Shifting Paradigms: Bringing Transdisciplinarity into the Light

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Abstract:*Addressing complex societal problems requires the collaboration of diverse academic and non-academic partners ideally through transdisciplinarity. Most academic faculty members are couched in their disciplinary mind set with more recent transitions to multi- and interdisciplinarity. Transdisciplinary thinking is the new kid on the block. Switching through mono, multi, and inter to transdisciplinarity will require a paradigm shift. Each is discussed in this paper, so people can more readily find themselves, clarify the nature of their work, and appreciate the magnitude of change required if they shift paradigms. The paper then (a) identifies traits of a transdisciplinary individual who can employ a transdisciplinary orientation, (b) addresses paradigm shifts at the collective and individual levels, (c) discusses how to deal with natural resistance to losing one's familiar way of thinking and (d) concludes with touchstones and safety-nets that encourage people to take the leap of faith required to embrace transdisciplinarity.*

Keywords:paradigm shifts; transdisciplinary thinking; mono, multi- and interdisciplinarity; transdisciplinary orientation

1 Introduction

Transdisciplinarity is lauded as the most effective approach for addressing complex societal challenges (Nicolescu, 2014) such as climate change, biodiversity loss, intractable conflicts, health pandemics, and unsustainability. The importance of transdisciplinarity is becoming increasingly evident with "an exponential growth of publications, a widening array of contexts, and increased interest across academic, public and private sectors" (Klein, 2014, p. 68).

This article concerns the imperative of transitioning from disciplinary thinking (i.e., mono, multi, and interdisciplinary) to the transdisciplinary mindset, which requires a significant paradigm shift – changes in thought patterns, reasoning logics, mental habits, and attendant practice as well as a radical change in personal beliefs and assumptions (Khun, 1962). This shift requires letting go of deeply familiar forms of disciplinary thinking and stepping into foreign territory. Trans literally means across and beyond to a new space (Harper, 2023).

To reach this space, people must be open to becoming a transdisciplinary individual who can approach complex problems from a transdisciplinary orientation (Augsburg, 2014; Misra et al., 2015; Stokols, 2014, 2018). Learning new ways to think about things is a double-edged sword, however, in that people can now see many new things, but they cannot see them clearly yet. They are initially on a paradigm shift learning curve. These paradigm shifts, if they happen at all, occur in stages, and can take upwards of 20 years (e.g., an entire generation). But people move through fairly predictable stages (to be discussed) (Barker, 1993; Osborne & Plastrik, 1996; Pike & Selby, 1988) intimating that the process can be monitored and facilitated. This bodes well for academics shifting to transdisciplinarity.

2 Comparing Mono, Multi, Inter, and Transdisciplinary Thinking

Transdisciplinarity was first introduced in the seventies (Apostle et al., 1972; Jantsch, 1972a, 1972b; Kockelmans, 1972) but never truly gained traction until the early 2000s (Klein et al., 2001; Nicolescu, 2002). It lived (lives) in the shadows of mono, multi, and interdisciplinarity and is only now creating its own shadow. This fact is why it is so hard for people to embrace transdisciplinarity – that and its marked difference from long-established approaches to knowledge building. Its absence from the light means the academy tends to balk at institutionalizing transdisciplinarity (McGregor & Volckmann, 2011; Vienni-Baptista & Klein, 2022). This article explores the differences among mono, multi, inter, and transdisciplinarity followed with what is involved in shifting paradigms –bringing transdisciplinarity into the light.

2.1 Monodisciplinary Thinking

In a world heavy with specialization and siloed disciplines, monodisciplinarity (also referred to as disciplinarity) is ever popular. People working in one discipline co-share common methodologies (i.e., research paradigms and philosophies), theories, methods, and language (e.g., concepts, jargon, and lingo), and their research interests align (Regeer as cited in McGregor, 2007). In monodisciplinary settings, disciplines are organized in the form of university departments, programs of instructions, degrees, scholarly journals, library holdings, and national and international associations (Wallerstein, 1999). Ertas (2000, p. 14) referred to the resultant "*intradisciplinary communication*" (emphasis added) that creates a well-developed, exclusionary identity.

Monodisciplinarity entails the specialized generation of new knowledge in a particular subject area to replace obsolete knowledge. This way, the discipline's body of knowledge is constantly updated and reformulated (Garcia & Siu, 2019). Problem posing and problem solving occur from the perspective of one academic discipline (e.g., epidemiology, sociology, economics, business administration, psychology, biology, medicine, or law). Often, just one subdiscipline (e.g., corporate law, consumer law, or family law) within a discipline (law) is used to address a problem (McGregor, 2007).

