the dominance of projects and the challenges with how projectification since the 1960s led to business procedures that migrated into public administration (Freeman & Schuller, 2020). The assumed sequence within any project is to first identify a problem, and then identify policies to solve it, and only then intervention follows. But according to Li (2016), this sequence is inverted in rural development, such that problems are selected for which technical solutions are presupposed to exist, and the project subsequently becomes the predetermined form of intervention. Political debate is thus avoided, but so is critical scrutiny of the project, making it less likely to bring real improvements to rural people. Similarly, Freeman and Schuller (2020) are also highly critical of what they call the "*market for projects*", where projects are "sold as *commodities* to the consumers" (i.e., the donors). Thus, projects are constructed for successful evaluations, to serve the donors, more than for the service provision to beneficiaries. They conclude: "*researchers must understand our connection to the aid industry and examine our own role in producing and selling projects*". Surely, there are exceptions, bottom-up work does take place, and no shortage of tools and frameworks are being offered (e.g., Theory of Change, Reflexive Monitoring, Dynamic Adaptive Policy Pathways, Living Labs, and many more), our point is that they still need to operate (and be funded) under the narrow constraints imposed by the project framing (Deutsch et al., 2023; Pereira et al., 2021). These insights are very much applicable to our analysis, as development aid initiatives share important elements with transdisciplinary work, particularly the need to navigate relationships with multiple stakeholders and complex problem dynamics.

Science has not escaped the projectification impulse, with projects being the default way to organize work in research (Dollinger, 2020; Fowler et al., 2015; Pascucci, 2023). The point we try to make in this section is that it is not just the initiative itself being operated as a project, but that everything surrounding it revolves around projects. Moreover, if more and more research takes the form of "transdisciplinary projects", taking it to an extreme, it would mean that everyone is needed everywhere at the same time. This point requires much further reflection.

3. Reframing Approach

Our method of investigation into the topic of transdisciplinarity is oriented by a reframing approach. That is, rather than a hypothesis-testing exercise, we approach the need to reframe the transdisciplinary project by applying framing/reframing techniques from the design profession. According to Dorst (2015), "*design contains a process of thinking around the paradox rather than confronting it head-on. The solution is not within the core paradox itself (which is stuck in closed definitions), but in the broad area of contextual values and themes surrounding the paradox*". Dorst (2018) proposed a design-based approach to support TD work. Here, we use part of the process he modeled to try to reframe coordination and cooperation of TD work itself.

How a problem is defined, or framed, has huge implications on how a problematic situation is addressed. As stated by (Bardwell, 1991):

"*Since problem definition is critical to the subsequent organization of one's understanding of and approach to that problem, a shift in the way one perceives problems and his or her role in them can have dramatic*

impacts. Thus, problem-framing offers a means of approaching problems that might otherwise have been avoided, forsaken, or just solved poorly.".

To frame means selecting certain aspects of a perceived reality and make them more salient, in ways that promotes particular problem definitions, interpretation of causality and recommendations (Entman, 1993). The concept of "frame" is related to "metaphor", as used by Andersson and Palmer (2023) for example. They used the "scaffolding" metaphor to refer to the many of the ways in which transdisciplinary work needs to be supported and protected. Reframing is a way of redefining problems, analyzing them from different perspectives, to help us understand them better and enhance our chances of finding satisfactory solutions (Bardwell, 1991; Euchner, 2019; Schön, 1984). It is not about finding the best problem definition, but about looking at different aspects of these multicausal problems (Wedell-Wedellsborg, 2017).

In situations when the problem can be predefined, conventional problem-solving basically employs induction. When the solution space is unknown, designers use abductive thinking (Lee, 2020). In design abduction, the desired outcome is the only known, and the designers need to work backwards to figure out '*what*' to create and '*how*'. Framing is the key to design abduction, as it creates distance from the existing solution (i.e., the project in our case), and helps to find novel standpoints from which a problem can be investigated (Dorst, 2015; Entman, 1993; Vermaas et al., 2015). Our desired outcome (the known) are the success criteria outlined in the introduction. 'The project' is today the dominant framing, which we challenged in Section 2. In Section 4, we explore alternative framings and how they can suggest possibly better ways of organizing TD initiatives.

