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A Co-evolutionary, Transdisciplinary Approach to Innovation in Complex Contexts: Improving University Well-Being, a Case Study

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Abstract

Complex societal challenges cannot be resolved with quick fixes, nor can they be successfully addressed from disciplinary or institutional silos. In this article we propose an innovative approach to tackling contemporary societal challenges based on complexity theory and transdisciplinarity. The lens of complexity reveals that such challenges emerge within complex contexts. Complex challenges cannot simply be resolved, due to their dynamic, non-linear nature. Instead, the complex context itself can be steered in a certain desired direction through iterative action and learning cycles. Transdisciplinary approaches help us understand how different perspectives and ways of knowing held by relevant actors can be combined to serve effective action in complex contexts. We have integrated complexity theory and transdisciplinarity to create a co-evolutionary model of innovation illustrating that who we work with, how we work, and what we learn and create co-evolve over time. We show how an innovation approach based on building a vision and including a reflexive social learning method can provide a guiding structure to this co-evolutionary process. We illustrate this approach with a case study focused on improving the well-being of staff and students at a university. We conclude the paper with implications for design.

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Introduction

Design is increasingly used to tackle complex societal challenges. In these complex contexts, innovation practitioners¹ use design practices as a means to frame problems,² transform organizations and systems,³ and contribute to the public good.⁴ Kees Dorst⁵ argues that when disciplinary practices jump to other fields of activity, they cannot simply be adopted without substantial change, but should be adapted to the needs of the target field. In this article, we present two characteristics of complex contexts that require the adaptation of design practices. First, innovation practitioners must work and design with the evolutionary nature of complex contexts and challenges in mind; and second, innovation practitioners must engage with expertise from across disciplinary fields and organizational silos.

Complex challenges emerge from complex contexts, which are dynamic and unpredictable.⁶ Complex contexts consist of multiple interconnecting components: individual actors, organizations, material infrastructures, and natural environments—all of which are entwined in layers of meaning, discourse, social values and desires, rules, political views, and histories, among other things. Although these material and immaterial components are interconnected in complex systems, it is not possible to identify clear linear or causal relationships between them. As a result, solutions to complex problems often produce limited effects and result in unanticipated impacts on other parts of the system. These types of complex challenges are sometimes referred to as wicked problems.⁷ Despite existing in-depth knowledge about the various aspects of a given problem situation and practical attempts to tackle the issues, wicked problems tend to persist. Innovation scholars⁸ have argued that there is a need to move away from one-off quick fixes towards a more continuous approach to innovation in complex contexts. In a previous article we referred to this approach aimed at steering the system in a desired direction as an evolutionary design approach.⁹

In addition to calling for an evolutionary approach to innovation, complex challenges are problems that cannot be solved from disciplinary and organizational silos by their very nature. A single disciplinary perspective would lack the breadth of perspective and the range of methodological tools required to build an adequate picture of a complex problem or topic.¹⁰ Similarly, action from various actors and organizational stakeholders is typically needed to weave comprehensive responses to complex challenges, stressing the need for participatory and collaborative innovation approaches. In this article, we argue that the evolutionary nature of innovation in complex contexts suggests that the collaborating partners themselves, and the ways they work, also evolve during the innovation process. The continuously shifting and changing nature of innovation contexts therefore invites innovation practitioners to become more deliberate about who they work with, and in which ways, by asking themselves, “Whose knowledge is relevant? Who has the capacity to innovate? Who is impacted? Who makes decisions? What power dynamics are at play?”

In this article we propose a new model of innovation that is co-evolutionary. It combines evolutionary and transdisciplinary perspectives which emphasize developing a vision and practicing reflexivity as part of the

- 1 In this article, we refer to “innovation practitioners” rather than “designers,” to acknowledge that design is one of multiple disciplinary practices that can be adopted by practitioners who are innovating in a complex context.
- 2 Kees Dorst, “Frame Creation and Design in the Expanded Field,” *She Ji: The Journal of Design, Economics and Innovation* 1, no. 1 (2015): 22–33, DOI: <https://doi.org/10.1016/j.sheji.2015.07.003>.
- 3 Colin Burns et al., “Red Paper 02: Transformation Design” (report, Design Council, 2006), <https://www.designcouncil.org.uk/resources/report/red-paper-02-transformation-design>.
- 4 Design Council, *Design for Public Good* (London: Design Council, 2013), <https://www.designcouncil.org.uk/sites/default/files/asset/document/Design%20for%20Public%20Good.pdf>.
- 5 Dorst, “Frame Creation and Design.”
- 6 David J. Snowden and Mary E. Boone, “A Leader’s Framework for Decision Making,” *Harvard Business Review* 85, no. 11 (2007): 68–76, <https://hbr.org/2007/11/a-leaders-framework-for-decision-making>.
- 7 Horst W. J. Rittel and Melvin M. Webber, “Dilemmas in a General Theory of Planning,” *Policy Sciences* 4 (June 1973): 155–69, DOI: <https://doi.org/10.1007/BF01405730>.
- 8 For example, Moore and Westley argue that “the capacity of any society to create a steady flow of social innovations. . . has profound implications on the capacity of a linked social ecological system to both adapt and transform. See Michelle-Lee Moore and Frances Westley, “Surmountable Chasms: Networks and Social Innovation for Resilient Systems,” *Ecology and Society* 16, no. 1 (2011): article no. 5, <https://www.ecologyandsociety.org/vol16/iss1/art5/>.
- 9 Mieke van der Bijl-Brouwer and Bridget Malcolm, “Systemic Design Principles in Social Innovation: A Study of Expert Practices and Design Rationales,” *She Ji: The Journal of Design, Economics and Innovation* 6, no. 3 (2020): 386–407, DOI: <https://doi.org/10.1016/j.sheji.2020.06.001>.
- 10 These factors are part of what Repko and Szostak define as *disciplinary inadequacy*: “the view that the disciplines by themselves are inadequate to address complex problems.” See Allen F. Repko and Rick Szostak, *Interdisciplinary Research: Process and Theory* (Thousand Oaks, CA: SAGE, 2017), 11.

- 11 Collins and Ison argue that the roles, responsibilities, and purposes of those involved in tackling complex challenges have to be re-conceptualized, not as mere participation, but as “a process of social learning about the nature of the issue itself and how it might be progressed.” Kevin Collins and Ray Ison, “Jumping off Arnstein’s Ladder: Social Learning as a New Policy Paradigm for Climate Change Adaptation,” *Environmental Policy and Governance* 19, no. 6 (2009): 358–73, DOI: <https://doi.org/10.1002/eet.523>.
- 12 Snowden and Boone, “A Leader’s Framework.”

innovation process. We will describe the model by examining a case study of an evolutionary innovation process aimed at improving the well-being of staff and students in an Australian university. We will demonstrate how, through an ongoing process of reflexive innovation, our responses to the above questions have shifted and evolved, leading to a more sophisticated and diversified understanding of the well-being challenge. We conclude with a discussion of some implications for design in complex contexts.

A Co-evolutionary Approach to Complex Systems Change

In complex contexts, the impact of human activity cannot be fully anticipated in advance. Thus, there is a need for innovation practitioners and relevant actors to shift away from problem-solving to learning the way forward together. This social learning approach¹¹ is aimed at collectively probing complex systems to learn about their dynamics, rather than seeking to simplify and delimit complex problems so they can be addressed directly and immediately.

One of the widely adopted approaches for engaging with complex problem situations through social learning, created by David Snowden and Mary Boone,¹² is the “safe-to-fail” experiment. As its name implies, this approach is underpinned by the understanding that although complex problems cannot be easily solved, and the dynamic effects of certain actions in complex systems are unpredictable, those effects can be observed and understood in retrospect. Safe-to-fail interventions are conceptualized as relatively small-scale forays into complex systems, designed to reveal the best paths toward desirable system change. Built upon available knowledge and speculation about how certain actions might unfold, safe-to-fail experiments are implemented directly in real life problem situations. The dynamic system’s responses to these interventions emerges naturally, and the real-world effects can be examined to determine how specific actions lead to certain effects. If the impact of a specific safe-to-fail experiment is positive, the effort and initiative can be amplified by putting more resources into it, for example, engaging more actors, or replicating the approach in adjacent contexts. If a safe-to-fail experiment does not lead to positive outcomes, its effects can be dampened — by simply removing or adjusting it — without any major negative impact on the rest of the system. Such experimentation and social learning is an ongoing practice — in a dynamic complex system, what was previously effective (an action or initiative) could always fail if used again, given the constant shifting and changing in the system’s configuration.