Intradisciplinary teamwork is a common occurrence with everyone from the same discipline or subdiscipline. Because they all have the same field of expertise, both cohesion and a common language are taken for granted during teamwork. These commonalities need not be created as a prerequisite to team formation and collaboration, nor must people adjust their typical thought patterns and mental habits to accommodate each other. Barriers to collaboration are minimal or at least not impacted by disciplinary differences (personality differences maybe as people wrestle with status and authority) (Sanchez-Segura et al., 2018; Strauss, 1999).

The downside to monodisciplinarity or intradisciplinarity is decreased exposure to alternative thinking and inefficient emergence of new ideas and innovation (Sanchez-Segura et al., 2018). A possible workaround is to populate the intradisciplinary team with members who have used their disciplinary expertise in different scenarios for different amounts of time at varying levels of experience: industry, government, education, or non-governmental agencies (Brill, 1976; Strauss, 1999). Using a food metaphor, monodisciplinarity is likened to a bowl of apples – the same color apple (discipline) or perhaps a combination of different colored apples (subdisciplines) (Choi & Pak, 2006) (see Figure 1).

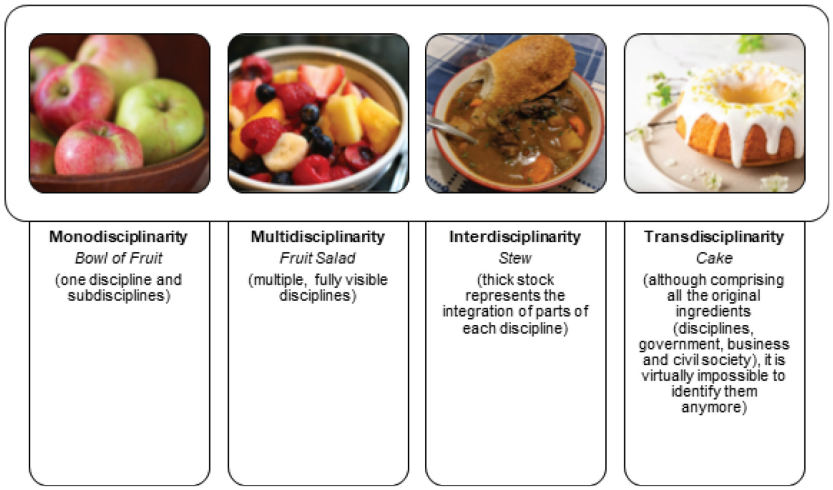

Figure 1: Food Metaphor for Mono-, Multi-, Inter- and Transdisciplinarity.

2.2 Multidisciplinary Thinking

Multi (more than one) is from Latin *mult* 'much, many' (Harper, 2023). Multidisciplinarity involves collaboration between and among several disciplines with no apparent connection among them and no explication of relationships among them. There is no intent to integrate anything. Instead, a scholar or researcher in one discipline turns to other disciplines to help address a problem (e.g., biologists may turn to biostatisticians, epidemiologists, sociologists, lawyers, and chemists). If this happens in person (instead of reading disciplinary contributions), these invitees come together to share their expertise on the issue while appreciating that knowledge integration is not the end goal; rather, it is to provide information to the person that approached them for their perspective, research, and thoughts (Apostel et al., 1972; Choi & Pak, 2006; Ilter, 2015; Jantsch, 1972a).

In effect, "people mingle disciplines, with each discipline maintaining its distinctiveness [and original identity while] retain[ing] their independence, temporarily taking direction from ... the [disciplinary] person who sets the goals of the team's work" (McGregor, 2007, p. 489; see also Ilter, 2015). When using multidisciplinary thinking, the thoughtful person draws appropriately from multiple disciplines, so relevant ideas can be combined to create a mental model for addressing a problem. Drawing on several disciplines other than one's own helps inform one's understanding from a perspective that is outside one's normal disciplinary boundaries (Dua, 2020). For example, a cancer control and prevention scientist may draw on sociology, epidemiology, public policy, law, psychology, economics, and political science to frame something new; however, only the cancer control and prevention scientist is engaged in integrative thinking.

In another interesting framing, the National Research Council (NCR) (2015) said, "[multidisciplinary thinking involves] researchers from different disciplines each mak[ing] separate contributions in an additive way" (p. 24) (see also Choi & Pak, 2006). That is, people's contributions would accompany, complement, supplement, or subsidize each other. They do not challenge each other's disciplinary boundaries. A multidisciplinary team has multiple expertise and specialties, but cohesion is low, and a common language is missing (Sanchez-Segura et al., 2018).