Framing is essentially a creative exercise rather than a systematic one; this presents obvious limitations of reproducibility within the research. It also is not a comprehensive endeavor; some reframing formulations may be better fits than others depending on the specifically desired outcomes and empirical realities being explored. Despite such limitations, the exercise of reframing helps to reformulate problems, expanding the solution space and thus allowing for new ideas and insights to emerge. These can be iteratively referenced and cross-checked against the desired outcomes throughout the process.

Our reframing methods involved first searching for alternative framings that better reflect the characteristics of TD work discussed above; we brainstormed and drew from our diverse personal experiences in transdisciplinary work, along with building on prior knowledge of "analogous subjects". After conducting thought experiments using multiple metaphors and frameworks that derived from this brainstorm (i.e. orchestra; sports team coordination; ecological systems; computer programming) we proceeded with a selection process of identifying closest analogous subjects. Our list thus distilled down to the four major framings that we discuss below. These each refer to areas of inquiry and situations that share some of the salient features we see in TD work but have developed somewhat independently. Examples of such areas include complex systems, networks, common good management, collective action problems, worker co-ops, and commons-based peer production. Second, we searched for insights in the extant literature, conducting literature searches through university library databases (e.g. including ProQuest, JStore, Web of Science) for works addressing transdisciplinarity and encompassing primarily the past twenty-five years. Our literature review also synthesizes research on the analogous subjects we discuss below. We reflected on these insights with regard to the values and potential shortcomings of each analogous framework as it informs transdisciplinary endeavors.

4. Results and discussion

We have put forward our case for why the 'project' is not a good way to frame 'transdisciplinary initiatives'. In sum, TD seeks to tackle wicked problems, which cannot be predefined, while project management is designed to solve well-defined problems. We now discuss a possible

substitution for the concept of 'management'. We argue that the notion of "*governing*" is a suitable alternative, understood here as an ongoing process that looks at the structures, frames, and power relations that influence governance in practice (Bratman, 2019). The notion of an ongoing process is entailed within governing, understood as the continuous enactment of governance, aligns well with the concept of "*process time*" introduced above (Ylijoki, 2016). Governance, as we use it, is distinct from the Foucauldian concept of governmentality in his writings on discourse/power and the dominance of government and managerial control in institutions. Rather, we focus on how people's interactions are structured into processes and relationships by rules and forms of decision-making and accountability that are imbued with power. This view is akin with the concept of "*reflexive governance*" for sustainability transitions, as described by De Geus et al. (2024).

More effective ways of governing TD work must acknowledge that collaborators' knowledge of relevant processes underlying the problematic situation at hand is partial and evolving. Strategies and approaches need to be flexible and adjusted based on a continuous assessment of what actually happens as the process evolves. In the following section, we offer four alternative framings, intended both to help us understand the system we are dealing with (Section 4.1 and 4.2), and hopefully pointing towards alternative ways for '*governing transdisciplinarity*' (Section 4.3 and Section 4.4).

4.1. Framing transdisciplinary initiatives as complex systems

Framing the complex and dynamic nature of TD work as complex adaptive systems (CAS) helps to clarify how multiple interacting components can produce emergent behaviors. This parallelism underscores the complexity of TD work. It highlights the potential for minor inputs to lead to significant impacts, which can inform flow pathways and effective implementation within TD research. It also highlights transdisciplinary knowledge as an emergent property of a complex system, and therefore not easily controllable. For example, healthcare initiatives foster innovative outcomes and perspectives using CAS approaches by integrating diverse inputs, such as disciplinary knowledge and stakeholder insights (Conroy et al., 2023; Kitson et al., 2018; Pinero De Plaza et al., 2021, 2023).