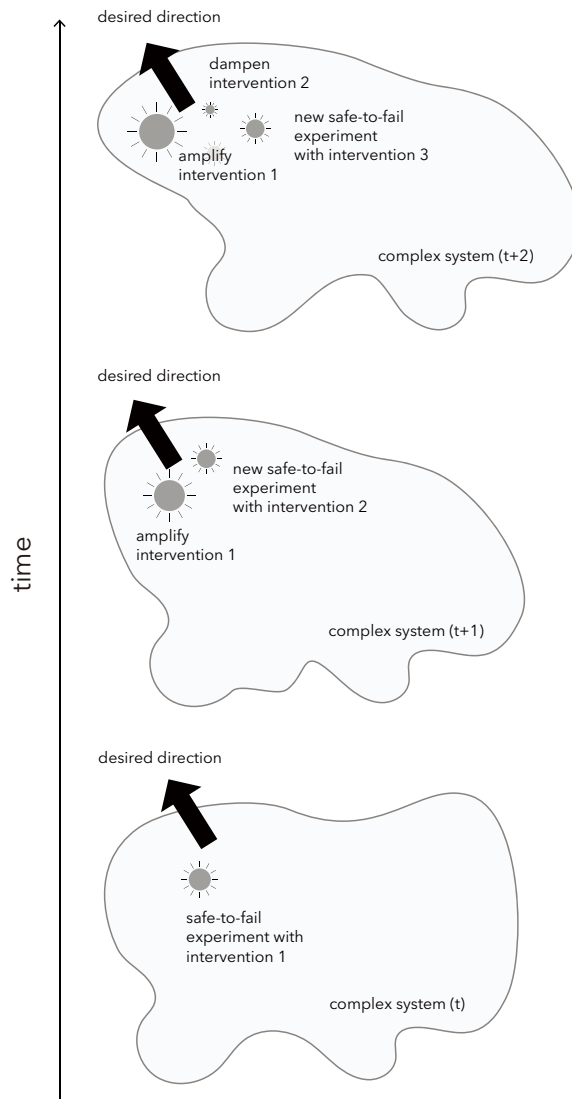
Government responses to the COVID-19 pandemic illustrate this approach, whereby many have implemented evidence-based one-size-fits-all strategies based on epidemiological science. These interventions are often intended to leverage linear cause-effect relations which are assumed to be universally applicable, for example by linking wearing of face masks with reduced spread of the virus. In contrast, some governments have also adopted approaches based on safe-to-fail experiments, such as the events organized

- 13 For more information, please visit <https://fieldlabevenementen.nl/fieldlab-english/>.
- 14 Fritjof Capra, *The Web of Life: A New Synthesis of Mind and Matter* (London: Flamingo, 1997), 222.
- 15 Nathan Crilly gives some examples of design studies which focus on various things that co-evolve in design. Nathan Crilly, "The Evolution of 'Co-evolution' (Part II): The Biological Analogy, Different Kinds of Co-evolution, and Proposals for Conceptual Expansion," *She Ji: The Journal of Design, Economics, and Innovation* 7, no. 3 (2021): 333–55, DOI: <https://doi.org/10.1016/j.sheji.2021.07.004>.
- 16 Eric Beinhocker, *The Origin of Wealth: Evolution, Complexity, and the Radical Remaking of Economics* (Boston, MA: Harvard Business School Press, 2006).
- 17 Jan Rotmans and Derk Loorbach, "Complexity and Transition Management," *Journal of Industrial Ecology* 13, no. 2 (2009): 191, DOI: <https://doi.org/10.1111/j.1530-9290.2009.00116.x>.
- 18 Frank W. Geels, "Processes and Patterns in Transitions and System Innovations: Refining the Co-evolutionary Multi-Level Perspective," *Technological Forecasting and Social Change* 72, no. 6 (2005): 681–96, DOI: <https://doi.org/10.1016/j.techfore.2004.08.014>.
- 19 Van der Bijl-Brouwer and Malcolm, "Systemic Design Principles."

by Fieldlab in the Netherlands.¹³ Fieldlab events are small, tightly controlled, closely monitored experiments that replicate or transpire during large gatherings in real life settings. The "event" may be a music festival or fun park where a limited number of visitors are surveilled and tested before and after the gathering. The experiments are designed to reveal insights into people's behavior and the behavior of the virus during public events or wherever large crowds gather — the exact settings where real data are needed for appropriate responses to be developed. Depending on the outcome, insights derived through these experiments can be used to develop measures and (technological) solutions to organize events in a safe manner.

The evolutionary complex systems approach to innovation typically consists of multiple experiments, since it is not known in advance which interventions will be effective. This approach is inspired by observations of natural systems whereby living entities adapt in a process of co-evolution with their environment through a process of differentiation, selection, and amplification. This living systems perspective goes beyond a narrow, Darwinian notion of adaptation by chance variation and natural selection. As physicist Fritjof Capra¹⁴ explains, "Evolution cannot be limited to the adaptation of organisms to their environment, because the environment itself is shaped by a network of living systems capable of adaptation and creativity. So, which adapts to which? Each to the other — they co-evolve." The analogy of co-evolution in living ecosystems has been applied to many contexts, including design¹⁵ and innovation. An example of co-evolution in business innovation is Eric Beinhocker's¹⁶ treatment of economies as complex adaptive systems in which business models, physical technology, and social technology co-evolve. He argues that these systems can be shifted by feeding them with a sufficient variety of experiments for selection and amplification. Likewise, in the context of social innovation, transition management theory promotes the selection and guided variation of "transition experiments"¹⁷ to influence today's sociotechnical transitions — the energy transition, for example, from fossil to renewable sources — which are characterized by the co-evolution of technology and society.¹⁸ In a previous article¹⁹ we showed how such evolutionary approaches are also reflected in social innovation practice: organizations a) run a portfolio of experiments with prototypes of designed interventions that are selected and amplified based on their impact on the system, and b) concurrently develop a vision for systems change in a desired direction (Figure 1). Adopting a co-evolutionary perspective, we acknowledge that innovation experiments both shape and are shaped by the encompassing system. One of the co-evolving *conceptual spaces* that we focus on in this paper is the *actor space*: the various people involved in innovation and their different ways of knowing. In the coming sections, first we will explore some participatory and transdisciplinary approaches to innovation, and then explain how different co-evolving spaces connect in an innovation process.

Figure 1
 An evolutionary perspective of how complex systems evolve through multiple safe-to-fail experiments with interventions that aim to shift a system into a desired direction. © 2021 Mieke van der Bijl-Brouwer.



Participatory and Transdisciplinary Approaches to Innovation

Complex challenges require collaboration among diverse groups of actors and organizations. While approaches to learning and creating together are well established in design, for example, through the tradition of participatory design or co-design, we argue that the lens of transdisciplinarity can complement design approaches and expand the repertoire of concepts, methodologies, and tools available to stimulate collective innovation.

Participatory design originated in Scandinavia in the early 1980s in the context of designing new technologies and systems for the workplace.

- 20 For a history of the Scandinavian origins of participatory design, see Judith Gregory, "Scandinavian Approaches to Participatory Design," *International Journal of Engineering Education* 19, no. 1 (2003): 62–74, <https://www.ijee.ie/articles/Vol19-1/IJEE1353.pdf>.
- 21 For example, participatory design has been widely adopted in public sector innovation labs and in the health sector. See Michael McGann, Emma Blomkamp, and Jenny M. Lewis, "The Rise of Public Sector Innovation Labs: Experiments in Design Thinking for Policy," *Policy Sciences* 51 (March 2018): 1–19, DOI: <https://doi.org/10.1007/s11077-018-9315-7>; Sara Donetto et al., "Experience-Based Co-design and Healthcare Improvement: Realizing Participatory Design in the Public Sector," *The Design Journal* 18, no. 2 (2015): 227–48, DOI: <https://doi.org/10.2752/175630615X14212498964312>.
- 22 For an introduction to transdisciplinary innovation, see Chris McPhee, Martin Bliemel, and Mieke van der Bijl-Brouwer, "Editorial: Transdisciplinary Innovation," *Technology Innovation Management Review* 8, no. 8 (2018): 3–6, <https://timreview.ca/article/1173>. For an introduction to the role of participation in transdisciplinary research, see Malin Mobjörk, "Consulting Versus Participatory Transdisciplinarity: A Refined Classification of Transdisciplinary Research," *Futures* 42, no. 8 (2010): 866–73, DOI: <https://doi.org/10.1016/j.futures.2010.03.003>; and Merritt Polk and Per Knutsson, "Participation, Value Rationality and Mutual Learning in Transdisciplinary Knowledge Production for Sustainable Development," *Environmental Education Research* 14, no. 6 (2008): 643–53, DOI: <https://doi.org/10.1080/13504620802464841>.
- 23 Sue L. T. McGregor, "Philosophical Underpinnings of the Transdisciplinary Research Methodology," *Transdisciplinary Journal of Engineering & Science* 9, no. 1 (2018): 182–98, DOI: <https://doi.org/10.22545/2018/00109>.
- 24 *Ibid.*; Alex Baumber et al., "Learning Together: A Transdisciplinary Approach to Student-Staff Partnerships in Higher Education," *Higher Education Research & Development* 39, no. 3 (2019): 395–410, DOI: <https://doi.org/10.1080/07294360.2019.1684454>.
- 25 Collins and Ison, "Jumping off Arnstein's Ladder."
- 26 *Ibid.*

It was based on the democratic ideal that those destined to use systems or artifacts should have a say in their design. Further, it was underpinned by the belief that inviting skilled users to participate in the design process can contribute importantly to successful design and high-quality product and system outcomes.²⁰ In recent years, participatory design—often referred to as co-design—has become increasingly popular in innovation contexts, and it is now widely adopted by innovation practitioners across industries and sectors.²¹

Participatory design approaches can be combined with other disciplinary and non-disciplinary perspectives to form a transdisciplinary innovation approach. Transdisciplinary research and innovation does not privilege a specific disciplinary paradigm, but seeks to integrate professional or academic expertise with insight and knowledge generated outside of academic or expert-led domains, such as local, practical, and Indigenous knowledge.²² By explicitly acknowledging and utilizing the complexity that lies between, within and across diverse stakeholders' knowledge and experience, transdisciplinary approaches actively seek a diversity in perspectives and provide processes to hold these potentially conflicting views in conversation with each other on more equitable terms. This stems from the ontological stance that there is no one reality that is true and uncontested,²³ and the assumption that understanding these complexities stimulates the evolution of understanding of the challenge towards a more optimal state for the common good. While disciplinary expertise is at the heart of transdisciplinarity, from a complex systems view, the specific approaches or strategies employed in a given situation are not predetermined from the outset. Instead, they co-evolve based on the challenge at hand, shaped by what is on and who is at the table, informed by disciplinary and non-expert knowledge through interactions by multiple stakeholders.²⁴

Transdisciplinary approaches not only provide scholars and practitioners with tools and methodologies for understanding stakeholder needs and wants which are then dealt with by experts; they incorporate a range of perspectives into innovation processes through *mutual* learning. In this way, experts and practitioners stand as much to gain from engagement as the individuals typically known as users or stakeholders in participatory design. In transdisciplinary practice, mutual learning occurs through collective sense-making and experimentation among diverse stakeholders, as their perspectives and values become enfolded in the shared understanding of the problem situation.²⁵

Finally, through explicit attention to different perspectives and relationships built in the process of mutual learning, transdisciplinarity stimulates lasting connections among the various players who are involved with complex challenges. This attitude to mutual learning and engagement with stakeholders is not just a phase of a design project—it is an ongoing process. Participants in transdisciplinary processes learn to collaborate better and are more likely to continue contributing to systems transformation in the long term.²⁶ Transdisciplinary practice, thus, supports ongoing learning among relevant actors, the co-evolution of relationships among stakeholders,²⁷ and, through engagement in practical initiatives, actors' (collective and individual) understanding of complex problem situations.