This is not problematic because people from the originating discipline integrate other discipline's contributions into useful information for themselves, but the multidisciplinary team does not, nor is it expected to, engage in integration. Everyone stays within their disciplinary boundary while contributing to a common goal without the intent to integrate. They may work parallel to each other or sequentially but not as a coordinated whole (Choi & Pak, 2006). Disciplines are adjacent (close to and nearby), but they only share respective information and knowledge, so each person can extract what is needed for their own disciplinary work (Mehta, 2019). This approach is likened to a fruit salad – each piece of fruit in the bowl

is still identifiable (Choi & Pak, 2006).

2.3 Interdisciplinary Thinking

Inter is from Latin *inter* 'between, among' (Harper, 2023). Interdisciplinarity involves coordinated, collaborative, and reciprocal work between and among academic disciplines (Lattanzi, 1998). Integration is the defining concept of interdisciplinarity (Khargonekar, 2018; Sanchez-Segura et al., 2018) as are coordinated cooperation and reciprocity (Renn, 2021). As a caveat, "there is no 'black and white,' clear division between what is interdisciplinary and what is not. Instead there are different levels of integration that different people/scholars call different names" (Garcia & Siu, 2019, p. 1) (e.g., crossdisciplinarity, pluridisciplinarity).

With interdisciplinary work, someone coordinates and facilitates meetings between scholars and researchers from several disciplines who work together on the same project. Assuming the space between disciplines is empty, bridges must be built to facilitate coordinated integration. Everyone comes together (walks across the bridges) to share their information, data, methods, tools, processes, concepts, and theories relevant to the issue at hand. Although members of interdisciplinary research teams may "surrender some aspects of their own disciplinary role, [they still] maintain a discipline-specific base" (Choi & Pak, 2006, p. 356). In the spirit of coordinated collaboration, everyone involved benefits from this reciprocal transfer arrangement by learning from and about each other as someone coordinates their expertise (McGregor, 2007). This pooled expertise and coordinated, collective decision making can lead to "mutual enrichment [and] advanced understanding" (Choi & Pak, 2006, p. 354) that is not possible if left to solitary disciplines.

Ideally, something new emerges from the interaction – a new theory, concept, method, analysis, tool, process, procedure, data, application, perspective, knowledge – even new disciplines (Choi & Pak, 2006). Interdisciplinary initiatives tend to yield "unified outcomes ... that [are] sustained and substantial" (McGregor, 2007, p. 490). The coordinated and coherent whole that is created from these interactions depends on people being able to analyze, synthesize, and harmonize disciplinary connections. Attendant working papers, joint reports, collections of recommendations, or future strategic plans emergent from the collaboration are tightly linked with one caveat. Each researcher's specific contribution to the interdisciplinary project is usually obscured, but each still retains their original disciplinary identity (Choi & Pak, 2006).

Choi and Pak (2006) likened this approach to a stew. While each vegetable (discipline) in the pot retains its original form, the thick stock represents the integration of some parts of each vegetable (discipline), so a new medium is created. This stew represents an interdisciplinary team comprising several people from related but not necessarily similar disciplines who are involved in reciprocal (mutually beneficial) collaboration scaffolded by shared, pooled expertise, and coordinated, collective decision making. The interdisciplinary outcome (thick stock) arose from integration within coordinated collaboration amongst elements in reciprocal relationship (Strauss, 1999).

2.4 Transdisciplinary Thinking

To continue the food metaphor, transdisciplinarity is like a cake. One starts with a wide-ranging set of ingredients that are *all* different yet must somehow be combined to attain the final product. The ingredients are blended and mixed (respecting their contradictory nature), and then this mixture is allowed to bake thus forming a totally new entity. The intermixing and baking involve both external and internal activity or chemistry. Things are not coordinated by one person but emerge naturally as in complex adaptive systems. Once baked, the cake comprises all the original ingredients, but it is virtually impossible to identify them anymore, and the cake is totally different from the original input. Indeed, the cake (a unity of disparate parts) supersedes the ingredients (Bailey, 2019; Choi & Pak, 2006). The integrative act of baking (i.e., solidifying into a new form) as a mode of creation is the hallmark of transdisciplinarity, which involves integrative collaboration between, among, and beyond academic disciplines to include the rest of the world as well: governmental bodies, industry partners, and civil society (Nicolescu, 2002).

2.4.1 Transdisciplinary Individual Traits and Orientation

This cake can only be made by people who employ transdisciplinary thinking (Augsburg, 2014; de Freitas et al., 1994). Not surprisingly, transdisciplinary work is only as strong as individual members and their ability to employ transdisciplinary thought patterns. Transdisciplinary thinking has the potential to generate innovative solutions to the world's most pressing problems; thus, it is critical to identify the traits and skills necessary for becoming an effective member of a transdisciplinary collaboration (Morales, 2017).