CAS theory enhances knowledge creation and dissemination across diverse systems in TD efforts (Kitson et al., 2018). It may help stakeholders better understand and influence their self-organization patterns. This perspective could help them navigate challenges, adapt to changes, foster collaboration, and improve knowledge translation (Archibald et al., 2023; Tieu et al., 2023). Framing TD initiatives as CAS elucidates the dynamics of TD work considering concepts from physics—such as perturbation and phase transitions—which can enrich TD initiatives' governance, resource management, and collaboration. Perturbation refers to disruptions that prompt systemic adjustments and adaptations, leading to flexible and responsive initiatives that may transform challenges into innovation opportunities (Turnbull et al., 1998). Phase transitions describe significant changes in a system's properties upon reaching a critical threshold, suggesting that incremental changes in TD initiatives can lead to substantial shifts, resulting in breakthroughs or systemic failures (McTaggart, 1991).

In response, innovative transdisciplinary approaches, like the PRO-LIFERATE_AI framework, offer alternative strategies that surpass the limitations of static project structures (Pinero De Plaza et al., 2025). These approaches champion a dynamic and continuous adaptation process that mirrors living systems, inherently capable of responding to emergent changes and challenges. Echoing this perspective, Davelaar (2023) in '*Transdisciplinarity as it emerges: a living-systems perspective*' highlights how transdisciplinarity continuously evolves through the interactions among participants, aligning with the natural dynamics of complex adaptive systems. Davelaar advocates for managing transdisciplinary work as flexible, adaptive, and responsive to emerging needs, a significant shift away from rigid, traditional project

management (Davelaar, 2023). This approach not only fosters resilience and adaptability but also resonates with the living-systems view that transdisciplinary efforts should be as inherently versatile and capable of evolution as the ecosystems they aim to benefit.

By leveraging complexity science and CAS theory insights, TD initiatives could enhance their effectiveness, adaptability, resilience, and impact across diverse systems and disciplines (Pinero De Plaza et al., 2023). Yet, despite such theoretical promise, the gap between theory and practical outcomes in TD collaboration underscores the universal challenge of managing complexity (Lawless et al., 2024).

4.2. Framing transdisciplinarity as a common good

Framing a TD initiative as a "*good*" can provide valuable insights for its management and governance. Principles of effective goods' governance, such as adaptive management, conflict resolution, shared decision-making, and sustainability of the goods, are also applicable to TD initiatives. By the "good" we mean not just physical and monetary resources but also the common pool of collective time, intellect, talent, knowledge, attention, energy, and goodwill of participants. Clearly, this pool is more than the sum of individual capabilities. However, it only exists as a potentiality at the start of the work, so it has to be actively co-organized to realize its potential, and there is no guarantee that it would form naturally.

If we assume this good as a kind of "*common pool*" resource, then the often-modest outcomes of TD work can be seen (metaphorically) as instances of the "tragedy of the commons" (Gardner et al., 1990; Hardin, 1968; Senge, 1990), where individual incentives don't align with the long-term health of shared resources (Kofman & Senge, 1993). Nevertheless, studies have demonstrated how the users of these resources can overcome these dilemmas and organize themselves for the governance of common-pool resources (Ostrom, 2008). For example, scholars suggest polycentric governance (Carlisle & Gruby, 2019) and modular structures (Pahl-Wostl & Knieper, 2014) to enhance resilience and adaptability. These approaches involve distributing power and authority while ensuring effective coordination among semi-autonomous centers, which evolve as participants gain more knowledge and integration.

Engaging in TD work is costly for researchers due to current project-based institutional constraints, offering little individual benefit and even risks (Büttner et al., 2023). Viewing researchers as "owners" or "shareholders" of a common pool, rather than mere workers, can lead to more effective TD initiatives. This approach can draw lessons from worker-owned cooperatives, where members co-own and co-manage the cooperative (Tchami, 2007), or from commons-based peer production (CBPP) initiatives, which emphasize self-organization and co-governance (Kostakis, 2019). Examples include Wikipedia and GNU/Linux. Open-source ICT systems like Decidim can aid collective decision-making in TD work (Serramia et al., 2019).