- 27 Elsewhere, we refer to the iterative, evolutionary nature of transdisciplinary stakeholder engagement as "stakehold-ing," Giedre Kligyte, Susanne Pratt, and Mariana Zafeirakopoulos, "Towards a Relational Values-Based Stakehold-ing Approach to Integrative Transdisciplinary Research with Stakeholders," in *Proceedings of International Transdisciplinarity Conference 2021*, ETH Zürich, September 13–17, 2021.
- 28 Snowden and Boone, "A Leader's Framework."

Designing for Innovation in Complex Contexts: A Co-evolutionary Transdisciplinary Model

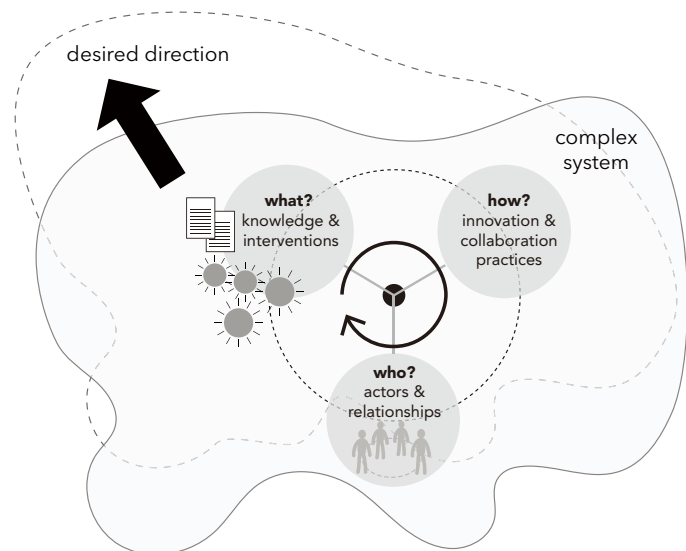
The transdisciplinary perspective highlights that it is not only innovative interventions, or the practices used to evaluate and strengthen them, that result in effective innovation. The individual actors and organizations involved with and in complex challenge being able to continuously share knowledge and expertise, and collaborate, innovate, and learn *together*—attending to that dynamic is equally as important to achieving systems change.

By combining the co-evolutionary approach to complex systems with transdisciplinary approaches, in the next section we propose a co-evolutionary model of innovation in complex contexts. It describes how *what* is being produced through an innovation process co-evolves with *who* is involved in that production and *how* these actors learn and innovate together (Figure 2). We might look at these elements as *co-evolving conceptual spaces*—an object space, an actor space, and a practice space that each evolve in their own ways, and also co-evolve in dynamic interaction and response to one another.

Figure 2

The co-evolutionary model of innovation in complex contexts shows how knowledge and interventions (object space) co-evolve with the network of actors (actor space) who produce the knowledge and create the interventions, as well as the innovation and collaboration practices (practice space) adopted by those actors.

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Let us further elaborate on these spaces and their interactions.

- The object space encompasses the initiatives or interventions that are being created (for example, a safe-to-fail experiment).²⁸ This also includes the knowledge that is produced about the problem situation and the effects of certain interventions, as well as the increased shared understanding of system dynamics and interactions within it.
- The practice space refers to innovation and collaboration practices, including methods and activity patterns that support innovation, such as

- 29 See Baumber et al. for a comparison of partnership practices from different disciplines and fields of practice. Baumber et al., "Learning Together."
- 30 An overview of complex perspectives on organizations in organizational and management studies is beyond the scope of this paper. Complexity management theories generally challenge the dominant rational discourse on organizations, including the concepts it takes for granted, such as control, planning, and prescription. For example, Ralph Stacey's theory of complex responsive processes "shifts the focus of attention from long-term, big-picture, macro level to the details of the micro interactions taking place in the present between living humans in organizations." Ralph Stacey, *Tools and Techniques of Leadership and Management: Meeting the Challenge of Complexity* (New York: Routledge, 2012), 3.
- 31 Margaret Wheatley has described how invisible forces like culture, values, vision and ethics each describe "a quality of organizational life that can be observed in behavior, yet doesn't exist anywhere independent of those behaviors." Margaret J. Wheatley, *Leadership and the New Science: Discovering Order in a Chaotic World* (San Francisco, CA: Berrett-Koehler Publishers, 2006), 54.

design approaches, entrepreneurial methods, or artistic and systems change practices. Collaboration includes co-design and participatory design in addition to collaborative practices from other fields such as citizen science, co-management, and socially engaged art.²⁹

- The actor space refers to actors and organizations who are involved in the innovation process, including their relationships to each other. This can range from people with lived experience or practical knowledge about the problem situation to decision makers, innovation experts, intra- and entrepreneurs, domain experts, activists, and so forth.

When innovative efforts are aimed at addressing a complex challenge, these three elements co-evolve, because they are constantly interacting. Some examples of these interactions are

- Within the practice and object spaces: innovation methods and practices shape what participants learn and what they create; in the same vein, what is being learned and created informs the choice of methods and practices; knowledge and interventions are therefore both output and input of innovation practice;
- Within the practice and actor spaces: how actors work together (using which participatory approaches, for example) impacts who is or who can be involved in the innovation process; equally, who is involved in an innovation process informs or influences how participants work together; and
- Within the actor and object spaces: what actors learn and create during innovation is influenced by who is involved and how their knowledge is integrated; in turn, the nature of the innovative outcome they (collectively) seek influences who is invited to collaborate and gather knowledge for its realization.

The model is an abstraction that offers a limited perspective on the complexity of organizational realities, where it is not always possible or desirable to separate actors from their practices and the knowledge and interventions they produce and adopt,³⁰ and where there are invisible forces at play.³¹ Nevertheless, this distinction among the three is useful. For one thing, it helps further clarify the realities of innovating in complex domains. For another, awareness of the distinction may help actors coordinate innovation processes using reflexivity and vision, as further outlined in the next section.

Coordinating Innovation Processes in Complex Contexts

A co-evolutionary innovation process aimed at responding to complex challenges is dynamic. It relies on engagement among diverse players in an ongoing process of mutual creativity and experimentation. This requires coordination and collaboration by a range of differently positioned actors who continually learn from each other and the innovation process they have undertaken. In the co-evolutionary and transdisciplinary innovation model presented in this article, that shared vision plays a key role in guiding the ongoing social learning process. Collective, distributed innovation work aimed at shifting a given complex context towards a more desirable future state is further supported by reflexive processes that stimulate mutual learning.

- 32 Jan Rotmans, René Kemp, and Marjolein van Asselt, "More Evolution Than Revolution: Transition Management in Public Policy," *Foresight* 3, no. 1 (2001): 15–31, DOI: <https://doi.org/10.1108/14636680110803003>.
- 33 Terry Irwin, "The Emerging Transition Design Approach," *Cuaderno* 87 (2020): 27–54, DOI: <https://doi.org/10.18682/cdc.vi87.3762>.
- 34 Sonja Blignaut, "Organizing Principles: The Spirit of Cynefin," in *Cynefin: Weaving Sense-Making into the Fabric of Our World*, ed. Riva Greenberg and Boudewijn Bertsch (Las Vegas: Cognitive Edge, 2021), 75.
- 35 Rotmans et al., "More Evolution Than Revolution," 23.
- 36 Cynthia Mitchell, Dana Cordell, and Dena Fam, "Beginning at the End: The Outcome Spaces Framework to Guide Purposive Transdisciplinary Research," *Futures* 65 (January, 2015): 86–96, DOI: <https://doi.org/10.1016/j.futures.2014.10.007>.
- 37 Merritt Polk, "Transdisciplinary Co-production: Designing and Testing a Transdisciplinary Research Framework for Societal Problem Solving," *Futures* 65 (January 2015): 114, DOI: <https://doi.org/10.1016/j.futures.2014.11.001>.
- 38 Florin Popa, Mathieu Guillermin, and Tom Dedeurwaerdere, "A Pragmatist Approach to Transdisciplinarity in Sustainability Research: From Complex Systems Theory to Reflexive Science," *Futures* 65 (January 2015): 45–56, DOI: <https://doi.org/10.1016/j.futures.2014.02.002>.

The Role of Vision in Complex Contexts

Without a sense of direction and purpose it is difficult to make strategic decisions, even in contexts that are well bounded. In complex contexts, where collective innovation efforts have to be coordinated by distributed actors, a commonly-shared vision plays an even more crucial role.