Fortunately, a roster of traits, skills, and attitudes comprising the transdisciplinarity mental model has evolved over time (Augsburg, 2014). As a caveat, transdisciplinary thought patterns depend on "the necessity of being grounded in a discipline, but also of being open to access of another [if needed]" (Augsburg, 2014, p. 237). Transdisciplinary thinking is especially relevant when engaging with issues that go beyond the academic world or disciplinary journals – issues that deal with fundamental dilemmas or societal crises that cannot be easily solved by traditional disciplinary approaches, methods, or analyses (Robinson, 2008).

To begin, transdisciplinary thinking depends on an ingrained respect for the collective in concert with receptivity to contradictory ideas. People must be willing to accept the unknown and trust that something will emerge. The transdisciplinary mindset depends on permanent inquisitiveness, creativity, flexibility, and adaptability. People must be able to build bridges, so they can build networks within the realm of unfamiliarity. Within these bridged networks, the transdisciplinary mind can engage in meaningful dialogue and discourse while suspending one's point of view. This temporary setting aside of one's positionality makes space for new things to cross-fertilize, fuse, and emerge. Transdisciplinary individuals value the process of discovering or uncovering perspectives that can be woven into something new (Augsburg, 2014; Helmane & Briška, 2017).

Nicolescu (2002) took a different approach. Instead of bridge building, he proposed that addressing complex problems happens in the space (gap) between actors. This is quantum space that is not empty but at its lowest level of energy and ripe with potential for new things to emerge. Bridges are not needed. Instead, people agree to step directly into this undulating space (rather than cross over it) and temporarily set aside their differences so cross-fertilization, intellectual fusion, integration, and emergence can occur. This requires a transdisciplinary mindset that (a) values many types of reality and ways of knowing (including the subjective and objective), (b) rejects fragmentation and the duality between science and humans, (c) sees the value in and necessity of contradictions and uncertainty, (d) trusts that something will emerge when using inclusive and complexity logics and (e) allows a transdisciplinary value set to arise that keeps the work moving forward. This agreed-to set of values (e.g., inclusivity, tolerance, cooperation, and solidarity) is more important than each person's value system (McGregor, 2023; Nicolescu, 2002, 2014).

To continue with the traits, transdisciplinary individuals are intellectual risk takers willing to temporarily leave the comfort of disciplinary and sectoral thinking because they appreciate that one source of knowledge is no longer enough. Moreover, they can use complex thinking while handling the immensity of knowledge in the world that can be brought to bear on an issue and can also be co-created using the transdisciplinary approach. They are intellectually curious and willing to learn from others. They are open-minded, inclined to value teamwork, and can engage in communication and active listening. They are capable of disciplined self-reflexivity, which entails self-awareness of any biases, blind spots, prejudices, and cultural and disciplinary practices that shape their interests and positions on an issue. They are also predisposed to reflect on the knowledge integration process and willing to take on new ideas that challenge their current mindset (Augsburg, 2014; Morales, 2017).

Transdisciplinary individuals also value mutuality amongst diverse minds while appreciating the difficulties in making this happen in practice given inherent contradictions and antagonisms. They combine this value of mutuality with trust in each other and the process. They tend to distinguish between and value both blind and earned trust. They are willing to suspend or surrender their own interests for the sake of the demands inherent in addressing transdisciplinary problems. They also possess the courage to temporarily abandon their disciplinary or sectoral home for the sake of integration and cross-fertilization of disciplinary and sectoral knowledge. Transdisciplinary individuals further value dependence (more so than disciplinary independence), and they see a collection of perspectives instead of just a collection of people

(Augsburg, 2014; Morales, 2017).

Stokols (2014, 2018) conceptualized a transdisciplinary orientation comprising transdisciplinary attitudes, values, beliefs, skills, knowledge, and behaviors. In addition to Augsburg's (2014) array of ideas and those noted above, Stokols added several more traits (see also Misra et al., 2015). To wit, transdisciplinary individuals are tolerant of unfamiliarity, trusting that it leads to something new. They are willing to invest time in learning about other academic fields and sectors that pertain to the issue at hand. They are also inclined to put in the requisite time and effort for prolonged transdisciplinary initiatives (Stokols, 2014).