Network structures constitute another organizational form for collective action and have interesting parallels with the organization of transdisciplinary work. Networks themselves need to be governed, and this must be achieved without the benefit of hierarchy. Inter-firm networks (Provan & Kenis, 2008) or collaborative environmental governance networks (Bodin, 2017; Grandori & Soda, 1995) offer more opportunities for analogical exploration (Schwarz-Plaschg, 2018). For example, Provan and Kenis (2008) describe different governance forms and propose criteria to select the most appropriate, based on what they call key structural and relational contingencies: trust, size (number of participants), goal consensus, and the nature of the task. In the context of collaborative environmental governance, Bodin (2017) analyzed how different governance structures and types of networks may fit or not depending on the characteristics of the environmental problem being addressed. Ding et al. (2024) studied what level of centralization in communication networks would be appropriate according to the degree of urgency of tasks. Analogously, in the case of transdisciplinary teams, collectivist governance may be better suited than the verticality implied

in traditional project management methods.

4.3. Framing TD initiatives as matrix-structured organizations

Transdisciplinary initiatives share many characteristics with medium-sized organizations, including numerous participants, parallel activities, and a long-term outlook. Both require coordination of multiple activities, resource allocation, and adaptation to dynamic contexts. Many organizations use matrix structures, which overlay traditional hierarchies with lateral authority (Ford & Randolph, 1992). These structures are popular in various sectors, including aerospace, automotive, banking, and public research institutions (Coccia, 2017; Sy et al., 2005). Matrix structures benefit organizations needing continuous innovation through high integration and improved communication (Morrison et al., 2008). They offer flexibility and adaptability, dynamically optimizing resource use as conditions change.

Actors within the matrix have specific responsibilities but must consider the impact of their work on others (García-Vidal et al., 2023). Synergistic coordination and collaboration are crucial, requiring organized structures, reciprocity, trust, and shared visions (Davidovitch et al., 2010; García-Vidal et al., 2023). Matrix structures also support organic networks for informal information exchange, adding flexibility. Hubs within these networks centralize information, while a central coordination team supports overall coherence (Vásquez et al., 2022). Traditional hierarchies provide general supervision and institutional support without intervening in matrix functions. Transdisciplinary initiatives, like medium-sized organizations, need complex coordination structures to manage budgets, coordinate researchers and stakeholders, and allocate resources dynamically.

Matrix structures popular in organizations perhaps could be adapted for transdisciplinary initiatives. For example, rows could represent short-term activities, and columns could represent disciplinary areas or institutional partners. This complex structure would require a dedicated coordination team, cross-institutional support, and efficient information flows. However, unlike organizations with clear leadership, transdisciplinary projects lack a designated chain of command. Also, matrix structures in permanent organizations need long-term commitment and time to mature, whereas transdisciplinary projects are short-term (1–5 years) and require quick establishment of governance structures. Literature indicates that both matrix structures and transdisciplinary initiatives are difficult and costly to set up and run, with their complexity not to be underestimated.

4.4. Framing transdisciplinarity as a self-governance process

Next, we explore a form of participatory self-governance that would seem appropriate under another alternative framing: sociocracy. Sociocracy, a form of participatory self-governance, emphasizes distributed decision-making and evaluation within self-organizing units responsive to changing conditions. Coined by Auguste Comte, sociocracy draws on cybernetics, biological feedback models, and systems thinking, differing from hierarchical corporate governance and voting-based democratic models. It aims for self-regulating circles of actors and institutions (Buck & Villines, 2019). Popular in intentional communities, schools, worker cooperatives, and businesses, sociocracy involves structures based on common consent, decision-making circles, feedback loops, and consent-based position assignments (Buck & Villines, 2019; Rau & Koch-Gonzales, 2018).

This approach may better align with the participatory nature of transdisciplinary work. For example, its four major rules that may help navigate decision-making are:

1. **Members' consent**: Decisions are made based on having no reasonable objections, rather than yes/no votes. If a member has a reasonable objection, the policy must be modified to address it.

2. **Consultation circles**: Defined forums where members deliberate and make decisions, focusing on achieving goals, improving methods, and developing skills. Organizational missions are guided by mission circles, with specific goals handled by smaller sub-circles.