The importance of a shared vision has been recognized and extensively explored in management theories that adopt a complexity perspective. For example, Jan Rotmans, René Kemp, and Marjolein van Asselt³² highlight how long-term visions can inspire and mobilize social actors to enact systemic change. Similar perspectives have also been adopted in design. For example, Terry Irwin³³ argues that within transition design, future visions are used to inform interventions and projects in the present that act as steps along a transition pathway toward desired futures.

Importantly, in complex contexts, these shared visions evolve as the innovation process unfolds—they are not fixed. "New options might become visible that ... could not [be] see[n] from the starting position,"³⁴ and the vision might need to be "adjusted based on what has been learned by players in previous experiments."³⁵ While organizational vision and mission statements are often created by executive and other leadership, the shared vision we are referring to here is co-created through the evolutionary process of innovation. It is not handed down—it evolves through ongoing sense-making and mutual learning by the participants. In some cases, this shared vision might not be explicitly articulated, however, there are clear benefits if it is explicitly discussed and negotiated by those involved in the innovation process.³⁶ Both reflexivity and mutual learning, discussed in the next section, support the collective process of co-creating and articulating a shared vision.

Reflexivity and Mutual Learning

Reflexivity is the key integrative meta-methodology required for participants to be able to develop a shared vision and achieve collective learning about complex challenges. To learn together, participants must transcend knowledge silos and integrate a variety of perspectives into a fresh understanding of a given problem situation. This can be achieved through deliberate reflexive approaches that stimulate purposeful engagement across differences.

Reflexivity can be defined as an "ongoing scrutiny of the choices that are made when identifying and integrating diverse values, priorities, world-views, expertise, and knowledge."³⁷ This involves a conscious, concerted effort by innovation process participants to explicitly acknowledge the contributions made by each one, and coordinating their diverse goals and intents. As we have already pointed out, reflexivity entails ongoing, thoughtful, collective deliberation on the what, how, and who of innovation activity. Through this reflexive work, assumptions about the value of certain perspectives, contributions, and approaches can be called into question; new directions can emerge by incorporating new knowledge and approaches from different domains. Building on a pragmatist research tradition, we propose that this type of reflexive social learning can take place by integrating deliberate acts of sense-making into practical innovation work.³⁸ However, we have argued elsewhere that a well-considered methodology is required to facilitate

- 39 Giedre Kligyte et al., "A Partnership Outcome Spaces Framework for Purposeful Student-Staff Partnerships," *Teaching in Higher Education* (June 2021): 1–19, DOI: <https://doi.org/10.1080/13562517.2021.1940924>.
- 40 Examples of recent studies that investigate well-being at the university include Gall Kinman and Sheena Johnson, "Special Section on Well-Being in Academic Employees," *International Journal of Stress Management* 26, no. 2 (2019): 159–61, DOI: <https://doi.org/10.1037/str0000131>; and A. Fernandez et al., "Setting-Based Interventions to Promote Mental Health at the University: A Systematic Review," *International Journal of Public Health* 61, no. 7 (2016): 797–807, DOI: <https://doi.org/10.1007/s00038-016-0846-4>.
- 41 For example, see Ruth Barcan, *Academic Life and Labour in the New University: Hope and Other Choices* (London: Routledge, 2016); and Cris Shore and Susan Wright, "Coercive Accountability: The Rise of Audit Culture in Higher Education," in *Audit Cultures: Anthropological Studies in Accountability, Ethics and the Academy*, ed. Marilyn Strathern (London: Routledge, 2000), 57–89.
- 42 Jennie Hudson and Victoria Ingram, "Stigma-Reduction & Help-Seeking in Australia Classrooms: A Research Report on the Batyr@School Program" (report in collaboration with Macquarie University, 2017), available at https://www.mq.edu.au/_data/assets/pdf_file/0004/551785/batyr-Research-Doc.pdf.
- 43 As Marion Kiely and Ellie Snowden argue, well-being is "an emergent property of the messy and moveable interactions between people, their relationships, interactions and the organizing practices, procedures and structures in which people find themselves." Marion Kiely and Ellie Snowden, "Weaving Well-Being into the Fabric of Our Organizations with the Cynefin Framework," in *Cynefin: Weaving Sense-Making into the Fabric of Our World*, ed. Riva Greenberg and Boudewijn Bertsch (Las Vegas: Cognitive Edge, 2021), 229.

these types of reflexive processes; it does not simply emerge as project tasks are carried out.³⁹

In the coming section, to illustrate the co-evolutionary model of innovation in complex contexts, we present the case of an innovation process aimed at improving the well-being of staff and students at an Australian university.

The Case: Well-Being at an Australian University

This case study concerns a multi-year, multi-project, multi-actor endeavor to improve well-being at an Australian university. The authors were involved in the project from 2016 to 2019. The explicit focus on well-being emerged and evolved through various initiatives; it was not an externally mandated or centrally led initiative.

Safeguarding well-being is an important challenge for universities. It is broadly accepted that students need to feel well to be able to learn and achieve their potential, while staff need to be well to engage in all aspects of their work. Yet with the massification and intensification of higher education, the well-being of learners, teachers, and researchers is at risk⁴⁰ and undesirable effects of metrics-driven high-pressure university environments have already been well-documented.⁴¹ In recent years, the deteriorating state of university staff and student mental health has become more widely acknowledged.

We argue that university staff and student well-being is best approached as a complex problem situation, as there is no single, straightforward way to successfully address the issue. even if the desire to support well-being is concrete, it is difficult to identify what the problem actually is or how to resolve it. The challenge is complex because various university stakeholders have different conceptions of well-being, including different understandings of personal and institutional responsibilities for improvement. Some might consider tackling the challenge of long waitlists for student counselling as the most efficient means of improving well-being, whereas others may see improving "well-being literacy"—ensuring that staff and students understand what well-being is and what they can do when they are feeling unwell—as the best response to pursue.

Well-being is also a complex topic because it comprises a host of interrelated problems that cannot be independently solved. For example, one of the successful programs at our university, facilitated by Batyr⁴² (a non-governmental organization), invites volunteers to share their stories of mental illness in the classroom, with the aim of raising student awareness about mental health and mental illness. As a result, more students have sought counselling, increasing pressure on a student counselling service that is already stretched to its limit.

Finally, safeguarding well-being at universities presents a complex challenge because it emerges within a complex and dynamic context.⁴³ The university itself constantly changes and evolves as an institution through new cohorts of students, newly developed courses, new teaching methodologies and technologies, and changes to policies that influence staff and students. Further, universities as institutions are embedded in academic and societal contexts which are in a constant flux, with a more radical transformation exemplified by the COVID-19 pandemic.

44 See for example Kligyte et al. "A Partnership Outcome Spaces Framework."

Evolution of the Well-Being Challenge

We three authors have all been involved in advancing well-being initiatives at University of Technology Sydney (UTS) in various ways. In addition to our backgrounds in design, education, and health, we worked together at the Transdisciplinary School (formerly the Faculty of Transdisciplinary Innovation), and collaborated closely with design researchers from the Design Innovation Research Centre and with a professor from the Faculty of Health. We also collaborated with a wide range of students, academic and non-academic staff, and university executives. Over the years, we set in motion multiple initiatives in the well-being space at UTS with the goal of improving or contributing to university well-being, as well as to connect with other interested parties across the organization and beyond. In many instances, alongside practical initiatives, we also carried out research activities shaped according to the specific needs of a particular initiative, including participatory design workshops, prototyping, interviews, and other forms of engagement with stakeholders, generating research outputs along the way.⁴⁴

For this article, we have selected four interconnected projects, each aimed at improving well-being in the university that shed light on the co-evolutionary and transdisciplinary nature of innovation in complex contexts. Key data include (1) research outputs and reports generated through each separate well-being initiative, including insights derived from various institutional stakeholders in interviews; and (2) written reflections and recorded reflexive dialogue sessions examining our experiences with organizational well-being initiatives through the lens of transdisciplinarity and systemic change. Extracts from these reflections are included in reflexive stories in the next section. We first describe each project and how it connects to the others, then apply the co-evolutionary innovation model to examine how the object, practice, and actor spaces changed, including how our shared vision for well-being at universities has evolved over time.

Our work started in 2016 when the first author and her team of design researchers were invited by a state-level public organization to contribute to designing a well-being framework that would help businesses and public organizations in NSW to improve and measure the well-being of their staff and target group. The first author felt inspired to continue working with the theme of well-being in her teaching and learning practice; that inspiration led to the "student well-being challenge" project, which included the participation of the third author, an undergrad student at the time. The first project also brought the first author in contact with a professor in mental health who was serving as a mental health expert on the project's advisory board. Together they decided to further pursue the shared goal of improving the well-being of students and staff at the university. That decision led to a third project aimed at the design of a well-being research and innovation hub.

The student well-being challenge was one of several initiatives carried out over the years as part of our invitation to university students to help tackle the complex challenge of well-being. In the specific example discussed here, 80 students pursuing a transdisciplinary undergraduate degree developed ideas for improving well-being in universities as part of a two-week intensive course on leadership and innovation in 2016.

