

Section 9.

Designing for Transitions

Editorial: Designing for Transitions

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“Transition Design acknowledges that we are living in ‘transitional times’. It takes as its central premise the need for societal transitions to more sustainable futures and argues that design has a key role to play in these transitions. It applies an understanding of the interconnectedness of social, economic, political and natural systems to address problems at all levels of spatiotemporal scale in ways that improve quality of life. Transition Design advocates the reconception of entire lifestyles, with the aim of making them more place-based, convivial and participatory and harmonizing them with the natural environment” (Irwin et al 2015).

The *Designing for Transitions* track at DRS 2018 encompasses emerging approaches to design research at the intersection of sustainable design and sociotechnical systems theory. Exemplary are the growing international research communities explicitly centred around Transition Design (e.g. Irwin et al 2015) and Systemic Design (e.g. Sevaldson 2017), aiming to strengthen the role of design in the context of societal challenges. Whether considered in terms of everyday social practices, at a community scale or at the level of global challenges, a framing around designing for transitions brings together considerations of temporality, futures, different types of literacies, participation, social innovation, human needs, and interconnectedness; designing for transitions involves designing how transitions are conceived, enacted, governed and managed.

Our aim at DRS is for the track to build bridges between scholars and designers who work on transition in design, whether their work is explicitly framed in terms of transitions, or whether they encompass expertise and framings which take a broader view of design for social sustainability. The selection of ten full papers on designing for transitions from the 33 submissions to the track provide a window onto a range of diverse current work from researchers with different disciplinary specialities, from social innovation to futures to energy use practices—but all also strongly congruent with the wider theme of DRS 2018, ‘Catalyst’.

The first session clusters five papers that explore ‘Future Visioning and Worldviews in Transition’ – recognising the importance of exploring narratives, mindsets, and visions of different possibilities and alternatives in considering designing for transitions. In the first paper (Hesselgren et al 2018), authors Mia Hesselgren, Elina Eriksson, Josefin Wangen and Looe Broms look at future images of energy transitions with newly designed tools to initiate dialogues and reflections for the future. The second paper is a theoretical reflection on the myths of modernity by Renata M. Leitão. The paper



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(Leitão 2018) considers myths that are hindering the transformation of our ways of thinking and conditions that will enable new epistemologies to emerge. The third paper (Srivastava and Culén 2018) investigates pathways for decreased consumption amongst millennials. Authors Swati Srivastava and Alma Leora Culén describe Zygo, a future service based on the second-hand marketplace. The fourth paper entitled 'A Vocabulary for Visions in Designing for Transitions' by Dan Lockton and Stuart Candy considers a set of concepts relating particularly to vision in designing for transitions by building on perspectives and projects from other fields (Lockton and Candy 2018). The final paper in this first session is by Jonas Fritsch, 'Affective Interaction Design at the End of the World'. This paper (Fritsch 2018) proposes a rethinking of affect in HCI and interaction design based on recent theoretical advances in cultural and critical theory, especially affective attachments on a macro-level.

Our second session stresses 'The Practice of Transition Design', through both papers reporting on practical cases, and more theoretical contributions to the analysis of practice in transition contexts. Terry Irwin kicks off, outlining an emerging Transition Design approach for addressing 'wicked' problems (such as climate change, loss of biodiversity, crime, poverty, and pollution) and catalysing societal transitions toward more sustainable and desirable futures, including describing how Transition Design is being tested on a community-based project (Irwin 2018). Next, Stacie Rohrbach and Molly Wright Steenson examine teaching and learning in Transition Design, creating a theoretical basis that informs the practice of transition design, outlines methods and tools and proposes opportunities for development (Rohrbach and Steenson 2018). İdil Gaziulusoy and Elif Erdoğan Öztekin's paper 'Design as a Catalyst for Sustainability Transitions' contributes a literature review on theories of sustainability transitions and design, also linking very clearly to DRS 2018's overall theme of examining design as a catalyst for change (Gaziulusoy and Erdoğan Öztekin 2018). The fourth paper, entitled 'Catalysing pathway creation for transition governance' by Sampsa Hyysalo, Sofi Perikangas, Tatu Marttila, and Karoliina Auvinen, reviews transition management for catalysing vision building, experimentation and pathway construction for sustainability transitions in a Finnish energy context (Hyysalo et al 2018). Our final presenters, Niti Bhan and Rinku Gajera, examine users in an informal trade ecosystems and the creation of a 'value web' or the value creator's entire value web, as a basis for systemic design interventions (Bhan and Gajera 2018).

While the authors presented visions and practices that demonstrate the critical role of design in the context of societal challenges, they generally stayed on the safe and perhaps 'conventional' side. There is not much explicitly *political* in these papers. What do we *not* see represented here? From our perspective as track chairs—drawing on our own research areas as well as others—we stress the need for an increasing focus on power, politics and the political economy of design for transitions. Transition Design must engage with politicised issues such as migration, decoloniality, the politics of climate change mitigation (not just adaptation) and other complex and controversial problems. Perhaps the de-politicised nature of these papers (and typically DRS papers in general) reflects the political economy of design research – and those voices who are able to participate in the Design Research Society community? We note the Decolonising Design group's DRS2016 statement: "We strongly believe that design, as a field of study, has systematically failed to address the questions of power that have shaped its own practice" (Ansari et al, 2016). One might argue that design research is insufficiently engaged with the debates in adjacent disciplines and that designers will find it hard create the change to which Transition Design aspires without better theory and practice around the politics of Transition Design. This expanded focus on of attention at the intersection of design, the environment and politics has been developed in some depth in recent work of one of the track chairs (Boehnert 2018) and in Arturo Escobar's recent publications (2015, 2018). Ultimately, Transition Design must engage with the system structures that determine whose interests are served by design.

Transition Design's focus on systemic approaches must be developed in greater depth. With this collection we see little work which really employs systems thinking or cybernetic ideas beyond fairly

basic notions of complexity or simple feedback loops; it seems as though there is a great opportunity here for a deeper systems investigation of transitions in different contexts, including via participatory methods (e.g. Birney et al 2017; Aguirre Ulloa and Paulsen 2017). As the field matures, we will also—hopefully—see more applied case studies of how a Transition Design approach works in practice, complementing the examples we have in this track at present. This might include more attention to the experience of transitions in everyday life—the ways in which the futures of everyday practices might evolve and change, and how design which centres on lived experience can address that (e.g. Scott et al 2011), how changes in agency (mediated by technological change) may trigger changes in social practices (e.g. Kuijter and Giaccardi 2018) and how that might relate to concepts such as commons and commoning (e.g. Onafuwa 2018 ; Morelli et al., 2017) or even situated ‘experiments in transition’ such as living labs (e.g. Keyson et al 2016) or living ‘in prototypes’ (e.g. Desjardins and Wakkary 2016).

In keeping with Mulder and Loorbach (2016) a multi-level perspective approach as well as a transition in the design regime itself are needed to bring both the emerging debate and the corresponding practices around ‘transition design’ forward. Hence, transitions are long-term, complex, and non-linear processes of systemic change, which usually only become visible at societal level over decades. The high level of ambiguity, unstructuredness, and uncertainty, makes it hard to plan and design transitions. The role of design is, however, visible in the various niches, experiments and design interventions indicating their proneness to address societal challenges. Key is how these niches together can shape the contours of the changing design regime. See for example, De Koning and colleagues (2017) who studied emerging city makers to understand how their design capabilities can enable systemic change through a focus on participatory design. These new types of city makers generally bring value to the cities, however, their value could be enriched through more participatory networks that stimulate crossovers and accelerate the transition towards sustainable futures. Track chair Ingrid Mulder’s work on participatory city making, working with communities and co-design of transitions is relevant here (Mulder & Loorbach 2016). Transition Design is practice linked to Transition Town movements and community activism. Here again power imbalances need to be theorised, and are all too often poorly articulated in design theory.

In this DRS track, we have brought together various niches in design research, which we hope not only contribute to the corresponding debate more widely at DRS 2018, in our track and in the foreseen keynote “Whose Design?” by Sadie Red Wing and Arturo Escobar, but also will enable a better framing of design for transitions, and mature our design repertoire and actions for transitions.

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Affective Interaction Design at the End of the World

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We are living in a time of ecological and humanitarian crisis that requires imminent action from the joint fields of HCI and interaction design today. This paper presents Affective Interaction Design as an emerging research agenda directly targeting end-of-world challenges. To arrive at this, the paper proposes a re-thinking of affect in HCI and interaction design based on recent theoretical advances in cultural and critical theory, in particular emphasizing how a broadened understanding of affect is necessary to better address affectively charged and uncertain situations such as those connected to the end of the world. The paper sketches out how Affective Interaction Design combines conceptual guidelines, design methods, a situational ethics and new ways of assessing the value of affective interactions over time. Finally, the paper outlines three end-of-world frames for engaging with concrete affective design experiments – the end of nature, the end of culture and the end of the human – where digital and interactive technologies can be used on a micro-level to catalyze changes in affective attachments on a macro-level.

affective interaction design; affect theory; transition design; design theory.

1 Introduction

In the last years it has become increasingly clear that the world is reaching a number of far- from-equilibrium tipping points related to recent developments in major environmental and societal crises facing us. In a very palpable way, we seem to be moving towards the “end of the world”. This image might be most clearly associated with the climate crisis, but is also present in such affectively tensed areas as the ongoing civil wars in Syria and Yemen, the current refugee and immigration crisis, the post-Brexit EU, the right-wing populism sweeping through politics in Europe and the US, a constantly looming terror and, lately, nuclear threat and the pervasive effects of the financial crash in 2008. According to the Belgian philosopher Isabelle Stengers, we are indeed living in ‘catastrophic times’ facing the imminent end of natural resources and a disequilibrium of the ecological and cultural systems with which we are familiar today (2013). In his book from 2010, *Living in the End Times*, Slovenian philosopher Slavoj Žižek identifies four so-called ‘riders of the apocalypse’, namely:



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“(...) the ecological crisis, the consequences of the biogenetic revolution, imbalances with the system itself (problems with intellectual property; forthcoming struggles over raw materials, food and water) and the explosive growth of social divisions and exclusions.” (2010, p. x)

Living at the end of the world means living in times where “choices in the present become highly charged affectively with fear for the uncertain future” (Massumi 2015, p. 4). For many this means coping with a growing urge to change this condition, accompanied by a feeling that it is impossible to find ways to act in the light of the overwhelming complexity presented by these interconnected global, ecological and humanitarian problems (Klein 2014). This is partly due to the difficulty of rationally comprehending the globally interconnected effects of a range of societal and environmental challenges that seem to be overlapping and spilling into each other (Tsing 2015).

Within HCI and design research, a response to this situation might be located in the emergence of Transition Design as an encompassing design-led agenda for engaging with a range of interconnected social, economic, political and natural systems to form more sustainable ways of living (Irwin 2015). Light et al. have also forcefully put forth a call for action under the heading of design for existential crisis in the anthropocene age (2017). The authors argue that technology designers and design researchers have a stake in the production of futures, and are hence implicated in the waves of change and uncertainty in a world characterized by ecological crisis, populism, mass migration, rising refugee numbers, automation and the like. Light et al. frame their project in relation to design as an existential challenge with a range of ethical concerns and the need for new design values to be explored in order to potentially “save humanity”. Within this frame, the authors point towards concrete suggestions for attuning designers’ towards meaning, purpose and fulfilment in difficult, unstable and rapidly changing times. Specifically, they argue that designers should focus on being “attentive, different, critical and in it together” (ibid., p. 6).

This paper extends the general call for action presented above while at the same time situating it in a tangential conceptual and genealogical trajectory presenting an emerging research agenda on Affective Interaction Design for end-of-world challenges. Essentially, the argument presented in this paper is that Affective Interaction Design can offer a research agenda that facilitates a sustained engagement with uncertain and affectively charged design situations at the end of the world. In cultural and critical theory, a large body of work within the so-called ‘Affective Turn’ has been instrumental in theorizing and analyzing situations characterized by uncertainty and trauma in more than a decade (Clough 2007, Gregg & Seigworth 2010). Starting from a basic Spinozan definition of affect as an “ability to affect and be affected” (Spinoza 1678), the paper introduces this affect theoretical genealogy into HCI and interaction design. Affect here is understood as a pre-personal intensity, that influences our bodily, vital forces directly (Massumi 2002). According to Spinoza, positive affects are those that make us feel alive and act in the world. Negative affects have the opposite effect, reducing our possible activity in the world and making this reduction felt. In this conceptual framing, end-of-world contexts would be characterized by negative affect, making it difficult to act or be acted upon. Living at the end of the world – or perceiving to be living at the end of the world – both has an impact on our ability to affect (what can we do?) and our ability to be affected (what matters?).

Based on three concrete affectively charged end-of-world design situations, this paper will show how it might be possible to design affective interactions on a micro-level for positive changes in affective attachments (Bennet 2001) and new possibilities for action on a macro-level. Importantly, though, this is not a trivial process, and often requires painful transitions tied to personal development and negative affects when effectuating this change (Massumi 2015). This means that Affective Interaction Design is not to be understood as an “easy-fix” for making people ‘feel good’ in difficult situations, or as overly relying on the supposed power to design your “way out of trouble”. Instead, this paper provides a call for action for a sustained engagement with affectively charged design situations at the end of the world.

To arrive at a working notion of Affective Interaction Design, the first section will present a new affect theoretical foundation for understanding affective concerns in HCI and interaction design based on recent findings from cultural and critical theory. It will be shown how this conceptual reframing better allows for a designerly engagement with affectively charged situations such as end-of-world contexts. Based on this, a more detailed description of how Affective Interaction Design can be developed as a research agenda comprising conceptual guidelines, methods, situational ethics and longitudinal assessments of affective design experiments leveraging the potential for affective mobilization in existing digital and interactive technologies. Finally, the article frames three concrete design experiments relating to three different “ends of the world”; the end of nature, end of culture and end of the human. This feeds into a general discussion of the Affective Interaction Design research agenda and points in the direction of future work to be pursued under this heading.

2 Rethinking Affect in HCI and Interaction Design at the End of the World

In the past two decades, affect has played a central role in broadening the scope of both the theoretical foundations and practical design implications of interaction design and HCI. Intensive work has been carried out under the heading of Affective Computing in an attempt to make computers better at displaying and recognizing human emotions as a central part of improving the interaction with interactive systems (Picard 1997). Emotional Design (Norman 2004) argues for understanding affective and visceral attachments to product design as a central aspect of a product’s success or failure, much in line with e.g. Jordan’s work on pleasurable object design (2002). However, within HCI and interaction design, Affective Computing and Emotional Design have been criticized for attempting to overly structuralize, formalize, and represent emotions and affect as ‘informational’ (see, e.g., Sengers et al. 2002, Aboulafia and Bannon 2004). A range of researchers have advocated rethinking the ‘informational’ or ‘cognitive’ understanding of affect, arguing that emotions and affect are in the affective interaction between a user and a system, and not to be found in the code or hardware (Boehner et al. 2005, Höök 2008). Recently, Lottridge et al. have defined an ‘*affective interaction*’ as any interaction that is coloured by an emotional experience (2011, p. 201). These ‘interactional’ approaches all emphasize the centrality of affect and emotion to understanding the richness and complexity of human experience and consequently the need to explore this in the design of interactive systems. In this body of work, the aim is less to contain affect than it is to unfold a range of different affective relations to be experimented with in the crafting of interactive system for design values such as self-reflection or ambiguity. Höök has further argued that in addition to the ‘informational’ and ‘interactional’ approaches to affect a third approach exists, where affect more generally falls within an experience-oriented (McCarthy & Wright 2004) approach to HCI and interaction design (2012).

Notable examples within an Affective Computing approach to design include projects on affective learning in how to train autistic children to express and recognize affective states (Blocher & Picard, 2002) and a range of projects aimed at measuring and reducing stress in computer tasks, combining facial readings and physiological data (e.g. McDuff et al., 2016). Recent work includes studies of how emotion tracking through various forms of data logging can promote successful behaviour change through affective forecasting (Hollis et al., 2015) and the design of a context-sensitive smartphone app to naturally embed inspiration to express gratitude in everyday life (Ghandeharioun et al. 2016). Concerning design projects within the ‘interactional’ approach, a prototypical example is the *Influencing Machine* (Sengers et al. 2002), an enigmatic installation where users influence the emotions of an (invisible) artificial agent expressing its emotions through visuals and sound. In line with this, *Affector* is an experiment in the co-interpretation of affect, where a video window between the offices of two friends communicates their moods by systematically distorting the video feed according to sensor readings (Sengers et al. 2008). A more recent example is *AffectAuru*, an emotional prosthetic that allows users to reflect on their emotional states over time, combining a multimodal sensor setup for continuous logging of audio, visual, physiological and contextual data and an interface for user reflection while using the system (McDuff et al., 2012).

Whereas the ‘informational’ approach to affect has rightly been criticized for sometimes reducing the complexity of emotional and affective concerns in HCI and interaction design to make them fit within a computing perspective, the ‘interactional’ approach often leads to designs that attempt to make people reflect on the richness of their own emotional situation, it might be argued that this also reduces affect to an individual’s immediate feeling, and lacks in ambition and scope for unfolding the potential of affective interactions when considering affect as constitutive force for both human experience and larger societal formations. Indeed, the end-of-world challenges that we are facing today point to the necessity to engage with the long-term evolutions of affective relations and attachments while extending the focus of inquiry from the immediate feeling of the interaction towards larger relational issues.

To mobilize a theoretical starting point for Affective Interaction Design that deals directly with these issues, this paper combines the advances in affect theoretical studies in philosophy, aesthetics, cultural and critical theory with interaction design research targeted at crafting interactive and digital technologies. Indeed, the interest in addressing affective guidelines in HCI and interaction design as seen in e.g. *Affective Computing and Emotional Design* should be seen relative to a general acknowledgement over the last decades of articulating and conceptualizing affective and emotional forces as basically constitutive for understanding human experience and development in a number of disciplinary fields (Stern 1985, Damasio 1994, LeDoux 1996, Kahneman 2011, Dolan 2012). In critical and cultural theory, there has been an ‘Affective Turn’ towards research into the impact on a non-cognitive and bio-social level of new media and technologies on our possibilities of experience in a globalized world (Massumi 2002, Sedgwick 2003, Clough 2007, Gregg & Seigworth 2010, Blackmann 2012, Karatzogianni & Kunstman 2012, Hillis et al. 2015). Importantly, this research has emphasized how affect must be understood not only as relating to an individual’s self-relation or assessment of emotions (“how do I feel”), but also as a constitutive force in a range of larger societal formations such as economic markets and stock trade (Massumi 2015), networked and social media (Hillis et al. 2015) and activist politics and Culture Wars (Reestorf 2016). Affective Interaction Design draws on this work and cultivates established philosophical theories of affect (e.g. Spinoza 1678, James 1912, Whitehead 1929, Bergson 1907, Deleuze 1970) that will be applied in order to clarify how these conceptual starting points can lead to new affective concerns in interaction design.

In Affective Interaction Design, affect is conceptualized as a pre-personal intensity that influences our bodily, vital forces directly. This is to be understood as a capacity to act and be acted upon through increase or decrease of e.g. joy, sorrow or desire (Spinoza 1678, Massumi 2002). Affect is neither purely natural/physiological, nor solely cultural. This also means that affect can neither be contained as the properties of a person, nor the properties of a system. Affective experience lies ‘in-between’ and thus brings together the natural and cultural in affective-felt tendencies that modulate the potential for action in a given situation (Massumi 2009). In earlier work, I have explored how this can be used in HCI and interaction design as a way to challenge basic notions of interaction and interactivity in material, processual and experiential terms (Fritsch 2009, Fritsch 2011). Here, the argument presented has been that starting from affective experience entails looking into the very formation of experience; that which *makes us* experience and the forces that modulate this. Importantly, affect differs from emotion, which is understood as recognized affect; affect is pre-personal and non-conscious whereas emotion has individuated to a conscious form. An example is feeling angry; you are already feeling something, before you recognize this feeling as anger. Munezero et al. have presented a framework based on the work of Massumi to better differentiate between affect, feeling, emotion, sentiment and opinion in relation to text detection, arguing that affect is non-conscious and a predecessor to feelings and emotions (2014, p. 104). Further, Massumi has argued that affect works on a microperceptual level with macropolitical consequences (2009).

Starting from an affect theoretical foundation means starting with affect as an in-between dimension of experience that modulates how we experience and the relations and attachments we form. Within the frame of Affective Interaction Design, this allows us to tentatively define affective

interactions as interactions with concrete digital and interactive technologies (on a micro-level) that catalyze new affective attachments and mobilize affect towards end-of-world problems (on a macro-level). End-of-world contexts are characterized by negative affect, making it difficult to act – and inter-act. Affective Interaction Design thus attempts to effectuate changes by altering affective attachments through affective interactions towards positive affects that offer new possibilities for action. Importantly, though, this is not a trivial process, and often requires negative affects as part of the process of change (Massumi 2015).

In addition to the explicitly affect-oriented approaches to design, Affective Interaction Design also draws on a range of findings from a number of design research approaches. The need to engage in critically challenging real-world issues, politics and policymaking through explorations of technology design adheres to longstanding perspective from Participatory Design (Greenbaum & Kyng 1991), Critical Design (Dunne 1999), Adversarial Design (Di Salvo 2012), Design Activism (Markussen 2013) and Transition Design (Irwin 2015). In relation to the proposed design experiments concerned with the climate and cultural crises, Sustainable Interaction Design (SID) serves as a foundational inspiration for exploring “(...) how interactive technologies can be used to promote more sustainable behaviors (Blevins 2007, p. 503). Affective Interaction Design adds to these design explorations an agenda for addressing affect conceptual guidelines, when intervening into design situations at the end of the world. The next section further develops how such an agenda might be comprised.

3 Sketching a Research Agenda for Affective Interaction Design

The societal imperative to find new ways of tackling the transversal nature and complex issues related to end-of-world challenges is coupled with the need presented in this paper to radically broaden the notion of affect in interaction design and develop Affective Interaction Design as a new design research agenda. In the following, the paper sketches out the different aspects of an affective research agenda in HCI and interaction design that fully acknowledges affect as a constitutive force of human experience and larger social and societal formations, such as those presented by end-of-world challenges.

3.1 Conceptual design guidelines and values

The majority of the research on affective design guidelines in HCI and interaction design has been aimed at establishing affect as a concept, which should be considered in the design and evaluation of computers to help people better perform specific tasks (Picard 1997, Norman 2004). Lottridge et al. present a range of guidelines for putting emotion research into practice, such as ‘to enhance performance through emotional input and regulation’, ‘to visualize emotion for decision support’ and ‘to foster the appropriate emotion for different learning goals’ (2012, p. 228f). However, what Affective Interaction Design aims to provide are specific conceptual guidelines for addressing behavioural change by altering affective attachments in relation to emotionally saturated issues such as end-of-world problems, through affective interactions. Developing appropriate affect conceptual guidelines and values to orient the design work in the proposed design experiments is a key activity in this respect. As opposed to design principles, which might be considered clear rules of thumb (Blair-Early & Zender 2008), the main task of these guidelines is to offer to interaction design researcher concepts, directions and themes of engagement that can guide the practical design work without in any way predetermining it. These guidelines will be formulated based on the presented theoretical foundation in the light of end-of-world challenges and refined through practical experiments.

3.2 Developing affective design methods and a situational ethics

It requires great considerations and care to intervene into affectively charged design situations at the end of the world, characterized by uncertainty and vulnerability. There is a substantial amount of literature in HCI and design addressing e.g. designing for vulnerable user groups but no established methods for addressing affective issues in the design process. Among others, Munteanu et al. describe this situation and call for a need to establish a ‘situational ethics’ (2015) for intervening into

such problematic design settings. The authors argue that a situational ethics is necessary to meet the ethical challenges in field work or design experiments involving at-risk or vulnerable user groups, both in the planning and execution stages of the research (2015). Since Affective Interaction Design deals with concrete affective tensions in cultural, natural and physiological situations of crisis, it will be imperative to consider the ethical challenges for both users and researchers. According to Munteanu et al., a strategy to build a situational ethics requires looking for 'ethical triggers', continuously assessing risks and adjusting protocols accordingly and ensuring a multidisciplinary design team (ibid. p. 113). A situational ethics will also outline viable ways of entering, leaving and sustaining the design initiatives. It will also affect the design methods and techniques occurring at all stages of the design process. Some of these methods will be appropriated in the light of the affective design agenda. In addition, new methods and techniques must be developed to cater specifically for affective data and concerns. Developing an extensive repertoire of affective design methods and a situational ethics is therefore key to guiding the practical design processes related to end-of-world problems.

3.1 Assessing the value of affective interaction design over time

Measurements of affect have a long history of influencing the development of HCI, where extensive research has been carried out to explore methods of assessing affective and emotional features in the evaluation of interactive systems (Lottridge et al. 2011, Pollak et al. 2011). However, this research is primarily concerned with establishing an accurate account of an individual's experience of a given interaction with a computer system and this system's capability to influence affective states and does not engage with the end-of-world issues presented above. There is a need to develop non-reductionist ways of assessing the value of Affective Interaction Design that go beyond the individual's immediate feeling, when interacting with the system, and accentuate long-term affective mobilizations and changes in affective states and relations towards specific societal issues. Therefore, it will be necessary to develop a model for studying affective attachments over time combining longitudinal digital ethnographic studies (Markham 2015) and continuous logging of physiological measurements (Lottridge et al. 2011) for observations on relational changes (macro). This will be combined with qualitative micro-analytical interviews (Stern 2004) and video-cued recall methods (Suchman & Trigg 1991) unfolding the micro observations of the affective qualities of the interactions with the different technologies. The aim is to combine the micro-analytics of the affective interaction with the long-term relational impact on affective attachments to cultivate new design values in an affective perspective.

3.2 New technologies and affective design exemplars

Affective Interaction Design must be established as a form of research-through design (Frayling 1993), where the theoretical mobilization should continuously be informed through a practice-based engagement with building affective design prototypes. It will be necessary to develop a range of affective design exemplars (Binder & Redström 2006), i.e. designs that specifically embody the Affective Interaction Design research agenda. As shown above, prior design experiments engaging with affect include work on the display and measurements of affective states in computer systems for learning and motivation and artistic interventions aimed at making people reflect on their emotions. The existing affective design prototypes within HCI and interaction design present a multifaceted interpretation of affect; from physiological measurements, facial recognition and computers aiming to express emotions to systems that foster affective and emotional reflections. However, there are no prototypes concerning the explicit use of an affective approach to meeting end-of-world challenges. Hence, Affective Interaction Design will develop affective design prototypes that can serve as guidance for future explorations. These prototypes will explore particular technologies believed to hold a potential for changing affective attachments, which will be further explored in the next section.

4 Framing Affective Design Experiments for End-of-world Challenges

This section presents three potential 'ends of the world' that can be used to suggest three overall frames for directing affective design experiments within the overall agenda of Affective Interaction Design. Some of the experiments draw on existing explorations, others remain on a more conceptual level, but they are all in-the-making. All three frames attempt to give an indication of how specific technologies can be developed and tested in the design of real-world applicable affective design prototypes proposing to change affective attachments and relations through micro-interactions targeting three end-of-world design situations: the end of nature, the end of culture and the end of the human.

4.1 End of Nature

The end of nature relates to the challenges we face with the current climate crisis. Data from the UN's *World Meteorological Organization* (WMO) indicate that 2016 was the world's hottest year ever on record, with devastating consequences for the melting of the Arctic Sea and a growing number of natural disasters worldwide¹. Within the overarching frame of Affective Interaction Design, a starting point for engaging with design experiments related to the end of nature might explore the design of affective interactions for changing habits related to the climate crisis deploying advanced and distributed sensor and actuator technologies. The goal would be to technologically stage affective attachments to issues related to the climate crisis, such as food or product consumption, CO₂ emission, carbon footprints, deforestation and other environmental issues. The hypothesis would be that creating a stronger affective link between people and the environment can lead to changes in behaviour and habits. This might be achieved through sensorial augmentation, which refers to an augmentation of the senses, using technological enhancement to detect something that the body cannot normally perceive (Linden et al. 2011). In an earlier project, we have developed Feltradio (Grönvall et al. 2016), which is a portable technology for sensing WiFi through sensorial augmentation and Electric Muscle Stimulation (EMS). In relation to the end of nature, we are currently exploring how to use the same infrastructure to affectively relate to e.g. the level of CO₂ emission, so people can actually experience that which they cannot normally sense. This might foster a critical awareness of the relations between people and the natural resources being used and lead to changes in behavior and action. The experiment thus utilizes micro-perceptual triggers (the sensor and actuator technologies) to create a sustained engagement with macro-issues (environmental challenges) through augmentation of big data streams into our affective and embodied experience of the world. This would potentially lead to a better sense of how one's actions might be connected ecologically to the greater environment, thus creating the foundation for making different choices and facilitating new forms of positive action.

4.2 End of Culture

The end of culture relates to the ongoing Culture Wars (Reestorf 2016), not least in the wake of the current migration and refugee crisis (especially from a European perspective), but also from a result of the geopolitical challenges caused by climate change. The *UN Refugee Agency (UNHCR)* reports that we are witnessing the highest level of displacement of people on record with an unprecedented 65.3 million (21.3 million refugees) people being forced from their homes². In addition to this very concrete end of culture, the increase in right-wing populism in a range of European countries is very much based on the perceived cultural threat posed by the flows of refugees and immigration which to many warrants an end to the culture they are familiar with. From an Affective Interaction Design perspective, one way of engaging with these issues might explore affective design experiments that use location-based and interactive platforms for affectively engaging storytelling to provide spaces for lasting cultural dialogue around issues of integration. The hypothesis is that it is necessary to

¹ <http://public.wmo.int/en/media/press-release/global-climate-breaks-new-records-january-june-2016>

² <http://www.unhcr.org/figures-at-a-glance.html>

initiate an actual dialogue between people to actually create changes in affective attachments towards refugees and migrants, but also to different fractions within native groups in increasingly culturally divided societies. Here, we would follow Guattari's call for individuals to "(...) become both more united and increasingly different (2000/1989, p. 69). Creating conditions for cultural dialogue and differential attunement might be explored through the use of mobile technologies, as a way of collecting and curating people's personal stories and sound in real-time from a range of distributed locations. These might include refugee camps, asylum centers or different residential areas in cities and villages. In the context of this paper, this would be a European country, but the scope is not limited to Europe. Around these sound recordings, spaces will be facilitated where people can listen to and engage with the stories and people behind those stories. These experiments extend an ongoing project with the use of interactive audio design in the creation of an affectively engaging interface for attuning to the differential qualities of people's voices (Fritsch & Jacobsen, 2017). In the overall project frame this experiment stages different encounters between people, stories and voices creating changes in affective attachments towards more positive forms of cultural dialogue.

4.3 End of the human

The end of the human relates to recent advances in technological implants and the rise of automation and robots replacing human skilled labor. The latter is closely connected to advances in AI and machine learning – e.g. in stock trading – once again challenging notions of intelligence and agency. Important existential questions have re-emerged with new intensity due to a number of advances increasingly challenging and blurring boundaries between humans and technology. The prospective of 'human enhancement', which aims to increase human capacities above normal levels through the use of different kinds of technology (Savulescu and Bostrom 2011), is inextricably tied to discussions of loss of humanity and economic inequality on a global scale. Affective Interaction Design experiments targeting this framing might explore different interfacial engagements and uncertainties connected very concretely with implantable technologies, for instance the Implantable Cardioverter Defibrillator (ICD) pacemaker. In short, an ICD is a device implantable inside the body (the heart) and able to perform cardioversion, defibrillation and pacing of the heart. In addition, the ICD collects and sends data about the patient's heart to the hospital via a router that comes with the device. People get the device implanted through an operation due to severe heart problems, potentially following a heart attack or stroke. This is in itself a life-changing situation characterized by anxiety, affective saturation and uncertainty, often involving a near-death experience. Following this, patients' need to both cope with getting used to living with a life-threatening disease and an implantable technology in their heart. This presents a range of challenges, as explored by e.g. Andersen et al. (2017) who have developed an app that makes the data from the ICD accessible for the patients. An Affective Interaction Design approach would seek to design concrete affective interactions through technologies that might change people's relations to their bodily vulnerability towards more positive affective attachments.