3. **Double-linked feedback**: At least two people participate in decisions in the superior circle, providing feedback and ensuring adaptability and communication across the organization.

4. **Assignment of positions based on consent**: Positions are assigned by the consultation circle after open discussion and consent. Roles like leaders, facilitators, and secretaries ensure task delegation and organization, with each person's voice treated equally (Rau & Koch-Gonzales, 2018).

Sociocratic governance emphasizes dynamism and adaptability through core decision-making standards. Participants evaluate policies by asking: Is it good enough for now? Is it safe enough to try? How can we find out if it's working? Decisions are time-limited and based on good-enough thresholds, with built-in evaluative standards for continuous adaptation. Applying sociocracy to transdisciplinary work would allow for iterative change and dynamic adaptation, shedding traditional project-based constraints. This approach fosters collective learning, critical reflection, and self-organizing teams (Owen & Buck, 2020). Non-hierarchical structures, as encouraged in TD work, enable new leadership emergence and free information flow (Joyce, 2010), distributing workload horizontally rather than vertically.

As with any alternative, a few caveats should also be considered about this self-governance framework. The practical demands and delivery expectations of scientific work often require more fixed, stable deliverables (i.e., publications or innovative devices) than the types of outputs encouraged within the regularly re-evaluated outputs that sociocratic decisions and processes encourage. The issue of scalability is also important to consider; while sociocracy has been shown to work at the scale of small, medium, and large organizations, the extent to which it can be applicable as an organizing framework to the institutions and organizational structures that govern transdisciplinary work and science remains as a question for further research.

5. Conclusions

Critiquing the project as a framing for transdisciplinary initiatives is not just a question of semantics; the project is an institution at the core of how science is organized. It largely dictates how science is planned and delivered, with research organizations essentially functioning as Project-Based Organizations, contracting work to funders. This has profound implications for all aspects surrounding science, particularly funding, training, communications, expectations of institutional norms and evaluations, and more. Given the complexity and multifaceted nature of contemporary problems, it is essential to think beyond the project. Current systems are particularly ill-suited to address these challenges. While demonstrating accountability to hosting institutions and funders remains crucial, it should not be the sole focus. And, in any case, projectification provides only a narrow form of accountability, insufficient for addressing the broader societal needs.

What if we were to challenge the predominance of the project as a framing in our institutions, what would it look like? This article examined the question from different perspectives, exploring alternative ways of framing transdisciplinary initiatives. Seeing transdisciplinarity through a complexity framing highlights the need for governance systems to accommodate for self-organization, emergence, non-linearity, unpredictability, and a certain level of chaos. The second framing points to the existence of a fragile common-pool, subject to conflicting interests, which needs to be collectively and carefully managed to avoid "*tragedy of the commons*" scenarios. The third framing allows exploring how organizations of similar size and complexity coordinate their work dynamically across organizational boundaries and reflects upon the institutional support structures that need to be in place for effective

leadership and responsibility. Finally, given the ethos of horizontality, inclusion and participation that define transdisciplinarity, framing it as a self-governing process guides us to sociocracy as a potentially useful model for decision making and coordination. Each of these framings offers a unique perspective to investigate this complex issue and provides principles for imagining better ways to govern transdisciplinarity. They all reveal the tensions between the transdisciplinary worldview, which emphasizes horizontality, inclusion, and participation, and the project management worldview, which focuses on achieving organizational efficiency.

Clearly, projects have a role within transdisciplinary processes as they provide a convenient and logical structure for organizing short-to medium-term, well-defined work. The need for projects may emerge during the transdisciplinary processes. However, the problem arises when projects are used as the primary organizational and decision-making framework. Using projects as the precursor to structure transdisciplinary initiatives undermines rather than promotes their intended goals. Rethinking transdisciplinary initiatives beyond the project framework could transform how we manage these efforts, yet this shift would be extremely challenging in a scientific context that so heavily relies on project-based organizational models. Revisiting the central question of this article, we posit that the ubiquitous project paradigm is a significant reason why working together in transdisciplinarity can be so difficult.

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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.

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