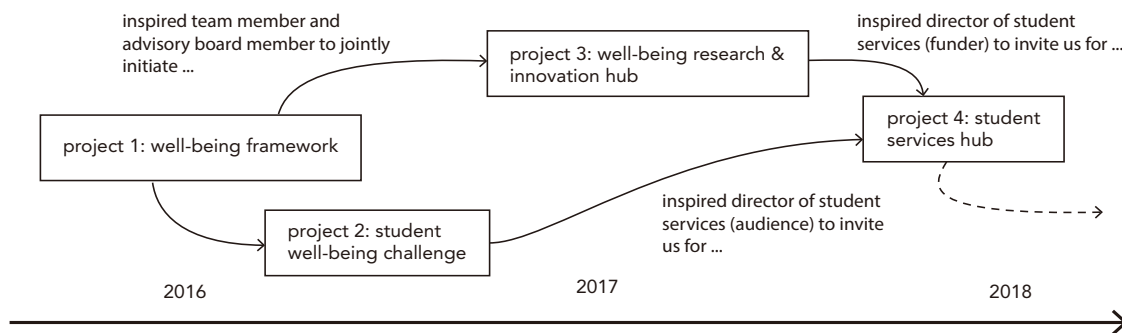


Figure 3
An overview of the four projects aimed at improving well-being in our university and how they are related. © 2021 Mieke van der Bijl-Brouwer.

The third project was dedicated to proposing a “well-being research and innovation hub”—a space where staff and students can share knowledge and develop innovative initiatives to improve well-being. With funding from student services and HR, we hired the third author and a design researcher to work on the project. The well-being research and innovation hub proposal was not implemented by the university because we did not manage to generate enough buy-in from university executives to invest in implementation. However, inspired by the participatory approach undertaken as part of the project, the director of university student services invited us to conduct the fourth project described here: developing a Student Services Hub. The director of student services had played the role of (internal) client during the student well-being challenge (second project) and had witnessed students’ proposals for improved well-being at the university firsthand. The fourth project, carried out in 2018, saw all three authors working in partnership with a group of students to develop a space—a hub—in a new university building to improve student access to university services and support. [Figure 3](#) shows how each project connected and contributed to the subsequent projects, all related to the shared purpose of improving well-being in universities.

Evolution of the Actor Space

In each project, we worked with a core team of innovators plus a wider group of decision-makers and advisory groups that included our funders, who influenced some of our decisions and played a crucial role in the implementation of ideas. Further, each project included a range of stakeholders and target group representatives as participants in the innovation process. The composition of the core group and cohorts of decision-makers and participants evolved continuously—and our roles changed as well.

The core team for the first project consisted solely of designers. Over the subsequent projects, teams became increasingly multi- and trans-disciplinary, with the fourth project team included designers, education and health experts, and students of communications and design. The projects gradually incorporated student perspectives as key constituents of the university community. Their role evolved from peripheral engagement to being positioned as experts of their own learning and well-being, able to offer a valuable

- 45 Kees Dorst, *Frame Innovation: Create New Thinking by Design* (Cambridge, MA: MIT Press, 2015).
- 46 Birger Sevaldson, "GIGA-Mapping: Visualization for Complexity and Systems Thinking in Design," in *Proceedings of Nordic Design Research Conference*, Helsinki, June 2011, available at <https://www.researchgate.net/publication/319930894>.
- 47 Rotmans and Loorbach, "Complexity and Transition Management."
- 48 Nicola Mitchell et al., "Benefits and Challenges of Incorporating Citizen Science into University Education," *PLoS One* 12, no. 11 (2017): 1–15, DOI: <https://doi.org/10.1371/journal.pone.0186285>.
- 49 Kligyte et al., "A Partnership Outcome Spaces Framework."
- 50 Bamber et al., "Learning Together."

contribution to the innovation process. For example, students who participated in the student well-being challenge (the second project) became part of the core team in the third and fourth project as paid team members. One of them is one of the co-authors of this paper.

Contributions from various participants influenced the directionality of the innovation process across the various projects. One of the most striking examples was the fundamental transformation of the shared vision as a result of engagement with Indigenous stakeholder perspectives in the first project. Initially, the project had involved prototype testing with representatives from various target groups, including representatives from Aboriginal communities. Over time, the Indigenous stakeholders went from offering feedback on our ideas to becoming leading voices for and contributors of well-being expertise (see Reflexive Story 1). This transformed vision of well-being was carried over into the subsequent projects.

Evolution of the Practice Space

Our initial approach was a design-based approach informed by Kees Dorst's⁴⁵ frame innovation methodology. In the first project, stakeholders participated in traditional participatory design, including a series of interviews, one co-design workshop with the advisory group, and stakeholder prototype feedback sessions. The stakeholders provided their perspectives, and the process was led by the core team of designers who used stakeholder input to frame the problem and develop a prototype solution to the well-being challenge.

In acknowledgment of the complexity of the challenge, our innovation approach gradually evolved from design only to include systems thinking-informed approaches. For example, we used collective systems mapping approaches⁴⁶ to work with stakeholders during the third project, and complemented the core team's design work with a grass-roots approach to bringing together innovations that were already happening at the university. That grass-roots approach was in line with other complexity approaches such as transition management,⁴⁷ in the sense that we not only drew on distributed expertise to inform the centralized innovation process, but also sought to mobilize the community to enact innovations in their own local contexts.

The way we worked with different stakeholders evolved as well. While we started with a traditional participatory design approach, we expanded our innovation process to include citizen science research methods⁴⁸ in the third project, and a students-as-partners approach⁴⁹ in the last project. The various approaches co-evolved when new actors joined project teams, bringing along new methods and approaches. Moreover, as part of our reflexive process, we regularly questioned our assumptions about what participation meant in our particular disciplinary contexts.⁵⁰ We concluded that an overarching partnership ethos could help us integrate our various perspectives — "partnership" was eventually explicitly named as our key approach in the Student Services Hub project. To strengthen reciprocity and equity in our relationships during the hub project, we recruited students as paid team members rather than treating them as stakeholders, as is the case in many participatory design initiatives.

- 51 We are particularly inspired by Graham Gee et al., "Aboriginal and Torres Strait Islander Social and Emotional Well-Being," in *Working Together: Aboriginal and Torres Strait Islander Mental Health and Well-Being Principles and Practice*, 2nd ed. ed. Pat Dudgeon, Helen Milroy, and Roz Walker (Barton, Australia: Commonwealth of Australia, 2014), 55–68, available at <https://www.telethonkids.org.au/globalassets/media/documents/aboriginal-health/working-together-second-edition/working-together-aboriginal-and-well-being-2014.pdf>; and Tyson Yunkaporta, *Sand Talk: How Indigenous Thinking Can Save the World* (London: HarperOne, 2019).
- 52 Martin E. P. Seligman, "PERMA and the Building Blocks of Well-Being," *The Journal of Positive Psychology* 13, no. 4 (2018): 333–35, DOI: <https://doi.org/10.1080/17439760.2018.1437466>.

Evolution of the Object Space: Knowledge and Interventions

Existing knowledge was gathered and new knowledge gained across projects as we integrated various perspectives. A range of different interventions were developed and implemented, in some cases leading to institutional outcomes and impact.

For example, the first project's funders wanted to develop a well-being framework that could be used by organizations to improve the well-being of their employees and target (user) groups, which included businesses, schools and universities, and local governments. It was a top-down initiative with an expectation for a one-size-fits-all outcome catering to various organizations across contexts. The well-being research and innovation hub project, on the other hand, was more focused on developing an infrastructure that could connect people with relevant initiatives. Rather than providing a single solution to the well-being challenge, we mapped the various well-being initiatives already taking place inside the university to develop community awareness and mobilize participants to generate well-being initiatives through new connections. In contrast, the Student Services Hub project was focused on developing a concept and a vision for a space within a new university building where students could get access to multiple university support services for well-being. It included the physical design of the space and an operating model. Although these interventions took different forms, they were all interconnected by the overarching purpose of enhancing well-being at the university, exemplifying the portfolio approach to innovation.

Each project led to new knowledge that was disseminated in project reports and academic publications. New knowledge was also incorporated into subsequent projects. For example, the encounter with the Aboriginal community representatives in the first project (see Reflexive Story 1) inspired us to read more about Aboriginal and Torres Strait Islander perspectives on social and emotional well-being.⁵¹ Various documents about health programs and policy in university were reviewed in the first and third project to learn from what other universities were doing, and the positive psychology literature⁵² was used to further inform our perspectives on well-being. This evolving knowledge continually influenced our shared vision.

Vision

Our vision of well-being innovation at the university evolved over time. It was informed by the literature and well-established research methods such as interviews with stakeholders. However, our personal experiences—illustrated in the reflexive stories in the next section—also played a role in its evolution. [Table 1](#) presents a summary of our vision on a healthy and happy university at the time of writing this article.

Initially, we promoted the goal of having "healthy and happy university staff and students." Informed by Indigenous perspectives on well-being, our vision was reframed to a "healthy and happy university" with a focus on community rather than individual well-being (Reflexive Story 1). Through the experiences of the first author and her work with the director of university student services (Reflexive Story 2), we developed a more integrated perspective on well-being, which encompassed work and learning as integral components of flourishing

Table 1 Key elements of our most recent vision of a healthy, happy university and how to work towards it.