The three frames for affective design experiments presented in this section all concern design situations characterized by affective uncertainty and crisis, where the affective tensions are far more palpable and form part of larger, collective eco-systems of power, politics, technology and resources. They are far-from equilibrium design situations saturated with fear since they very clearly present affective encounters with "difference as alterity – as otherness" as noted by Susan Ruddick (2010). This is most obviously the case for the end of culture and the current refugee and migration crises in Europe, where the feeling of cultural identity and values for many is being questioned in the encounters with refugees and immigrants defined as 'others'. Difference as alterity, however, is also central to understanding design challenges at the end of nature and the human. Concerning the end of nature and the climate crisis, 'the other' can both be used as a way to frame the clash of alternative positions in the climate debate, but also in our lack of establishing a real relation or affective attachment to nature understood as an 'other'. Here, cultivating affective attachments through sensorial augmentation becomes a way of bridging between culture and nature. Concerning

the end of the human, an implantable technology might be immediately understood as an ‘other’ – but the same might be said about the relation to the whole body, which has been altered into something completely different from what you were used to. In direct continuation of this, Massumi reminds us that “(a)ffective politics, understood as aesthetic politics, is dissensual, in the sense that it holds contrasting alternatives together without immediately demanding that one alternative eventuates and the others evaporate. It makes thought-felt different capacities for existence, different life potentials, different forms of life, without immediately imposing a choice between them.” (2009, p. 12). This calls for design experiments that explore “actual differentiation” and conditions of emergence, and do not attempt to impose solutions in advance. This is very much in line with the ideas presented in a Transition Design approach to engaging with “wicked problems” on an ecological, social and societal scale, and in a non-reductionist way (Irwin 2015).

In all of the proposed frames above, affective interactions would attempt to catalyze experiential changes creating more positive affective attachments during the long-term use of the design, leading to new abilities to act. The suggested experiments both highlight how it is possible to define design challenges from an end-of-world perspective, and how it might be possible to engage with these challenges through design from an affective point of view. While this move into concrete contexts and technologies comes with a risk of reducing the overall design agenda, they are necessary to connect the conceptual guidelines with an interventionist design agenda. Importantly, though, it must be stressed that the presented experiments are in no way the only experiments that could be carried out within the presented ends of the world.

5 Discussion

Affective Interaction Design is an emerging research that arguably poses a range of questions and strikes many themes that must be critically discussed both in relation to the framing of end-of-world challenges as well as the overall affective framework. First, it should be noted that the argument put forth in this paper is not that the world is about to end any time soon – statistically speaking it has never been more peaceful, prosperous or connected as it is today (e.g. Pinker 2011) – or that digital technologies can save us or provide sustainable solutions to the multifaceted problems we are facing today. Rather, the argument is for interaction design to develop a serious commitment and engage explicitly with affectively saturated design situations at the end of the world to be able to change the current course towards more sustainable transitions. As has been shown, the ‘ends’ also hold a generative potential, and point to a need for rethinking our existing affective attachments and habits and thus stimulate positive shifts in attitudes and policies that will help us better act in the face of the challenges we are facing.

As emphasized above, this attitude should not be mistaken for a naïve optimism based on a too strong belief in the role of design in making these transitions. There are a number of seemingly insurmountable dilemmas and challenges that characterize an engagement with design situations at the end of the world. And there is a fair chance that processes and proposed designs will fail. This should not, however, prevent the joint fields of HCI and interaction design from engaging with these issues. Affective Interaction Design tries to pose a nuanced approach to thinking interaction design’s role in changing our current conditions for living in the light of the challenges presented at the end of the world. The presented research agenda embodies a commitment for making a difference through a sustained engagement. To achieve this, the agenda must be conceptually founded, bound up with concrete methods and ethics and develop strategies for making sense of the potential impact and value of the different designs in a non-reductionist perspective over time. In addition, it would also be necessary to cultivate Affective Interaction Design into an engagement with broader issues of large-scale policymaking to ensure a continued impact.

Affective Interaction Design does not attempt to ‘annex’ existing design approaches such as Adversarial Design, Transition Design or Sustainable Interaction Design under an affective heading. These are existing approaches that all deal with pertinent aspects when it comes to developing a

critical, reflective and interventionist approach to interaction design in order to engage with some of the most important societal problems we are facing today. Indeed, some of the main values and motives going onto Affective Interaction Design draw on and relates to a range of different design approaches that are not directly affectively motivated. However, the argument presented is that HCI and interaction design can greatly benefit from developing a long-lasting design agenda that explicitly aims to engage with the affective complexity characterizing design situations at the end of the world. As has been shown, in order to do this, it will be necessary to revise the existing definition of affect as it is currently presented in Affective Computing and Emotional Design. Again, it is important to stress that an affect theoretical foundation opens a way of thinking affect as a constitutive force in an experiential, societal and socio-cultural perspective, which goes beyond reflecting on one's own emotions or trying to teach computers to register and express human emotion to smooth out interaction.

A valid point of critique concerning both the overall framework and the presented design experiments would be whether it might not be possible to engage in activities that would contribute even better to a more sustainable future than the examples in this paper. A derived question might be, whether a range of the things you could do would in fact not work better and more sustainably without technology. Here it is important to remember that the outset for the Affective Interaction Design research agenda is to develop a different approach to developing digital and interactive technologies in the light of the challenges presented at the end of the world. This does not mean, however, that a non-technological solution might work better in a concreted design case, e.g. for creating spaces of cultural dialogue and lasting integration. A continuous awareness of the possibilities and limitations of the design agenda should be integral to the situational ethics developed.

6 Conclusion

This paper presents Affective Interaction Design as a new research agenda for engaging with end-of-world contexts and challenges in HCI and interaction design. The agenda introduces an affect theoretical foundation for understanding design contexts characterized by crisis and uncertainty, and comprises conceptual guidelines, methods, a situational ethics, measures for assessing the longitudinal value of affective interactions and novel affective design exemplars. Three frames for design experiments have been proposed targeting affectively charged end-of-world challenges through concrete interactions with different technologies (micro-triggers) that might lead to positive changes in relations and attachments, potentially triggering behavioral changes or changes in habits (macro changes).

In the future, it will be necessary to further cultivate this research agenda to develop be fundamental new insights into design processes concerned with affectively saturated design situations, and strategies for leveraging the affective potential of existing and new digital and interactive technologies. The sheer complexity of the presented affectively saturated design situations at the end of the world and the pervasive and transgressive nature of the challenges they embody, provide a complicated starting point for a necessary engagement with a range of issues. There are no signs that end-of-world challenges will disappear in the coming years, rather on the contrary. In this light, Affective Interaction Design functions as general call for action for HCI and interaction design to rethink existing and explore new ways of thinking and doing design.

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A Vocabulary for Visions in Designing for Transitions

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Visions of sustainable futures have been proposed as a key component of transition design, offering a way for today's situations and design proposals to be compared and critiqued in the light of desired future states. Such ambitions are necessarily wide-ranging, and call for drawing together strands on design and speculation from diverse sources. Here we seek to add to the momentum by exploring a set of concepts relating particularly to this role of vision in designing for transitions. Building on perspectives and projects from other fields, we present elements of a visionary vocabulary, situating these terms in relation to challenges and opportunities for transition thinking and practice in design research.

futures, imaginaries, visioning, transition design

1 Introduction

Among the proposed elements of transition design, “visions of sustainable futures” feature centrally, in order that “contemporary lifestyles and design interventions can be assessed and critiqued against a desired future state” (Irwin, Kossoff, Tonkinwise, & Scupelli, 2015a, p.8). The big-picture ambitions of such an agenda point to a need for exploring and synthesising approaches from practitioners and researchers in other fields whose work deals with questions of vision, futures, and how they relate to the present. One starting point here, to follow from this need, is to take steps to equip transition designers with a vocabulary—a repertoire of concepts—which can both make these approaches more salient, and help make them easier to engage with.

In this piece we seek to explore a set of concepts relating particularly to this role of vision in designing for transitions, which start to build up elements of a vocabulary. In preliminary fashion we build on perspectives and projects from other fields, and aim to situate them in relation to challenges and opportunities for transition thinking and practice. Some have been noted in transition design literature before, while others have not, but all are established concepts rather than new coinages. Our purpose is to identify and borrow from existing practice some potentially useful heuristics, moves, philosophical prods, or *lenses* that seem to offer promise to those keen to engage in design with transitional agendas in view. Assembled here, then, are seven ways of seeing, for tackling the ‘visionary’ aspect of designing for transitions. The seven are: *Lenses* themselves;



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Imaginaries; Backcasting; Dark matter; Circularity; Experiential futures; and New metaphors. What follows describes each lens and explains its relevance to the emerging practice as we currently see it.

A note on this paper's structure: we have experimented somewhat with a more modular structure, including a short Discussion section, *Why have we included this?*, after each concept. Our intention is that this potentially makes it easier for ourselves and others to add to the vocabulary, by keeping discussion close to the concepts themselves.

2 Methodology: Lenses

Our methodology in choosing the elements for this vocabulary is centred around the idea of lenses—we are claiming nothing more than collecting together a set of different tools for seeing, which in a poetic way we feel are complementary, as a proposition and starting point for others to build on. There are many other concepts we could have chosen, but this is the set that we did choose.

This first set of lenses overall draws inspiration from a number of works that have sought to expand the vocabulary of concepts or repertoire of gambits readily available in one domain or another. The architect Alexander and colleagues' classic *A Pattern Language* (1977) is one such; designer Hill's more recent *Dark Matter and Trojan Horses* (2012) is another. Musician Eno and artist Schmidt's *Oblique Strategies* cards (1975) hover generatively in the background; likewise the *Group Works* card deck created by the Group Pattern Language Project (2011), a deck collecting concepts and moves for facilitation; and theatre director Boal's *Games for Actors and Non-actors* (2002). Games maker Schell's *The Art of Game Design: A Book of Lenses* (2008), another member of this extended family, is a helpful reference even if we are not necessarily using his focal term in quite the same way. Lockton, Harrison, and Stanton (2013; 2010) discuss a variety of pattern-like formats for design tools, arriving at 'lenses' as a metaphor for different worldviews of human behaviour. Our own use of 'lens' here is probably a bit closer to the spirit of philosopher Dennett's inventory of "handy prosthetic imagination-extenders and focus-holders", in *Intuition Pumps and Other Tools for Thinking* (2013, p. 2). And one final model to mention, psychologist De Bono's *Wordpower* (1977, p.4) collects a range of terms with the popular expansion of systems literacy in mind:

[A]n understanding of dynamic and interactive systems means a whole new way of looking at processes rather than just at things. For this purpose we are only now beginning to build an adequate vocabulary. When we have built this vocabulary and assimilated the related concepts our understanding of the world around will be much improved. This I see as the next quantum step in our cultural development.

We do not pretend that these fragments contain anything as impressive as their sources of inspiration, or that the small starter set gathered here is necessarily part of an impending 'quantum step in cultural development'. However, we are interested in contributing to the reservoir of available approaches to the worthy, ambitious forms of emerging practice outlined in transition design literature to date (Kossoff, Irwin, & Willis, 2015). The promise of usefulness for guiding an aspiring transition designer's attention and action in the area of vision has served as the main basis for selecting these lenses.

And the first lens to highlight is that of lenses themselves. The various works cited above all seem to manifest a similar impulse—a kind of modular, tactical, pragmatic, creative, open-minded collector's approach to gathering and indexing elements of intellectual, operational and artistic usefulness. Many fields of course have their own master term for such collections: the 'playbook' in certain sports; cookbook; songbook; encyclopedia. The term 'score' as an organising category is perhaps best known in connection with music, but in the hands of landscape architect Halprin (1970) extends to many other activities. Unsurprisingly perhaps, the area of language offers many organising frames (and there's another metaphor) at different levels, including 'language' itself, library, vocabulary, dictionary, grammar, and alphabet. One of the most fruitfully catalytic organising concepts for modular collections of knowledge parlays the component 'pattern' (fashion) into a designerly

aggregate, ‘pattern language’, first elaborated in architecture (Alexander et al., 1977), and since widely taken up in software development (Gamma et al., 1994) and interaction design (Tidwell, 2005; Fincher, 2012).

All of the above are alternative metaphors carrying different entailments (see **New metaphors**) and, admittedly, considerable potential for self-referential confusion. We have chosen ‘lenses’ as a deliberate extension of the ‘vision’ metaphor and a central challenge contained in designing for transition: imagining and catalysing a (presumably) radically different systemic state. New ways of doing and seeing go hand in hand; the latter are perhaps marginally easier to write about, but we try to blur that boundary wherever possible.

2.1 Discussion: Why have we included this?

Designing for transitions is ambitious. It is inherently multiscalar and inter- if not fully transdisciplinary. Its would-be practitioners need ways of sharing what they are doing, what seems to work, and at this stage the appropriate thinking and learning tools are bound to be modular and piecemeal rather than all-encompassing. We suggest that this notion of patterns or lenses — the modular collection and deployment of approaches to examining, thinking about, and acting in various situations — itself harbours potential as part of the development of transition design practice.

Related: heuristic, new metaphors, pattern language, playbook, score

3 Imaginaries

Mindset has been named a core component of transition design (Irwin et al., 2015b), primarily expressed through the idea that “openness, mindfulness, and self-reflection” are crucial when designing with transition in view. In addition to these attitudinal aspects, another level at which mindset considerations and ways of thinking can be explored, particularly in the context of visioning, is found in the notion of *imaginaries*. Here we argue that, as a lens, tuning into and investigating the ‘imaginary’, with regard both to current situations and to possible futures, promises invaluable insights for visioning.

What are imaginaries? The very broad sense in which we use the term here includes: societal-level conceptions (Appadurai, 1990) or (at least partly-) shared visions of issues such as climate change, health, immigration, identity, law, or even countries themselves (Anderson, 1983); myths and beliefs which can motivate collaboration (Harari, 2014); or sociotechnical narratives about how certain types of technological development could affect the way we live (Jasanoff & Kim, 2015); along with more individual or small-group scale notions perhaps more familiar to interaction designers, such as mental models (e.g. Revell & Stanton, 2017; Jones et al., 2011), mental imagery, associations, metaphors (see **New metaphors**), and so on. There is an argument that imaginaries of futures can affect people’s actions in the present (Lanzeni, 2016; Jasanoff & Kim, 2015), and the related concept of a culture’s ‘images of the future’, developed by sociologist Polak in the 1950s, proposes precisely this (1973 [1955], p. 19):

Any student of the rise and fall of cultures cannot fail to be impressed by the role played in this historical succession of the future. The rise and fall of images of the future precedes or accompanies the rise and fall of cultures. As long as a society’s image is positive and flourishing, the flower of culture is in full bloom. Once the image begins to decay and lose its vitality, however, the culture does not long survive.

This may be said to represent a kind of self-fulfillingness (see **Circularity**), but imaginaries do not emerge independently: those that we have are constructed, over the courses of our lives, through both our social and experiential contexts. They are not permanent, but they are often persistent.

Design—and arts more broadly—can be seen as a form of language encompassing the fictional or imaginary, making it real enough to be addressable, to be considered and critiqued and reflected on.

Dilnot (2015) suggests that design simultaneously *states* “This!” and *asks* “This?” It has the power to render visible and tangible imagined situations, whether better or worse than the ones we are in; to design artefacts as ‘tokens of better ages’; to apply ideas of utopia as a method (Levitas, 2013); and to inspire and open up vistas—if not always actual maps—towards different futures, through speculation and design fiction. What do designers do, if not, in some sense, give us experiential pockets of imaginaries—our own, reflected back at us, as well as visions of alternatives, fictional for the time being, but towards which we might be in transition? (see **Experiential futures**)

As a process, investigating imaginaries starts by engaging with, and seeking to understand, people’s existing collective or individual conceptions of their situation; how the systems around them work, from their perspective; and what mindsets accompany those conceptions (Figure 1; Figure 2). Then, through externalising those imaginaries, or making them tangible or engageable-with (e.g. Bowden, Lockton, Gheerawo & Brass, 2015; Aguirre Ulloa & Paulsen, 2017), a community has the opportunity to reflect on and learn about its own thinking. Turning from this general process to consider futures imaginaries more specifically; surfacing a community’s expectations, aspirations and beliefs about its own prospects can inform the development of deeper and more robust visions — while being firmly planted in and cognisant of the contexts and cultures where those imaginaries are found. A simple way to do this is found in “The Polak Game”, a brief and lively classroom activity based on the work noted above regarding the sociology and history of images of the future (Hayward & Candy, 2017). There are various typologies available for describing and mapping future imaginaries found among a population, including Ethnographic Futures Research (EFR) (Textor, 1995), Generic Images of the Future (Dator, 2009; Candy et al, 2006), and the Systems Mythology Toolkit (Hendricks, 2014). A framework for customising particular deployments following the whole process suggested above (map, multiply, mediate, mount, and map again) can be found in Ethnographic Experiential Futures (EXF), “a design-driven, hybrid approach to foresight aimed at increasing the accessibility, variety and depth of available images of the future” (Candy & Kornet, 2017).

3.1 Discussion: Why have we included this?

Using the lens of imaginaries helps to sensitise both ourselves and others to the functioning and dynamics of what and how we imagine the systems we are in, as they are and as the might be. In this area, transition designers can serve a valuable role as translators or mediators between minds and ideas, and the world, between current situations and possible new ways of living.

Related: ethnography, experiential futures, images of the future, phenomenography, mapping, mental models.

4 Backcasting

Suppose you’re trying to figure out how change could unfold—for yourself as a designer, or for a community.

One way to try to do this is to examine the evidence, past and present, and seek to discern in the tea leaves some pattern or portent of what is likely to occur next. There is a family of approaches for “forecasting”, and quantities of effort and ink are expended in pursuit of this form of inquiry (Tetlock & Gardner, 2016; Silver, 2015). Efforts to extrapolate from what is known today into times to come, to cantilever conclusions from the seemingly sure footing of the present into the future’s murky zone, often fail (Funk, 2017; Taleb, 2007), and many professional and academic futurists warn of the folly of a predictive stance when it comes to human affairs (Dator, 1996).

But one might also approach the question in precisely the opposite direction. This other tack, another way of seeing, is about the creation of scenarios *backwards* from a posited point in the future. What if we stipulate, for the sake of argument, that the future we are interested in looks and operates *like so*, some number of years or decades from now. *What would it take in order for that to happen?* What would need to occur?



Figure 1. Teenagers at the Derby Silk Mill, Derby, UK, pinning up their drawings of “What does energy look like?”, an investigation of energy imaginaries by Flora Bowden and Dan Lockton as part of the Helen Hamlyn Centre for Design and SustainRCA’s SusLabNWE project. Photo by Dan Lockton.



Figure 2. Students at Carnegie Mellon School of Design construct ‘mental landscapes’ representing group imaginaries of projects, part of an investigation by Delanie Ricketts and Dan Lockton of the Imaginaries Lab. Photo by Dan Lockton.

A prediction-minded onlooker may wonder what in the world could possibly be the basis for such speculation, and if accurate extrapolation is the name of the game, what we are suggesting here

may seem a very odd thing to do: backwards, indeed. But understanding “the future” calls for inquiry ranging beyond whatever happens to seem most likely at any given moment. While an important frame, the probable shows us only part of the bigger picture. As the second author points out in introductory futures classes, “Any single image of the future, no matter how compelling, is incomplete.” For one thing, the probable is a constantly changing vista: Look at the moment-to-moment meanderings of any share price for a demonstration. Think how the punditry morphs on the day after a surprising election outcome. In the futures field there is a classic trio of possible, probable and preferable futures (Toffler, 1970; Amara, 1981), which helps serve as a reminder that the question of what appears most likely to transpire, if taken too narrowly, leaves underexamined equally vital questions of what else might occur instead (the possible) and what we might want or not want (the preferable).

The word ‘backcasting’ was coined and the approach originally proposed for a normative use of scenarios in the energy industry: “backcasts are not intended to indicate what the future will likely be, but to indicate the relative implications of different policy goals.” (Robinson, 1982, p. 337). Its use has broadened in the years since, including development of participatory approaches incorporating perspectives from diverse stakeholders, although still typically with a normative bent: “The essence of the backcasting approach to future studies is the articulation of desired futures, and the analysis of how they might be achieved” (Robinson, Burch, Talwar, O’Shea, & Walsh, 2011, p. 756).

Here we are using the term slightly more broadly still, not to refer exclusively to the development of normative scenarios, but as a lens or angle of approach, a structure of thought, which could be used to try to reason backward in exploratory fashion from any posited future outcome. This is the heart of a scenario generation process originated by Dator (2009, p. 16), elaborating ‘generic images of the future’, where the narrative pathways examined are not just preferred futures, but the most divergent set of trajectories possible; growth, collapse, discipline, and transformation (Dator, 1979; Dator, 2009; German, 2017).

The backcasting lens invites us to ask: in order for this to occur, what would need to happen? One can use it to inquire into the boundaries of the possible, and to deduce the approximate shape of what would be necessary to realise a particular pathway, positive or not. It may reveal new possibilities — or impossibilities.

Take for example entrepreneur and inventor Saul Griffith’s examination of global renewable energy. Calculating humanity’s annual energy spend for the early 2030s at a modest total of 15 terawatts, he describes the challenge of renewably meeting this target: “It’s not the Manhattan Project, it’s not the Apollo Project — they were science projects. The project we have to do is much more like World War II, except this time [all countries] play on the same side. That’s [the scale of] what you need industrially” (Griffith, 2008).

A particular method that may help operationalise this lens (again, for any scenario) has been developed over the past decade; a heuristic for looking at transitions through “Three Horizons” (Hodgson and Sharpe 2007; Curry and Hodgson 2008; Wahl 2016). In essence this method divides the transitional process, whatever it may be, into three phases: now (horizon one), then (horizon three), and the interim phase between (horizon two). It provides a way of attending to and creating a narrative out of whatever is really at stake in transitioning from one state of affairs to another (Figure 3).

Effective use of the backcasting lens would help not only with avoiding the vicissitudes of extrapolative thinking, but also the temptation of dominating discussion with a single preferred future. Just as it is insufficient to examine change with an eye only to the probable, in designing for transition with normative ideals in view, the risk perhaps lies in excessive focus on defining a single positive future; navigating, as it were, with only one point of reference. Here too: Any single image of the future, no matter how compelling, is incomplete. The attempt to try to deduce one’s way

backward from there to actions today, a simplistic 'deficit model' for planning, embeds a dangerously brittle and linear conception of what bringing desired change into being entails. What is called for instead is a thinking environment or mental ecology (see **Experiential futures**), one rich enough with reference points that you know what you're looking to avoid, as well as what to pursue, and so that you are poised to meet whatever comes along. To venture an analogy to the importance of biodiversity in an ecosystem, or disciplinary range and neurodiversity in a team investigating a complex topic; resilience comes from requisite variety (Conant & Ashby, 1970; Dubberly & Pangaro, 2007).

4.1 Discussion: Why have we included this?

Backcasting may not be the only way to stretch and test our mental models of what tomorrow may bring, but it might be one of the most useful. This lens, applied not solely to 'planning' but to ensuring a diverse range of images of the future, we surmise, may well be a critical part of a healthy and transition-capable society (see **Imaginaries**). It seems a good candidate for key resources one might identify as necessary for navigating the wildly multivariate, hyperdimensional process of moving through history. Not a single, official, doctrinaire commitment, monomaniacally pursued (numerous instances of which, particularly from 20th century history, we leave the reader to imagine for herself). A constellation of alternatives to think with; not the ideal or preferred alone, but imaginal diversity.

Related: alternative futures, deductive forecasting, experiential futures, imaginaries, scenario generation, visioning

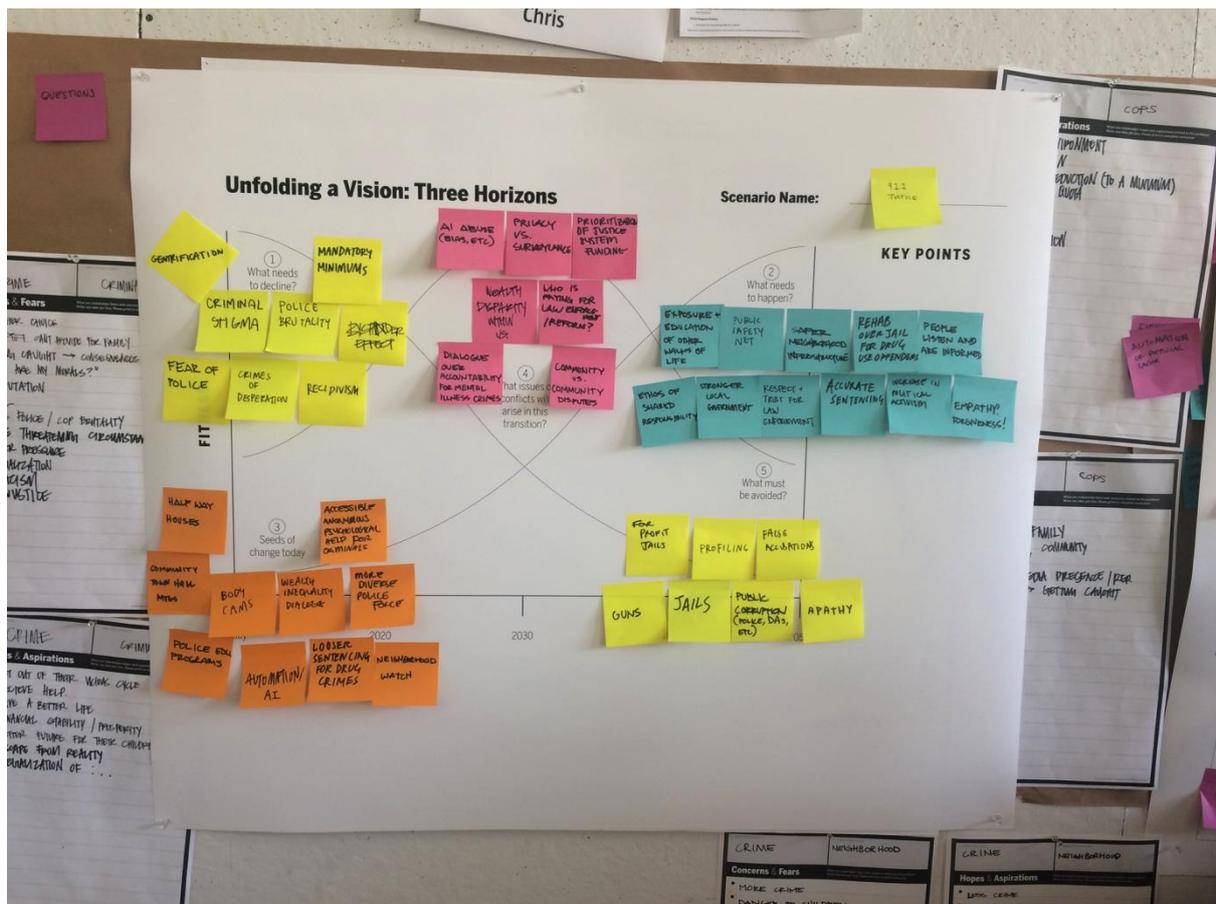


Figure 3. A transitional scenario in progress, constructed by Carnegie Mellon School of Design undergraduates working backward from their own ideal visions for 2050, as part of a class taught by Stuart Candy, Terry Irwin and Stacie Rohrbach. Photo by Stuart Candy.

5 Dark Matter

The systems approach embraced by transition design (e.g. Kossoff, 2015; White, 2015) recognises explicitly that there is more involved in change at scale and over time than simply the decision to redesign a product or service in isolation. Designed artefacts, services, and even software, are embedded in contexts, bound up in the practices and cultures of everyday life, and the organisational priorities, traditions, and structural legacies which end up determining what actually gets designed, by whom, and who has agency to change it. Laws, standards, conventions, histories, prejudices, algorithmic biases, path dependency, the actions of actors elsewhere, and a whole range of other factors (see **Imaginaires**) are all part of the systems within which designers seek to act.

A transition designer should thus be able to be more effective through paying attention to these (evolving) contexts as much as to the ‘thing’ itself, to design with insight into the ways in which the (often largely invisible) aspects of systems will work to support or constrain change. As transition design education develops, we might find it necessary to incorporate modules for learning about these systems, through classes about as well as practical engagement with public policy, management, community organising, and a range of other topics not usually included in a ‘design’ education. This could be framed as a call for more attentiveness to *infrastructures* within design. Infrastructure “never stands apart from the people who design, maintain and use it. Its designers try to make it as invisible as possible, while leaving pointers to make it visible when it needs to be repaired or remapped. It is tricky to study for this reason” (Star & Bowker, 2002, p. 230). Urbanist Keller Easterling, describing her concept of ‘infrastructure space’, notes that “[s]ome of the most radical changes to the globalizing world are being written, not in the language of law and diplomacy, but in these spatial, infrastructural technologies” (Easterling, 2014, p.15).

Star (a sociologist) and Bowker (an informatician) note that infrastructures often only become visible on breakdown, only apparent when they fail or stop working, or perhaps impede planned changes to a system. This relates to what Hill (2012, pp. 83–85) has called “the dark matter of strategic designers... organisational culture, policy environments, market mechanisms, legislation, finance models and other incentives, governance structures, tradition and habits, local culture and national identity, the habitats, situations and events that decisions are produced within”. Hill uses the term specifically to refer to “what makes it difficult for installations to scale”, the (metaphorical) “material that absorbs or rejects wider change” beyond a one-off prototype or demonstration. He argues that “[a] genuine and concerted engagement with dark matter is what would enable an intervention to become systemic, permanent, influential... the strategic designer has to understand the characteristics of dark matter just as designers might understand wood, steel, glass, pixels and grids.” There is an extension to this argument which suggests that the ways in which different actors or stakeholders may perceive the dark matter (Figure 3), or not, is also worth paying attention to: what is invisible to one person may be very visible to others. For example, Mata-Marin and Lockton (2017) examine how migrants in the US experience ‘borders’ in everyday life, through designed artefacts such as credit cards and drivers’ licences—regulating access and exerting control by embodying politics of difference—but which may be completely seamless to other people in the system. Perhaps part of a designer’s role is to make this dark matter not just visible, but *legible* to those who are affected by it, but for whom it may be unreadable. Jain, Jankauskas and Ardern (2016), Lockton (2016a), Galik (2016), Bosch (2016), Gómez-Mont (2016) and others have examined how approaching policymaking in Mexico City and London with the aim of legibility could lead to new approaches for engaging the public in understanding and being involved with future directions for their cities, including aspects of the use of sensor technologies and other ‘smart city’ approaches.

There are also parallels with concepts such as Conway’s Law (Conway, 1968; Brooks, 1975)—an organisation designing a system will create a system which replicates the communication structure of the organisation that designed it. Does transition design necessarily involve attention to (re-)designing the organisations involved in a project, to improving or reforming communication

structures within a community, or between the community and other interested stakeholders such as local councils, utilities, transport authorities, and so on? Star and Bowker (2002, p. 233) suggest that “[f]requently a technical innovation must be accompanied by an organisational innovation in order to work: the design of sociotechnical systems engages both the technologist and the organisation theorist.”

For Le Dantec and DiSalvo (2013, p. 247), the role of the designer engaged with infrastructure should be “the work of creating socio-technical resources that intentionally enable adoption and appropriation beyond the initial scope of the design, a process that might include participants not present during the initial design”. This approach which would see dark matter, perhaps, as something transition designers could actively consider using and manipulating, to turn it into a platform for communities to adapt and adopt themselves.

5.1 Discussion: Why have we included this?

Dark matter can be a useful lens for reminding us to pay attention to the elements of the system which designers might not traditionally have considered relevant, and for developing a more comprehensive account of how change happens.