Those embracing a transdisciplinary orientation further believe that, compared to solo disciplinary efforts, collaborative efforts amongst diverse individuals are more likely to create valuable translational outcomes (i.e., readily applied in context where needed) (Fiore et al., 2019). They value a holistic approach to viewing and addressing research and problems and appreciate the benefits of co-creating conceptual frameworks that reflect the situation's complexity rather than narrowly using disciplinary frameworks. The transdisciplinary individual also values community and collective-oriented governance practices that better enable challenging group and teamwork (Misra et al., 2014; Stokols, 2014, 2018).

Finally, Morales (2017) identified additional transdisciplinary individual traits. People fully accept that knowledge can come from many sources and emerge in many ways. They can decompartmentalize information to build bridges or step into the gap as they acknowledge and are knowledgeable about the situation's complexity. They know that disciplinary knowledge is necessary but not enough for holistic integration. Rather than identifying the problem from a disciplinary stance, transdisciplinary thinkers co-develop and co-direct research and problem solving with academic and non-academic partners. They view everyone as equals and value inclusion.

3 Shifting Paradigms

Without question, moving to transdisciplinary thinking (i.e., becoming a transdisciplinary individual employing a transdisciplinary orientation) involves a paradigm shift away from firmly entrenched mono, multi, and interdisciplinary paradigmatic thinking. Paradigm is from Greek paradeigma 'show side by side' (i.e., close together and facing the same way). Paradigm is also from Late Latin paradigma 'pattern, example' (Harper, 2023). The term paradigm has thus come to mean thought patterns held by people, so they can work side by side going forward (e.g., how to conduct research and produce or create new knowledge).

A paradigm is a pattern for how people should think about and reason through something (e.g., how to do research) (Breton & Largent, 1988). A pattern is a discernible or regular order (i.e., consistent arrangement of repeating parts) in which a series of things occur or unfold (e.g., weather patterns). As a caveat, a thought pattern does not mean people repeat the same thoughts each day. Instead, it means they use the same mindset each day when they are reasoning and thinking. People use thought patterns (paradigms) to interpret what they see and guide their actions (Brill, 1998). For example, positivism (a research paradigm) holds that the only way we can be positive the truth (valid knowledge) has been found is if researchers used the scientific method (normal, empirical science). This belief and assumption deeply shape one's thoughts about how to do research – what is acceptable as reality, knowledge, logic, and the role of values in research (McGregor, 2018).

Following internal thought patterns and habits of reasoning ensures things turn out as expected and intended – with no surprises (much like following a pattern to make a desk or a blueprint to build a house). Paradigms (thought patterns) comprise rules (assumptions) about what is worth knowing, believing, and doing. These rules keep paradigms free of significant contradictions, thereby making them trustworthy for use (Brill, 1998) (e.g., use the scientific method to conduct research to produce objective, bias-free knowledge while eschewing subjective, value-laden knowledge, which is deemed invalid and unworthy).

The next section elaborates the process and dynamics of shifting paradigms. Given that many actors are likely grounded in long-held paradigms, shifts will be necessary at the broader collective level (e.g., societal, organizational, institutional, governmental, and corporate) and the narrower individual level. Each

has its own steps or phases.

3.1 Collective Paradigm Shifts

At the collective level, a successful paradigm shift involves three types of players assuming unique roles (based on a settling-the-wild-west metaphor) (Barker, 1993). Paradigm *shifters* (visionaries) spell out the new way that fundamentally alters the way things are now done (exemplified in the alleged 1865 *New York Tribune* editorial comment, "Go West, young man") (Hughes, 2023). Paradigm pioneers are the first people off the mark to take a risk and use new rules and ideas (e.g., wagon train masters, and pioneers). Paradigm *settlers* wait until others validate the new way and only then settle in and use it. The pioneers do all the work to bring the shifter's vision to life. On their wagon train, pioneers face resistance, deal with contradictions, sustain faith when facing the unknown, and are courageous (not easily overcome). They can stay the course until a new status quo is established. The settlers do not pull up roots (shift paradigms) until the pioneers have mapped the shifter's envisioned new territory and assumed all the risks (Barker, 1993; Friefeld, 2015).