Vision Elements	
A holistic and integrated view of well-being	We adopt a holistic view of well-being from the positive psychology of self, which acknowledges the interrelatedness of our physical and mental health, as well as how our health is related to our social connections. Rather than seeing well-being as separate from work and learning (as in: separate services to prevent or cure health issues), we adopt a view that the way we organize our work and education is the key to well-being and flourishing.
A connected community of students and staff	Social connections are the most influential factor in defining our health and well-being. We therefore suggest striving to be a university system comprising a connected and inclusive community that includes all types of students, professional staff, casual staff, and academic staff and where everyone involved is committed to increasing university "social capital."
We already have (most of) what it takes	The university already has many resources required to work towards a healthy and happy university. There are already many people at the university who are passionate about improving student and staff well-being. We have researchers with expertise in collecting and analyzing data. And we have people with expertise in design and innovation. All we need is to find ways to connect them and support these efforts towards collaborative action.
Continuous internal innovation	There are some great generally applicable, existing well-being initiatives available, but we propose complementing these with an approach that designs and measures initiatives adjusted to specific contexts within the university. Because we see the university as a complex system, we recommend working with a "portfolio" of initiatives that are continuously developed, tested, and then either removed or amplified, as well as a recognition of "emergent" initiatives.
A healthy and equitable research and innovation approach	We propose a well-designed (healthy) inclusive partnership approach to ensure that we practice what we preach. This partnership approach moves away from designing for to designing with. We acknowledge that partnership approaches require continuous dialogue and reflexivity about (power) relationships. We take responsibility for our own health and the people we work with, and aspire to research and innovation work that challenges us as innovation practitioners but also keeps us healthy and sane.

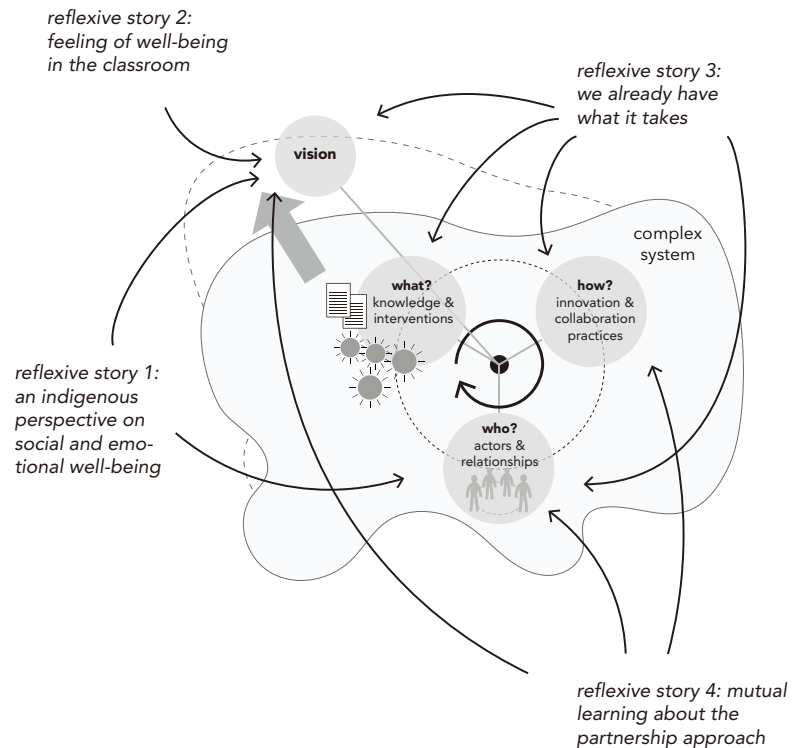
in universities. For example, we shifted away from seeing health services as performing a separate well-being function within the organization towards a vision of well-being collaboratively enacted by the university as a whole. This evolution was informed by interviews in the first project (Reflexive Story 3) and our experiences with the well-being research and innovation hub. In the fourth project, we further challenged our assumptions about who has a say and is able to innovate in the university well-being space by working with students to untangle the traditional power hierarchies between university students and staff during reflexive sessions (Reflexive Story 4).

Reflexivity in the Case of University Well-Being

During our work on well-being at UTS, we have increasingly made space for reflexivity in our daily practice. Through reflexive conversations, collective sense-making, and writing together, we have become more conscious about how we were integrating different types of knowledge and epistemology in our work. Writing the multiple iterations of this paper enabled further reflexive conversations and mutual learning about our innovation practice.

To achieve mutual learning, we deployed specific reflexive strategies, including reading and writing together, as well as creating space and time for reflexive dialogue. This practice of sense-making gradually became more structured. In a later project we scheduled opportunities to come together as a team to share and discuss our experiences. Before these reflexive sessions,

Figure 4
The excerpts of reflexive stories from our well-being initiatives in relation to the co-evolutionary model of innovation in complex contexts. © 2021 Mieke van der Bijl-Brouwer.



53 See Gee et al., "Aboriginal and Torres Strait Islander Social."

we would read selected readings as provocations and each write a short piece about our experience in the project thus far. We would then read each other's reflexive writing and discuss.

The following section features extracts from our reflections, illustrating how our reflexive approach contributed to the development of our vision and helped us structure the evolving process of innovation. These examples are intended to provide the authentic authorial voices and bring the reflexive approach to life. Figure 4 shows how these excerpts relate to the evolving vision, and to the who, how and what questions in our model.

Reflexive Story 1: An Indigenous Perspective on Social and Emotional Well-Being

(Source: author and design team member, well-being framework)

As part of the design approach to develop a well-being framework, we developed a prototype framework and evaluated it qualitatively in group interviews with different stakeholder groups, including a group of representatives from different Aboriginal well-being organizations in NSW. I met with three people at the university and brought a copy of the prototype to discuss. I felt a bit nervous about the meeting, because I felt we could have done better at considering Indigenous perspectives when developing the prototype. The three people who provided feedback on the framework indeed soon mentioned that there were many issues with the framework, the main one being that it did not align with the Aboriginal and Torres Strait Islander peoples' perspectives on social and emotional well-being.⁵³ They took the time to

explain what this meant: community is an important part of the Indigenous perspective, and well-being is not understood as just being about the individual person, but about the community as a whole. If an individual is unwell, the community or family is unwell. And as a consequence, health issues are dealt with collectively by the community. I could easily connect this to my own experiences of poor mental health. When I was feeling unwell I went to a psychologist who was of great help. However, I went on my own, while my family and friends, in particular my husband, were also impacted by my mental health challenges and after each session with a psychologist I had to go home and explain to them what I had learned. Would it not have been better to also include them in my healing process?

Impact on the Vision and Actor Spaces

Through this experience, we understood that well-being is not just about individual students or staff members, but about the university community as a whole. We also realized that Indigenous communities can provide profound knowledge to inform our work. They are more than a user group to consult for feedback on prototypes.

Reflexive Story 2: Feelings of Well-Being in the Classroom

(Source: two authors, lecturers)

To finish off the well-being challenge, we asked students to present their ideas to an audience of students, staff, and experts. One of the experts was the director of student services. After watching the presentations, we asked him to provide some plenary feedback to the students. He mentioned that there were many interesting ideas presented, but that what he found most interesting was not the ideas, but the “feeling of well-being” in the classroom that moment, which he said was not common. The students were visibly excited to present their results and they were clearly supporting each other, not just within the teams, but within the cohort as a whole. Why shouldn’t all university contexts and learning experiences have a similar quality of connection, care, and well-being?

Impact on the Vision Space

Through this experience we started to see that well-being is directly influenced by the way we shape university activities and the culture inside cohorts and classrooms. Rather than relegating well-being to the status of a (separate) service — by providing a dedicated counsellor for mental health issues, for example — well-being should be at the heart of how we shape our university, including research and education. This insight was incorporated into our vision.

Reflexive Story 3: What Is Already Happening in the University

(Source: multiple authors, well-being research and innovation hub)

In the well-being framework project we took the university as a case and interviewed people who had an interest in student and staff well-being. For example, we spoke with a professor who had started to integrate meditation



Figure 5
Kate Elton's *Little Book for Big Worries*. © 2020
Kate Elton.

in her research training classes for PhD students after having experienced burnout herself. We also found a young employee who had designed a small booklet with tips on how to cope with anxiety, based on her own experiences of anxiety (Figure 5). It turned out there were many initiatives by staff and students already trying to do something to improve well-being at the university. But these initiatives did not seem to be connected and we did not know a lot about their impact. How to connect these initiatives to collectively learn from them?

Impact on the Vision, and on the Practice, Object, and Actor Spaces

This experience impacted our work on many different levels. We started to envision a future in which the whole university community contributes to improving well-being (vision). We developed this into a concept for a well-being research and innovation hub (object space), where university community members might come together to learn and innovate to improve well-being. By inviting a range of staff and students who were already implementing well-being initiatives in collaborative sessions, we expanded the network of actors involved with the well-being challenge (actor space). Finally, this experience inspired us to start looking for new ways to connect university staff and students around initiatives, and to measure the impact of our way of working (practice space).

Reflexive Story 4: Mutual Learning about the Partnership Approach

(Source: students)

One of the student team members reflected on their perception of the relationships within the team in the initial phases thusly:

“The expectations I had ... working intensely alongside one another, students and academic staff in an equal partnership. The initial experience working on the project did not feel this way ... it felt like the tutors were supervisors over a student-led project.”

After discussing this in our reflexive dialogue session, we adjusted the way we were working together, creating more fluid and informal interactions.

The students' experiences of partnership began to change over time.

“The relationships between us as students leading them, and the staff invited to be involved, shifted as more workshops were held and our work progressed. During the first workshop it felt that students running the workshop was novel. During the following workshops, bias against us as students began to disappear and the fact that we were ‘student’ partners became inconsequential to the work being done.”

“The fluidity of the relationships that were formed was exciting. It encouraged greater responsibility and allowed for greater respect—both ways.”

These observations made by students made us (as educators) wonder: what would university experience look like if it allowed time for student-staff and student-student relationships to grow and evolve, with opportunities for both students and staff to be exposed to a range of thinking and experiences that stimulate mutual learning about well-being?

- 54 Crilly explores the question 'at what levels does co-evolution occur?' within the context of design activity. Crilly, "The Evolution of 'Co-evolution' (Part II),"
- 55 *Ibid.*, 345.