Related: infrastructuring, sociotechnical systems, complexity



Figure 4. Members of the public in Pittsburgh, PA, create maps of their perceptions of the ‘dark matter’ of local government, as part of the Imaginaries Lab’s Civic Visions project (Ashlesha Dhotey, Theora Kvitka, Nehal Vora, Matt Prindible, Silvia Mata-Marin and Dan Lockton). Photo by Ashlesha Dhotey.

6 Circularity

The idea of the *self-fulfilling prophecy* (Merton, 1948; 1995) is well-known enough to pass without much comment. But it is worth explicitly considering it in relation to visioning and transition design. Most obviously, there is the point that compelling visions of “desirable” futures are partly, presumably, intended to inspire people to work towards making those visions reality—to fulfil the prophecy. More nuanced treatments of futures (see **Experiential futures**) tease out some of the issues wrapped up in this idea.

Equally, though, prophecy can bleed into our imaginaries of the present—the ways in which we define our current situation, and how potential futures link to it, can end up structuring and determining the ways we act now. The sociologists Thomas and Thomas (1928, pp. 571–2) suggested that “If men define situations as real, they are real in their consequences”, and thinking along these lines, we see that there can be a self-fulfilling nature to imaginaries. If we believe something to be real, and act as if it is real, and design and build institutions and infrastructures around that ‘reality’, the effect may be the same as if it had been real in the first place. What were once fictions become fact.

For example, the journalist Metcalf (2017) discusses the self-fulfillingness of imagining society as a market, drawing on Hayekian ideas: “The more closely the world can be made to resemble an ideal market governed only by perfect competition, the more law-like and ‘scientific’ human behaviour, in the aggregate, becomes.” In a design context, the idea of a kind of circular causality in which designers’ models of users (Lockton, Harrison & Stanton, 2012) or the assumptions or models imposed by clients, funders or other commissioners of work end up being designed into systems which then effectively make those imaginaries real, is not uncommon. Conversely, as pioneering scenario thinker Herman Kahn observed, “prophecies can be self-defeating as well as self-fulfilling” (Kahn, 1962, p. 18).

Design affects what people do, and what people perceive they *can* do. Everything around us that has been, or is being, designed, from the layout of our cities to the infrastructure of our governments to the way our doctor’s surgery receptionist answers the phone, in some way influences how we engage with and make use of it, how we make decisions, what is easy and what isn’t. It also, over time, affects how we think, and how we understand the world that we’re part of, both individually and together as a society. And it affects our belief in our own agency, our own ability to change things (Lockton & Ranner, 2017). Designed artefacts, services, software or other elements of systems which embed particular notions of human nature (Lockton, 2016b) can, over time, lead to people acting in ways which come to *match* the models that the designers have of us or want us to become. As both Lanier (1995) and Dunne (2006) have expressed in different ways, if things that people use are designed with a caricatured model of a human, they may end up making that caricature real: we may end up behaving in the way the models assumed anyway, because we are configured by the systems and structures in which we live our lives—a curious form of self-fulfilling prophecy. Or put another way, perhaps, irony.

So in designing for transitions, within systemic contexts, it is worth reflecting on the *circularity* of the endeavours we are engaged in: to what extent are the variables that we believe they are shaping actually in turn shaping us, and the actions we take? Architect and cybernetician Glanville (1995) used the example of a thermostat ‘controlling’ the room temperature, but itself being controlled by the room temperature. Even this simple causal shift—considering a system from the perspective of the entity we normally assume to be in control—can provide new insights into the agency we have as designers. For example, how are transitions shaping designers, just as designers shape transitions? How does our work contribute to or co-create the issues we are seeking to address? Does concern or panic about futures lead to concern and panic being normalised or designed into the system? How can we use this approach in a more positive way? By analogy to the idea that the legal system and lawyers co-create the need for each other, how do we avoid this happening with transition design?

6.1 Discussion: Why have we included this?

Much design which aims to have an effect on social or environmental issues becomes itself constrained by or locked into assumptions about those issues, becoming part of the system it seeks to affect; or the changes it makes end up reproducing the structures of the problems that led to the need for intervention in the first place. There is value in transition designers being attuned to irony, aware of this self-fulfilling risk, and examining closely the assumed causal links embedded within projects and approaches.

Related: circularity, imaginaries, irony, reflexivity, second-order cybernetics

7 Experiential futures

To design is to grapple with the future. To design for civilisation-scale transition, even more so. The trouble with ‘the future’ is that it doesn’t exist. It’s a construct, a stew of more or less examined assumptions and interpretations carried over from the past, blended with extrapolations of trends and emerging issues in the present, inflected through hope and fear to produce fantasies and imaginaries projected into various quarters of the possible, probable, preferable, and their opposites.

It turns out that the troubling nonexistence of the yet-to-be is also an opportunity. Pages unwritten await their authors. The futures in our minds may sometimes pretend to us that they simply reflect on and respond to the outside world, but they are a technology of discourse and agency, a special subset of imaginative storytelling. While seeming merely to be inspired by observed change, they are in fact covertly shaping it.

Experiential futures refers to a set of approaches to make alternative futures present. The juxtaposition of ‘experience’ and ‘future’ is a deliberate contradiction: the here and now, the impressions of senses and mind, 1:1 scale reality as we experience it moment to moment; all this set against an inherently abstract notion of the to-come, by definition absent, forever at a temporal remove. Experiential futures (XF) seeks to make productive use of that contradiction, and harness the energy of its friction, by collapsing the distance, rendering absent and abstract futures cognitively and culturally tractable.

An experiential scenario is a future brought to life. It’s a tangible ‘what if’, more textural than textual, and a way of thinking out loud, materially or performatively, or both. Seeking to collapse temporal distance and offset our habitual discounting of future events (Ainslie, 2001), XF angles for ‘what ifs’ real enough to trick the body into taking them seriously. Its contours are generous, taking in “the gamut of approaches involving the design of situations and stuff from the future to catalyse insight and change” (Candy, 2015, p. 18). XF “involves designing and staging interventions that exploit the continuum of human experience, the full array of sensory and semiotic vectors, in order to enable a different and deeper engagement in thought and discussion about one or more futures, than has traditionally been possible through textual and statistical means of representing scenarios”. (Candy, 2010, p. 3)

As a lens, it is an invitation: how might you take your idea — any idea — of a future and bring it concretely to life, now? This move may be motivated by a wide diversity of agendas from the exploratory to the evangelical, the entertaining to the educational (Candy, 2010, p. 114). Any reason to think or feel into any future is a reason to mediate it, make it experiential. The matter of interest is not the design of artefacts per se, but the design of circumstances for thought (which may manifest as or incorporate artefacts). Less contents than context; less stuff than situations; less the things themselves than the conversations, insights and actions they enable. In each case, the latter implies and includes the former as appropriate (Figure 6).

We must make our freedom by cutting holes in the fabric of this reality, by forging new realities which will, in turn, fashion us. Putting yourself in new situations constantly is the only way to ensure that you make your decisions unencumbered by the inertia of habit, custom, law, or prejudice--and it is up to you to create these situations. (Graeber, 2015, p. 96)

Some experiential futures examples from among many (for more see Candy, 2010; Candy & Dunagan, 2017):

- A product that immerses its user in a simulation of natural environments, apparently promoting the health of stressed-out urban office workers in the early 2020s, launched and demonstrated in the midst of a large (real, present-day) interior architecture trade show (Alter, 2016; Figure 5).

- A technology for babysitting infants in a virtual pod, presented in a present-day art museum, but surrounded by the accoutrements of a commercial sale context (product specifications, price banners, brochures), as one might find them in an electronics store in the next decade (Furness, 2017).
- A special future edition of the New York Times, reporting from the following year and embodying a fulfillment of progressive/liberal fantasies, handed out to commuters in the streets of Manhattan (Lambert, 2009).

The view through this lens is the capacity to regard the effective engagement with futures as about the generation or construction of scaffolding to think and feel with. The entire sensory and semiotic context of the body is the relevant canvas – and not just for the individual, but also for groups. ‘The Time Machine’, a room where you can inhabit a pocket of (say) the year 2040 for (say) 20 minutes, is one example of a pattern for immersive scenario creation that becomes possible through this lens (Candy, 2013; 2014).

Consider the philosophical concept of the ‘extended mind’ (Clark & Chalmers, 1998; Dunagan, 2015): thought isn’t contained exclusively inside our skulls, but it occurs in and with our environments. This view could be adopted as a frame for examining all sorts of ordinary, existing practices, but it can also be taken further. If a notebook or whiteboard is a convenient prosthesis for memory, an experiential scenario is a prosthesis for imagination. It is a provisional, localised, and made-to-order ‘mental ecology’ (Bateson, 1972). The manifestation an imagined future context (see **Imaginaries**) variously in forms tangible, material, interactive, playable and performative, provides a wealth of opportunities to think and feel with beyond producing the most eloquent report. Experiential futures uses the idioms of reality to mediate hypothetical as *hyperthetical*, something *more than* just a thesis; an almost-real place.

Media theorist McLuhan’s concept of the anti-environment may be useful here. The anti-environment relates to the environment in a sort of dialectical figure/ground relationship whereby the former highlights the unnoticed or taken-for-granted properties of the latter (the fish out of water realises with a jolt, at last, what it has been swimming in). “It is useful to view all the arts and sciences as acting in the role of anti-environments that enable us to perceive the environment.” (McLuhan, 1967, p. 42)

So: all possible futures (literally an unimaginably vast space of stories one might tell) multiplied by all possible situations and stuff from within each. This represents a dazzling astronomical superabundance of theoretical design possibility. It is both wildly transdisciplinary and transmedia in character. That does not mean that the result or the ideal is an all-encompassing, extravagant *gesamtkunstwerk*: it is simply a medium-agnostic design opportunity. Simplicity will often be best, but it is perhaps the “simplicity on the other side of complexity” (reputedly prized by Oliver Wendell Holmes). It’s more a matter of producing circumstances than a report, a video, or a telling artifact: any one of those things may indeed turn out to be the best thing for the job, but noting and avoiding unjustifiably mediumist assumptions is key.

7.1 Discussion: Why have we included this?

All of the above brings into focus the critical need for thoughtful and critical attention: what futures to choose to manifest in this way, when we consider transitions? Prototyping or performing something random that is purportedly ‘from the future’ might seem worth it as a lark, the first time or two, but sooner or later the mere conceptual novelty of long-range prototyping for its own sake has to wear off (Candy, 2018, p. 243). What is left is perhaps a closer attention to *which futures*, in *whose interests*, with *what effects*. Deeper questions. More critical questions. Opportunities to do better.

Related: critical design, design fiction, experiential scenarios, guerrilla futures, imaginaries, immersive storytelling, speculative design, transmedia, worldbuilding



Figure 5. Visitors to a large interior design and architecture show interact with NaturePod, a hypothetical future product demonstrated and launched at the show as if it were commercially available. Installation by Situation Lab, photo by Connie Tsang.

8 New Metaphors

It has been argued that metaphors and analogies are central to much human reasoning, understanding, and creativity (Hofstadter, 2001), as well as the language we use (Lakoff & Johnson, 1980). Here we use the term ‘metaphor’ in a broad, intentionally imprecise way, to refer to a class containing a variety of ways in which one thing can be understood in terms of another.

One simple reason for metaphors’ prevalence is that by mapping features of an existing or familiar situation onto a new or unknown one, we are enabled to grasp and (be more confident that we can) understand it more quickly. As such, metaphors are often used strategically in design (Saffer, 2005; Cila, 2013; Hekkert & Cila, 2015). Nevertheless, metaphors are not *the thing itself*—they are always an abstraction, a model of the situation rather than the situation modelled. They can be a map to a territory, but should not be mistaken for the territory. As with models, all metaphors are wrong, but some are useful (Box & Draper, 1987). The constraints, affordances, and assumptions that a metaphor suggests or imposes can themselves condition or structure our interaction with, or approach to, a new situation, as we understand, or come to understand it in terms of the old. Metaphors become “enabling constraints” (Hayles, 2001, p. 144). The hunt for “defensible metaphors”, to use cybernetician Gordon Pask’s term (Scott, 2017), is not trivial.

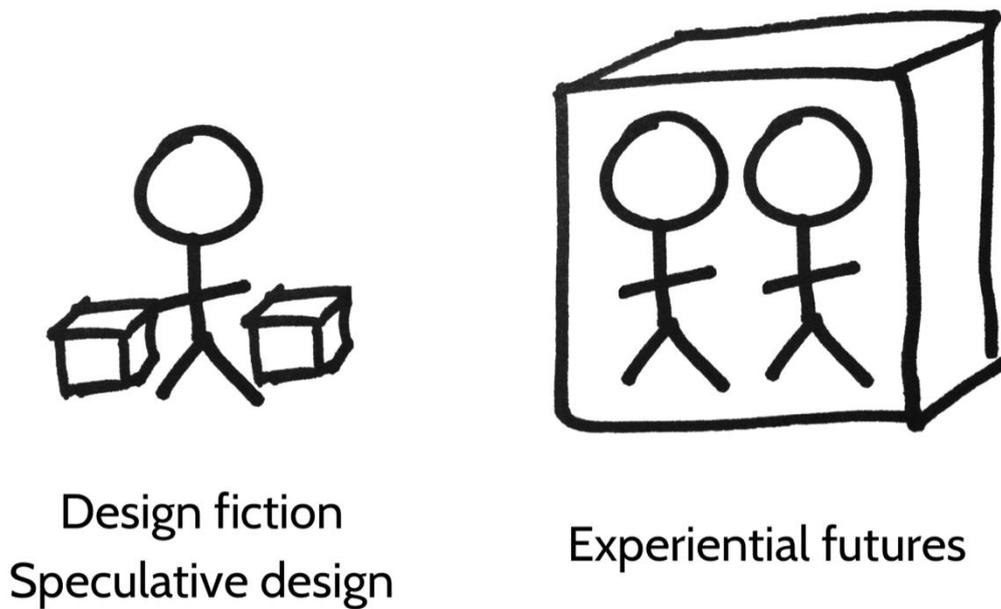


Figure 6. The lens of experiential futures invites attention to whatever it takes to create an effective context scaffolding thought and feeling about possible futures. Diagram by Stuart Candy (thanks to Greg Van Alstyne). Originally published in Candy & Dunagan (2017).

So, how does this apply to transition design? As a corollary lens of ‘**imaginaries**’, we suggest not just attempting to understand the existing metaphors in use in a situation, but actively generating, proposing, and following through the implications of *new* metaphors (Cila, 2013; Schön, 1979; Jung et al., 2017) for concepts pertinent to the frame of transition taking place—and the potential futures embodied in visioning. This is not primarily about devising novel metaphors for the specific design of products or interfaces—although this work is interesting—but, at a system level, something closer to Klaus Krippendorff’s (2006, p. 11) notion that designers could “create and start using new metaphors, new vocabularies, and new ways of languaging, like poets and science fiction writers do, thus bringing forth new ways of conceptualizing the world and encouraging new practices.” Mary Catherine Bateson (1984), in her own work, and in discussing the work of her parents Margaret Mead and Gregory Bateson, has also frequently employed the idea of reframing societal issues through using new metaphors, for example “the idea of ‘home’ as a place to give and receive nurture” becoming “a new metaphor for the workplace” (Moyers, 1988). It is worth noting here that White (2015) considers aspects of transition design itself to be based around the application of metaphors from ecosystems to social systems.

One significant area where new metaphors might offer opportunities for transition is the economy. A number of economists (e.g. Landau & Keefer, 2014) have noted the ways in which the metaphor of ‘the national economy is a household budget’, commonly employed by media and politicians alike, is not just an oversimplification but a structural error in terms of many key features of the systems under discussion, such as fixation on ‘balancing the books’. This leads to specific decisions being made (austerity policies for example) that arguably cause harm or restrict the ability of the system to adapt to changes in circumstances. How would public political discourse on the economy be different if a different metaphor were used? (We can imagine ideas such as ‘the economy is a garden’ or ‘the economy is a loaf of bread being baked.’) Would it be better used to *explain*, or to *persuade*? Or both?

8.1 Discussion: Why have we included this?

The art of designing new metaphors and framings is well advanced in political contexts (Lakoff, 2014) and increasingly in corporate settings (Erard, 2015), but has been underexplored in design and

futures, and offers potential for transition designers to enable communities to think about, envision, and understand their current situation and possible futures, both locally and at global scale, in new ways. The new metaphors can be generated in a number of ways, from matching ‘structural features’ of situations, to a semi-random process of bisociation (Koestler, 1964; Lockton et al, 2018—Figure 7). But a participatory process in which communities co-design the new metaphors, involving people in understanding their own and each other’s understanding as the metaphors are constructed and explored seems preferable from a transition point of view to one where new metaphors are imposed by an authority seeking to persuade.

Related: frames, imaginaries, lenses, worldbuilding



Figure 7. Participants at an Imaginaries Lab New Metaphors workshop run by Dan Lockton and Sarah Foley at the Google SPAN conference, 2017, talk through their ideas for new metaphorical representations of concepts. Photo by Dan Lockton.

9 A Conclusion

One of our aims in entering the transition design research discourse is to find ways of working practically which embody and advance the ideas inherent in the transition design paradigm, while making use of the many techniques and methods developed in other fields (among them design research more widely, foresight and futures studies, design for social change, systemic and strategic design, and more) and iterated over the course of many projects and engagements. This modest collection of ideas is put forward partly as a provocation, partly as potential departure point for a more comprehensive endeavour, and partly as an invitation for others working within, or interested in, designing for transitions to contribute lenses they find useful for new ways of seeing. The authors welcome readers’ suggestions.

At this time, the vocabulary is of course fragmentary. But this will change. Part of the transition at stake is our internal, collective, developmental shift from preliminary, tentative and miscellaneous beginnings, to an expanding reference universe of cases and terms, and a better-established sense of how to do what needs to be done. Lately, efforts inspired by the framing concept of the ‘pattern language’ have begun to outline the makings of a body of practice with similar large-scale transitional and transformational intent (Finidori et al., 2015; Baumgartner et al., 2016). The

questions we conclude with for the moment, then, concern how we might ultimately build a collection of transitional lenses into something more systematic. What would a pattern language for transition design look like? What other areas of design research have lenses to contribute?

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Transition-oriented Futuring: integrated design for decreased consumption amongst millennials

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This paper is concerned with the problem of overconsumption and opportunities to create alternative marketplaces that could ease the transition towards less, and different ways of consuming in everyday life. We argue that a more holistic view of the design context, multiple perspectives, and approaches, give more profound insights, explorations, and framings of the problem. Zygo, a future service for teens and young adults, based on the second-hand marketplace, illustrates our approach. Zygo challenges consumer lifestyles and provides a possibility for designing alternative practices around the use of everyday things. Repositioning the second-hand market as a scaffolding that supports and connects the youth in the transient, different and yet complementary phases of their lives, Zygo helps manage aspirations and needs of the youth, while raising awareness around consumption practices. Zygo is both an argument for an integrated design approach, drawing on service, system and interaction design, as well as social practice theory, and a designed proposal with the potential to promote transition design thinking.

integrated design; service futuring; transition design; sustainable consumption

1 Introduction

Conventional design of artifacts for everyday living and marketing strategies for including these in our everyday lives are still engaged in positioning consumer goods for short adoption and disposal cycles, and a long-term consumer engagement with the brand. The basic value proposals are still related to profit. One of the key strategies for securing profit from goods and services is by gaining social status through ownership of exclusive items. It is, however, becoming increasingly obvious that strategy of focusing on the unrealistic vision of the future with continued economic growth and maximization of the profit on the one hand, and social status perceptions based on ownership of goods on the other, have resulted in environment-eroding, unsustainable consumption, and use practices. Societal passage towards a more sustainable everyday future is needed (Irwin, 2015; Irwin, Kossoff, Tonkinwise, & Scupelli, 2015). Design has the potential to chart this passage and make the transition easier. Design's potential lies in considering systemic changes, and the ability to address the interconnectedness of social, economic and environmental aspects by framing a design space in which the resolution can be found. Understanding of the role of design in these larger, complex



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transformations and transitions that goes beyond the design of artifacts is currently unfolding and includes holistic, integrated, and meaning-oriented approaches. For example, when considering sustainable living, previously disconnected studies of made environments, nature and its resources, society and culture, and values and drivers of economies are all important and needed when engaging in rephrasing questions around eco-technological, cultural and political tensions through design (White, Gareau, & Rudy, 2017).

In this paper, we tackle the current “throwaway culture” and look at alternative propositions and ways of increasing the use time of durable consumer goods. Recently, this problem gained traction in sustainable design discourse within human-computer interaction (HCI) (Blevis, 2011; Cooper, 2004; Odom, Pierce, Stolterman, & Blevis, 2009; Pierce & Paulos, 2011; Pierce, Strengers, Sengers, & Bødker, 2013; Remy & Huang, 2015) and sustainable design discourse (Hinte, 1997; Lubin & Esty, 2010; Manzini & Vezzoli, 2003; Roy, 2000). In response to the environmental concerns related to the large volume of acquisition and disposal from the first-hand market offering new and unused goods, the second-hand market has been discussed as a viable alternative that might reduce the demand for new goods by reusing and extending the lifespan of durable and functional consumer goods (Gregson & Crewe, 2003; Pierce & Paulos, 2011; Thomas, 2003). However, second-hand marketplaces have existed for quite a long time, yet they continue to remain a niche practice (Pierce & Paulos, 2011). Online and mobile based second-hand marketplace services are more recent. While in theory, they present potentially more sustainable alternatives (Hanks, Odom, Roedl, & Blevis, 2008; Odom et al., 2009; Pierce & Paulos, 2011) to traditional marketplaces, in practice, the experience with such services remains unfulfilling. As a consequence, their uptake is limited, and there is a danger that also these may fail to become a real, mainstream alternative to the first-hand market.

The research presented in this paper is part of a larger research project that involves industrial partners and focuses on the design of services for more sustainable consumption, exploring the potential of second-hand marketplaces to prolong use of consumer goods. We focus specifically on service futuring for millennials, age group of 16-27 years old, because they use technology in everyday life comfortably and naturally (Selwyn, 2013), and have a strong role as influencers for other age groups (Prensky, 2001; Selwyn, 2013). Additionally, the emphasis on a younger demographics supports the possibility of designing for rituals and routines of second-hand use. These rituals and routines can evolve over time and be carried forward later during the adult life through what is referred to in transition design literature as a “sustained and gradual change” (Irwin et al., 2015).

While several strategies for facilitating more sustainable consumption patterns through design have been proposed, design for second-hand marketplaces has remained predominantly focused on seamless discovery and inclusion of second-hand consumer goods as service offerings. In contrast, we primarily focus on practices of acquisition, dispossession, and reacquisition (Pierce & Paulos, 2011). The secondary theoretical premise draws from transition design on changes rooted in, and extrapolated from, the existing system it intends to slowly transform (Irwin et al., 2015). We argue that it is essential to ground *future* service design concepts and approaches in a fuller, integrated understanding of current *practices* related to consumption of consumer goods in general, and second-hand marketplaces in particular. To this end, we use service futuring and visioning methods to discuss and create preferred futures, as exemplified by *Zygo* (Srivastava, 2017). To create *Zygo*, Research through Design (RtD) (Fallman, 2008), social practice theory and practice-oriented design (Kuijter, 2017; Shove, Pantzar, & Watson, 2012), service design (Manzini & Vezzoli, 2003) and systemic design (Sevaldson, 2011) were used. Thus, *Zygo* is an example of a designed concept for futuring, as well as an argument in favor of an integrated and holistic design approach towards a sustained and situated shift to decrease consumption among millennials by creating new, more sustainable everyday practices.

2 Background

In Manzini and Vezzoli's work (Vezzoli & Manzini, 2008), the emphasis is laid on systemic approaches towards sustainable product consumption. They suggest that sustainability should be discussed separately from approaches directed towards optimizing operations and materials. The work of Kuijer, de Jong and van Eijk, (Kuijer, Jong, & Eijk, 2013), brings forward the idea that alternatives to existing everyday practices of consumption can be designed. They point out that, while there is no consensus on establishing and measuring optimal consumption levels, there is a widespread agreement on the fact that current consumption levels are dangerously higher than what can be socially sustained in the very near future. Pierce et al. suggest that "*sustainable interaction design has less to do with redesigning material technologies themselves than with redesigning how we think about, and relate to those technologies already made*" and reframe consumption practices in terms of acquisition, possession, dispossession and reacquisition (Pierce & Paulos, 2011, p. 2392). They also suggest that, while building functional and durable goods is crucial, the problem of premature disposal of perfectly functional durable goods is still there. Thus, a purely functional perspective is not sufficient to tackle the problem. Building on this body of work, we explore design approaches for reconfiguring practices of *reacquisition* based on an understanding of the current everyday practices of *acquisition* and *dispossession* in the consumer marketplace. We start by framing everyday practices.

2.1 Framing everyday practices

Social practice theory conceptualizes human actions and the ways people conduct their everyday lives in terms of their routinized behaviors, or practices (Wakkary, Desjardins, Hauser, & Maestri, 2013). In (Shove et al., 2012), the authors deconstruct practices into three constituent elements: materials, competences and meanings, see Figure 1.

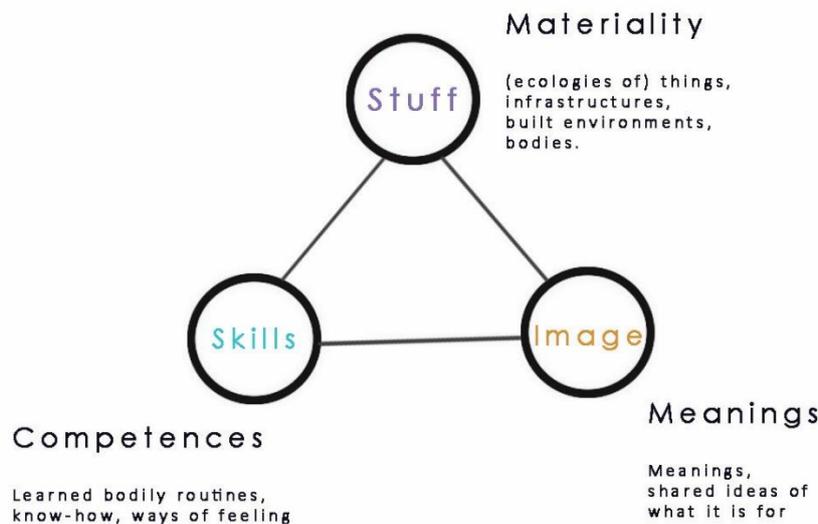


Figure 1 Model of social practice. Based on the model from (Shove et al., 2012)

Shove et al. argue that a specific configuration of these elements, with minor variations at the time of performance by a community, constitutes what is known as a practice. Elaborating further, practices, when performed in a specific context, show some variations in the configuration of the constituting elements and this is referred to as *practice as performance*. However, *practice as entity* is comprised of a variety of similar performances and constitutes a common understanding of a practice within a community. Lastly, the authors differentiate between *proto-practices*, *practices* and *ex-practices* as the three stages practices move through. Proto-practices are understood as proposals for future practices and ex-practices refer to practices that are dying or dead. While practice theory acknowledges that practices have their own internal logic and may be hard to

change due to inertia, they also offer the promise of change at a scale far beyond that of the traditional service design based on discovery and inclusion (Ingram, Shove, & Watson, 2007).

Two aspects of framing practices in (Shove et al., 2012) are central in the context of design for second-hand reacquisition and reuse. First, the authors identify *materiality* as a key element, which helps position and determine the role of durable goods, as well as digital artifacts, in this study. Secondly, the framing of '*practice as entity that is performed in endless variations*', presents an interesting opportunity to explore the temporal and malleable aspects of reacquisition practices. The value of this approach is in being able to uncover complexities, interdependencies, and dynamism of the *collective and cumulative actions* and make design efforts at that level (Pierce et al., 2013; Wakkary et al., 2013). We argue, in line with Kossoff, Pierce, Kuijer, Wakkary and others (Kossoff, 2015; Kuijer, 2017; Pierce et al., 2013; Wakkary et al., 2013) that social practice theory allows for reframing of reacquisition and reuse as socially constructed practices. This underlines the need for exploratory research and design approaches to reacquisition and reuse.

Service futuring is one way to engage in reflexive conversations about the role of theories, practices, products, services, values and other ingredients needed for transition towards more sustainable consumption. When discussing service futuring in relation to Zygo, we also make use of the rich set of concepts presented in (Ingram et al., 2007) related to general mechanisms the acquisition of goods (social comparison, self-identity, mental stimulation and novelty, matching or the Diderot effect), specialization, appropriation, assembly and normalization, as they relate to practices of acquisition, possession, dispossession and reacquisition.

2.2 Other Influences

Apart from the practice and interaction-based approaches, a more systemic view on the use of durable goods has also been suggested (DiSalvo, Sengers, & Brynjarsdóttir, 2010). This research direction led to reexamination of production, use and reuse, as a holistic approach, calling it strategic sustainable design. The discussion around strategic sustainable design hinges on the concept of service economy (Manzini & Vezzoli, 2003) and Product Service Systems (PSS) (Roy, 2000). It is driven by value exchange, where people interact with services and not material goods, hence positioning strategic sustainable design directly within the discipline of service design.

We argue that dealing with practices as a unit of design in sustainable interaction design (SID) should be explored as an important complement to the service-oriented perspectives. In (Kuijer, De Jong, & Van Eijk, 2013), the authors argue that systemic approach towards SID implies that practices themselves need to be designed. From a design standpoint, the framing of *proto-practices* as design proposals (Shove et al., 2012), offers a parallel to *prototypes* that are commonly discussed as outcomes of the interaction design process. Further, we argue that systemic solutions need to consider the role of services in the design of practices that address the short usage of consumer goods. This is important because durable commodities do not exist in isolation. They are a part of a larger ecosystem that addresses extended usage scenarios such as support, replacement, refurbishment, all of which have been discussed in strategic service design and PSS literature, e.g., (Manzini & Vezzoli, 2003; Roy, 2000). The interdependence of interaction and service design in the context of artifacts and their ecosystems, has been featured in discussions within design research (Buchanan, 2001; Fallman, 2007; Holmlid, 2009). While Buchanan and Fallman have approached this interdependence through concepts of fourth order of design and services as digital artifacts respectively, Holmlid emphasized the value of integration of identified interdependencies of service and interaction design.

3 Zygo: Integrated Framework

Integration of service, interaction design and social practice theory perspectives, we argue, creates a hybrid lens through which we can view the design context for second-hand use and reacquisition of durable goods. In this way, discussion of the materiality of goods is brought into service design, as

well as the ability to consider a larger service ecosystem within interaction design. Further, we argue that dispossession and reacquisition need to be discussed as practices. Working with futuring of a service, calls for an approach that allows for objective descriptions of social practices and behaviors in the present, while cultivating emergent futures through abductive and creative processes, assisting in tracing the path of transition. Generally, design research has been known to be especially effective in future focused and exploratory situations when dealing with complex issues with no perfect solutions. Thus, Research through Design (RtD) (Gaver, 2012) provides an overarching framework to guide our inquiry. In particular, we use the interaction design research triangle (Fallman, 2008) as a tool to drift between design studies, design explorations and design practice. We find the triangle to be a useful tool, regardless of the order of design (symbolic, material, service, or complex systems). Research through Design positions the design practice as a means to engage in informed speculations about the future, based on an empathetic understanding of a situation of a theoretically and topically relevant problematic, resulting in proposals, rather than predictions (Zimmerman, Forlizzi, & Evenson, 2007).

In the context of our research, design practice is framed by our engagement with industrial partners in a larger project that is concerned with more sustainable consumption. Thus, a real-world service organization and its second-hand marketplace has been evaluated at the start of our research. However, our work is guided by our research intent to explore a radically different future and thus, the design practice is focused on design and implementation of presently possible alternatives and visions of future services, as if they existed today, that link consumers, service providers, goods, values, goods, practices and the underlying technologies in a holistic manner.