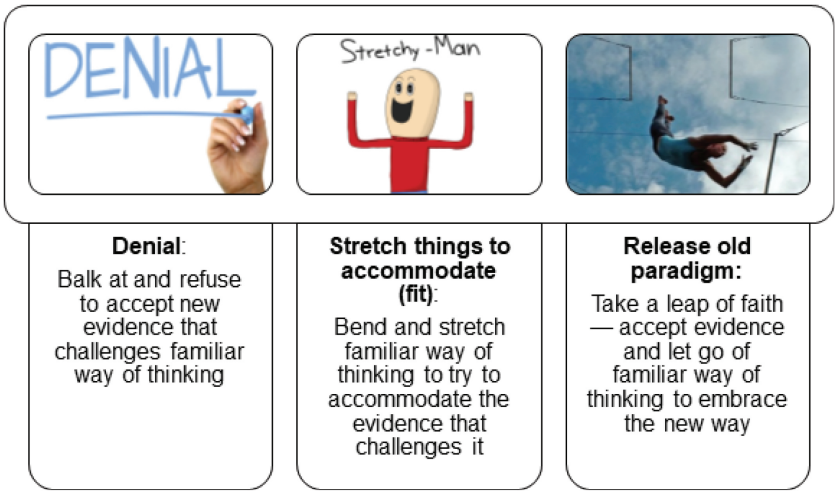

Figure 2: Three Stages of a Paradigm Shift.

3.2 Individual Paradigm Shifts

When shifting paradigms, individuals (especially paradigm settlers – the last to give in) normally move through a series of three predictable steps: (a) denial, (b) stretching things to accommodate and (c) releasing the old paradigm (Belasco & Adams, 2007) (see Figure 2). Denial constitutes refusal to acknowledge an unacceptable truth. At this stage, something rattles a person's existing way of seeing their world, and they deny it, as they cannot face or accept the new evidence that things must change – the tried-and-true way is not working anymore. Paradigms are long-held assumptions about the way things are supposed to be done. True evidence questioning their efficacy is damning because embracing this evidence means one's orderly, safe, and predictable world is turned on its head. The resultant loss of stability and assurance is normally quite terrifying. Most people go to great lengths to avoid change. Balking at challenges to familiarity is, however, is a very normal response (Belasco & Adams, 2007).

Denial can go on for years, but invariably, repeated challenges to the wisdom of doing things the tried-and-true way can occur so often, so strongly and on so many fronts that the person cannot, in good conscience, dismiss the evidence any longer. This paves the way for the second step of a paradigm shift—stretching things to fit. People try to bend their current paradigm to accommodate (fit) the

problematic evidence (e.g., gaining weight yet trying to don a too-small sweater). For some, the discomfort is so strong they cease trying and fall back into denial (e.g., wear their old sweater and make no lifestyle changes). For others, the discomfort helps them finally accept that their old way of doing things is no longer effective (e.g., they need a new sweater and a different lifestyle). With this life-altering realization, they open themselves to letting go to make room for new thought patterns – a new paradigm (Belasco & Adams, 2007).

The final step of shifting paradigms is releasing the old one and embracing the new one. Much like an aerial acrobat, the person releases the safe, familiar trapeze (i.e., steps off the high platform while gripping a horizontal bar – old paradigm) and reaches for and grasps the other bar (the new paradigm) in midair with or without a safety net. The temporary period of free fall (called the neutral zone) before landing in the new paradigm (grabbing the other bar) is terrifying for most yet liberating for others. This leap of faith — letting go before fully understanding the new way — is the final step to releasing and replacing the old worldview with new thought patterns (Belasco & Adams, 2007; Osborne & Plastrik, 1996).

3.3 Resisting Paradigm Shifts

Breton and Largent (1988) tendered several legitimate reasons for resisting paradigm shifts. Anyone contemplating shifting gears (or asking others to do so) from mono, multi, and interdisciplinarity to transdisciplinarity should acknowledge and respect these challenges to letting go and strategize accordingly.

3.3.1 Unacknowledged Addiction

Foremost, people unknowingly become addicted to invisible processes (identified by paradigm shifters as not working anymore) that manifest visibly in day-to-day workings. As an example, dependence on the scientific method, siloed disciplines, privileged empirical knowledge, and protective specialization reflect underlying processes that are hard to expose and let go. Worse still, economic, political, technological, cultural, historical, and social processes reinforce adherence to these deeply entrenched thought patterns (Breton & Largent, 1988).

To further compound matters, the symptoms themselves (e.g., siloed disciplines and hyperspecialization) become so familiar that they, too, are invisible. Adherents are blind to their influence (Breton & Largent, 1988). "The level of 'thinking distortion' that influences people in these situations is astonishing" (McGregor, 2006, p. 5). Being asked to critically examine dominant paradigms and consider letting them go can be incredibly threatening and discomfiting, leading to denial and resistance. "Because these powerful mental models [provide] stability and certainty, we often struggle fiercely to keep them intact, even after they have outlived their usefulness and grown to cause more harm than good" (McGregor, 2006, p. 5).

It is becoming increasingly evident that research confined to just disciplines (i.e., mono, multi, and interdisciplinarity) is not enough to confront the complexity of problems facing humanity. But doing research with government, business, or society is frowned upon under discipline-only research paradigms due to the loss of sacrosanct objectivity and the perceived threat of complicity and partisanship (Nicolescu, 2014). We, thus, witness tenacious adherence to disciplinarity at the expense of considering transdisciplinarity and what it can offer.