Impact on the Vision and on Collaboration

Here we learned that partnership is an evolving relationship which requires effort; it is not simply working with students. It takes time for new types of relationships to emerge and reflexive dialogue can stimulate this process (practice space). This learning also influenced our vision: we saw how university well-being includes an awareness of power relationships within its community, for example among teachers and students.

Discussion

The Complexity of Transdisciplinary Collaborations that Address Complex Challenges

The university well-being case study illustrates the co-evolutionary nature of innovation in complex contexts. Each of the reflexive stories shows an instant which we retrospectively identified as a moment where one or more of the three spaces and/or the vision evolved or co-evolved. At the same time, an academic article can never completely reveal the complexity of such a case. While we discuss four interconnected projects here, innovation processes in complex contexts do not have clear boundaries or distinct beginning and end points. Other projects and activities also influenced the four projects described in this paper, and our work continues to influence new and emerging well-being projects and initiatives. For example, the first author has moved to another university where she continues to initiate and participate in student and staff well-being initiatives. Other initiatives have been introduced but have not survived, failing to generate institutional momentum needed to move forward. In addition, the reflexive stories only provide snapshots of our learnings, instead of a comprehensive account of the challenges of transdisciplinary work. However, the model has helped us as a retrospective sense-making approach to consolidating the organizational and individual learning that has occurred. A next step could be to use this framework to deliberately shape mutual learning processes using reflexivity to validate the dimensions of the framework.

More generally, the model, and its three co-evolving innovation spaces, presents an abstraction of the messy reality of innovation endeavors — the articulation of the three spaces and the way they interact does not describe the full complexity of innovating towards complex challenges. For example, in addition to the three spaces outlined in the framework, we could consider other factors, including the resources required to enable innovation processes and implementation and the influence of the physical and natural environment. Further insights could also be generated by exploring the different levels⁵⁴ of co-evolution within and between the three spaces. For example, within the object space, design studies commonly acknowledge the co-evolution of problem and solution, which might co-evolve within and between individuals, teams and projects.⁵⁵ Along similar lines, we might explore co-evolution among individuals, teams, and networks within the actor space, and individual practices in relation to wider organizational and network practices. Future research could be aimed at a further conceptual development of co-evolution as a key feature of transdisciplinary collaborations aimed at tackling complex

- 56 For example, in transition design, see Terry Irwin, "Transition Design: A Proposal for a New Area of Design Practice, Study, and Research," *Design and Culture* 7, no. 2 (2015): 229–46, DOI: <https://doi.org/10.1080/17547075.2015.1051829>; Donald A. Norman and P. J. Stappers, "DesignX: Complex Socio-technical Systems," *She Ji: The Journal of Design, Economics, and Innovation* 1, no. 2 (2015): 83–106, DOI: <https://doi.org/10.1016/j.sheji.2016.01.002>.
- 57 Van der Bijl-Brouwer and Malcolm, "Systemic Design Principles."
- 58 Mitchell et al., "Beginning at the End."
- 59 Kees Dorst, "The Core of 'Design Thinking' and Its Application," *Design Studies* 32, no. 6 (2011): 521–32, DOI: <https://doi.org/10.1016/j.destud.2011.07.006>.

societal challenges, which might help us to better understand and influence the nature and scope of transdisciplinary work.

Implications for Design Practice

The evolutionary perspective on innovation in complex contexts presented in this paper has several implications for design practice. First, it requires designers to think beyond single solutions for narrowly defined problems to broader portfolios of interventions addressing complex challenges more holistically. This invites designers to systematically consider impact beyond a single project to long term continuous innovation in specific contexts. Similar strategies are becoming more widely adopted in the design research field.⁵⁶ These types of approaches can also be observed in practice, such as in design for social innovation.⁵⁷ An important implication for designers is that this evolutionary perspective shows the importance of investing longer term into specific domains of complex challenges, instead of pursuing a consultancy model where designers typically execute individual projects. In addition, the co-evolutionary perspective introduced in this paper implies that the outcomes of innovation projects should be assessed beyond the specific interventions or knowledge produced during the project lifecycle, and include relationships that are formed between actors, the shared vision shaped through project collaboration, and reflexive learning about collaborative and innovation approaches.⁵⁸

Secondly, the transdisciplinary perspective on innovation in complex contexts requires designers to open up their practice to other ways of knowing. This involves flexibility in innovation and partnership approaches, and the adoption of reflexive practices. It could be argued that design is a transdisciplinary practice by definition, integrating knowledge from various disciplines such as psychology, engineering, and business, and systematically engaging with knowledge from users or consumers to generate desirable, feasible, and viable outcomes. A transdisciplinary perspective invites designers to further expand these knowledge sources to include other ways of knowing that might be relevant to specific complex contexts. Drawing on the example of the Indigenous ways of knowing influencing our vision of well-being, we propose that innovation in complex contexts requires the academy to begin exploring how to promote engagement with different ways of knowing in design.

Thirdly, the case study also demonstrates that transdisciplinarity can foster flexibility in innovation and partnership approaches and help evolve how we work with what we learn and how we collaborate with others. An important question for designers to consider is the role of design tradition and methods when innovating in complex contexts. In our case, we gradually moved away from a design-only approach to a more pluralistic and transdisciplinary innovation process. At the same time, design played a role in each of the four projects, in particular, the core design practice of framing⁵⁹ was continuously used to advance our transdisciplinary thinking. Those with a design background in this work found it helpful to not identify strictly as "designers" but as transdisciplinary innovation practitioners, innovating in a complex context, who adopt certain design practices and

60 See also Baumber et al., "Learning Together."

61 Sangiorgi urged designers to introduce reflexivity into their work to address power and control issues in each design encounter. Daniela Sangiorgi, "Transformative Services and Transformation Design," *International Journal of Design* 5, no. 2 (2010): 29–40, <http://www.ijdesign.org/index.php/IJDesign/article/view/940/344>.

principles in addition to other approaches. The designer author of this article also found it useful to learn about partnership approaches in other disciplines to reflect on participatory design and its benefits and limitations.⁶⁰ Thus, perspectives on participation expanded through transdisciplinary collaboration can further help innovation practitioners adapt their collaborative approaches to specific complex contexts and networks of actors.

Finally, as we have argued, reflexivity can provide structure to innovation processes in complex contexts. Reflexivity has been discussed as an approach to consider power relationships in design.⁶¹ In this article, we show how reflexivity can also be used to reflect on the evolutionary design process as a whole, including the evolving vision, ideas, knowledge, networks of actors, and ways of innovating and partnering. Designers are increasingly dealing with ambiguity and uncertainty in innovation processes that include multiple moving parts. Reflexive processes can provide them with a guiding structure in dynamic contexts like these. Our future research will include further exploration and experimentation to develop a deeper understanding of reflexive methods and practices that can support design and transdisciplinary innovation in complex contexts.

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Declaration of Interests

There are no conflicts of interest involved in this article.

References

- Barcan, Ruth. *Academic Life and Labour in the New University: Hope and Other Choices*. London: Routledge, 2016.
- Baumber, Alex, Giedre Kligyte, Mieke van der Bijl-Brouwer, and Susanne Pratt. "Learning Together: A Transdisciplinary Approach to Student-Staff Partnerships in Higher Education." *Higher Education Research & Development* 39, no. 3 (2019): 395–410. DOI: <https://doi.org/10.1080/07294360.2019.1684454>.
- Beinhocker, Eric. *The Origin of Wealth: Evolution, Complexity, and the Radical Remaking of Economics*. Boston, MA: Harvard Business School Press, 2006.
- Van der Bijl-Brouwer, Mieke, and Bridget Malcolm. "Systemic Design Principles in Social Innovation: A Study of Expert Practices and Design Rationales." *She Ji: The Journal of Design, Economics and Innovation* 6, no. 3 (2020): 386–407. DOI: <https://doi.org/10.1016/j.sheji.2020.06.001>.
- Blignaut, Sonja. "Organizing Principles: The Spirit of Cynefin." In *Cynefin*, 62–76.
- Burns, Colin, Hilary Cottam, Chris Vanstone, and Jennie Winhall. "Red Paper 02: Transformation Design." Report, Design Council, 2006. <https://www.designcouncil.org.uk/resources/report/red-paper-02-transformation-design>.