In design explorations, the focus is on extrapolations from the present to what *can be*, in other words, exploration of future practices and future-oriented design proposals. In the context of second-hand use and over consumption, explorations of technological or alternate service-centric proposals are not based on current market expectations. By way of providing an exemplar from this activity, we explored the role of designed artifacts as enablers of second-hand use. One of the objects designed for this purpose is called *Radius* and was designed as a metaphor for the price and other kinds of tags found on new objects. However, rather than providing expected attributes, *Radius* exposes a demand or a supply of items in the second-hand market. This object was designed as a behavioral nudge to place consumer goods on the second-hand market. *Radius* was a conceptual exploration, created free of market, or even technical constraints. Through engagement in reflective making, key discussions emerged, such as how the ecosystem in which *Radius* is placed affects its form and function, how to ensure decrease in consumption, how it can be shared with household members, etc.

Reflections related to seamless integration of diverse design approaches and practices are related to the design studies area of Fallman's design research triangle (Fallman, 2008) and show how the three design activity areas influenced and informed each other in this research.

3.1 Zygo: Service

Knowing that services focusing on second-hand goods are in theory an opportunity for transition towards more sustainable use of goods, but that in practice the situation is a lot more complicated and problematic (Gregson & Crewe, 2003), we began by understanding current services in the local context. The largest local service for repositioning of second-hand goods is something like Craigslist in the USA. It was established in the early 2000 and has been the biggest and the most influential second-hand market service since. In terms of online services, although not local, eBay has had the most significant presence. However, local mobile services have started growing since 2014, and several have been targeting youth and young adults. All of them are based on traditional service design concepts, based on functionality supporting optimal discovery and placement of goods as service offerings. This, in turn, influences people's perceptions and engagement with such services, which they view as mobile digital classifieds rather than marketplace alternatives, see Figure 2.

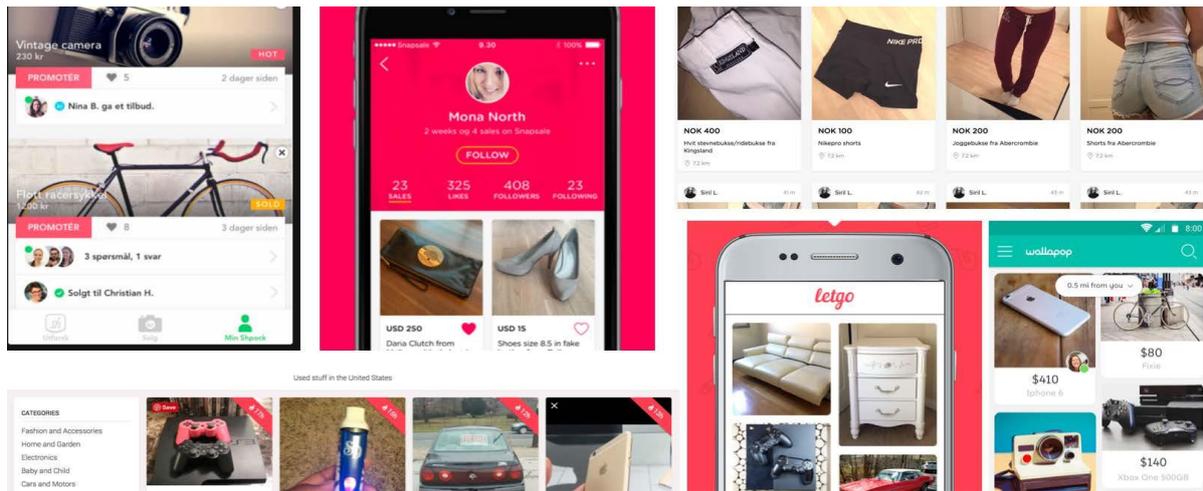


Figure 2 Collage of current online second-hand marketplaces. The images aim to show that products are the exclusive focus in these spaces. No novel or transformational value propositions are visible in these marketplaces.

Therefore, we contend that for the second-hand marketplaces to become a true alternative to the first-hand ones and establish new, de-centralized and localized consumer-consumer relationships, their practices and perceptions need to be challenged, and reframed, both conceptually and through the design of alternate service proposals, situated in a localized context.

Encapsulating the integrated design approach, Zygo is a service proposal based on localized practices of second-hand use and designed around place, people and possessions (see Figure 3), with a focus on the practices and perceptions of the local youth (between 16 to 27 years). It is framed as a scaffold to stages of life in which the youth are deeply invested in independently developing a sense of who they are and who they want to become in the future.

Data on consumption practices, lifestyles and social influences have been collected from sixteen participants, amounting to about 35 hours of recorded material. The main behavioral archetypes (Hartwell & Chen, 2012) that we identified through the analysis of our data were 1) *'nurtured dweller'* – a youth living at home, interested in first-hand purchases and part time income sources, contributing to the second-hand inventory, 2) *'busy frugal nomad'* – those managing shared and temporary living arrangements on a student budget and 3) *'steady independent mover'* - with steady jobs and the ability to replace need based goods with aspirational ones. Zygo has been designed to play a visible role in managing the connections and communication flows between these archetypes, by connecting complementary practices, lifestyle aspirations and needs, see the central part of Figure 3. It incorporates four supporting components: 1) Radius, as an interactive object that helps make decisions on what to sell and buy, 2) diverse print materials that help visualize Zygo as an existing service, 3) a high fidelity mobile prototype of the service and 4) a concept video, utilizing animation and storytelling to articulate possible ways of configuring the elements of consumption practice. Details regarding Zygo and its components, e.g., the functionality of the mobile app prototype, interface concerns related to Radius and other issues that would be addressed within interaction design or service design are outside the scope of this paper. Instead, alternative forms of current and future uses of Zygo and its potential to transform practices towards more sustainable ones, are of central concern. Zygo makes it clear that it aims to support dialogue between different archetypes engaged with the service, help them plan and manage a self-reliant life, assist by sharing relevant information for their transient situation and empower them to become engaged with local, driven and young community it serves.

The following three future narratives feature one of the archetypes each. Narratives are fictive but grounded in the interview data and on Zygo as a designed artifact.

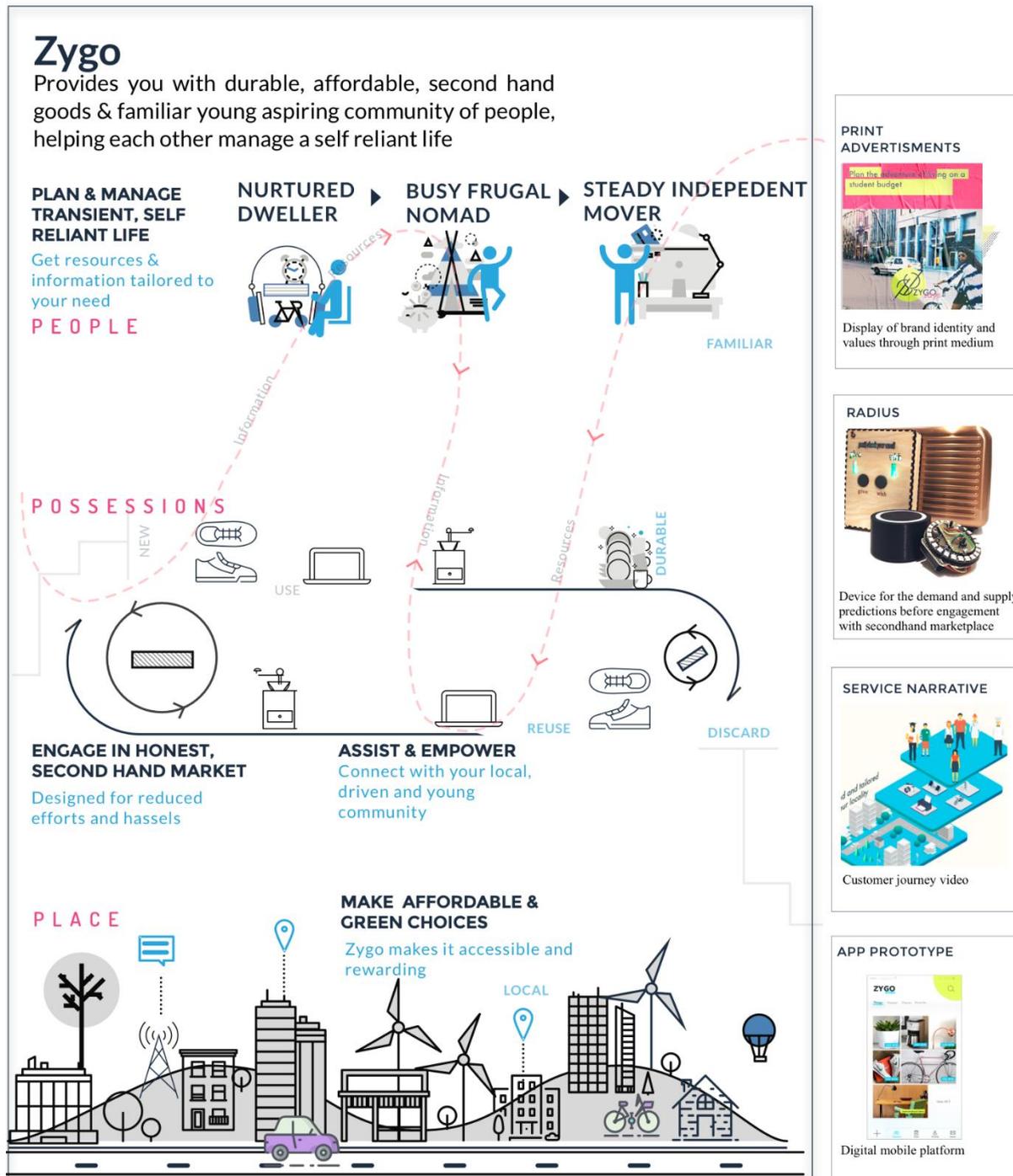


Figure 3 Service visualization, depicting the value landscape. The side images show the supporting elements of the service. These include a mobile app prototype, a video showing the service narrative, a device prototype that shows supply and demand and, finally, printed materials and branding elements

3.2 Zygo: Futuring narratives

3.2.1 Busy Frugal Nomads: Martine and Emma

Martine and Emma are roommates, and long-time friends. Martine is 23 today, but there is no time for a birthday celebration. She and Emma have spent the whole day packing and cleaning their rental apartment. It has been a long and tiring day, yet full of anticipation. The last year of college is over, the dream job is on the horizon. Taking a picture off the wall, Martine glanced at Emma and burst into laughter. Emma was hugging their purple reading chair hard, clearly unhappy about the prospect of parting

with it. A freshman girl was to come in 20 minutes and take the chair away. Emma knew that she cannot take it with her to the city she is moving to. Martine loved the chair too, but her heart was now set on a limited edition Hygge living room piece that she will get for her new place. For the past few months, she has been taking a longer route home, the route that led by Hygge's window display, showcasing what she considered to be the ultimate chair. Martine looked at the picture in her hand. She found herself staring at a photograph showing the party in their gorgeous living room, from two years ago. It evoked lots of memories of their arrival to this place. Martine had just a few books, a bicycle, some lamps and her favourite curtains. Even though the studies and the part time job took most of her energy, she and Emma still managed to create more than a decent interior, on a tight budget. Thanks to Zygo and its University Circle. Martine and Emma, as was traditional when graduating, put a bunch of things from their apartment on Zygo University Circle, the purple chair being one of them. Everyone bought as a freshman and sold when graduating. It was customary to take good care of things in use, in particular, of things for home that were solid and made with love. It was nice and convenient. The incoming students would always look for stuff at the University Circle first, because it was very local, and thus, even without a car, easy to pick things up. They called this "Zygoing" the place.

It was the day when they got the much sought after coffee machine from a newly graduated girl that Martine famously declared that she and Emma were Zygo pros. Time really passed fast. For four years, this place was home and it reflected so much of who Martine was then, and who she wanted to be, too. Snapping back to the present, Martine turned to Emma: "You know, I will miss very much Zygoing my new place with you. Apart from Hygge's chair, I will Zygo everything. Do you really have to go live that far away?" Emma smiled and patted the back of the purple chair "I will never forget how we killed our backs carrying this chair for the entire four blocks, and then up to the third floor. We were just awesome."

The narrative shows Martine and Emma as part of the established social practice around acquiring home stuff from Zygo's University Circle. They bought from graduating students, they sold when they graduated. It was local, green and they felt good about it. This way of engaging with the service even got a name: Zygoing. The girls made an assembly of things from Zygo easily, as they appropriated things in a manner consistent with the vision of frugal, communal student life. They got nearly heirloom, lovable pieces of furniture that it was hard to part from. However, Martine was facing a possibly challenging situation. Buying the Hygge chair, she risked having to get everything much classier than intended, in order to match the superb design of Hygge chair. The matching, or Diderot effect (Ingram et al., 2007), and the social comparison mechanism during the transition from student to professional life were known to trigger overconsumption. Fortunately, Martine was a Zygoing pro, and was aware of this possible trap. The narrative offers opportunities for futuring and discussing practices related to the service, in conjunction with thinking about social practices and consumption mechanisms, both at the theoretical level and at the level of engagement with Zygo over time, tracing the evolving worldview, while transitioning towards the preferred future.

3.2.2 Nurtured Dweller: John

At 17, and from the age of 3, John has an immense passion for electronics. However, he is still in high school and does not have a job yet, so money is an issue and his parents are not very understanding. Earlier this morning, he asked mom if he could do chores to earn some money so that he could buy XyLens II, and her response was: "Did you not get that last month?" "That was just a XyLens, mom, not XyLens II". "Besides", mom said, "you need to see some friends and not live for this stuff only." John has been using Zygo since he discovered the service 2 years ago. He always sold components or other stuff that he did not need any more, in order to be able to support and develop this passion.

He would take up new technologies so fast that he would usually be done with them when others just discovered them. Thus, he never had problems selling his stuff. Fortunately, because he often needed extra money to pay for new things. Zygo had the best selection of specialized used items, sometimes even cutting-edge prototypes from the local tech companies that represented rejected research directions. He loved those the best, but they were quite rare. He managed to get only three so far.

Zygo noticed John's special interest, ability and passion for what he does (seeing how he tweaked some standard electronics and was selling way better stuff as second-hands). At this moment, the Zygo stuff was sitting around the table, their coffee pot heated on John's solar heating element, a tweak he sold recently and an employee happened to buy. They were discussing the possibility to use enthusiasts like John and offer him a part time work with their new and still very small research and development team that held totally radical ecological perspective in relation to digital technologies, including following of the principles of green informatics for Zygo's own development. The company held stance that design of their service is never really finished, they were open to exploration and understood that there is no such thing as infinite economic growth, but employees depended on their income and Zygo could not put them in jeopardy. Yes, John should be offered part time work at Zygo. He will no longer need to ask mom for money and mom will not have to worry about his social life.

Like some youth in our interviews, who still lived with their parents, John was interested in engaging with the first-hand market, in his case, a very specialized one. Only very special second-hands were of interest. John consumed a lot of technology, usually new, niche second-hands, and sold a lot. Using the newest technologies stimulated him immensely, and through this experience, he shaped his own identity as a that of a digital wizard and a nerd, i.e. The Creation of Self-identity and Mental Stimulation and Novelty from (Ingram et al., 2007) were the mechanisms that led him to consume. There are several lines of inquiry that open up through this narrative, we outline two. Firstly, how does John exactly use the Zygo app? Does he use any other products in his dealings with the service, e.g., Radius, or alternatives to it? Does he have any practices established in relation to how and when he uses Zygo? If so, how are they performed? Is there room for creating proto-practices? Do other "super users", like John, have different practices? Secondly, how could people like John, powered by skills, knowledge and passion, make Zygo's green aspirations more visible?

3.2.3 Steady Independent Mover: Edward

Edward loved his mornings. His 27 years old body was thriving on morning runs. He just returned from a run, and was tending to his breakfast making routine. He looked through the kitchen window, and found out that he was once more admiring the view. It had a bunch of qualities he appreciated. A scarce find these days. Waiting for the toast, he could not help but notice some Go-wheels in the area. "Well, at least they are bio-powered", he thought, avoiding conflicting emotions of guilt and pride. Guilt emerged every time he thought he had some responsibility for Go-wheels presence everywhere, and pride whenever he acknowledged that they actually do their job well. Go-wheels were driverless carts, used by the vast majority of delivery services these days. Zygo Inc., where Edward now works, is one of them. When businesses were looking for green alternatives, Zygo led by example. Edward appreciated the vision of the company. He accepted the job offer at Zygo because of its cutting edge, dynamic and global work profile. Also, because the company was familiar. He grew up using their services. His four star rating and all the badges he won as a youth prove his long lasting devotion to the service. Now, a part of Zygo, living the life he always wished for, he was working with a team introducing Zygo's hologram inventory displays to local stores. Interacting with holograms is fun, but he still likes the Radius that helped him earn many of the badges. Two days ago, he stepped into his favourite shoe store and found himself

scanning a pair of running shoes with Radius. The light on the Radius turned green. It meant that he could get a used pair on Zygo. He pressed the order button. Edward glanced at shoes sitting in the hallway. He ran in them today. He picked them up yesterday from a Go-wheel, just after he returned from work. The shoes came with a story of the previous owner, a local athlete. They were barely broken in, but still more comfy than a new pair.

Edward's story illustrates how the products like Radius, made to fit the purpose of disposal, may promote buying second-hand and increase the loyalty to the brand, even passed student age. This narrative stretches further away in the future than the previous ones. It paints a longer time trajectory of Zygo's existence and use and can be used to speculate and critically reflect on artifacts in the narrative (holograms, Go-wheel carts, Radius, badges) and lifestyles that they co-create together with human actors.

4 Discussion

Everyday life is, potentially, a powerful transformative space. It is also a space that we are so used to that it makes it hard to scrutinize. It is easy, for designers in line with everyone else, to miss larger issues around consumption and consumption related everyday practices (Ingram et al., 2007), especially since traditional interests of designers are focused on new products and services opportunities, and not everyday life with designed objects and practices around use. Thus, drawing contextual boundaries around design spaces for transition towards decreased consumption of new goods by moving the second-hand marketplaces from their niche position mainstream, is not a simple matter. As with all complex, systemic design situations, there is an entanglement of things, people, social practices and environment, and there are no obvious ways to delineate what should be a part of a design context and what not. However, thinking within the framework of four orders of design (Buchanan, 2001), in increasing levels of complexity, is helpful, even though they differ in their strategy, intention, and outcomes. Buchanan (ibid.) suggests that the first order engages in communication, using symbols and graphical design as main vehicles of communication. The second order encompasses the traditional design and focuses on products, material things. The third one advances to interactions, experiences and services, while the fourth considers systems and environments. Each requires distinct skills, methods, and design practices.

In designing Zygo, all four orders of design were important and each is represented by one, or more, of its components. The first order of design enables Zygo to communicate about itself, through printed materials and video. It uses graphic design and visual symbols to communicate information about the service, and animation to show a typical day in lives of Zygo users. What printed and video material communicate is not arbitrary. The design of this material emerged by engaging with our research focus and maintaining a design workbook (Gaver, 2011), that helped create a visual account of '*reflection in practice*' (Schön, 1984) of *influences, rationales and assessment* of the work on Zygo, and allowed us to extract meaningful images, animated narratives and quality information about the service proposition.

Radius is an outcome of the second order of design, it is a designed object made to generate questions around practices related to acquisition, dispossession and reacquisition of consumer goods.

Zygo App is also a designed object, a research prototype and an outcome of the first iteration of service futuring. It belongs to the third order of design as it provides for interactions, experiences, planning and managing actions related to the second-hand market at Zygo. Lastly, Zygo enables creation of practices around the service. Introducing environmental and sustainability concerns, as well as an opportunity to design proto-practices and subsequently social practices, moves the entire project into the fourth order of design. This, as expected, leads to increased complexity and entanglement of issues. The narratives presented in the previous section, aim to highlight aspects of near and far future with Zygo, and draw a picture of how Zygo works and what are the potential issues with respect to the transition towards decreased consumption.

Service futuring for transition needs to establish a set of principles that would enable new, future forms of design and design practices to emerge. Ways of supporting deliberate conversations leading to collective action that enables transition are also needed. Narratives, as the ones presented here, open for such conversations today. They, however, need to be well crafted and rooted in data and data analysis (e.g., finding archetypes of consumption from interview data and identifying challenge points in today's practices), as well as how they support and provide theoretical insights, in order to communicate to others, for example, industrial partners, the relevance of futuring.

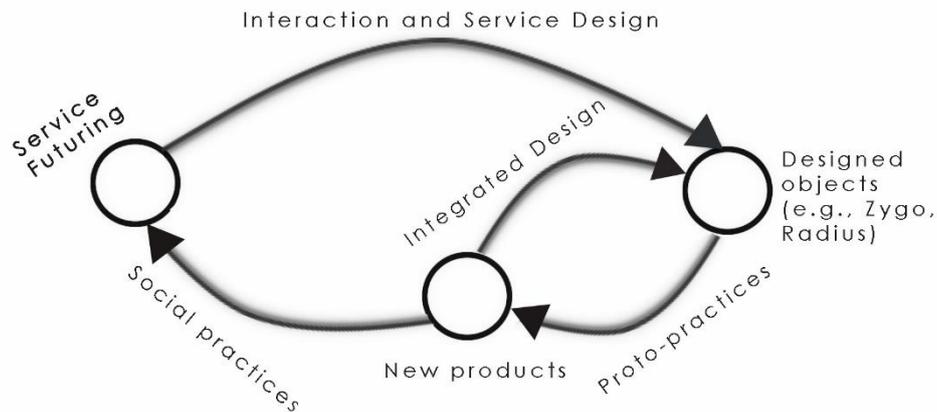


Figure 4 The model of Service Futuring based on Integrated Design approach, including social practices and design at all four orders, for transition towards a more sustainable consumption

We propose an approach to integrated design that draws on interaction and service design, social practice theory and practice-oriented design, see Figure 4. Starting from very concrete and practical concerns of industrial partners, we engaged in design studies and theoretical concerns around the underlying research inquiry and, using research through design, constructed designed objects, Radius and Zygo. Understanding that knowledge emerging from RtD is *provisional, contingent and aspirational* (Gaver, 2012, p. 937), making these objects provide a basis for practice studies and other queries. Knowing that there is a high demand for an unused toaster, would you sell it? Would new practices based on Zygo and Radius emerge? How would proto-practices be used? Such inquiries lead to new product opportunities, or to re-design and new explorations with designed research objects, including making of new ones. The new products, however, should have the power to create and support new social practices, such as Zygo's University Circle, introduced in the first narrative. As mention earlier, the service futuring is dynamic and after each successful product and practices related to it, new futuring can take place.

In reference to the transition design framework from (Irwin et al., 2015, p. 7), in this work we have focused on the entanglement between new ways of designing and theories of change, as a way of creating a vision for transition, see Figure 5. Integrated design that includes all four orders of design and practice-oriented design for service futuring is a proposal that was hinted at in (Ingram et al., 2007), and developed here, starting from design of research products, and including then study of proto-practices and how they move towards practice as entity and social practices.

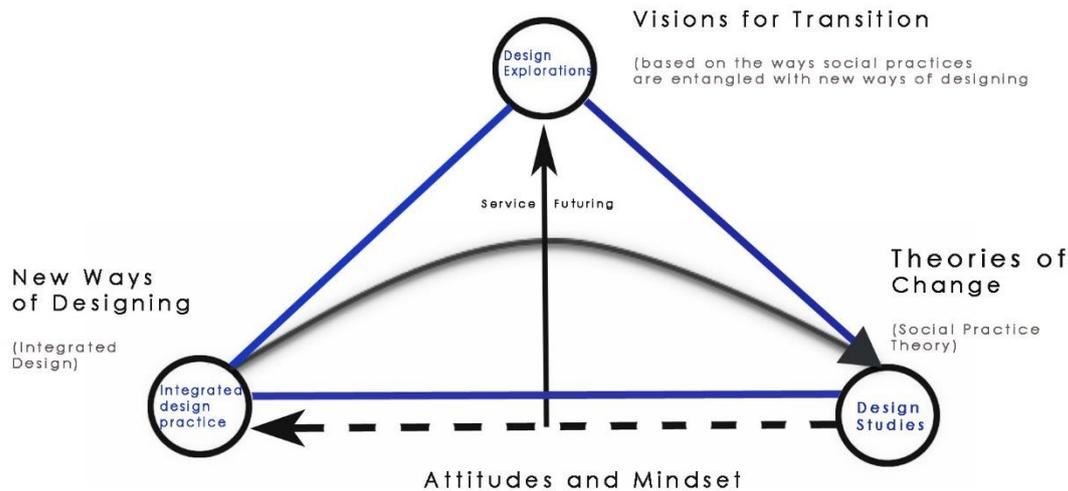


Figure 5 Transition Design Framework to gradually transform consumerist practices towards more sustainable ones

As mentioned in the introduction, the overarching methodology and, specifically, design research triangle were used throughout the work. The positioning of the triangle as shown in Figure 5, is delineating the dominant areas of RtD engagement (practice, studies and explorations) and elements that promote transition (Integrated design, social practice theory and futuring). This correspondence, just like drifting is in RtD, is fluid and does not prescribe. The reflective account of our engagement with RtD as the basis for our knowledge contributions, moves the focus back to design studies to create a final account of the knowledge generated from the explorations related to Zygo futuring.

In conclusion, we hope that the presented approach demonstrates possibilities of cross-fertilizing theories, diverse design practices within interaction, service and practice-oriented design. In our view, Zygo, and the presented narratives, exemplify a design concept that could be a viable alternative for the real world to transition towards more sustainable consumption practices.

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Exploring Lost and Found in Future Images of Energy Transitions: towards a bridging practice of provoking and affirming design

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We need to transition our society in a more sustainable direction, for example through enormous cuts in carbon emissions. Yet this future is hard to envision and work towards. In this project, with a transition design posture, we have designed tools that we believe can be useful to initiate dialogues and reflections for the future. In particular we are interested in using the bridging between *provocative* and *affirmative* design as a way to explore and articulate what people see as the *lost and found* of such a transition. In this paper, we present a study where we used a practice lens to address one possible low carbon future through a provocation workshop. We present our methodology, the tentative tools we used during the workshop and the experiences as expressed by the workshop participants.

sustainability transitions; transition design posture; provocative and affirmative design; lost and found

1 Introduction

Every day, we are bombarded with news of extreme weather events, species extinction and land devastation. A search in the Swedish media archive shows that between 2014 and 2017 there was an average of 21 000 articles per year in Swedish newspapers on climate change related topics¹. We know that several of the planetary boundaries have been overstepped (Steffen et al., 2015) and the scientific community is univocal in its agreement that climate change is real and with human origin (Stocker et al., 2013). We also know that a failure to keep global warming under 2 degrees Celsius, or, preferably, 1.5 degrees, most probably will lead to changes in climate systems with “severe, pervasive and irreversible impacts for people and ecosystems” (IPCC 2014, p.8). Yet, the transition to a more sustainable society with less carbon emissions is moving slowly. The UN emissions report of

¹ The articles were identified through searching for words including “klimat” (climate) in Swedish printed media published 2014-2017. Press releases and news agencies were excluded. The search was done 2017-11-05.



2017 shows that the gap between the reductions needed and the national pledges made in Paris is “alarmingly high” (UNEP, 2017).

This is not a new concern. Back in 2001, Norgaard (2011) did a one year ethnographic study in a Norwegian village and showed that despite the diminishing weeks of snow cover that affected the villagers’ livelihood, based on ski tourism, her respondents still avoided talking or thinking about climate change. Norgaard’s study showed that it is not lack of information that hindered action from the Norwegian villagers, but that people tend to shut out information that makes them uncomfortable. Through avoiding negative emotions and refraining from thinking about the future, climate change is actively (although not consciously) made into a “back-of-the-mind” issue. However, for a transition to happen, climate change needs to be transformed to a “front-of-the-mind” issue in politics (Giddens, 2011) as well as in everyday life. But how do we overcome the mechanisms of denial?

Studies on climate change communication have shown that too much alarmism depersonalizes the problem and makes it harder for individuals to engage and act (Ereaut & Segnit, 2006; Lowe, 2006). Moreover, while alarmist accounts could indeed induce emotions like fear, which could be a driver for pro-environmental behaviour, many people suffer from a perceived lack of agency and alternatives. Fear, rather than motivating people to act, thus lead to feelings of helplessness, hopelessness and inaction (Kollmuss & Agyeman, 2002).

Weber (2010) suggests that for individuals to become more engaged in climate change concretisation is needed, both by making climate change consequences more specific, as well as moving these closer in time and place. Schneider-Mayerson (2017) instead points to the lack of positive images of what low carbon futures might look like, making action hard to encourage. Furthermore, Randall (2009) describes the parallel narratives on climate change, where the problems lead to catastrophic losses, but where the solution narratives are often devoid of loss. Ignoring loss when working with climate change risk effects can hold back change efforts, or distract us from action, and result instead in rejection and avoidance, manic activity, idealization of lost things, or focusing on false solutions (ibid.).

In this paper, we seek to explore how transition design and futures studies could be used as empowering tools in relation to climate change mitigation. In particular we explore ways to identify and articulate what people see as *lost and found* in the transition to a low-carbon society, to investigate if there are ways to confront the *lost*, so this seems less threatening, and to mentally and emotionally invest in the *found*, to make the transition more appealing.

2 Framing our project as transition design

Sustainability transitions are extraordinarily complex, future oriented, abstract and global, as compared to less challenging problems that tend to be more immediate, visible and local (Geels, 2010). This implies that sustainability transitions need to be addressed by transdisciplinary approaches in which not only different scientific disciplines are involved but also other types of knowledge cultures such as practice based, tacit and lay knowledge (Miller et al., 2008; Robinson, 2004; 2008). Also Stirling (2011) urges for transdisciplinary approaches to open up for plural possibilities of transformations.

Transition design is an emerging design research field that aims at engaging design practice in exploring and enabling transitions towards more sustainable futures. It acknowledges that design can act as catalyst for change, even for complex systems, and suggests a role for designers as change agents (Irwin, Kossoff, & Tonkinwise, 2015). Irwin, Kossoff and Tonkinwise (2015) present four “building blocks” of transition design: 1) visions for transitions, 2) theories of change, 3) posture and mindset, and 4) new ways of designing. We elaborate on these building blocks in this paper, although in a different order. First, we explore what an interlinking of posture and mindset with theories of change brings us (focusing on socio-technical transition theories and social practice

theories, respectively). Thereafter, we continue with exploring ways of designing and developing visions of transition.

2.1 Mindset and posture from within theories of change

Transition design advocates a mindset and posture that is *precautionary*, encouraging an explorative, reflexive and critical stance rather than aiming for optimized solutions (Tonkinwise, 2016). Transition design also advocates a mindset that is *participatory*, promoting collaborative efforts which acknowledge lay and tacit knowledge and know-how alongside professional and academic knowledge. A precautionary mindset and posture resonates well with socio-technical transition theories, such as transition management, as these promote reflexive learning for adaptive governance through visioning and experimentation (Kemp, Loorbach, & Rotmans, 2007). Transition management is also in line with a participatory mindset and posture but has traditionally focused on engaging people-as-professionals rather than as lay experts or experts on everyday life.

To understand the local, place-based and situated, and to engage people-as-people, a practice-oriented approach is useful. Practices are routinized activities carried out in everyday life (Reckwitz, 2002). Social practice theories focus on how people's everyday practices are shaped in the social context. Using social practice theories as a way to understand how to change "behaviours", is to acknowledge that the possibility of change lies in the emergence and maintenance of the practice itself (Warde, 2005). Social practice theories constitute one field of the transition theories and as such, is the one closest to people and their behaviour (Geels, 2010; Shove & Walker, 2010). They are particularly well-suited as a basis for transition design since the starting point for design has traditionally been in understanding (and influencing) the needs and wants of people (Forty, 1986). Also, the flatter ontology of social practice theories suits the design researcher, trained in messiness (Schön, 1983).