3.3.2 Protective Cloaking Devices

The threat posed by changing paradigms is so real that people often create protective cloaking devices (Breton & Largent, 1988). The purpose of this cloak is to shield them from those who are challenging their deeply entrenched paradigms. To create this protective cloak, paradigm resisters align themselves with like-minded peers who use the same mental models. The cloak further serves to block aspects of their lives and practice that cannot be addressed using their current paradigms. Unfortunately, the resultant blind spots represent failure to take advantage of new ways of thinking. Because blinders cripple paradigm shifts, cloaking devices aid in maintaining the status quo.

3.3.3 Taboos

People can also create taboos to ward off an incursion into the cloak's protective zone (Breton & Largent, 1988). A taboo is a prohibition on something deemed unacceptable or excluded from practice. It is inviolable, forbidden, and sometimes sacred (Harper, 2023). For example, some consider it taboo to challenge disciplinary knowledge, specialization, and the scientific method, which are held sacrosanct (highly revered and untouchable). Academics who do so often face alienation, blocked promotions and tenure, and research funding obstructions. Such is the case with interdisciplinary and transdisciplinary scholars compared to disciplinary. The centuries-old university reappointment, tenure, and promotion (RTP) system is designed for *disciplinary* career progression (NRC, 2015; Stokols, 2014) not transdisciplinary.

3.3.4 Defensive Routines

A final resistance strategy is using defensive routines to protect oneself from pain, embarrassment, surprises, contradictions, or feeling threatened (Argyris, 1986; Breton & Largent, 1988). In this case, it is the possibility of one's thinking (paradigm) being exposed as deficient, insufficient, or irrelevant in contemporary times. Defensive routines are thoughts, actions, or policies that protect the usual way of functioning (Breton & Largent, 1988). People routinely push back to defend the status quo by reasoning that (a) things have always been done a certain way, (b) a way of thinking worked in the past, (c) everyone is doing it this way or (d) job security and reputation are at risk if they challenge the status quo. Constantly being on the defensive can stifle and even stymy any possibility of mental breakthroughs or paradigm shifts because it is anti-learning (Argyris, 1986).

Also, the sense of belonging with like-minded others in the discipline is often too important to risk being threatened (Breton & Largent, 1988). University faculty members gain their disciplinary identity through socialization, contributions to disciplinary knowledge accumulation, application of disciplinary knowing in practice, self-positioning in their field, and external shaping as a member of their discipline (Hyland, 2001). The possible loss of disciplinary identity with a paradigm shift to transdisciplinarity is untenable for most people. They need support in this transition.

3.4 Supporting Paradigm Shifts

With a full appreciation of (a) the existence of a paradigm shift learning curve, (b) steps people move through to shift thought patterns and (c) natural resistance to the loss of familiar worldviews, paradigm shift advocates can heed key advice for how to support people in this transition (Ferraro, 2014; Luukkonen, 2022; Osborne & Plastrik, 1996).

3.4.1 Communicate Anomalies, Clarify New Direction

After discerning anomalies, whereby the existing paradigm is deemed inadequate for contemporary problems, paradigm visionaries (shifters) and pioneers (leaders) must help others perceive this dissonance as well. For most people, perception is their reality. Thus, perceiving that their most basic assumptions do not hold anymore is the first step in a paradigm shift, and people need help with this change in their reality. It is also important to give people a clear set of new rules and different assumptions that they can begin to embrace to better tolerate the ambiguity associated with letting go of familiar thought patterns. All aspects of the new paradigm must be set out clearly and enticingly (Osborne & Plastrik, 1996).

Providing detailed information about what the new way looks like builds trust and faith that the shift works (see McGregor, 2023, for different transdisciplinary approaches); this trust makes it easier for people to let go. To aid in letting go, paradigm pioneers (leaders) should provide proof that others who shifted paradigms flourished using the new thought patterns (Osborne & Plastrik, 1996). McGregor and Volckmann (2011) provided such evidence for transdisciplinarity (see also Vienni-Baptista & Klein, 2022).

3.4.2 Buffer Zones, Touchstones, and Safety Nets

A key part of leading a paradigm shift is respecting that people need time to adjust to the idea that a paradigm shift paradoxically begins with an ending. Endings can be frightening and daunting. Most people linger for some time in the buffer zone that separates the old and new paradigms. Buffer zones serve to reduce shock (i.e., sudden or upsetting events triggering stress). Paradigm shift leaders should, thus, intentionally create touchstones for people, such as reference points and guidelines that serve as anchors during the paradigmatic struggle. It is also imperative that a safety net is provided to help people feel secure while facing difficulties. Safety nets deflect forces experienced during paradigm shifts by dissipating the impact of this life-altering change. With a safety net in place, people are more likely to risk changing their thought patterns (Osborne & Plastrik, 1996).