- Capra, Fritjof. *The Web of Life: A New Synthesis of Mind and Matter*. London: Flamingo, 1997.
- Collins, Kevin, and Ray Ison. "Jumping off Arnstein's Ladder: Social Learning as a New Policy Paradigm for Climate Change Adaptation." *Environmental Policy and Governance* 19, no. 6 (2009): 358–73. DOI: <https://doi.org/10.1002/eet.523>.
- Crilly, Nathan. "The Evolution of 'Co-evolution' (Part II): The Biological Analogy, Different Kinds of Co-evolution, and Proposals for Conceptual Expansion." *She Ji: The Journal of Design, Economics, and Innovation* 7, no. 3 (2021): 333–55. DOI: <https://doi.org/10.1016/j.sheji.2021.07.004>.
- Design Council. *Design for Public Good*. London: Design Council, 2013. <https://www.designcouncil.org.uk/sites/default/files/asset/document/Design%20for%20Public%20Good.pdf>.
- Donetto, Sara, Paola Pierri, Vicki Tsianakas, and Glenn Robert. "Experience-Based Co-design and Healthcare Improvement: Realizing Participatory Design in the Public Sector." *The Design Journal* 18, no. 2 (2015): 227–48. DOI: <https://doi.org/10.2752/175630615X14212498964312>.
- Dorst, Kees. "The Core of 'Design Thinking' and Its Application." *Design Studies* 32, no. 6 (2011): 521–32. DOI: <https://doi.org/10.1016/j.destud.2011.07.006>.
- Dorst, Kees. *Frame Innovation: Create New Thinking by Design*. Cambridge, MA: MIT Press, 2015.
- Dorst, Kees. "Frame Creation and Design in the Expanded Field." *She Ji: The Journal of Design, Economics and Innovation* 1, no. 1 (2015): 22–33. DOI: <https://doi.org/10.1016/j.sheji.2015.07.003>.
- Fernandez, A., E. Howse, M. Rubio-Valera, K. Thorncraft, J. Noone, X. Luu, B. Veness, M. Leech, G. Llewellyn, and L. Salvador-Carulla. "Setting-Based Interventions to Promote Mental Health at the University: A Systematic Review." *International Journal of Public Health* 61, no. 7 (2016): 797–807. DOI: <https://doi.org/10.1007/s00038-016-0846-4>.
- Gee, Graham, Pat Dudgeon, Clinton Schultz, Amanda Hart and Kerrie Kelly. "Aboriginal and Torres Strait Islander Social and Emotional Well-Being." In *Working Together: Aboriginal and Torres Strait Islander Mental Health and Well-Being Principles and Practice*, 2nd ed. edited by Pat Dudgeon, Helen Milroy, and Roz Walker, 55–68. Barton, Australia: Commonwealth of Australia, 2014. <https://www.telethonkids.org.au/globalassets/media/documents/aboriginal-health/working-together-second-edition/working-together-aboriginal-and-wellbeing-2014.pdf>.
- Geels, Frank W. "Processes and Patterns in Transitions and System Innovations: Refining the Co-evolutionary Multi-level Perspective." *Technological Forecasting and Social Change* 72, no. 6 (2005): 681–96. DOI: <https://doi.org/10.1016/j.techfore.2004.08.014>.
- Greenberg, Riva, and Boudewijn Bertsch, eds., *Cynefin: Weaving Sense-Making into the Fabric of Our World*. Las Vegas: Cognitive Edge, 2021.
- Gregory, Judith. "Scandinavian Approaches to Participatory Design." *International Journal of Engineering Education* 19, no. 1 (2003): 62–74. <https://www.ijee.ie/articles/Vol19-1/IJEE1353.pdf>.
- Hudson, Jennie, and Victoria Ingram. "Stigma-Reduction & Help-Seeking in Australia Classrooms: A Research Report on the Batyr@School Program." Report in collaboration with Macquarie University, 2017. https://www.mq.edu.au/__data/assets/pdf_file/0004/551785/batyr-Research-Doc.pdf.
- Irwin, Terry. "Transition Design: A Proposal for a New Area of Design Practice, Study, and Research." *Design and Culture* 7, no. 2 (2015): 229–46. DOI: <https://doi.org/10.1080/17547075.2015.1051829>.
- Irwin, Terry. "The Emerging Transition Design Approach." *Cuaderno* 87 (2020): 27–54. DOI: <https://doi.org/10.18682/cdc.vi87.3762>.
- Kiely, Marion, and Ellie Snowden. "Weaving Well-Being into the Fabric of Our Organizations with the Cynefin Framework." In *Cynefin*, 227–41.

- Kinman, Gall, and Sheena Johnson. "Special Section on Well-Being in Academic Employees." *International Journal of Stress Management* 26, no. 2 (2019): 159–61. DOI: <https://doi.org/10.1037/str0000131>.
- Kligyte, Giedre, Mieke van der Bijl-Brouwer, Jarnae Leslie, Tyler Key, Bethany Hooper, Eleanor Salazar. "A Partnership Outcome Spaces Framework for Purposeful Student-Staff Partnerships." *Teaching in Higher Education* (June 2021): 1–19. DOI: <https://doi.org/10.1080/13562517.2021.1940924>.
- Kligyte, Giedre, Susanne Pratt, and Mariana Zafeirakopoulos. "Towards a Relational Values-Based Stakeholding Approach to Integrative Transdisciplinary Research with Stakeholders." In *Proceedings of International Transdisciplinarity Conference 2021*, ETH Zürich, September 13–17, 2021.
- McGann, Michael, Emma Blomkamp, and Jenny M. Lewis. "The Rise of Public Sector Innovation Labs: Experiments in Design Thinking for Policy." *Policy Sciences* 51 (March 2018): 1–19. DOI: <https://doi.org/10.1007/s11077-018-9315-7>.
- McGregor, Sue L. T. "Philosophical Underpinnings of the Transdisciplinary Research Methodology." *Transdisciplinary Journal of Engineering & Science* 9, no. 1 (2018): 182–98. DOI: <https://doi.org/10.22545/2018/00109>.
- McPhee, Chris, Martin Bliemel, and Mieke van der Bijl-Brouwer. "Editorial: Transdisciplinary Innovation." *Technology Innovation Management Review* 8, no. 8 (2018): 3–6. <https://timreview.ca/article/1173>.
- Mitchell, Cynthia, Dana Cordell, and Dena Fam. "Beginning at the End: The Outcome Spaces Framework to Guide Purposive Transdisciplinary Research." *Futures* 65 (January, 2015): 86–96. DOI: <https://doi.org/10.1016/j.futures.2014.10.007>.
- Mobjörk, Malin. "Consulting Versus Participatory Transdisciplinarity: A Refined Classification of Transdisciplinary Research." *Futures* 42, no. 8 (2010): 866–73. DOI: <https://doi.org/10.1016/j.futures.2010.03.003>.
- Moore, Michelle-Lee, and Frances Westley. "Surmountable Chasms: Networks and Social Innovation for Resilient Systems." *Ecology and Society* 16, no. 1 (2011): article no. 5. <https://www.ecologyandsociety.org/vol16/iss1/art5/>.
- Nicola, Mitchell, Maggie Triska, Andrea Liberatore, Linden Ashcroft, Richard Weatherill, Nancy Longnecker. "Benefits and Challenges of Incorporating Citizen Science into University Education." *PLoS One* 12, no. 11 (2017): 1–15. DOI: <https://doi.org/10.1371/journal.pone.0186285>.
- Norman, Donald A., and P. J. Stappers. "DesignX: Complex Sociotechnical Systems." *She Ji: The Journal of Design, Economics, and Innovation* 1, no. 2 (2015): 83–106. DOI: <https://doi.org/10.1016/j.sheji.2016.01.002>.
- Polk, Merritt, and Per Knutsson. "Participation, Value Rationality and Mutual Learning in Transdisciplinary Knowledge Production for Sustainable Development." *Environmental Education Research* 14, no. 6 (2008): 643–53. DOI: <https://doi.org/10.1080/13504620802464841>.
- Polk, Merritt. "Transdisciplinary Co-production: Designing and Testing a Transdisciplinary Research Framework for Societal Problem Solving." *Futures* 65 (January 2015): 110–22. DOI: <https://doi.org/10.1016/j.futures.2014.11.001>.
- Popa, Florin, Mathieu Guillermin, and Tom Dedeurwaerdere. "A Pragmatist Approach to Transdisciplinarity in Sustainability Research: From Complex Systems Theory to Reflexive Science." *Futures* 65 (January 2015): 45–56. DOI: <https://doi.org/10.1016/j.futures.2014.02.002>.
- Repko, Allen F., and Rick Szostak. *Interdisciplinary Research: Process and Theory*. Thousand Oaks, CA: SAGE, 2017.
- Rittel, Horst W. J., and Melvin M. Webber. "Dilemmas in a General Theory of Planning." *Policy Sciences* 4 (June 1973): 155–69. DOI: <https://doi.org/10.1007/BF01405730>.
- Rotmans, Jan, René Kemp, and Marjolein van Asselt. "More Evolution Than Revolution: Transition Management in Public Policy." *Foresight* 3, no. 1 (2001): 15–31. DOI: <https://doi.org/10.1108/14636680110803003>.

- Rotmans, Jan, and Derk Loorbach. "Complexity and Transition Management." *Journal of Industrial Ecology* 13, no. 2 (2009): 184–96. DOI: <https://doi.org/10.1111/j.1530-9290.2009.00116.x>.
- Sangiorgi, Daniela. "Transformative Services and Transformation Design." *International Journal of Design* 5, no. 2 (2010): 29–40. <http://www.ijdesign.org/index.php/IJDesign/article/view/940/344>.
- Seligman, Martin E. P. "PERMA and the Building Blocks of Well-Being." *The Journal of Positive Psychology* 13, no. 4 (2018): 333–35. DOI: <https://doi.org/10.1080/17439760.2018.1437466>.
- Sevaldson, Birger. "GIGA-Mapping: Visualization for Complexity and Systems Thinking in Design." In *Proceedings of Nordic Design Research Conference*, Helsinki, June 2011. <https://www.researchgate.net/publication/319930894>.
- Shore, Cris, and Susan Wright. "Coercive Accountability: The Rise of Audit Culture in Higher Education." In *Audit Cultures: Anthropological Studies in Accountability, Ethics and the Academy*, edited by Marilyn Strathern, 57–89. London: Routledge, 2000.
- Snowden, David J., and Mary E. Boone. "A Leader's Framework for Decision Making." *Harvard Business Review* 85, no. 11 (2007): 68–76. <https://hbr.org/2007/11/a-leaders-framework-for-decision-making>.
- Stacey, Ralph. *Tools and Techniques of Leadership and Management: Meeting the Challenge of Complexity*. New York: Routledge, 2012.
- Wheatley, Margaret J. *Leadership and the New Science: Discovering Order in a Chaotic World*. San Francisco, CA: Berrett-Koehler Publishers, 2006.
- Yunkaporta, Tyson. *Sand Talk: How Indigenous Thinking Can Save the World*. London: HarperOne, 2019.