When aiming at supporting sustainability transitions, attention can be paid to vertical relations, as in the multi-level perspective (Geels, 2010), or to horizontal trajectories and interconnections of practices (Shove & Walker, 2010). Transition design could be used to mediate between socio-technical transition theories with their top-down hierarchical approaches and, and social practice theories with their bottom-up focus on everyday life and flat ontology. The capacity to iterate between concrete details of everyday life and more abstract concepts is a characteristic of most design practices (Nelson & Stolterman, 2003). However, what is specific in transition design is the connection to more macro-scaled societal structures and processes. Hence we believe that transition designers as change agents can thus operate at multiple levels of scale, including time and place.

2.2 Ways of designing and visions: Provoking and affirming design

To even further connect with people and their everyday practices, we believe co-design can be productive. Co-design, as a design research approach, is based in a participatory mindset where users are viewed as partners (Sanders, 2008). This partnership can be formed with different outlets (*for* or *with* the user) and different timescales in mind (near or far futures), forming a number of different design research approaches (Sanders & Stappers, 2014). In co-design, as ways to empower creativity amongst participants, bridging between *pasts*, *presents* and *futures* is often used, i.e. to discuss the present situation whilst referring to past experiences and then to envision future possibilities (Sanders & Stappers, 2012). Co-design can also be implemented, together with users, to explore the connection between the tangible, present and local (such as dinner practices) with the more abstract, future and global (such as climate change impacts). This is difficult, however, and we argue that there is a need for tools to further help participants in these different movements – in time, in place and in possibilities.

In the following we will use the concepts – *provoking* and *affirming*, respectively – to denote two design approaches we think are essential for transition design and which can be used in co-design workshops. We define provoking (or provocative) design approaches as those aiming at destabilizing

and de-familiarizing (Bell, Blythe, & Sengers, 2005) the taken for granted, routinized and “back-of-the-mind” issues, in this way opening up for re-presenting and re-narrating processes. We define affirming (affirmative) design approaches as those aimed at supporting an exploration of the self, within ideas of present norms and practices, providing full preferential right of interpretation to the user. We acknowledge that there is tension between these concepts, but also see potential in using them for bridging purposes.

In this paper, we explore how such a bridging of provocative and affirmative design approaches could look in terms of concrete design tools, and how this can be used to explore more sustainable energy futures. We see design tools as *research devices*, which are links between objects and methods that can act as hinges between concepts and practices (Lury & Wakeford, 2012). To use them in practice-based design research is to design and use artefacts to initiate thinking processes. More specifically we explore how such bridging research devices can be helpful to empower users to explore and articulate their images of more sustainable energy futures, in particular as a way to explore personal and societal *lost and found* in relation to sustainability transitions. This also includes the bridging of the tangible-present-local to the abstract-future-global, as discussed above.

3 Using traces of practices

3.1 Introducing Empowering Energy Futures

The material presented in this paper was developed in the research project *Empowering Energy Futures* carried out in Stockholm, Sweden 2015-2017. The team was interdisciplinary, including researchers and practitioners with backgrounds in industrial design, interaction design, human-computer interaction, futures studies, systems analysis and graphic design. The overarching aim of the project was to explore people’s images of the future from an energy transition perspective. In this paper, we focus on a subset of the activities in the project, where we sought to develop supportive tools for people to explore their own low carbon futures. Central to this effort was a ‘provocation workshop’ to which environmentally engaged participants were invited to explore the *lost and found* in such futures. Furthermore, the project developed an energy fiction, *Vitiden*, in the form of a manifesto and future archaeology with inspiration from design fiction. The energy fiction and its development will be presented in a separate forthcoming paper.

3.2 What future and which everyday life?

As a basis for the project we decided to use a scenario study by the Swedish Energy Agency called “Four Futures” [*Fyra framtider*] (Energimyndigheten, 2016). It explores and describes four possible futures in the years 2035 and 2050 with a focus on how the Swedish energy system could be developed. Each of the four scenarios – Forte, Vivace, Espresso and Legato – is premised on a specific combination of driving forces: in Forte, economic growth and a strong export industry are the main priorities of Swedish society; Vivace builds on ecological modernization and export of Swedish green-tech; in Espresso individual consumers and flexibility stand in focus; and for Legato ecological sustainability and global solidarity are the main concerns. These drivers influence not only the development of the energy system per se but also how industry, built environment, transport systems, and, to some extent, everyday life are organised. Each scenario is described in both qualitative and quantitative terms.

Since the aim of this project was to explore sustainable futures, and not just any futures, we decided to work solely with the scenario Legato, the only scenario in line with meeting the Paris agreement to keep global warming under 1.5 degrees. An initial analysis of Legato made it clear that while behavioural changes were mentioned, their descriptions were quite detached from everyday life, essentially making it difficult for people who were not energy systems experts to engage in this future and understand how it would affect them. Trawling for traces of practices in the text however resulted in a net list of eleven practices (or ‘lifestyle changes’), including, for example, to bicycle more, to use car sharing, rental car or taxi instead of owning a car, and to work less or to work more

locally. Looking closer at the list, it became clear that several of the practices focused on ‘production’ activities such as how and where to work, and that the rest mainly dealt with transport. Practices concerned with how we eat and reside were missing altogether, something that later found its explanation in the fact that Legato’s impacts were mitigated through efficiency measures in production and infrastructure. Yet, reading between the lines, we could see that eating and residing as practices would also be affected by this particular future, if only indirectly, so we decided to add these to the list of practices. Another reason for this ‘corruption’ of data was that previous experience has shown that it is very difficult to engage people in discussions about everyday life while excluding large parts of it. Legato and its background data were also analysed to concretize what the changes in the energy system would imply in quantitative terms. This analysis showed that in Legato the carbon emission per person per year in 2050 would be 0.6 tonne of CO_{2e}, as compared to today’s 10.8, i.e. emission cuts by 94 per cent².

To understand what the low carbon practices in Legato could be like we decided to interview ‘early adopters’ and forerunners of sustainable lifestyles. From the net list of practices, we extracted four that we wanted to explore in more depth: “work less”, “increase the level of self-sufficiency”, “refrain from longer trips” and “refrain from environmentally burdening consumption”. Indeed, such practices are entangled and hard to separate, and in the end, we identified and conducted contextual in-depth interviews with five respondents (Table 1).

Table 1 The five forerunners and their four entangled practices.

	Work less	Refrain from consumption	Refrain from longer trips	Increased self-sufficiency
Downshifter	x	x	x	
Stopped flying			x	
Guerrilla-farmer/activist		x		x
Organic farmer			x	x
Simple living	x	x		

Interviews were semi-structured and carried out by three of the researchers in the homes of the respondents. Interviews were audio recorded and notes and photographs were taken (see Figure 1 for examples). The insights into the forerunners’ practices formed a basis for the subsequent design work. Their already existing practices could be considered potential practices for the many in the future and as such gave us insights into the tangible-present-local as possible departing points for the abstract-future-global.

² These calculations were made in several steps, including converting the partial-territorial system definition used in the construction of Legato to a consumption-based system definition more in line with the societal values of Legato. A comprehensive account on these calculations is available upon request.



Figure 1 Examples from in-home-interviews with forerunners.

4 Reconceptualizing the future through trigger materials

When planning the workshop, we considered different kinds of materials that could be used to promote reflection and discussion amongst the participants. These were developed with emphasis on helping the participants to bridge the tangible-present-local to the abstract-future-global, and with particular emphasis on finding ways to balance the provocative with the affirmative. Another starting point was the wish to create a workshop process that meandered from the individual to the group and so on to more global issues. In the end, this resulted in the development of four different trigger materials used before and during the workshop.

4.1 Trigger material 1

The first trigger material was a homework assignment, where the invited participants were asked to make a climate footprint calculation before the workshop. For this purpose, the Swedish “Klimatkalkylatorn”³ was chosen, which was suitable as it was readily available, fairly easy to use, included clear and simple result presentations with a coverage of the majority of the carbon emissions from everyday consumption, and was developed by trustworthy organizations. The idea with this trigger material was for it to function as a sensitizing material (Sanders & Stappers, 2012), making the participants reflect beforehand on their current and past activities in relation to climate impact. Once in the workshop, the participants were asked to present their own results and were then presented with a brief presentation of the future we were to explore where the average carbon footprint per person and year would be 0.6 tons CO₂e.

4.2 Trigger material 2

The second trigger material was developed as a set of cards and a 2x2 matrix, with one dimension spanning from “happy” to “sad”, and the other from “more in the future” to “less of in the future”. The cards were inspired by photo elicitation (Harper, 2002). The specific pictures were chosen to represent possible configurations of the practices identified in Legato, the reference research and the interviews. Another selection criteria was to have an equal or close to equal representation of gender, class and ethnicity across pictures. We also sought to include ambiguous pictures, as well as more ‘dystopian’ pictures. The 2x2 matrix was developed inspired by explorative futures studies in which similar matrices are used to examine uncertainties.

The cards depicted different activities, practices and things – concrete enough to support associations, but still open for interpretation (See Figure 2). The idea was that the participants

³ <https://www.klimatkalkylatorn.se/> developed by SEI and WWF.

should use the cards to explore what their hopes and fears were in relation to a more sustainable future, essentially helping them explore and articulate *lost and found*. As a primer, the participants had the individual carbon footprints from the first trigger material as well as the targeted carbon footprint of 0.6 CO₂e. After a period of self-reflection, the participants presented to the group some of their selected cards and placings, and described their feelings connected to these.



Figure 2 The cards used as the second trigger material.

4.3 Trigger material 3

The third trigger material comprised seven fictitious headline posters, representing possible configurations of Legato. The headlines were inspired by artistic explorations⁴ of futures and presents. The headlines were designed to spur reactions, to confront the participants with possible futures as if they were already here. The main reason for giving the futures-as-present the shape of headlines was that we wanted to use a familiar form but avoid images. Through this the participants did not have to spend time making sense of the form before making sense of the content (to the extent that these two can be separated). The avoidance of images aimed to activate the participant's own imagination in the sense-making process, thus decreasing the risk that participants distanced themselves from the content because they did not like or believe in our way of visually representing it. During the workshop, the participants were first invited to individually place post-its with their immediate thoughts at the different posters. This was followed by a discussion, after which the participants were divided into smaller groups to discuss more in depth one of the headline posters and its implications.

4.4 Trigger material 4

The fourth trigger material consisted of “fill-in-the-blanks” posters, where the participants themselves filled in the missing words. The material was created to support reflections, but also as a playful and co-creative ending to the workshop, inviting the participants to ‘check out’ while creating decrees about the present and future.

⁴ Examples include the project “Wish you were here? Postcards from the Future” by Robert Graves and Didier Madoc-Jones, and Barbara Kruger’s collages.

4.5 Workshop participants

The workshop was arranged in May 2017, with 9 participants and conducted in Stockholm, Sweden. The participants were recruited by Kantar SIFO⁵ from a database of people willing to be part of discussion groups and who had indicated they were interested in environmental issues. Five were women, four were men and the participants were between 27 and 70 years old. Besides their mutual environmental interest, the participants were recruited to have a spread in interests and values. The two-and-a-half hour workshop was arranged during the evening and followed a workshop schedule that was open for the participants' discussions and reflections as interests shifted.

5 Engaging with the trigger materials

In this section, we describe some examples of the discussions that took place and provocations that the trigger materials created, with a focus on our perception of how the participants expressed their thoughts on *lost and found*.

5.1 Trigger material 1

In the beginning of the workshop, when the participants presented themselves and talked about their climate footprints, most of them were uncomfortable or even distressed, since (all but one of them) had larger footprints than they had anticipated:

"I was surprised, I thought I would be much lower, I've always seen myself like a hero, and then I'm just average. I thought everyone else were much more environmental villains compared to me."
Participant 5

The participants' results in the climate footprint calculation carried out prior to the workshop ranged from 7.2 to 19.2 CO₂e. All the participants had environmental concerns and tried to consume less or make more sustainable choices in their everyday lives. Furthermore, the climate footprint calculator results had surprised them, showing how large a portion of their footprints came from flying or housing, which they had previously not been aware of. There was a sensed tension when discussing their climate footprints and a subdued atmosphere around the table. When the goal of 0.6 CO₂e was presented there were exclamations of surprise and frustration.

5.2 Trigger material 2

When presented with the second trigger material (see Figure 3), the part focusing most clearly on *lost and found*, some of the participants moved between hope and despair as they navigated through different possibilities. Having previously expressed anger with their current footprints, some of the participants turned around and became positive as they realised that they would perhaps not miss so many of their current lifestyle choices. Instead, they expressed wishes for the non-material and the simple, as expressed in the following quote:

"An increase in non-material phenomena, experiences rather than buying things, things you do together, there was this picture with dancing people for example. Playing games, camping, things that do not require so much resources." Participant 2

Several participants also thought that we would live healthier in the future, as well as finding calmness and fulfilment in things closer to home. Some participants expressed hope in the development of new technologies including new types of foods. When it came to losses and fears, many expressed sadness over the loss of travelling, and fears for a more insecure and unstable future, with potentially more conflicts over resources, climate fugitives and irreversible waste from our current affluent society.

Some of the images, like those depicting for example military marching, were difficult for the participants to relate to and were interpreted differently. Some participants were confused with

⁵ Kantar SIFO is a company working with opinion and social research, surveys and recruitment for different polls.

how the four fields of the matrix were to be interpreted as what they thought would happen or what they wanted to happen. Clearly, there was a tension between these two. Some participants had a need to also understand how the transition would happen, and even though they could envision alternative futures, they got stuck in not understanding how the necessary changes could possibly take place. Some participants expressed wishes regarding clear directions from governments and policy makers with new laws, regulations and even rationing of, for example, fossil fuels.



Figure 3 Participant reflecting and placing cards in the 2x2 matrix.

5.3 Trigger material 3

The third trigger material (see Figure 4) was the headline posters, and these also stirred up a fair amount of emotion, both negative and positive. When asked for first impressions, “Tonight the last airplane took off” was the headline poster that received the most attention. For some it was preposterous, a fable:

“It will never happen, [...] unless it is a world war. It is too black and white, there will always be exceptions. There will always be airplanes, even if it was decided that we ordinary people are not allowed to fly. There would be military or unquestionable transports of medicine.” Participant 9

Many expressed sadness and loss of what the lack of travelling would lead to, but some also expressed positive feelings if flying were forbidden, potentially making train trips better and cheaper. One participant raised the question whether the reachable world would shrink whereby understandings of other cultures and customs might diminish. In the collective discussion around the headline posters, further topics were brought up, as if the posters had set in motion thinking about connected matters. One example was a discussion around self-sufficiency that prompted the participants to discuss working hours and a larger shift of time perception in society.

After a vote around the table, three of the headlines were chosen to be discussed in more depth in smaller groups (“Last airplane taking off tonight”, “10 steps towards increased self-sufficiency”, “Stockholm’s major road will become a place for urban farming”). In the smaller groups, several tensions and problematic dilemmas were brought up. Regarding airplane transportation, the participants discussed the difference between necessary flying (for example medicines in emergency situations) and unnecessary flying (for example Thailand vacations). Other travel practices, such as train trips, were discussed as alternatives and the participants pointed out that appreciation of travel time could be an alternative value to promote. Also appreciating holiday time in your home

town was pointed out as an alternative to unnecessary flying. Furthermore, the poster “Introducing meat tax” was discussed as a very realistic headline that actually could be implemented already this year. In order for a meat tax to have effect, the participants felt that the level of this tax would need to be very high. Furthermore, the participants also discussed the need for rationing fossil fuels and comparisons were made to how this took place in the 1970s and how well it worked at that time.



Figure 4 Participant writing down his first impressions of the headline poster stating: “Last airplane taking off tonight”.

5.4 Trigger material 4

In the last exercise, the participants created their own posters of possible future headlines from newspapers and magazines (see Figure 5). Several of the participants put the message: “For the sake of my children and grandchildren, I refrain from flying, car-driving and eating meat”.

Finally, there was an open discussion around the table where the participants were encouraged to talk about how they had experienced the workshop as a whole. Some described it as being intense and thought provoking, as expressed in the following quote:

“The uninhibited consumption our generation has experienced will never be relived. We are standing at a crossroad, we can’t continue like this. We have to end it. I almost feel like an old dinosaur. Soon the comet will come and then everything will be changed.” Participant 1

But many of the participants also expressed feelings of hope and positive outlooks for the future, even though some of them had come to the workshop with negative feelings about their own footprint and despair related to the seemingly impossible task of changing society into a more sustainable one. Some of the participants expressed gratefulness in being part of the workshop and claimed that they had learnt many new things and acquired interesting ideas. As a summary, the whole group, despite being diverse except for their engagement in environmental issues, seemed to gain a thirst for knowledge and a context to talk about climate change and the future.



Figure 5 Participants with the posters they made, from left to right: “Spiritual development/meditation circles is my new Friday family time”, “Your sweat will create energy”, “More plants give peace of mind” and “For the survival of my grandchildren I refrain from meat and flying”.

6 Discussion: Balancing act

The trigger materials, i.e. research devices, used in this research project were designed to engage users in exploring and articulating *lost and found*, deliberately developed to be both provocative and affirmative. To start with, we used forerunners of practices identified as important for sustainability transitions. Meeting these forerunners in their homes to discuss their everyday lives enabled us to access their knowledge about how to solve everyday issues and to use this as design inspiration for the trigger materials. In these in-home-interviews, we focused on understanding the practices, including how they emerged and were maintained, i.e. how links were broken and established. As practices are dynamic and unstable, as well as bundled together, it is crucial to understand their interconnections (Shove and Walker, 2010). Even though practices can never be controlled, they can be orchestrated (ibid.) and since our intention in this project was to understand how to push sustainability transitions, we were specifically interested in understanding how the forerunners had made new practice bundles and how these changes came about.

From the interviews and analysis of *Four Futures* we could identify a large number of entry points to discuss energy futures with our workshop participants. As is often the case in a design process, the real challenge was not in finding material but in deciding how to conceptualise this into working categories. In this project, we deliberately designed to balance and bridge (see Sanders & Stappers, 2012) the affirmative, the mundane everyday here and now, with the provocative, imagining fundamentally different futures. However, it is as challenging to shift from understanding the present to construct possible futures as it is to think outside the current norms and values to develop future ideas.

The trigger material developed for the workshop included questioning norms as well as discussing established and well-known everyday practices. This balance between provoking current everyday life while still being affirmative to how it is actually conducted, is what we tested in the design of the trigger material, with the aim of engaging the participants in exploring *lost and found* in a sustainable future. For example, in trigger material 1, each workshop participant assessed their current CO₂e emissions. This sensitizing device worked well to create a space for reflection, even prior to the workshop, and most of the participants were provoked by their individual results. To use an audit can create a space for reflection that might contribute to more sustainable practices (Hargreaves, 2011). When faced with the need to decrease CO₂e emissions, from their individual results to the goal of 0.6, some of the participants felt frustrated as they did not know what they could possibly do to reach such a low level. However, as the workshop continued, it was clear that the individual assessment had caused reflection of possible futures, with new things found even whilst keeping links to current everyday lives.

With the second trigger material, it was clear that the co-design approach (which enabled the participants to first individually reflect and then tell the group about their card selections and

placements) worked well as a bridge between participants' present practices (some which might be lost) and envisioned future possibilities (which in many cases were new found values). The images also worked to facilitate the transformation from concrete details to bigger and more abstract pictures. However, some of the images, for example those that caused reflection on war and totalitarian societies, were simply discarded by some as they were considered too provocative. When too provocative, the participants could not (or did not want to) connect to the material and no reflections were initiated. In this case, when the images were too provocative, the trigger material did not work so well, which is in line with research on climate communication (Kollmuss & Agyeman, 2002). Some participants got stuck in trying to figure out whether the matrix should depict what would happen, or what they wanted to happen in the future. Even though this ambiguity could be hampering, we believe that it is needed, since it can capture both fears and aspirations.

The third trigger material, the posters with deliberately strong headlines, spanned both the provocative and the affirmative. Some of the headlines pushed the participants quickly into future possibilities and they had no problems envisioning drastic changes of current regulations, laws and taxes to enable reaching targets, since this would ensure that they as individuals would not be the only ones breaking the norm. As many of the required changes are actually uncomfortable and inconvenient, provocations can be needed for this push. It was clear in the workshop that citizens desire that policy makers take actions and guide. The headlines also gave rise to many discussions and to some revelations of new things that might be found in a sustainable future - later displayed when the participants made their own headlines (trigger material 4). Here some of their concerned losses related to what they would abstain from in order to save the world for their children or grandchildren. However, many focused on newly found things, such as more time, more spirituality and new solutions. For some of the participants it was also difficult to understand how some suggested practices could possibly be implemented. The struggle to connect visions of desirable futures with change of existing everyday practices, and the need to understand the complete and complex implementation, is not uncommon for those who are not used to creative thinking and creative processes. We can also see that the trigger materials one by one might not help in bridging the tangible-present-local to the abstract-future-global, but in unison they helped the participants, in different ways, to make movements in time, place and possibilities.

7 Conclusions

In this project we have, through practice-based design research and with a transition design posture, designed tools that we believe can be useful to initiate dialogues and reflections on the future. We can see that the trigger materials worked well as research devices, and that they managed to, if not bridge, at least allow for a co-existence of provocative and affirmative approaches.

This research project has had its focus on Sweden and we have carried out just one workshop in Stockholm – we have had no ambition of painting a complete picture of all possible images of futures people might have. Moreover, we have developed only one set of trigger materials. We see great potential for developing different trigger materials that could be tested in different types of workshops, and to change the type of people participating. It could be interesting to conduct workshops with those in power positions, like politicians and authority leaders. We believe that a further development of the trigger material presented in this paper could be useful as workshop material in, for example, non-profit organisations or study circles, where there could be interest for creative explorations of *lost and found*.

It is clear that there is a discrepancy between the actions needed to reach the target for a sustainable energy system and the images people have of their existing and future energy use. Even so, people in Sweden are willing to engage in issues around transitions but many do not know what to do or where to start. We believe it is important to widen the horizon to help people understand that an energy system is not set in stone, and that many different futures are possible.

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Recognizing and Overcoming the Myths of Modernity

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This paper aims to contribute to the debate around the cultural dimension of the transitions by shedding a light on myths at the core of the modern civilizational project. The term *myths* is used to talk about stories that embody the values of the modern project, which became a certainty in people's minds. Transitioning to a sustainable civilization entails that we create and adopt new storylines. In order to do so, designers must be story-listeners and recognize the myths that are hindering the transformation of our ways of life. The modern world is, arguably, a world with only one storyline that separates the world in two (e.g., developed and developing). I argue that designing new societal projects demands the collaboration between multiple cultures. In the modern world, however, we do not have an epistemology that enables such collaborations. Therefore, several myths of modernity need to be recognized and dispelled to allow for new epistemologies to emerge, so that we can purposefully create new stories for a new civilization.

design for transitions; sustainability; modernity; southern epistemologies

1 Introduction

The starting point of this paper is the recognition that humanity is living through a deep transition, which was triggered by the awareness of the enormous crises we all are enmeshed in – “such as climate change, loss of biodiversity, depletion of natural resources, and the widening gap between rich and poor” (Irwin 2015: 229). For several decades designers have tried to address the crises by treating the symptoms, solving problems or trying to reduce the damages. Transition design, on the other hand, takes as its central premise the need for societal transition and advocates the reconception of entire lifestyles (Irwin, Kossoff & Tonkinwise, 2015).

Arguably, the “reconception of entire lifestyles” is another expression for cultural change. In the last decades, several design researchers (Ehrenfeld, 2008; Fry, 2009; Orr, 2002; Vezzoli & Manzini, 2008; Walker, 2010) have advocated for a change in the cultural model as the main path to address the current crises. Those authors have argued, using different words, that the colossal environmental and social crises are consequences of the Western/Modern lifestyles. For instance, Ehrenfeld (2008)



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argued that “unstainability springs from the cultural structure of modernity itself: the way we hold reality and ourselves as human beings”(p.7).

Nonetheless, discussions about culture and the cultural dimension in design are almost absent. This absence, for Manzini (2016), critically limits our possibilities to design for a societal transition. And so, the term ‘cultural change’ is often used as a meaningless buzzword. Perhaps, as stated by Asino, Giacomo & Chen (2017), since culture is a concept hard to explain or grasp. And yet, it is at the core of what we do, what we value, who we believe we are and what we believe we do, how we act, and how we make sense of our experiences. As Manzini (2015) argues

If what must emerge is a new civilization, the issue is not only one of solving problems; a civilization is also, and primarily, made up of values, of qualities, and, in more general terms, of sense systems. (p. 3)

This paper aims to contribute to the debate around the cultural dimension of the transitions by shedding light on stories and myths at the core of the modern civilizational project. In their DESIS¹ book *The Pearl Diver: the designer as storyteller*, Bertolotti, Daam, Piredda and Tassinari (2016) suggest that, in designing for social innovation and radical change, “it is becoming increasingly urgent to think about the implications of the stories we tell and the ways in which we tell them” (p. 9). Arguably, story-telling is one of the main tools of a design for transition – as designing a fair and sustainable society entails creating and adopting new stories (Ehrenfeld, 2008). But, in order to do so, Berlotti et al. argue that designers must be story-listeners:

The storyteller is thus, first and foremost, a story-listener. He is someone who has the ability to look at things other people do not pay attention to, because they regard them as too small or insignificant: the fragments of the mainstream narrative. (Berlotti et al. 2016, p.20)

I use the term myths to talk about stories that embody the values of the modern project, which became a certainty in people’s minds. In a similar vein, Arturo Escobar (2012) affirms that certain representations have become dominant in the Western social imagery, shaping the ways in which reality is imagined and acted upon. Even when reality starkly contradicts those representations, he suggests that “it seems impossible to conceptualize social reality in other terms” (Escobar, 2012, p. 5). I argue that, in order to design for transition, we (design experts) need to recognize the myths spun out of the modern project – i.e., being story-listeners – so that we can purposefully create new stories.

2 Culture and worldview

The paper describing Transition Design – written by Irwin, Kossoff, Tonkinwise and Scupelli (2015) – opens with a quote from Buckminster Fuller:

You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete.

What is the cultural model in need of changing? It is the cultural paradigm of Europe and North America, which has been shaped since the Enlightenment in the pursuit of the Modern project – that which has been conceptualized as modernity. The problem is that this model is not external to ourselves. It is also internal, shaping our cognitive framework and worldview. As Leroy Little Bear explains:

Different ways of interpreting the world are manifest through different cultures. (...) Culture comprises a society’s philosophy about the nature of reality, the values that flow

¹ DESIS is a network of design labs with the purpose to promote design for social innovation in higher education institutions so as to generate useful design knowledge and to create meaningful social changes in collaboration with other stakeholders (<http://www.desisnetwork.org/about>)

from this philosophy, and the social customs that embody these values. Any individual within a culture is going to have his or her own personal interpretation of the collective cultural code; however, the individual's worldview has its roots in the culture - that is, in the society's shared philosophy, values, and customs. (Little Bear, 2000, p. 77)

And, since culture shapes how we think and interpret reality, it is so embedded in us that we take it for granted. Clifford Geertz (1973) argued that “man is an animal suspended in webs of significance he himself has spun” (p. 5). He defined culture as those “webs of significance”, which serve to generate and maintain meaning. Through the webs of significance, we interpret and make sense of the world. We can compare them with lenses that change that which we see, for better or for worse (Huesemann & Huesemann, 2011). If we are not aware that our lenses are distorting our vision, we take the distortion as the real and true image. Our actions upon the world will reflect and perpetuate the distortion, unless we make a conscious effort to examine our lenses – by bringing our beliefs and the stories we tell into awareness.

Most modern beliefs have already been criticized by numerous studies². Nonetheless, modern stories and myths still shape the way laypeople think about the world. And, most importantly, they shape the discourses of numerous designers who aim to address the environmental and social crises. What motivated me to write this paper was remarking that many myths of modernity are prevalent in design initiatives that aim to address complex social and environmental problems.

There is no doubt that my personal cultural background (Brazilian-Canadian) and professional identity (design practitioner and researcher) influence my perceptions, the stories I hear and the stories I am able to tell. I am a Brazilian whose parents have distinct ethnic backgrounds. Since my childhood, in moving from one side of my family to the other, I understood that people can hold and embody disparate worldviews. This skill has been useful since I moved to Canada, over a decade ago, and in seven years of participatory action research in collaboration with Indigenous peoples. In my research activities, my partners are often Indigenous (Canada's First Nations) while my academic colleagues are North American (settlers) and European, therefore, I had to be aware of the different worldviews at play.

3 Myths of modernity

Myths of modernity have been crafted since the Scientific Revolution of the 16th and 17th centuries, in which the work of Enlightenment philosophers and scientists – notably Rene Descartes, Francis Bacon, Thomas Hobbes and Isaac Newton – laid the foundation for modern scientific, technological and social progress (Merchant, 1980). Enlightenment can be seen as the creation of a new framework of ideas about man, society and nature, which challenged the conceptions of the feudalistic worldview (Hamilton, 1992). The conception of reality that emerged has been named as modernity. Briefly,

modernity is a particular ontology that in the last centuries determined the division between nature and society, a colonial distinction between modern and non-modern indigenous peoples, the myth of progress as a unidirectional linear path, and a strong confidence on Cartesian science. (Gudynas, 2011, p. 447)

Although the foundations of modern thinking were established in the 16th and 17th centuries, the project of modernity achieved its most effective expression with the onset of industrialization in the 19th century (Hall, 1992; Hamilton, 1992). Meanwhile, design was established as a profession and a recognized expertise with the advent of the Industrial Revolution (Kaine & Dubuc, 2010). As a result, the foundations of our field are interwoven with the project of modernity and its worldview.

² A few books cited in this paper: The Formations of Modernity (Hall & Gieben, 1992); Decolonizing Methodologies (Smith, 1999); Encountering Development (Escobar, 2012) and Epistemologies of the South (Santos, 2014)

Below, I outline the synopses, characters and props of a few stories forged out of the beliefs of the modern project and the myths related to them. I chose the following seven myths because I believe they are particularly relevant to the field of a design for transitions. Before discussing each myth and their implications, I introduce a specific character and the plot of their story (in italics). Those plots combine many stories that I have listened to over the years. And, since we are dealing with myths, I exaggerate the elements of those stories.

3.1 *Leading Character – The hero and his weapons: reason and technology*

The modern Western man is the hero of our stories³. Originally, however, he was not born modern, nor a hero. Until the 17th century, prior to Enlightenment, most Europeans lived in close interaction with the land and nature. Our European man became modern because he wished so. Modernity was created as an ideal to be pursued, as a project of eternal progress.

Why is he a hero? As king Arthur found Excalibur, our hero discovered the ultimate weapons of his time: reason and technology. Those weapons allowed him to break away from his obscure past. And since then, he has been sworn to use his weapons to free humanity from all ills.

3.2 *MYTH 1. Our hero solves problems that have plagued humanity since the beginning of times.*

Arguably, this is the great myth of the modern project. There is a true heroism and idealism behind modernity. The modern project was created out of a great dream: to promote an improvement in all the conditions of life. Finally, man had reason. Finally, man could understand the universe, the laws of nature, and control his environment.

In the 17th and 18th centuries, the optimism generated with the Scientific Revolution gave rise to the belief that reason would soon solve all of the problems facing society and promote an ever-increasing level of well-being. Huesemann and Huesemann explain that “the early successes in science and technology encouraged the belief that human reason was capable of generating not only scientific progress but also social and moral progress” (2011, p. 149). Another aspect of this myth is the concept of universalism: as science understands the general laws which govern the entire universe, science and reason could be applied to any and every situation (Hamilton, 1992).