As examples, Luukkonen (2022) explained that new paradigmatic habits and rituals can create a sense of safety. They provide structure, order, and handrails to help steady people on the ladder of change. He believed that small, satisfying changes to thought patterns (i.e., introduce and try out different habits and rituals) can lead to remarkable results and positive paradigm shifts because rituals and habits pertaining to the new paradigm help people fit in and find their way. They bring order and efficiency to their world and help them feel safe and more ready to risk changing their thought patterns.

Ferraro (2014) recommended that paradigm shift advocates should consider training the trainers about the new paradigm. This includes people in institutional management (such as deans and chairs) who work closely with the rank and file who are being asked to shift. They can lead and support faculty members and students in shifting to transdisciplinarity. Another strategy is to arrange for anonymous surveys, whereby people can securely and safely share thoughts about their experience with a shift in thinking.

To help people become more accepting of the paradigm shift, paradigm leaders can also create an environment where people can take a risk, experiment with new thought patterns, and know that if they fail in this test run, there are no negative consequences. Another suggestion is to frequently enact different and small changes in thought patterns to ease people into the shift. This "small and constant" (Ferraro, 2014, para. 15) incremental approach is better than dropping significant changes on people with no warning.

Additional pragmatic advice includes innovatively enticing people to try out the proposed paradigm. Paradigm leaders must also walk the talk to give the new paradigm credibility; they, too, must use these thought patterns. They must also send a clear signal that people are expected to make a clean break from the past, and that a shift is needed. Paradigm pioneers (who do the grunt work) must be encouraged to act. Injecting intentional, periodic shots of new blood (i.e., those who embrace the new paradigm) is also recommended. Call attention to success stories. Respect resistance, but weed out fear by using communication, information, and positive reinforcement and support. People must be willing to risk leaving familiarity behind. Finally, identify and bridge fault lines that may be preventing the paradigm shift. Fault lines uproot things and can stall paradigm shifts, which are themselves, ironically, uprooting (Ferraro, 2014; Osborne & Plastrik, 1996).

3.4.3 Habits, Hearts, and Minds

This collection of touchstones and safety-net guidelines pertains to changing mental habits, touching hearts, and winning minds (Osborne & Plastrik, 1996). Respectively, mental habits can be changed by creating different experiences for people that challenge their thought patterns. Their eventual appreciation that the old way of doing things does not work anymore opens the door to new ways of thinking and acting. Touching hearts entails doing something that makes a person feel a particularly strong emotion. This involves creating scenarios, whereby people must break out of deeply felt attachments thus enabling them to experience shifts in intellectual and emotional commitment to long-held thought patterns. Winning someone's mind depends on paradigm leaders acting with dignity, integrity, and openness when encountering resistance. Paradigm leaders who are thus seen as authentic and genuine are more likely to win people over to the new paradigm. The latter can then develop new understandings and mental models about where they need to go and how to get there (Osborne & Plastrik, 1996).

4 Conclusion

Deeply entrenched ways of doing research that subsequently inform how to deal with crises are being challenged. Research and practice pursuant to addressing complex problems will benefit from transdisciplinary thinking, which inturn is dependent on life-altering paradigm shifts. To that end, this article explored the differences between mono, multi, inter, and transdisciplinary thinking, so people can more readily find themselves, clarify the nature of their work, and appreciate the magnitude of change required if they shift paradigms to transdisciplinary thinking. A roster of skills, traits, and attitudes was shared, so people can better grasp what their new approach to research and practice might entail. Appreciating how difficult it is to change thought patterns, people should also know that shifting paradigms occurs at collective and individual levels.

Becoming a transdisciplinary individual who can employ a transdisciplinary orientation can be envisioned and more likely realized with a full appreciation for what is involved in shifting mind habits and thought patterns. People naturally resist losing their familiar way of thinking and need support, touchstones, and guidance if they ever hope to take the leap of faith required to move forward into unfamiliar, transdisciplinary thinking. That said, transdisciplinarity has cemented itself as a promising strategy for addressing complex problems. This paper contributes to making that promise a reality – to bringing transdisciplinarity into the light via powerful, long-overdue paradigm shifts.

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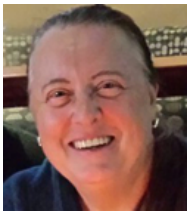

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