Designers have been profoundly influenced by this myth of solving all the major universal problems – using “techno-solutions” – since the birth of our profession. This myth is still present in the discourse of contemporary designers. For instance: in 2017, ‘EDIT – Expo for Design, Innovation & Technology’ took place in Toronto, as a festival of the future and world-changing ideas⁴. Its main exhibition, curated by Bruce Mau, was named “Prosperity for All”. On its first wall, we could read:

Around the world, people are collaborating to design solutions to challenges that have vexed society since the beginning of human history. Our collective project to understand the universe and the complex dynamic world we live in, and design tools for the challenges we face, has been profoundly successful. Never in human history have more people escaped the bonds of poverty, disease, and ignorance to explore their potential and participate in the bounty, beauty, and opportunity of modern life.

In 2017, it is troubling to see a design festival about the creation of the future presenting the ideas and beliefs created in the 17th and 18th centuries – seemingly ignoring all the criticism these ideas have received in the last two centuries. Nonetheless, several design researchers⁵ have presented critical perspectives to the fallacy that modern solutions can improve the human condition and solve

³ No, modern myths do not pass the Bechdel test, since female characters do not have independent well-developed storylines (Bechdel, 1986).

⁴ It was self-described as “an immersive expo-meets-festival designed to celebrate the innovative work that is making the world a better place for all people” (<http://editdx.org/>)

⁵ Among them, Ehrenfeld, 2008; Fry, 2009; Orr, 2002; Vezzoli & Manzini, 2008.

all problems. In designing for transition, we should work to make those critical perspectives mainstream.

As Banerjee (2003) argues, after more than 200 years of Industrialization, “the benefits delivered by the grand design of progress and modernity are, at best, equivocal” (p. 143). Today we have an increasing awareness that the current social and environmental crises we face are linked to the Western ways of life and to the consequences of colonialism (e.g., slavery, dispossession of lands and forced assimilation). Framing our current problems as problems that have been plaguing us since the beginning of times does not help us to solve the numerous problems generated by pursuing the modern project for over 300 years.

3.3 Character #2 – The dragon: the hero’s enemy

Once we have our hero and his sword, he needs enemies out there to combat. The ultimate enemy of the modern project is nature and its irrationality – that which cannot be predicted or controlled. Dragons are irrational unpredictable creatures, and are out there to be slain.

Please note that the key expression here is “out there”. “In the Cartesian form of objective reality, action and reality are independent. Reality is simply out there” (Ehrenfeld, 2008, p.26).

3.4 MYTH 2. Problems are external to ourselves

Cartesian rationality can be understood as a separation between man and nature, mind from body, intellect from emotions, observer from observed (Dussel, 2008; Merchant, 1983). This separation paved the way “for a mechanistic reductionist science, which, in turn, yielded powerful knowledge on how to dominate, control and exploit the environment (Huesemann & Huesemann, 2011, p. 4).

The Cartesian separation impacts the way designers understand and frame the problems facing society – as reality is out there, problems are conceived as being out there as well. Certainly, humanity faces numerous external problems that need external solutions. Our enormous crises, however, stem “from the models through which we imagine the world to be a certain way and construct it accordingly” (Escobar, 2015, p. 15).

This second myth explains why social designers dedicate so little thought to cultural aspects – i.e., worldviews. As a result, designers tend to search for external solutions to problems that we see as separate from ourselves. I name those seemingly external problems as “dragons” – and searching for external solutions as the activity of dragon-slaying.

An example of such “dragons” is poverty. Because it manifests as a lack of material resources, it is tempting to slay that dragon by providing resources to the poor. Nonetheless, poverty is a systemic problem. The destitution prevalent among certain groups of people is a consequence of how modern societies are structured (Appadurai, 2004; Escobar, 2012; Viveiros de Castro, 2017). Therefore, poverty is not a problem out there to be solved with material resources only (Sen, 1999), since social structures comprise values, norms, beliefs, meaning systems, and so on. It is telling that, in Western culture, the modern conception of happiness and well-being is also external, attached to the possession of material goods (Vezzoli & Manzini, 2008; Walker, 2010). The problem of human suffering, something intrinsic to the human condition, has been framed in the modern world as an external problem that could be solved with material resources (mostly goods and, if that fails, medication).

Because many social problems manifest themselves in the form of symptoms that appear to be treatable by science and technology, it has been tempting to redefine these complex social problems as simple technical challenges. (Huesemann & Huesemann 2011, p. 75)

As an example of external fixes, Huesemann and Huesemann (2011) cite the use of medicine or surgery to address diseases that are the result of lifestyle choices. Vezzoli and Manzini (2008) use another example: it is easier to design “light products” and to promote the development of clean

technologies than to drastically rethink our conception of well-being and our consumption patterns – which is cultural.

External fixes attempt to ameliorate the symptoms instead of recognizing them as warning signs of deeper cultural problems (Huesemann & Huesemann, 2011). Ehrenfeld (2008) suggests that designing those external fixes diverts our attention from striving to create sustainability – which will be an outcome of new ways of life and worldviews.

3.5 Character #3 – the magician and his techno-elixir

Even though our hero believes that technology is the panacea, dragons are multiplying and threatening to destroy the planet. After each dragon is slain, three others appear. In these desperate times, our hero needs the help of a magician who can conceive a more powerful sword.

After six months, his second sword is not effective enough to slay all the new dragons. Consequently, the magician keeps conceiving new and improved swords. At some point, he realizes that instead of a sword he could create a rifle or a bazooka. He could improve the hero as well, creating elixirs to enhance his strength.

Clearly, the work of the magician is highly specialized; it is reserved for the best brains. The destiny of the human race is at the hands of those brilliant few. And so, the population has hope that one day the magicians will create the perfect techno-solution to save the world.

3.6 MYTH 3. The search for the magical solution to save the world.

The third myth can be encapsulated in Buckminster Fuller’s definition of design science:

The function of what I call design science is to solve problems by introducing into the environment new artifacts, the availability of which will induce their spontaneous employment by humans and thus, coincidentally, cause humans to abandon their previous problem-producing behaviors and devices.⁶

Even if many contemporary problems were created by applications of technology, there is still a remarkable confidence that more science and technology will be the solution (Huesemann & Huesemann, 2011). Transition design entails that we define ‘design science’ and its purposes in different terms.

Furthermore, the belief that a few brilliant people (e.g., design experts) will conceive the magic solutions is disempowering and disabling to the overall population. Manzini (2015) suggests that such an approach creates passive, “not to say lazy and incapable, subjects” (p. 95). Inspired by the work of Sen and Nussbaum, Manzini proposes that we move away from the idea of users and consumers as passive figures, and start to consider people as active and capable subjects. He argues that in “a world in rapid and profound transformation, we are all designers” (Manzini, 2015, p. 1).

At issue now is understanding who can be included in the “we all.”

3.7 Background characters – The exotic Other

In the 15th and 16th century, Europeans “discovered” new worlds and new peoples. Since then, those Others have played background roles in our hero’s storyline – most often in nonspeaking capacity. Those extras do not have independent storylines – as we know, history starts when Western men arrive. The Others are only represented in the tales of intrepid explorers. Today, they are in the background of selfies taken by travelers who visit 40 countries in 3 months.

3.8 MYTH 4. A planet with only one storyline: becoming modern

Since the beginning of the European expansion, the Others were treated as history-less peoples and their territories as terra-nullius (Sahlins, 1999; Smith, 1999). The leading role of the modern man entails that we live in a planet with only one storyline: the heroic story of the modern man. John Law

⁶ Retrieved from <https://www.bfi.org/about-fuller/big-ideas/design-science>

(2011) named this myth as the “One-World world”. This one and only storyline is “conceived from the perspective of the Euro-American historical experience and exported to many world regions over the past few hundred years” (Escobar, 2015, p. 14).

The overall plot can be summarized as such: humanity is moving, in a linear and evolutionary process, from a primitive or traditional level to an advanced and modern level. The ‘primitive’ ways of life were close to nature – as the pre-modern European ways of life – therefore the savages need to be ‘evolved’ (or civilized or developed). Consequently, modern culture delivers the benefits of civilization to the backward (or developing) ones (Dussel, 2008). Spreading the benefits of civilization was a noble undertaking in the European’s – and subsequently in North-American’s – perception (Viriri & Mungwini, 2010). In the One-World world storyline, we are all here to become modern (or developed, in more recent wording).

An interesting feature of the myths of modernity is that buzzwords and terms keep changing, but the plot remains the same. After the Second World War, terms such as *to civilize*, *savage* and *primitive* went out of fashion, and were replaced by *to develop*, *underdeveloped* and *developing* (Banerjee, 2003). The desirability or the need for development was never questioned, even when the conditions of life of millions of people deteriorated since the 1950’s (Escobar, 2012; Sen, 1999).

As the project of modernity created a separation between humans and nature, the myth of the single storyline entails another separation: the ones who live the single storyline under the One-World world (the West), and the ones who do not yet (the rest) (Escobar, 2015; Hall, 1992). For Boaventura de Sousa Santos, modern western thinking creates some invisible and radical lines

that divide social reality into two realms, the realm of “this side of the line” and the realm of “the other side of the line.” The division is such that “the other side of the line” vanishes as reality (Santos, 2007, p. 45).

On the other side of the line there is no real knowledge; there are beliefs, opinions, intuitive or subjective understandings, which, at the most, may become the raw material for scientific inquiry (Santos, 2007, p. 47).

Not only the line divides the world in two, but Stuart Hall (1992) argues that the concept of the West allows people to: (a) classify societies into different categories (e.g., western and non-western); (b) condense a number of different characteristics of different societies, cultures, peoples into one picture; (c) compare to what extent different societies resemble, or differ from, one another (and so, non-western societies can be said to be ‘close to’ or ‘catching up with’ the West); (d) evaluate and rank other societies against certain criteria. “For example, ‘the West’ = developed= *good*= desirable; or the ‘non-West’ = under-developed = *bad* = undesirable” (Hall, 1992, p. 277).

Hall’s and Santo’s arguments are easily verifiable: how many Western design schools teach the ways of designing and producing material culture of different societies as something of value to the contemporary world, not as history or curiosity? How many indigenous designers teach western designers? How many designers go to other continents to learn with other cultures (and not to study them or to help them)? Few, as the knowledge of the Others – produced on the other side of the line – is most often seen as an inferior knowledge (Swadener & Mutua, 2008).

From the point of view of a western transition designer, what is the problem in the fact that the Others play non-speaking roles and we live in a world of a single storyline? We develop awareness about ourselves – and of our own cultural patterns, worldviews and assumptions – through contrast with that which we are not (me and not-me). In other words, we can only become aware of the features and flaws of our worldview in contrast with other storylines. However, the encounter between different cultures is usually framed inside the storyline of *becoming modern* – the Others are simply *catching up* with that story and need a little “help” from the western heroes to do so. Thus, the flawed myths remain (mostly) undisputed. As Sousa Santos points out:

The problem is that after five centuries of ‘teaching’ the world, the global North seems to have lost the capacity to learn from the experiences of the world. In other words, it looks as if colonialism has disabled the global North from learning in non-colonial terms, that is, in terms that allow for the existence of histories other than the ‘universal’ history of the West. (Santos, 2016, p. 19)

3.9 Character #5 – The penitent hero

Some modern men realize that all their weapons and all the magic used to slay the dragons have deeply damaged their environment. They see the consequences of their actions – and of their fellow heroes and magicians – and cry. How could humans do so much harm? It seemed that humanity had no way out, as our nature was inherently destructive – that is simply the way we live on this planet. Then, the heroes and magicians come to the conclusion that they have to clean the damages themselves, because they are the only ones with the power, knowledge and technological advancement to do so.

Let’s remember that this is a planet with only one storyline – the story of the modern hero. It does not matter whether he is confident or penitent.

3.10 MYTH 5. Humanity is a virus: nature must be protected from human hands to be preserved

Science-fiction created in the 20th century became increasingly dystopic. We became immersed in tales of a barren future – taking place either in an artificial world or in an arid and violent environment. And since the damages were unavoidable, because they are byproducts of human ways of life, we should strive to minimize them – consuming less, producing less, discarding less, and so on. Tony Fry (2009) refers to this approach as “sustaining the unsustainable”.

Almost everything being done in the name of sustainable development addresses and attempts to reduce unsustainability. But reducing unsustainability, although critical, does not and will not create sustainability. (Ehrenfeld, 2008, p. 7)

This myth shows a deep lack of imagination that there can be other ways of shaping our presence on this planet. What we need in order to design sustainability is not less damage, but different worldviews. “No matter how dominant a worldview is, there are always other ways of interpreting the world” (Little Bear, 2000, p.77). For instance, if we visualize progress as a linear evolution, our model of production/consumption/discard will be also conceived in a linear fashion. Products are designed within this frame of mind, which keeps feeding unsustainable lifestyles. Therefore, creating sustainability entails breaking away from linear thinking, and adopting new ways of understanding evolution, production and consumption.

Another way of (seemingly) minimizing the damages caused by modern ways of life is to protect nature from human hands. Inspired by the work of John Muir, several national parks and natural reserves have been created throughout the globe (Edwards, 2005; Novaes, 2007). This way of “saving the environment” from us, is directly linked to the myth of separation between humans and nature. “The obvious truth regarding humans as part of nature escaped the philosophers of the Enlightenment” (Huesemann & Huesemann, 2011, p. 4).

In the modern worldview, two forms of representation of nature coexist: (a) as untouched nature or wilderness and (b) as natural resources that can be transformed into commodities (Diegues, 1998). “In both of these cases, paradoxically, the forest should be uninhabited, which denies the existence of innumerable cultures and societies that live in the forest” (Diegues, 1998, p. 26). Most often, the untouched nature is a myth, as Victor Margolin (2010) argues: “in fact, humans have intervened in nature throughout history and what appears to us as the natural world today is a world that has absorbed these interventions” (p. 71).

The actions to protect nature from human hands have been controversial at best. I faced that issue in 2010, when I studied an indigenous population in Brazil (Leitão, 2011). Caíças live in one of the most precious and biologically diverse ecosystem on the planet. Since 1985, environmental regulations established by the government – with the support of international organizations for environmental conservation – imposed severe restrictions to the traditional subsistence practices, without proposing alternatives to sustain the local communities (Novaes, 2007; Pedroso-Júnior & Sato, 2005). The result was a social tragedy, as many villagers lost their livelihoods⁷.

This kind of conflict is happening not only in Brazil. Dowie (2005) argues that there are millions of native people in similar situations all over the world:

It's no secret that millions of native peoples around the world have been pushed off their land to make room for big oil, big metal, big timber, and big agriculture. But few people realize that the same thing has happened for a much nobler cause: land and wildlife conservation. (Dowie, 2005)

On a similar note, but from a different point of view, María Mies and Vandana Shiva argue:

In the early phases of colonization, the white man's burden consisted of the need to "civilize" the non-white peoples of the world — this meant above all depriving them of their resources and rights. In the latter phase of colonization, the white man's burden consisted of the need to "develop" the Third World, and this again involved depriving local communities of their resources and rights. We are now on the threshold of the third phase of colonization, in which the white man's burden is to protect the environment — and this too, involves taking control of rights and resources. (Mies & Shiva 1993, in Banerjee, 2003, p. 143)

No, designing the transition towards sustainable ways of life cannot be white man's burden, as the way of thinking that brought us here cannot get us out of here. I believe, as Escobar (2011; 2015), that the transition to a sustainable civilization should be embraced as a collaboration between multiple cultures, from the two sides of the line – overcoming the dualism that marked the last four centuries. A dualism created by the myth of the single storyline, in which the numerous storylines of different cultures have been labeled as opposite from the heroic tale of the modern man. In other words, the numerous storylines available on this planet are not opposite to the modern story, but alternative – other possibilities.

There are numerous cultures in the world whose knowledge could be mobilized in order to remake the relationships between humans and nature and to create new conceptions of productivity, consumption and evolution.

Alternatives are not lacking in the world. What is indeed missing is an alternative thinking of alternatives. (...) This immensity of alternatives of life, conviviality and interaction with the world is largely wasted because the theories and concepts developed in the global North and employed in the entire academic world do not identify such alternatives. When they do, they do not valorize them as being valid contributions towards constructing a better society. (Santos, 2016, p. 20)

For Santos (2009), at issue here is that we do not have an epistemology that enables the dialogue and cooperation between the vast diversity of worldviews. I argue that, in order to establish a true dialogue between different knowledges, many myths of modernity need to be recognized and dispelled, allowing for new cognitive frameworks and new epistemologies to emerge.

Inside the modern myths, most often the modern hero will continue talking to inferior or mythic beings (as our next character).

⁷ My study documented the community's initiatives to improve their living conditions through craftsmanship (Leitão 2011).

3.11 Character #6 – Children of the forest: the guardians of the Garden of Eden

Many modern stories present the idealized guardians of the forest who reconnect the hero with nature. From *Game of Thrones* to *Avatar*, those peoples symbolize the mythic ecological innocence that was lost in the modern world. Nonetheless, the children of the forest are vanishing. Our hero runs into the last survivors of those noble cultures.

3.12 Myth 6. Indigenous peoples as guardians of the pre-industrial mythic past

In the Western worldview, indigenous cultures are inevitably vanishing because of the contact with the modern life (Hunter, 2011; Sahlins, 1999). The survivors are guardians of ‘traditional’ knowledge – linked to the past and pre-industrial – as a counterpoint to modern (scientific) knowledge.

I spent the last seven years collaborating with Indigenous artists and cultural stewards. My partners frequently said to me: *we don't want to be seen as folkloric characters*. Indigenous peoples are contemporary people – who have been affected by globalization and industrialization – and fight for decolonization and self-determination at this present time. Nevertheless, considering them as relics from the past is a way of invalidating contemporary indigenous knowledge – that which they are doing and making right now in order to create a better society.

Why is contemporary Indigenous knowledge particularly relevant to the design for transitions? The idea that a transition to a new civilization is needed arises from the recognition that Western civilization reached a breaking point. We recognize that modern ways of life are unsustainable and a societal change is needed. Otherwise, we will most likely see the destruction of our world. Therefore, transition entails a dialogue about survival and resilience to a (forced and mandatory) deep change in the way we shape our presence on Earth.

The term “indigenous peoples” refers to numerous distinct populations, who live in different contexts, with distinct cultures and experiences. In common they share the legacy of the colonization of their lands and cultures, and the denial of their sovereignty (Smith, 1999). Therefore, they have already experienced the destruction of their World and have a lot to say in terms of resilience and adaptation to drastic changes.

Santos (2009) uses the concept “South” to describe this place of human suffering, struggle, resistance to the project of Modernity, as well as resilience. This South is not a geographic concept, since it also exists in the geographic North in the form of excluded and marginalized populations (Santos 2016). Santos argues that southern knowledges are modern in the way that they have interacted with and resisted the hegemonic worldview for five centuries. Therefore, they consist in “alternative modernities” (Santos, 2009) or “alternatives to development” (Escobar, 2015). One example of an alternative societal project created in the South is the *Buen Vivir* in Ecuador and Bolivia (Gudynas, 2011).

3.13 Myth 7. The active ingredient: eliminating irrational aspects of indigenous knowledge

As pharmaceutical companies extract the active substance of plants to create drugs, sometimes westerners tend to study southern wisdom to extract its active (universal) principle. In other words, in looking for the active principle, there is a tendency to eliminate many aspects of indigenous knowledge that are incompatible with modern beliefs. Nevertheless, in order to create new lifestyles, the specific ways people conceive life – their epistemologies – matter.

For instance, Meyer (2008) explains that for Hawaiian people, knowledge that endures is spirit driven, in the sense that it is a life force connected to all life force. Spirituality here refers to life’s intelligence and not to religion. Likewise, Dillard (2008) states that spirituality is the essence of African people. “It is a kind of cosmological spirituality that holds central the notion that all life is sacred” (Dillard 2008: 3). Martin-Miraboopa argues that, for Aboriginal people, “country is not only the Land and People, but is also the Entities of Waterways, Animals, Plants, Climate, Skies and

Spirits” (2003: 2017). People are no more or less important than the other entities, therefore all things are respected for their place in the overall system (Martin-Mirraoopa 2003).

Moreover, for several epistemologies, the body is involved in the process of knowing. Meyer explains that in Hawaiian worldview, the body is the central space in which knowing is embedded. “Our body holds truth, our body invigorates knowing, our body helps us become who we are.” (Meyer 2008: 10). He argues that the *feeling mind* is not conceived as separate from the *thinking body*.

I believe that, in order to know other epistemologies, only intellectual understanding is not enough – they need to be embodied. For example, we can understand that other cultures have a cyclic conception of evolution and time, instead of linear, but cyclic time is something lived and experienced. Thus, the challenge of creating new epistemologies involves embodying the multiple forms of understanding the world and being present in the world. A challenge of the education for the transition.

4 Conclusion

This paper argued that the transition towards sustainable societies is a work that should involve the collaboration of the multitude of cultures and knowledge systems available on Earth. This paper aimed to identify a few myths that embody the beliefs of the modern project and limit our possibilities of collaborating and creating new worldviews. In this sense, recognizing the pillars of modernity that are hindering deep transformations in the Western ways of life.

Creating a new civilization, however, it is not only a task of story-listening – be that listening to the myths of modernity, or the southern cosmologies. The task ahead is the task of creating stories that were never imagined before, but will enable us to achieve our long-standing dream of human flourishing.

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The Emerging Transition Design Approach

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This paper outlines an emerging Transition Design approach for addressing “wicked” problems (such as climate change, loss of biodiversity, crime, poverty, pollution, etc.) and catalysing societal transitions toward more sustainable and desirable futures. Wicked problems are “systems problems” that exist within large, socio-technical systems and therefore require new problem-solving approaches. The Transition Design Framework brings together an evolving body of practices that can be used to: **1.** visualize and “map” complex problems and their interconnections and interdependencies; **2.** situate them within large, spatio-temporal contexts; **3.** identify and bridge stakeholder conflicts and leverage alignments; **4.** facilitate stakeholders in the co-creation of visions of desirable futures; **5.** identify leverage points in the large problem system in which to situate design interventions. Rather than a fixed, templatised process, the Transition Design Framework provides a logic for bringing together an evolving set of practices relevant to designing for systems level change. This paper reports on how this approach is being tested on a community-based project that was informed by classroom-based coursework.

transition design; wicked problems; socio-technical transitions; sustainable design

1 The Need for a New Design-Led Approach

A new, design-led approach is needed to address the complex, wicked problems confronting societies in the 21st century (Hughes & Steffen, 2013; Jensen, 2017) and to seed and catalyse societal transitions toward more sustainable and desirable long-term futures (Porritt, 2013, pp 274-276). Problems such as climate change, water security, poverty, crime, forced migration, and loss of biodiversity are “systems problems” and challenging for several reasons: 1) they involve multiple stakeholders with conflicting agendas (Dentoni & Bitzer, 2015, p 68); 2) straddle disciplinary boundaries; 3) are ill defined and stakeholders rarely share an understanding of the problem; 4) the problem is continually changing and evolving; 5) problems exist at multiple levels of scale and are interdependent and interconnected; 6) any intervention (attempted solution) in one part of the system, ramifies elsewhere in unpredictable ways; 7) interventions take a long time to evaluate, and



problems, a long time to resolve (Rittel & Webber, 1973, Buchanan, 1995; Coyne 2005; Irwin, 2011a, 2011b, 2015).

Traditional design approaches (that were characterized by linear processes and de-contextualized problem frames, whose objective was the swift realization of predictable and profitable solutions) were inadequate for addressing this class of problem (Irwin, 2011b, p 235; Sanders & Stappers, 2008, p 10; Norman & Stappers, 2016). Areas of design focus such service design, experience design, design for social innovation, deep design, metadesign and various ecological and sustainable design processes take a more systematic approach in addressing complex problems. However, they still tend to frame problems within relatively narrow spatio-temporal contexts and do not offer a comprehensive approach for identifying *all* stakeholders and addressing their conflicts. A more holistic approach is needed to address problems that will take dozens of years or even decades to resolve.

A new, design-led approach should:

- Enable stakeholders to arrive at a shared definition of the problem and an understanding of its complexities and interdependencies
- Identify stakeholder concerns, relations, expectations and beliefs and factor them into both problem frames and designed interventions in order to leverage collective stakeholder intelligence (Forrester, Swartling & Lonsdale, 2008; GPPAC, 2015, p 4)
- Provide a process for stakeholders to transcend their differences in the present by co-creating visions of a shared and desirable long-term future (visioning)
- Frame wicked problems within radically large spatio-temporal contexts
- Provide stakeholders and interdisciplinary teams with a palette of tools and methodologies useful in resolving wicked problems and seeding/catalysing systems-level change
- Provide a rationale for “intervening” in complex systems and “solutioning” over long periods of time (dozens of years or even decades) vs. creating short-term, one-off solutions

2 The Importance of Stakeholder Involvement in Wicked Problem Resolution and Systems Transitions

Wicked problems and socio-technical systems transitions are challenging because of the high degrees of social complexity which permeate them. Social issues form the roots of many wicked problems, yet often go unseen and unaddressed by traditional problem-solving approaches. Identifying these social roots and involving *all* affected stakeholders (Carlsson-Kanyama, Dreborg, Moll, & Padovan, 2008; Baur, Elteren, Nierse & Abma, 2010; Simon & Rychard, 2005) is crucial in resolving wicked problems and designing for systems-level change. User- and human-centred design approaches seldom have the objective to identify *all* affected stakeholder groups and surface their concerns. Rather, these processes identify “key” groups and privilege the concerns of some over others (for example the concerns of the group commissioning a project, perceived target audiences or those of higher socio-economic rank).

Because the distribution of power among stakeholders is almost always unequal (Bauer et. al, 2010, p 233; Lawhon & Murphy, 2011), if one or two groups are in the position to frame (define) the problem, their needs and concerns will be privileged over those of others. Although traditional design-led approaches consider user preferences and motivations, they seldom examine the individual and collective stakeholder beliefs, assumptions and cultural norms that have contributed to the problem. Social factors such as practices and behaviours are underpinned by beliefs, assumptions (Niedderer, Cain, Lockton, Ludden, Marckrill & Morris, 2014; Ajzen, 1985; 1991) and cultural norms, and *must* be taken into consideration when framing the problem and designing “systems interventions” (solutions) aimed at its resolution (Incropera, 2016, p 15).

Transition Design draws on approaches from the social sciences to understand the social roots of wicked problems and places stakeholder concerns and co-design/collaboration at the heart of the

problem-solving process. We use the term “stakeholder” to refer to anyone who has a stake or interest in a specific issue or is affected by a particular problem. The importance of engaging stakeholders in the problem-solving process is well known, particularly in the areas of policy and governance, environmental issues, backcasting and conflict resolution (Grimble & Wellard, 1997, p 173; Bohling, 2011, p 4; Quist & Vergragt, 2006, p 1028; Carlsson-Kanyama, et. al, 2008, pp 34-35; Global Partnership for the Prevention of Armed Conflict, 2015, p 4), but it has yet to be integrated into most traditional design-led approaches.

An Australian Public Service policy report noted that “a key conclusion of much of the literature about wicked policy problems is that effectively engaging the full range of stakeholders in the search for solutions is crucial” (2007, p. 27). There are many well established methods for engaging stakeholders in relation to complex problem solving, for example: Multi-stakeholder Governance (Helmerich & Malets, 2011), Multi-Stakeholder Processes (MSPs) (Global Partnership for the Prevention of Armed Conflict, 2015) and Stakeholder Analysis (SA) (Grimble & Wellard, 1997).

Participatory Action Research (PAR) (Cornwall & Jewkes 1995; Chatterton, Fuller and Routledge, 2007), focuses upon knowledge for action (p. 1667), and is “aimed at social transformation rather than to use a set of tools aimed at the ‘production of knowledge’ and the ‘solving’ of ‘local’ problems” (Chatterton, Fuller and Routledge, 2007, p. 218). The Global Partnership for the Prevention of Armed Conflict list the following benefits of multi-stakeholder engagement (MSP) (2015, p. 23):

1. The involvement of more actors provides a broader range of expertise and perspectives. This means problems can be **analyzed better**, based upon several different viewpoints.
2. Such analyses can lead to a more **comprehensive strategy** to address complex conflict situations.
3. MSPs provide the opportunity for greater understanding of different stakeholders’ capacities, roles and limitations, thus contributing to **better coordination** of interventions.
4. MSPs can help organizations **pool and share resources**, including skills, funding, staff time, and logistical or administrative resources.
5. The involvement of multiple stakeholders can be conducive to public outreach and awareness raising at different levels simultaneously, increasing the reach from grassroots to policy mobilization. In this way, they have potential for **multiplier effect** when the key messages of the process are communicated to the participants respective constituencies.
6. MSP can contribute to building **trust** among diverse stakeholders, and enable relationships that can outlast the process itself.
7. They can provide a platform for much needed **capacity building** among practitioners at different levels.
8. Sharing skills and knowledge can enable participants to see problems in a new way, which is also conducive to **innovation**.

Transition Design argues that stakeholder relations can be seen as the “connective tissue” within a wicked problem, and failure to address these concerns and complex relations, are barriers to problem resolution. Conversely, because stakeholder relations permeate the problem (system), they also have the potential to be leveraged in designing interventions aimed at its resolution (Reed, Graves, Dandy, Stringer, 2009).

3 The Transition Design Framework and Phased Approach

A Transition Design approach for addressing wicked problems and catalysing systems-level change is emerging. We call it an “approach” rather than a “process” because this work will require a variety of tools and methodologies, used in different ways—no single, prescribed process would be effective in all circumstances. The approach described in this paper emerged out of workshops conducted with the city of Ojai, California to frame their water shortage as a Transition Design problem (Irwin, 2017) and was informed by coursework in the design program at Carnegie Mellon University and short courses taught in 2016, 2017 in the UK and Spain. Two key components have emerged: A framework that provides logic for bringing together knowledge and practices outside the design disciplines, and a three-phased approach for applying them to design interventions. It should be stressed that this approach is still in nascent form and is offered here as an invitation to other researchers and practitioners to provide feedback, critique and engagement with the objective of co-constituting a new area of design focus aimed at systems-level change.

3.1 The Transition Design Framework

Four mutually reinforcing and co-evolving areas of knowledge, action and self-reflection

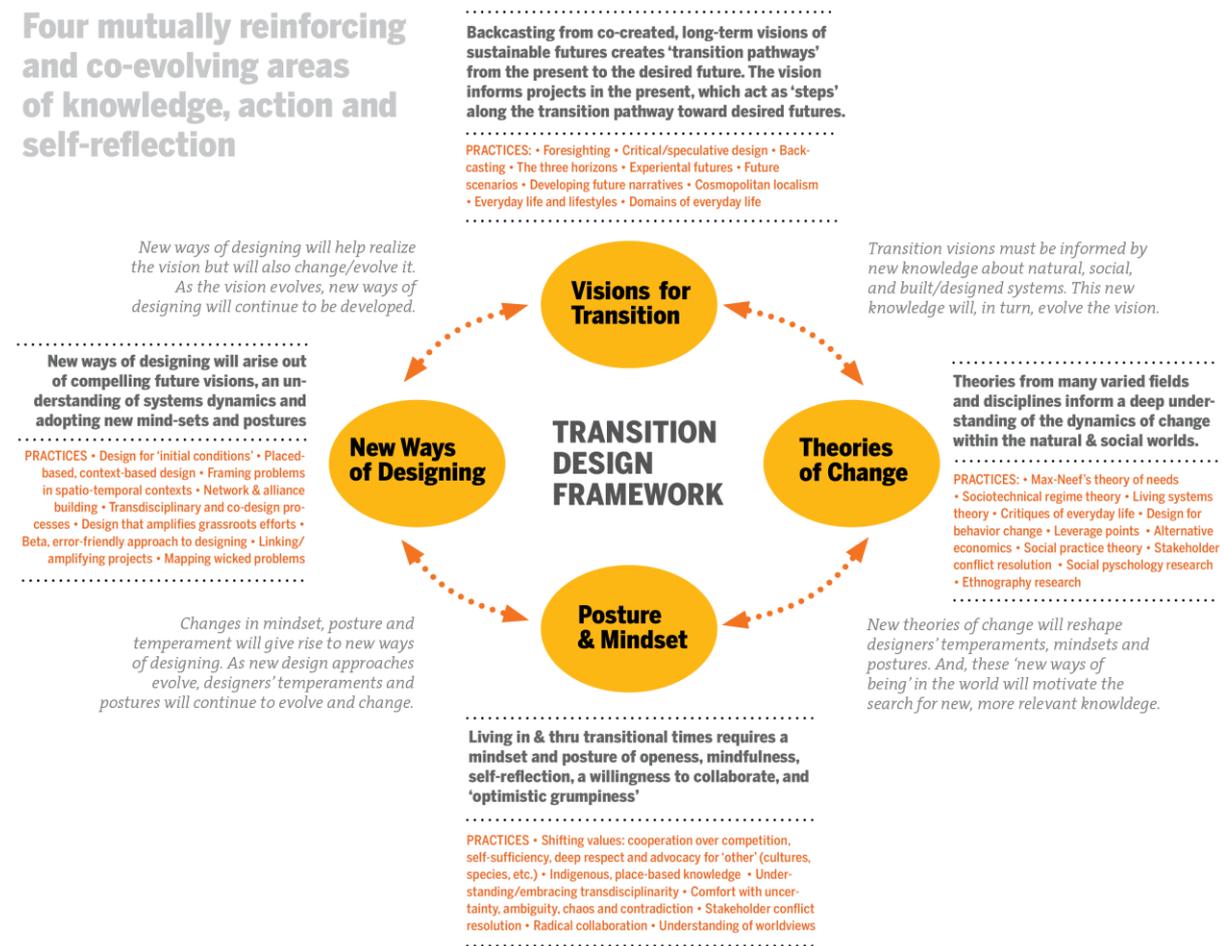


Figure 1. The Transition Design Framework brings together a body of practices in four key areas useful in designing for systems-level change. Source: T. Irwin.

The Transition Design Framework provides a logic for bringing together a variety of practices (knowledge and skillsets outside the design disciplines), situated within four mutually-influencing, co-evolving areas that are relevant to seeding and catalysing systems-level change: Vision (because we need to have clear visions of what we want to transition toward), Theories of Change (because we need a variety of theories and methodologies that explain the dynamics of change within complex systems), Mindset and Posture (because we will need to develop postures of open,

collaboration and self-reflection in order to undertake this work), and New Ways of Designing (which will arise out of the previous three areas). Each of these four areas contains a variety of practices that can evolve and change, and which together, form a “palette” from which practitioners and researchers can configure situation-appropriate designed interventions.

3.2 The Transition Design Phased Approach

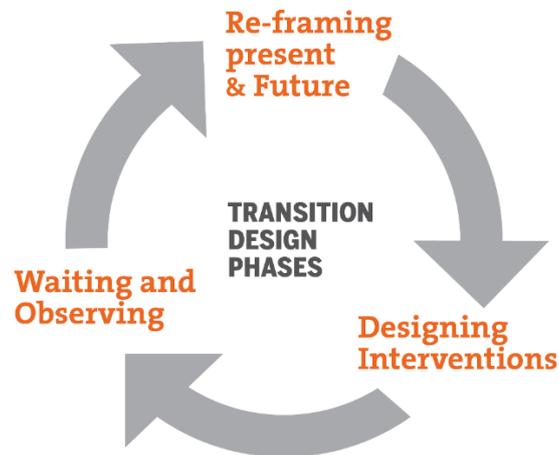


Figure 2. The emerging Transition Design approach suggests three phases comprised of reframing the problem and its context in the present and future, designing interventions, then observing how the system responds. These broad phases accommodate a variety of practices and processes tailored to specific problems and contexts. Source: T. Irwin.

Practices from the framework can be applied within three phases: Re-Framing the Present and Future; Designing Interventions; Waiting and Observing. Rather than a process, these phases suggest the types of action (or inaction) that should be considered when designing for systems-level change.

4 Reframing: The Present and Future

In this phase, stakeholders “reframe” the problem in the present and envision a long-term future in which it has been resolved. Whether it is acknowledged or not each stakeholder affected by a wicked problem has an implicit or explicit vision of the future associated with it (Rawolle, Schultheiss, Strasser, & Kehr 2016, p 1). Sociologist George Lakoff describes frames as “mental structures that shape the way we see the world” (2004, p xi-xii). These structures and cognitive models are influenced by metaphors, norms, mass media, political movements, personal history, etc. and each stakeholder group brings with them, their limited understanding of the problem (the problem frame) as well as their fears, expectations and beliefs with them, all of which are influenced by individual and collective “frames”.

4.1 Mapping the Problem in the Present

In this step, stakeholder groups collaborate to visually map the wicked problem, identifying as many relationships within it as possible. This process is intended to: 1. Enable stakeholders to achieve a shared definition of the problem; 2. Provide stakeholders with an understanding and appreciation of the complexities of the problem; 3. Develop an appreciation of the limited perspective and knowledge base of each stakeholder group (i.e. no single stakeholder group can solve the problem); 4. Enable stakeholders to adopt collaborative (as opposed to confrontational) postures which aid in transcending differences; 5. Position stakeholder workshop participants as representatives (within their wider community group) of a diversity of stakeholder perspectives; 6. Create a visual artefact (problem map) that can be continually updated and validated through qualitative research and informal feedback, to serve as a rallying point for community education, action and awareness.

The 2007 report by the The Australian Public Service Commission stressed the importance of achieving a shared understanding of the problem among stakeholders: “it can be extremely difficult

to make any headway on an acceptable solution to the wicked problem if stakeholders cannot agree on what the problem is. Achieving a shared understanding of the dimensions of the problem and different perspectives among external stakeholders who can contribute to a full understanding and comprehensive response to the issue is crucial (p. 27).” How problems are framed determines how they will be understood and acted upon. Bardwell (1991, pp 604-605) argues that people solve problems based upon mental models (cognitive maps) assembled over the course of their lives and draw on these subconsciously when encountering new situations. Therefore, people frame new problems in old ways reflecting existing values, assumptions “profoundly impacting upon the quality of solutions.” Because addressing wicked problems will be a new experience for most people, it is imperative that old frames and cognitive models are set aside, in order to reframe the problem using the group intelligence of stakeholders themselves.

An important part of the Ojai problem mapping process involved identifying as many inter-connections and lines of relationship as possible between factors/causes. The types of relationships found within a wicked problem such as a water shortage include: **interdependencies** (between the social issue of residents’ lack of awareness/ignorance of the water shortage and the political issue of a lack of support for developing new policies restricting water use), **causal relationships** (the economic issue of businesses promoting tourism and development is causally related to the environmental issue of the depletion of local water reserves and the environmental issue of the decline of ecosystem health due to the increased demand for water), **conflictual relationships** (the economic issue of increased tourism is at odds with the social issue of residents facing a water shortage while tourists in the hotels are not compelled to conserve) **or affinities** (between the political issue of the need to pass new laws limiting water use and alignment with the environmental issue of conservationists’ desire to protect the integrity of local water sources) and relationships that **feedback** on each other (the economic issue of marketing to increase tourism increases the popularity of Ojai as a destination, which results in more people, using more water, which exacerbates the water shortage—a positive feedback loop). These relationships comprise *the dynamics within wicked problems* often go unaddressed by traditional design approaches.



Figure 3. In the Ojai workshops, stakeholder groups mapped contributing factors to the problem in 5 areas: political issues, economic issues, infrastructural issues, social issues and environmental issues. This was accomplished in a ½ day session using post-it notes. A discussion among participants about the interconnections and causal relationships within the problem map informed the creation by workshop facilitators of a higher fidelity map (figure 4). Source: T. Irwin

A wicked problem 'systems map' can keep track of existing projects and aid in planning new ones

A wicked problem is essentially a system. Understanding the dynamics of the system can reveal 'leverage points for intervention' (Meadows) that have the potential to create exponential change within it. It can also aid in strategically linking existing projects for greater leverage.

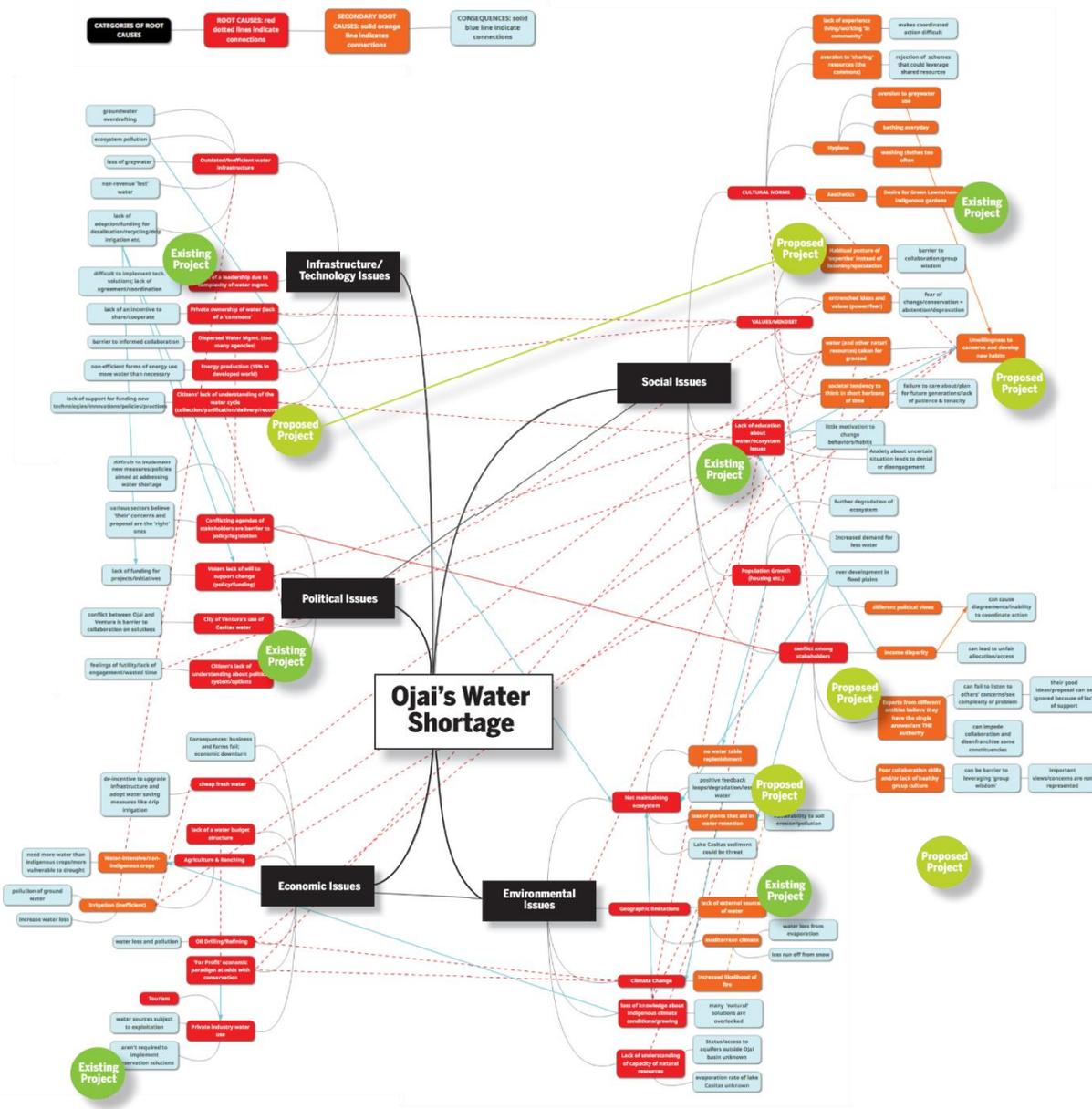


Figure 4. Based upon the problem mapping conducted by workshop participants and subsequent discussions, organizers developed this visualization, adding lines of connection and relationship. Green circles demonstrated to the community how new and existing projects and initiatives can act as strategically placed “interventions” aimed at transitioning the system (problem) toward a future of water security. This map is intended as an early “sketch” to guide qualitative stakeholder research aimed at validating or refuting nodes and relationships. In this way the map becomes a visual representation of a community’s collective understanding of the problem of water security. Source: T. Irwin

Asking stakeholder groups to map the problem together accomplished several things: 1. Participants discovered facets of the problem they were unaware of, which challenged what they believed to be “true”; 2. The process fostered empathy for the way the water shortage affected other stakeholder groups; 3. Transformed a potentially “confrontational” meeting among opposing stakeholder groups into a co-creation process with elements of discovery and “play”. And, it prepared them for the following step which looks more closely at the relations between groups.

4.2 Mapping Stakeholder Concerns & Relations

Failure to consider stakeholder concerns, fears, hopes and desires related to the problem can be a barrier to problem resolution. As yet, there is no design-led process aimed at identifying these concerns and integrating them into problem frames and designed interventions. However, in other fields there are many well documented approaches, including Needs-Fears Mapping (Wageningen University, 2017), Conflict Analysis Tools (Mason & Rychard, 2005), and Multi-Stakeholder Processes (Hemmati, 2002), to name a few. These delve more deeply into understanding stakeholder differences, mindsets and relations than traditional design processes (such as actor and stakeholder mapping which often privilege the consultant/expert designer's or client's point of view), and offer collaborative processes for resolving conflicts and facilitating more meaningful collaboration and understanding.

What these approaches lack is a design-led component leading to tangible action and material results. For example, designed interactions, communications and artefacts can educate, clarify and facilitate new behaviours and outcomes and permeate socio-technical systems. Transition Design aspires to integrate these stakeholder conflict resolution methods as a strategy for addressing wicked problems.

In the Ojai workshops, stakeholder groups listed both their fears/concerns and hopes/desires related to the regional water shortage and were asked to identify and label relations among groups. Tape was used to connect points of opposition (red) and points of affinity and alignment (green) (figures 5 & 6) to which they added notes explaining the nature of the connection. This informal and rather "boisterous" process interjected an element of discovery, surprise and "play" into what would ordinarily have been a tense and potentially confrontational debate among diverse stakeholder groups about how to solve the problem. The results showed several red lines of stark oppositions (instances in which one stakeholder group's greatest fear is another's fondest wish) but these were identified in a spirit of discovery and friendly competition to see how many connections could be identified. Dialog between opposing groups was collegial, even light hearted and stakeholders were surprised at the number of lines of affinity among groups, which became points of positive speculation and discussion.

A final discussion around the large, sprawling map of concerns, fears, hopes and desires focused on how red lines of opposition could be resolved, and lines of affinity leveraged. This shifted the focus from debating differences to conversations about how to resolve them. More research to validate this approach is planned; however early signs show it has the potential to spark dialog among stakeholders with opposing agendas and move them toward collaboration in areas of common interests and objectives. In a final, self-reflective exercise, groups examined the cultural norms, beliefs and assumptions (held by their stakeholder group) that may have contributed to the water shortage. This is challenging work, because few of us are skilled in examining our own worldviews and mind-sets (Lent, 2017; Clarke, 2002; Woodhouse, 1996; Kearney, 1984; Kuhn, 1962) as the roots of a wicked problem. Once stakeholder groups identified their cultural norms, beliefs and assumptions connected to the problem, they were asked: "if by 2050, the problem has been resolved, how would cultural norms, beliefs and assumptions have changed?"



Figures 5 & 6. Stakeholder groups listed their fears/concerns, hopes/desires and the 2017 “beliefs” about water that might have contributed to the problem (pink and green sheets). Beliefs and assumptions about the problem were listed on the yellow sheets. All of these were hung on the wall and the entire group looked for lines of opposition (red tape) and alignment (green tape) in order to identify conflicts (barriers) as well as alignments that could be leveraged in formulating design interventions. Source: T. Irwin.

At the conclusion of the exercise, each stakeholder group had two sets of contrasting beliefs, assumptions and norms: one set for 2017 (that had contributed to the problem) and a second “future” set from 2050 (that would inform its resolution via the re-conception of lifestyles and place-based solutions). As an example, one group articulated their 2017 beliefs as “we believe that water is something to be bought and sold, because there will always be enough of it.” This contrasted with their set of 2050 beliefs: “water is precious and sacred—it is part of ‘the commons’ and everyone has a right to enough. To waste it is seen as a criminal offense.” This exercise, while challenging, marked a distinct change in tone in the workshop. Participants appeared to slow down and became more speculative, even contemplative. Encouraging participants to adopt this new posture (which relates to the Mindset & Posture area of the Transition Design Framework) prepared participants for the following step:

4.3 Future Visioning

Transition Design aspires to draw on a range of foresighting techniques that enable stakeholders to co-create compelling visions of long-term, lifestyle-based futures in which the problem has been resolved and many stakeholder fears/concerns addressed and hopes/desires fulfilled. These visions help stakeholders transcend present-day differences and they act as both a “magnet” that pulls communities toward co-envisioned, desirable futures, and a compass which guides the design of systems interventions in the present.

The intersection of foresight studies and design has given rise to several new areas of theory, research and practice including Design Fiction (Lindley & Coulton, 2016; Sterling, 2005), Speculative/Critical Design (Dunne & Raby, 2013) and Experiential Futures (Candy & Dunagan, 2017; Candy & Kornet, 2017) that are concerned with envisioning and prototyping both *possible* and *preferable* futures. Candy and Dunagan (2017, p 3) note that “experiential futures [are able to] catalyse high quality engagement, insight, and action to shape change, using whatever means fits the situation” and seek to provide individuals and groups with glimpses of a future that resonates more deeply than other modalities.

New tools and approaches for enabling stakeholders to co-create compelling visions of long-term, desirable futures are needed. Stakeholder groups in the Ojai workshops undertook an exercise called “Snapshots from 2050” to develop lifestyle-based narratives of Ojai in 2050, in which the water shortage had been resolved. Groups were provided with relevant examples of “day-in-the-life” narratives to ensure they remained focused on *the holistic process of envisioning/reconceiving*

entire lifestyles, vs. the dominant, reductionist approach of envisioning discipline-based solutions. Groups were provided with narrative word/image “templates” and prompted with questions such as: “what would the resolution of the problem make possible for your stakeholder group?”; “what might you be able to do/accomplish that you currently cannot?”; “in what ways would your everyday life (practices, surroundings, profession, home life) look different or be better if the water shortage were resolved?”

Groups used their previously articulated 2050 beliefs, assumptions and cultural norms as the springboard for the futuring exercise. They were asked to consider how their 2050 “worldview” might inform new practices, behaviours and designed interactions, and how artefacts would be part of their narrative. Participants also referenced their earlier lists of fears/concerns and hopes/desires, and speculate about how they would have been resolved or fulfilled in the future, and as a way to develop more concrete examples for the day-in-the-life narratives. In a final group critique, groups reprised the exercise of drawing green lines of affinity and red lines of opposition between the different narratives. The results showed many green lines due to the striking similarities among the visions, and few red lines of opposition. Our hypothesis (which can only be borne out through additional, extensive research with more groups) is that the “space” participants enter into when envisioning a desired, common future, enables them to transcend opposition and conflict in the present and focus on affinities and similarities in a commonly envisioned, hypothetical future.

What aspect of the problem does your snapshot address? your headline below

**NEIGHBORHOOD SAFETY, POLICE AGGRESSION
LACK OF STRONG COMMUNITY**

Describe the ways in which societal and cultural, assumptions, beliefs and norms have changed in 2050. How are they different from the beliefs and assumptions that underpin the problem now?

IN 2050, CRIME IS SEEN AS A RESPONSIBILITY OF EVERY COMMUNITY TO RESOLVE, AND A FAILURE TO SUPPORT THOSE CITIZENS WHO TRY TO CRIME. THE COMMUNITY TAKES RESPONSIBILITY TO JUDGE THE ACCUSED AND TAKE CHARGE OF THEIR REHABILITATION IN ORDER TO SUCCESSFULLY REJOIN SOCIETY. THE FOCUS HAS SHIFTED FROM PUNISHMENT TO REHABILITATION AND ATONEMENT IN ORDER TO REJOIN DIGNITY AND RESPECT. ULTIMATELY, TO BE ABLE TO LIVE AND CONTRIBUTE MEANINGFULLY.

Snapshots of Lifestyles in 2050

1. A MANIFEST AND RISE AN EVILER WOMAN IN A LOCAL NEIGHBORHOOD

2. HE IS ARRESTED BY THE LOCAL NEIGHBORHOOD SECURITY FORCE AND TAKEN TO THE JUDGEMENT CENTER.

3. IN THE JUDGEMENT CENTER, HE APPEARS BEFORE A PANEL OF INDIVIDUALS WHO MAKE THE FINAL DECISION ON HIS CONVICTION RESPONSIBILITY.

4. DURING HIS AND HIS VICTIM UNDERGO REHABILITATION, HE USES AT THE JUDGEMENT CENTER, WHERE HE IS GIVEN MEDICAL CARE, DRUG COUNSELING AND WORKS IN THE COMMUNITY GARDEN IN ORDER TO REJOIN THE JUDGEMENT CENTER IS ADVISED HE IS ALSO GIVEN PROFESSIONAL AND EDUCATIONAL IN THE GARDEN, REJOINING EACH PLAN.

5. AFTER A FEW WEEKS HE MEETS WITH THE VICTIM TO RE-DO BUSINESS AND RESTRONGEN HIS MUTUALITY BONDING LINKS.

6. HIS SENTENCE IS COMPLETED IN COMMUNITY SERVICE AND HE PARTS TO HELP HIS VICTIM BUILD A VEGETABLE GARDEN.

7. AFTER HE SERVES HIS SENTENCE, HE IS GIVEN THE OPTION OF JOINING THE COMMUNITY. HE IS REAPPOINTED FOR HAVING PAID HIS DEBT AND BEGINS TO COUNSEL 'AT-RISK' YOUTH IN THE COMMUNITY.

GROUP NAME
FRIENDSHIP RESIDENTS

SNAPSHOT PROFILE
At what level of scale is your snapshot situated?
(The household, neighborhood, city or region)
THE NEIGHBORHOOD

What fears/concerns/hopes/aspirations does it address?
LACK OF COMMUNITY INVOLVEMENT, OVERALL LACK OF SAFETY IN THE NEIGHBORHOOD, MAKE "EYES ON STREET" POLICING THAT INVOLVES THE LOCAL COMMUNITY, SOME OF THE ROOT CAUSES OF CRIME ARE BEING ADDRESS (LACK OF EDUCATION, LACK OF COMMUNITY ROLE MODELS, INABILITY TO MAKE A LIVING/UNEMPLOYMENT)

What basic needs (according to Mas'Neef) are met by this snapshot from the future?
PROTECTION, UNDERSTANDING, PARTICIPATION, SUBSISTENCE, CREATON, IDENTITY, FREEDOM.

Transition Design Tools: Irwin & Kossoff, Carnegie Mellon University 2017

Figure 7. Workshop stakeholder groups were provided with templates and examples of how to develop future, lifestyle-based narratives that incorporate solutions “holistically” in a narrative. This template provided participants with an example of a future snapshot in which neighborhood crime had been resolved. Source: T.Irwin.



Figure 8. Each stakeholder group presented their future narrative in a studio-based critique style. Source: T. Irwin.

4.4 Backcasting

Backcasting (Robinson, 1982; Dreborg, 1996) has been successfully used to address long-term, complex societal issues that involve multiple stakeholder groups (Carlesson-Kanyama, et. al., 2008; Quist & Vergragt, 2006). It begins with defining a desirable future then “backcasting” to the present to create a “transition pathway” along which projects, initiatives and programs are positioned as initial “steps” in a longer transition. It differs from forecasting in approach. Forecasting extrapolates current trends (based in dominant paradigms out of which the problem arose) into the future, whereas backcasting attempts to define preferable futures, analyse their consequences, and determine the conditions necessary for them to materialize. Robinson (1982) notes “the major distinguishing characteristic of backcasting analysis is a concern, not with what futures are likely to happen, but with how desirable futures can be attained. It is thus normative, involving working backwards from a particular desirable future end-point to the present, in order to determine the physical feasibility of that future and what policy measures would be required to reach that point (p. 337).” Transition Design proposes backcasting as a collaborative activity in which stakeholder groups leverage their visions of desirable futures to inform tangible, consensus-based action in the present. Due to time limitations, Ojai workshop participants did not delve deeply into this process. Groups were asked to create a transition pathway from the present to their 2050 vision and use post-it notes to speculate on what projects, initiatives, and milestones would be necessary (between the present and 2050) to achieve the vision. This technique draws on the approaches used by Porritt (2013), Carlesson-Kanyama et. al. (2008), and Sharpe (2013) in using backcasting to envision a process of societal transition.

Workshop organizers observed that participants were highly challenged when asked to think in long horizons of time and struggled with the exercise. Further research must be undertaken to evolve the backcasting process for Transition Design, and it is likely that a variety of approaches can be employed and combined in different ways (including the STEEP and Three Horizons tools).

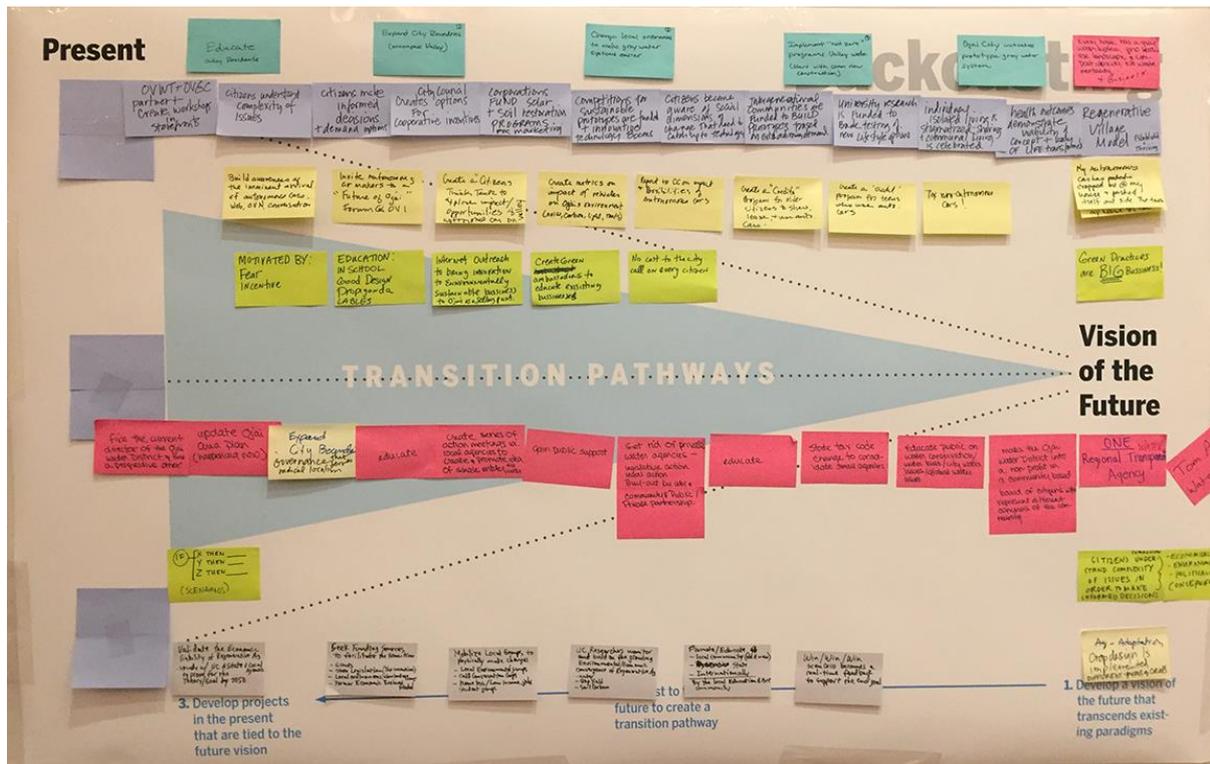


Figure 9. Stakeholder groups mapped a speculative transition pathway from their desired future to the present, with each post-it representing a tangible project/initiative or milestone. Large plotter “canvases” provides participants with a visual structure within which to work. Source: T. Irwin

Irwin, Tonkinwise, and Kossoff (2015) have proposed an iterative and cyclical process, shown in figure 10, for backcasting and visioning as the slow process of problem resolution and societal transitions unfold. This process ensures that long-term thinking becomes common and that future visions do not become “fixed” and static, but rather, are in a continual process of evolution and change, based upon feedback and outputs from present and near-term projects (steps in the transition).

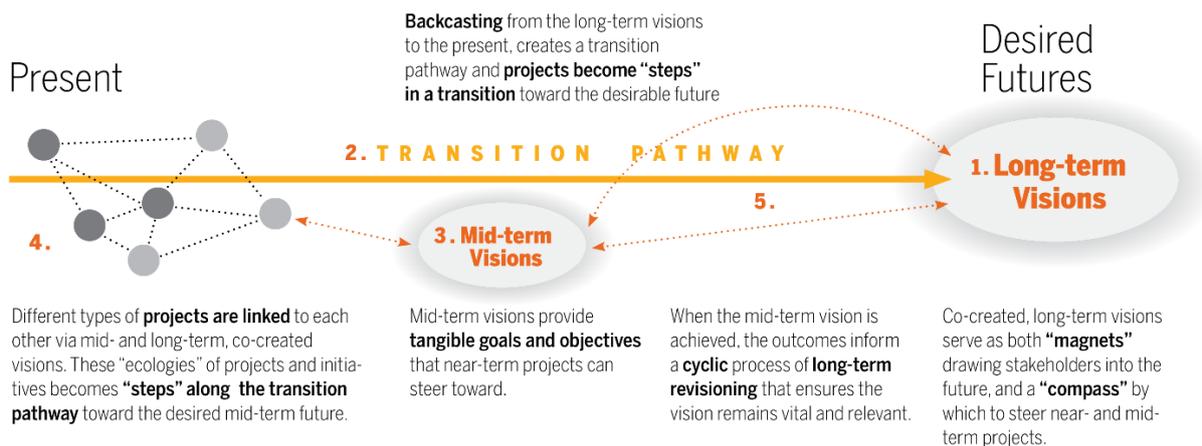


Figure 10. Backcasting from a co-created future vision creates a “transition pathway” along which new and existing projects can be connected and situated as “steps” in a long transition toward the desired future. Source: T. Irwin, G. Kossoff, C. Tonkinwise.

5 Designing Interventions

Phase 2 situates both the problem map and the future vision within a large, spatio-temporal context (figure 11). It also draws on tools and approaches from the Transition Design Framework to develop

interventions for problem resolution and systems transition. Most design-led approaches situate problems within small, manageable problem frames and contexts in order to arrive at swift, profitable solutions. We argue that wicked problem resolution requires myriad interventions at multiple levels within extremely large spatio-temporal contexts (over long periods of time). Wicked problems exist at multiple levels of scale and *always* have their roots in the past because it takes years, decades, or even longer for problems to become wicked. It is necessary to look at both higher *and* lower systems levels to understand the problem's ramifications and consequences in the present, and look to the past in order to understand the problem's root causes and evolution.

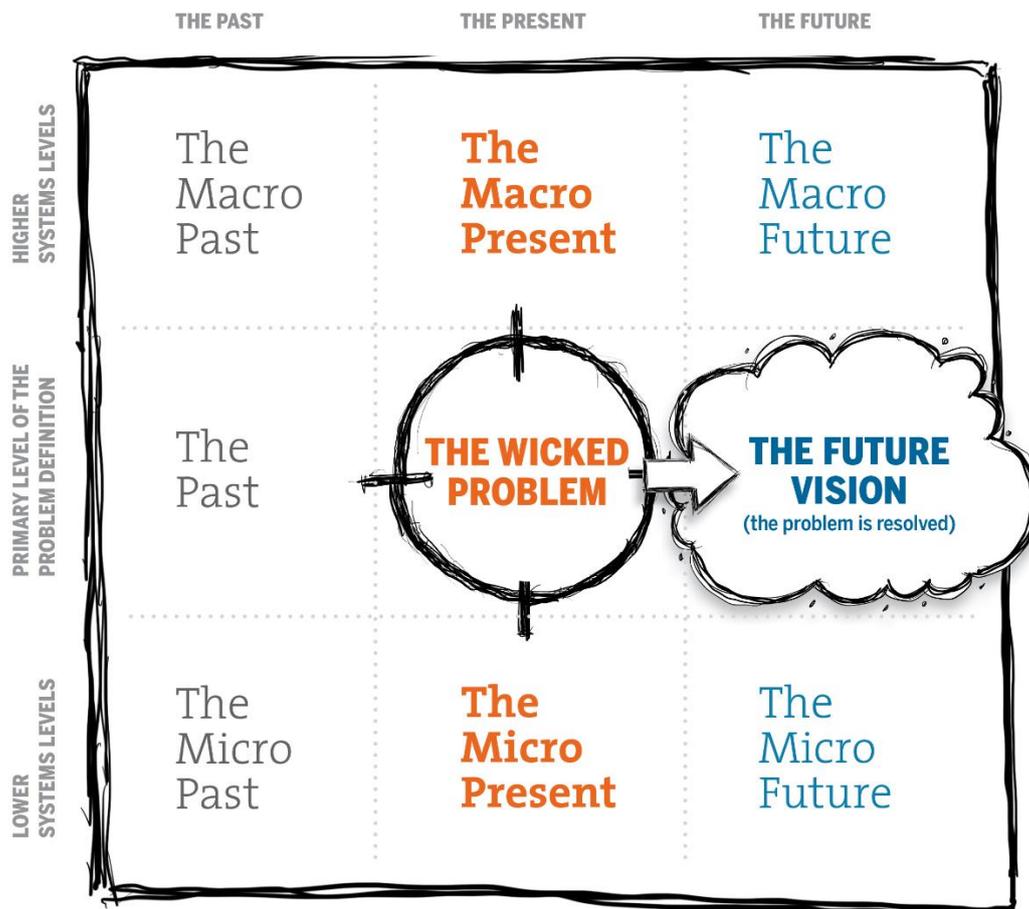


Figure 11. Transition Design draws upon the concept of the Multi-Level Perspective (Geels 2006) to situate both the wicked problem and a future, lifestyle-based vision in a large, spatio-temporal context. This large context is explored in order to identify the most promising points of “intervention” lie within this large context. Source: T. Irwin.

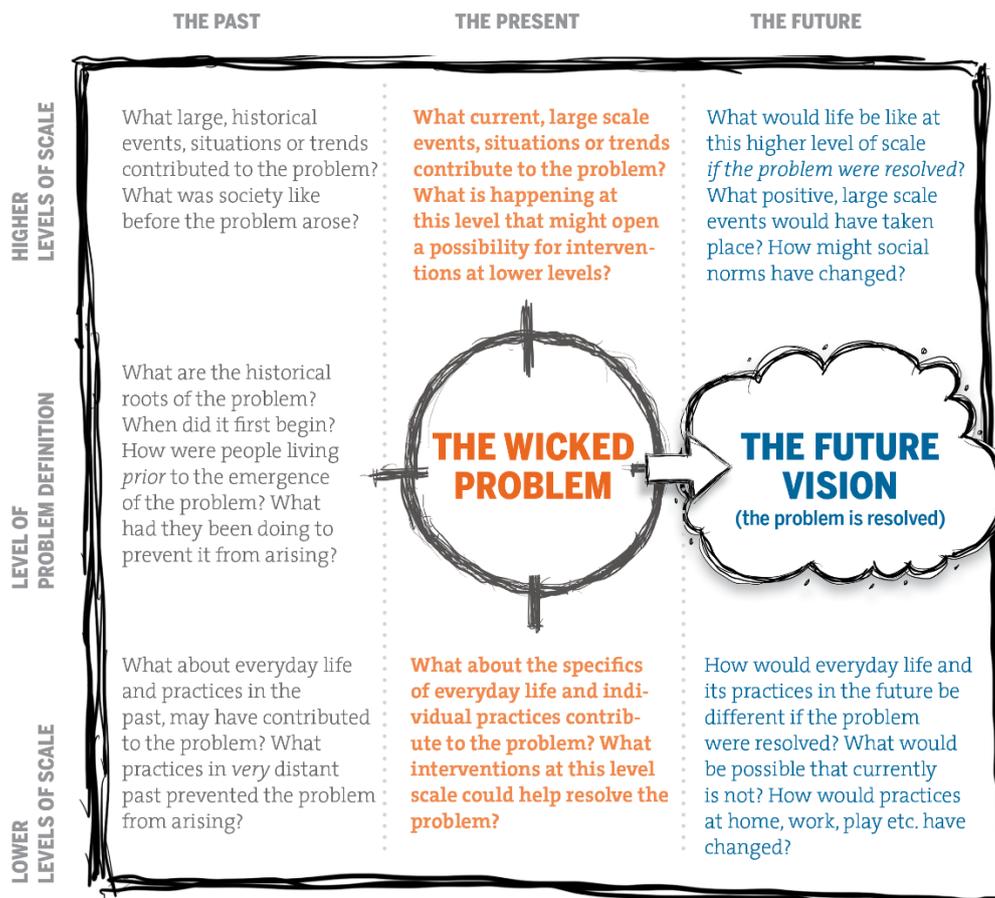


Figure 12. Specific questions can be asked at each level in the past, present and future in order to guide research and bring a higher level of fidelity to the future vision. Source: T. Irwin.

In essence, phase two of the transition design process involves *looking up and down systems levels in space, and backward and forward in time* in order to contextualize and address wicked problems—both dimensions play a role in devising interventions (figures 11 & 12). Exploring this large context helps us: **1.** understand the **present**-day ramifications and consequences of wicked problems (looking up and down systems levels); **2.** Understand how wicked problems evolved and identify their root causes (in the **past**); **3.** Know where to situate interventions aimed at transitioning the system (problem and context) toward the preferred **future**.

Many of the practices listed in the Transition Design Framework (Figure 1) will prove useful in the design of systems interventions (both in wicked problem resolution and initiating systems transitions). Due to the limited length of this paper, only six have been listed in Figure 13 on the following page, with an overview of the practice, its relevance to Transition Design and references where more information can be found.

5.1 Linking and Amplifying Projects

Many one-off projects and initiatives are often developed to address wicked problems like a water shortage; however, Transition Design argues that these are unlikely to resolve the problem, or catalyse systems-level change. A new design-led approach must provide a rationale for linking efforts together, over time, for greater traction and ‘leverage; (Meadows, 1999). Linking new *and* existing projects (from multiple sectors, including service design and social innovation) to each other *and* long-term visions of co-created, desirable futures is a key Transition Design strategy (Figure 10).

Tools & Practices for Designing Systems Interventions

PRACTICE	WHAT IT IS	WHAT IT IS USEFUL FOR	REFERENCES
MLP The Multi-Level Perspective	Conceptual framework used to investigate how large socio-technical systems transition over long periods of time. Describes 3 distinct systems levels in which events unfold, infrastructure and artifacts arise, and webs of interaction occur.	Useful in exploring large, spatio-temporal contexts; identifying the historical roots of complex problem(s) and “entrenched”/intractable areas within a large system; reveals opportunities for disruptions (designed interventions); provides large enough context to reveal connections between multiple wicked problems.	Geels, 2006 Irwin, Tonkinwise & Kossoff, 2015 Gaziulusoy & Brezet, 2015 Grin, Rotmans & Schot, 2010 Rotmans & Kemp, 2003 Trist & Murray, 1993
Max-Neef’s Theory of Needs	Proposes that needs are ontological, non-hierarchical, finite and universal , but how they are satisfied is limitless and specific to culture, place, gender, age, and era. “Poverities” of unmet needs are the root of many problems.	Can be integrated into problem frames to ascertain if the proposed solution is meeting genuine needs (in sustainable ways) or whether it might be undermining the ability to meet other needs. Can be used as an approach to socially and environmentally responsible design . Useful in designing systems interventions at mezzo and micro levels.	Max-Neef, 1991 Irwin, 2011 a, p 50 Kossoff, 2011, p 130
Social Practice Theory	Considers the entire ecology of elements that are involved in practices: materials, competencies and meanings . Used as a strategy for sustainability, it looks particularly at how practices arise and then become inertial.	Can be used at the micro-systems level to understand how people’s practices contribute to wicked problems and systems entrenchment. Because practices are so ubiquitous , they can be used as a leverage point for change within complex systems like wicked problems and socio-technical systems.	Shove & Walker, 2010 Shove et. al., 2012 Kossoff, Tonkinwise & Irwin, 2015 Scott et al., 2011 Kuijjer & De Jong, 2011 Bourdieu, 1997 Giddens, 1984
Design for Behavior Change	Focuses on people’s attitudes, behaviors, motivations and understandings to leverage psychological principles in the design of products and services that can influence users’ behavior for social benefit .	Understanding how individuals’ and groups’ beliefs, attitudes and behaviors contribute to both wicked problems and systems inertia or entrenchment can become a strategy for systems-level change. Useful in combination with social practice theory in examining the social interactions and interdependencies found within large, socio-technical systems and wicked problems.	Lockton et. al. 2013 Jana, 2010 Abraham & Michie, 2008
Domains of Everyday Life & Lifestyles	Everyday life and lifestyles refer to the way in which individuals, communities and societies meet their needs. The Domains Framework proposes that everyday life is comprised of nested systems levels in which particular types of needs are best satisfied: The household, the neighborhood, the city, the region, the planet.	Can be used as a more appropriate context within which to conceive sustainable solutions and design interventions and catalyze systems-level change. Solutions can be intentionally situated in a particular domain of everyday life to become more effective systems interventions . Long-term visions are more powerful when developed within the context of everyday life and lifestyles.	Lefebvre, 1991 Debord, 2002 SPREAD, 2012 a, b, c Kossoff, 2011 de Certeau, 1984
Social Pathways Matrix The Winterhouse Institute	A model developed by design educators to map the territories in which designers now work . The matrix shows the scale of engagement and the range of expertise required of types of projects and their impact.	Can be used as a guide in designing interventions in large, spatio-temporal systems . The tool can inventory existing and proposed interventions in order to ensure that interventions are situated at multiple levels in the system (wicked problem) and over multiple time horizons.	Winterhouse, 2017 Irwin, 2015 Amatullo, 2016

Figure 13. The practices above are listed in the Transition Framework and can be especially useful in designing systems interventions within large, spatio-temporal contexts. Source: T. Irwin.

Amplifying projects (Manzini, 2015, pp 123-124; Penin, 2010; Amplifying Creative Communities, 2010) refers to the need to look for what is already working at the grassroots level in order to support and “amplify” these efforts. This will call for decidedly different mindsets and postures—that of the non-expert, who approaches a new situation in a posture of empathy and sensitivity to “emergent solutions”. The expert designer mindset that aims to “fix what is wrong” through superior specialist knowledge, whereas the transition designer “looks for what is right” within local, indigenous efforts already underway.

6 Waiting and Observing (Mindset & Posture)

In order to seed and catalyse change in complex systems and resolve wicked problems, multiple interventions, at multiple levels of scale over multiple time horizons will be required. Working with and *within* large, slow moving systems will involve periods of activity and intervention counter-balanced by intervals of observation and reflection in *order to understand how the system has responded to the perturbation*. This contrasts with traditional, design-led approaches, characterized by fast-paced, linear processes whose objective is clear, predictable, conclusive results (solutions). Complex systems with large social components (lots of people interacting with each other) display properties of self-organization, including “the spontaneous emergence of new structures and new forms of behaviour” (Capra, 1996, p 85). Because these systems are self-organizing, the ways in which they react to perturbations from their environment (designed interventions) are internal and self-determined; i.e. their response cannot be predicted. This is an extremely important principle that, if properly understood, should radically transform traditional design process. The context for these interventions—socio-technical systems and social organizations—will rarely respond to an intervention the way we think it will, and the more complex the system, the more unpredictable its response. This principle of self-organization is why so many meticulously designed solutions fail. Instead of thinking in terms of “designing solutions”, transition designers must think in terms of “solutioning” at multiple levels of scale, over long periods of time. Or, as Wheatley and Kellner-Rogers have said, we must learn to “tinker” things into existence (1996, p. 10).

This extremely important part of the Transition Design approach will be highly controversial because it challenges the dominant socio-technical, economic and political paradigms out of which most wicked problems have arisen. These paradigms are based upon a style of thinking that has been widely critiqued and described in turn as “mechanistic”, “reductionist” and “de-contextualized” (Author 2011b, p 254; Capra 1996; Capra & Luisi, 2014; Scott, 1998; Toulmin, 1990; Mumford, 1971; Berman, 1981). Sociologist George Ritzer argues that this style of thinking dominates 21st century society via business models characterized by efficiency, calculability, predictability and control (Ritzer, 2004, pp 12-15). Transition Design argues that these same characteristics are found in traditional problem-solving processes and are—ironically—one of the root causes of wicked problems (Irwin 2011b, p 235).

Designing for systems-level change will require fundamentally different mindsets and postures (Irwin 2015, p 236) and will be slow, patient work with “emergent outcomes.” It will also challenge dominant paradigms that demand fast, concrete, predictable and profitable results. Orr (2002) makes an important distinction between fast and slow knowledge, arguing that “the twentieth century is the age of fast knowledge driven by rapid technological change and the rise of the global economy. This has undermined communities, cultures, and religions that once slowed the rate of change and filtered the appropriate knowledge from the cacophony of new information” (p 36). The aim of slow knowledge is resilience, harmony and the preservation of patterns that connect (p. 39) and will challenge transition designers to adopt a slower pace and the ability to think in longer horizons of time. Stewart Brand of the Long Now Foundation asks “how do we make long-term thinking automatic and common instead of difficult and rare?” (Brand, 1999, p 2). Similarly, the “seventh generation” principle from the Great Law of Iroquois Confederacy required its citizens to make crucial decisions with the welfare and preservation of the 7th future generation in mind (Loew, 2014). This type of long-term thinking, along with an understanding of the longer, slower cycles that govern the natural world, *must* underpin a Transition Design approach.

The Transition Design approach can be compared with Chinese acupuncture. An acupuncturist will closely observe the patient for a period of time in order to understand the imbalances or blocks in the system (body) and then place needles along specific meridians in order to shift energy (this is similar to a practitioner designing systems interventions). After placing the needles, he/she will *always* wait and observe how the body (system) responds. Sometimes several weeks might go by before another treatment is recommended. The practitioner places needles based upon his/her experience and a “working hypothesis” that a certain response is *probable*, however a good

practitioner will wait to see how a specific individual responds (based upon their own physiology, psychology, lifestyle, etc.) before intervening again. Designing interventions for socio-technical systems will require a similar approach in which periods of action and intervention are punctuated by periods of observation and reflection *in order to understand how the system is responding*. This process will be at odds with 21st century expectations for quick, conclusive, profitable and quantifiable results. For this reason, the transition designer will also need to develop compelling arguments and narratives about the (long-term) value and benefits of the process itself.

7 Conclusion

This paper has outlined an emerging, design-led approach for addressing complex, wicked problems and catalysing societal transitions toward more sustainable futures (figure 14). It emphasizes the need to engage *all* stakeholders (human and non-human) affected by the problem in order to create a shared problem definition and understanding of the oppositions and alignments among them. A framework or “guide” for situating problems within large, spatio-temporal contexts is proposed. This framework can be used to understand root causes and consequences and identify leverage points for interventions aimed at transitioning the system along a transition pathway toward a co-envisioned future.

Transition Design aspires to become a flexible, integrated approach that makes design-led tools and approaches available to transdisciplinary teams working on transition-related projects and initiatives. Still in its nascent phase, it will require researchers and practitioners from many disciplines and a diversity of cultural perspectives working together to constitute a broadly applicable, transdisciplinary process. This paper is presented as an invitation for critique, speculation and a roadmap for further research.



Figure 14. An overview of the emerging Transition Design approach is presented using several of the practices included in the Framework. These can be configured differently and appropriately for different problems and situations. Source: T. Irwin.

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Transition Design: teaching and learning

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Central to the development of transition design is its foundation in higher education. The theoretical basis that informs the practice of transition design develops from an emergent process comprised of hypotheses, theory, and testing in educational settings. These approaches—which focus on tackling specific, complex, placed-based challenges—must be tailored to address the nature of specific contexts and the varied learning of student cohorts and their respective needs. This paper investigates the value and thoughtful integration of transition design practices into design education and proposes curricula for undergraduate design students. It outlines methods and tools that are utilized in our teaching, describes successes, identifies challenges, presents ideas for improvement, and proposes opportunities for development.

transition design, education, curricula, teaching

1 Introduction

The thorny problems that transition design can address are all around us. They fall under the category of “wicked problems” that appear insurmountable because of their scale. Wicked problems can’t be formulated because each one is a symptom of another problem. For example, a succession of hurricanes recently hit several areas of the southern United States and Puerto Rico. Climate change is a contributing factor to the strength of these storms. Nonetheless, geographical, global, local, and political factors also play a role in the intensification of storms. Where do we begin to tackle the problem? On a local level, low high school completion rates, child poverty, incarceration, and the lack of affordable housing are all interconnected issues in an African-American neighbourhood. Where we attempt to intervene at the outset will have an impact on every other part of the equation. Indeed, the way that a wicked problem is defined “determines the nature of the problem’s resolution” (Rittel & Webber, 1973, p.166).

Identifying appropriate places and ways to intervene in systems is not a small feat, but an important one to tackle and teach. This paper addresses the question: How can transition design be taught effectively in undergraduate education? It details a course sequence and the rationale for specific approaches, outlines observations and discoveries gleaned, and defines areas that warrant



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improvement. It also emphasizes the teaching of transition design as a learning process, in which its curricular development and delivery furthers inquiry and discovery.

2 Overview of Course Structure, Methods, and Tools

We witnessed the merits of integrating transition design into the graduate and doctoral programs at Carnegie Mellon University through the teaching of seminar courses over the past two years. Consequently, we decided to explore teaching undergraduate students transition design concepts because we believe they are essential for all design students to learn. We used core content, activities, and sequencing from our prior experiences teaching transition design to inform the curriculum of a senior design research studio that was taught in fall 2017. We integrated into the course a range of readings seminal to the study of transition design that originate in other disciplines, and leveraged the futures and foresight expertise of a new faculty member. The course also built on the students' prior knowledge and skills gained in the design studies courses that they had previously taken that focused on futures, systems, and cultures.

Our goal was to introduce students to the necessity of societal, systems-level change in addressing complex problems, the value of imagining and realizing sustainable futures, and the roles of designers in these processes. Through a series of choreographed lectures, discussions, and activities, the course sought to help students: 1. Adopt expert and non-expert postures when investigating and working through complex, wicked problems; 2. Gain insight into approaches and methods that aid the study of factors affecting the harmony between people and their environment; and 3. Apply insights that were framed as a toolkit, to the design of speculative services and socially minded interventions that help transition societies to sustainable futures. We implemented this approach because our experience and research indicates that students gain a deep understanding of concepts when they follow reflective processing of information with active practice of concepts.

In the context of a three-hour studio course that convened twice a week over a 15-week period, Professors Stacie Rohrbach, Stuart Candy, and Terry Irwin taught 48 undergraduate design seniors. We identified "cosmopolitan localism" (Manzini, 2005), which situates itself in place-based practice but global in its exchange of information, as important to the study and practice of transition design. We positioned our teaching of transition design in contexts that are familiar to our students while encouraging them to consider the global ramifications of their actions. At the onset of the course, we introduced students to wicked problems that exist throughout Pittsburgh. Randomly configured into eight teams of six students, each group spent several weeks investigating issues that contribute to: (1) the lack of affordable housing or (2) public transportation, (3) gentrification, (4) poor access to quality education or (5) food, (6) crime, or (7) poor air or (8) water quality in the region. In an attempt to move students through steps that we identified as critical to the understanding of transition design, we utilized a range of methods and tools as outlined below.

2.1 Framing Wicked Problems

Diagramming Root Causes and Consequences to Place-Based Issues

We began the course by focusing on wicked problems that warrant systems-level change. Students viewed familiar and foreign examples of problems that related to each of their topics to aid the breadth and depth of their thinking at various levels of scale. The introductory lecture and discussion sought to help students gain insight into the contexts, characteristics, and interconnectedness of wicked problems within the context of large systems.

We asked the students to conduct secondary research on their topic and then visualize the existing problems and outcomes they discovered. We provided each team with the STEEP (social, technological, economical, environmental, and political) framework printed on a panel, which they used to categorize their findings. The students were also tasked with identifying the root causes of issues and the consequences of current actions. To aid their thinking, the students learned about leverage points, which Donella Meadows describes as "places within a complex system (a

rather than identify their perceptions as elements of reality. As a result, worldviews typically reinforce existing beliefs and expectations.

Instead of perpetuating a mechanistic worldview that exacerbates capitalistic tendencies, the studio course instead supported a holistic worldview—one that considers the interconnectedness of facets that comprise sociotechnical systems challenges (Capra, 1997). A few characteristics of this shift in perspective include relating instead of dominating, cooperating rather than competing, co-learning and re-skilling, and designing for long-time horizons (Woodhouse, 1996). Holistic thinking encourages a speculative posture where students are curious, pose questions, and emphasize relationships rather than simply aiming to solve problems and focusing on objects. A mind-set that values waiting and observing is a critical component of this approach.

In this unit of the course, students defined and investigated stakeholders related to their topics. Although the students didn't have immediate access to specific stakeholders at that time, we asked them to use the information they gathered to speculate the fears and concerns, and hopes and aspirations of those groups to familiarize themselves with the step and recognize its importance to transition design. (Figure 2) Each team chose three stakeholder groups related to their topic that represented a diverse set. They then performed triad mapping, which revealed points of affinity and opposition among the groups, and the nature of their relationships. (Figure 3)

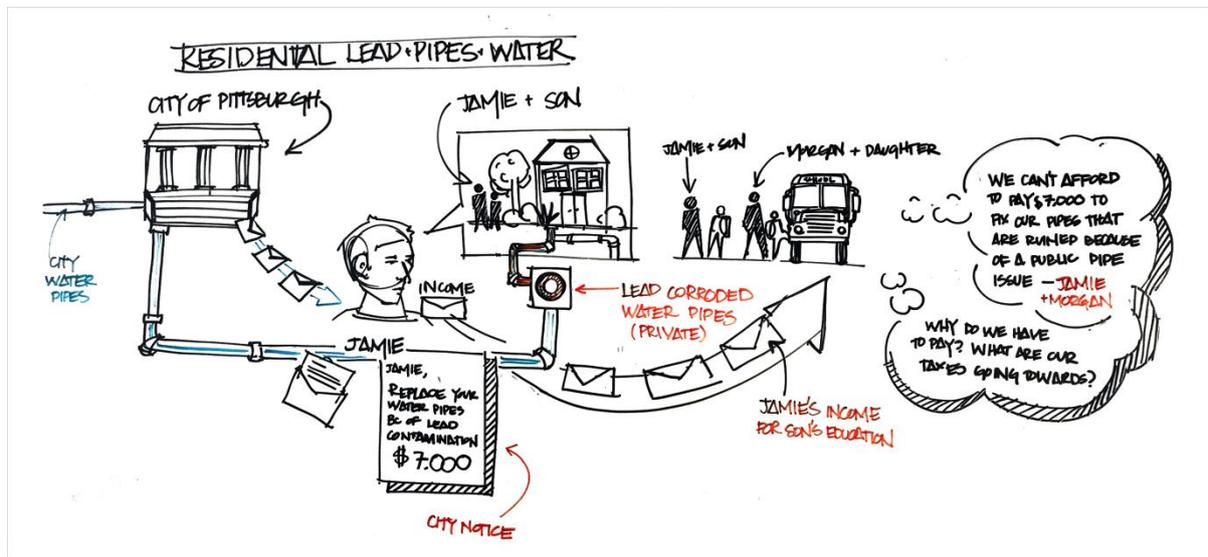


Figure 2. Students described the fears/concerns and hope/aspirations of air quality stakeholders in Pittsburgh.

Generating Alternative Futures		
	Setting/Scenario Type: <u>COLLAPSE</u> Time Horizon: <u>2050</u>	Notes
S Social	<p>POPULATION DECREASE INDIVIDUALS THAT LIVE IN AREAS WITHOUT COMMUNITARIANISM LEAVE THE CITY</p> <p>THE PRIVATE PLAYERS CHOOSE THEIR BATES BASED ON THEIR OWN AGENDA + SEGREGATION +</p> <p>INCREASED RATES OF ATHAMA'S LAKE CANCER</p> <p>GAP IN LIVELIHOOD EDUCATION DUE TO INCREASED SEGREGATION + DEGRADATION</p> <p>OPINION RATES GIVEN EXPANDED CIRCLES + GANGS FORM</p> <p>VALUED AREAS BECOME DANGEROUS LIVING SITUATIONS</p> <p>INDIGENOUS INDIANS USE AND IN ABANDONED AREAS</p> <p>ONE OF THINGS OVERLAP IN LOW INCOME AREAS</p> <p>LOWER/NO ACCESS TO FOOD'S PRODUCE LEAD TO HEALTH ISSUES</p>	
T Technological and Infrastructural	<p>PORT AUTHORITY HAS DISMISSED + PRIVATE PLAYERS STEP UP</p> <p>INFRASTRUCTURE REPLACES, WANT OF PRIVATE ELECTION</p> <p>INFRASTRUCTURE COLLAPSES DUE TO LACK OF FUNDS</p> <p>HAZARDOUS HOUSING MAINTENANCE LEADS TO SAFETY RISK OF LI KICKOUTS</p> <p>PIPE FAILURE FROM LACK OF FUNDS LEADS TO PARTS OF THE CITY STRANDED WITHOUT WATER (UNCOMPENSATED)</p>	- HOW WOULD THIS AFFECT DISTRIBUTION OF WHAT HAPPENS TO THE HOUSES, LIGHT EAT, INCARCENES?
Ec Economic	<p>DUE TO THE SHORTAGE OF BATES MANY LOSE THEIR JOBS LEADING TO ECONOMIC DISTRESS</p> <p>PREDATION INCREASE LEADS TO LOWERED PROPERTY VALUE AND HOUSING SITUATION</p> <p>REINFORCED AND MONEY CIRCULATE ONLY WITHIN AFFLUENT AREAS OF PGH</p> <p>TRANSFORMATION ROUTES SHARED TOWARDS PREFERRED ROUTES</p> <p>FAILURE OF SMALL BUSINESSES IN DEGRADED AREAS</p> <p>INFRASTRUCTURE BECOMES MORE EXPENSIVE TO MAINTAIN BECAUSE OF CLIMATE FLUX</p>	- PGH WHERE WOULD ITS OLD BRIDGE BE PUT OVER?
En Environmental	<p>DEFUNDED ENVIRONMENTAL EFFORTS AS PRIORITY PRECEDENCES</p> <p>OWN FACTORIES OPERATE TO CREATE ELECTRICITY AND EARLY MARCHES LEAD TO CARBON EMISSIONS</p> <p>DEFUNDED EFFORTS TO CLEAN RIVERS LEAD TO DAMAGED WATERPLANTS</p>	
P Political	<p>POLITICAL LEADERS COULD BECOME THE LARGELY TIED TO PRIVATE PLAYERS</p> <p>INCREASING BATES ARE FORMING SEGREGATED NEIGHBORHOODS</p> <p>TENSIONS BETWEEN RIGHT/LEFT WING POLITICIANS COMPLICATE SOLUTIONS</p> <p>TENSIONS GOVERNMENT IS UNABLE TO PROVIDE SAFETY FOR PEOPLE (KID'S)</p> <p>POLITICS SKEWED TOWARD AFFLUENT VOTERS VOICES.</p>	

Figure 4. Students explored alternative futures by mapping social, technological, economical, environmental, and political issues through grow, collapse, discipline, and transform lenses.

In subsequent class sessions, students drilled down levels of scale to explore their futures in greater granularity and think more deeply about the scenarios they developed. Focusing specifically on their topics, the student teams collaboratively created a vision for the year 2050 in which the current problem they had been studying no longer exists. In this exercise, students were urged to consider granular aspects of the situation. The students again developed a written story to convey their ideas, with some teams designing objects and services in 2050 in support of their histories. (Figure 5) Next, we introduced students to “Seeing in Multiple Horizons: Connecting Futures to Strategy” (Curry & Hodgson, 2008) to shape their thinking of short-, medium-, and long-term change. The framework also strives to facilitate “cultural transformation and aid innovative exploration and wise action in the face of uncertainty and not-knowing” (Wahl, 2017). The framework presents three horizon lines that show the status quo, disruption to system possibilities, and a transformation toward regenerative culture. Wahl (2017) explains, “Three Horizons thinking offers a methodology and practice of seeing things from multiple perspectives and valuing the contribution that each perspective makes to the way we bring forth the world together.” The students applied the three horizons to define milestones along a timeline that lead to the vision they defined over a thirty-year period. Their textual/visual speculations served as the first steps in defining design opportunities situated within larger systems. (Figures 6 & 7)



Figure 5. Students visualized designed objects and services that existed in their vision of 2050 as a means of clarifying their ideas and aiding their writing.

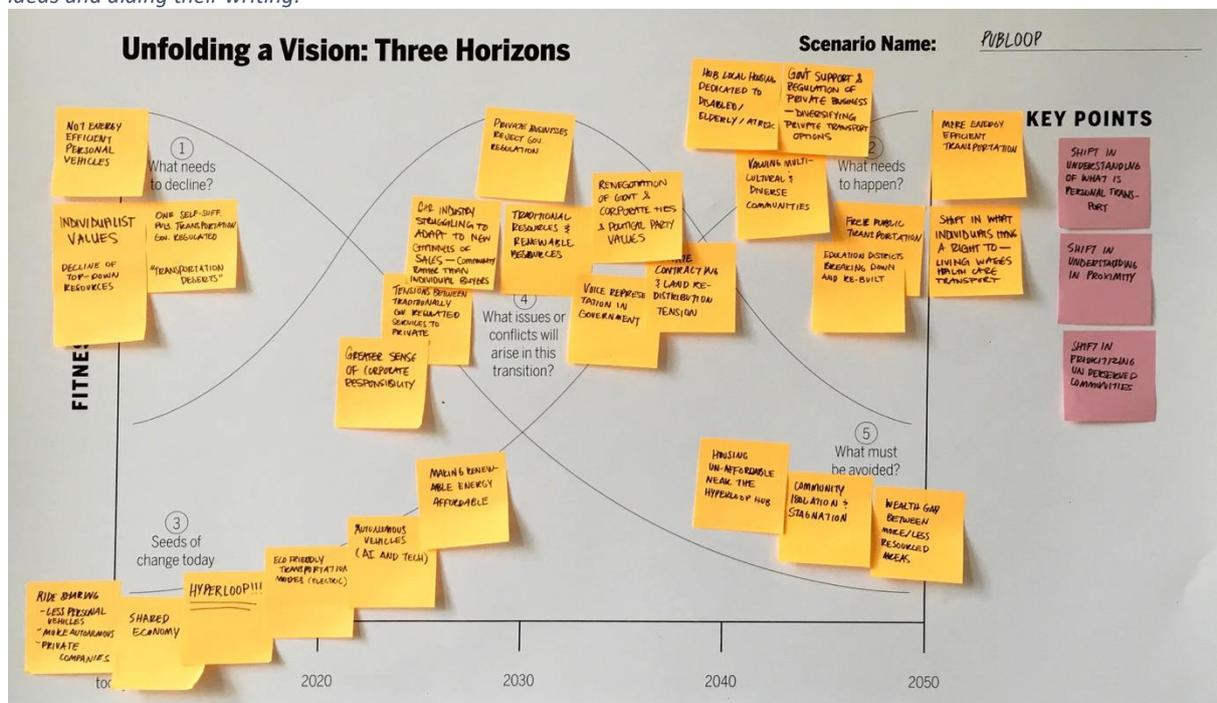


Figure 6. Students used the Three Horizons framework to see their ideas from multiple perspectives and identify the value of

each contribution.

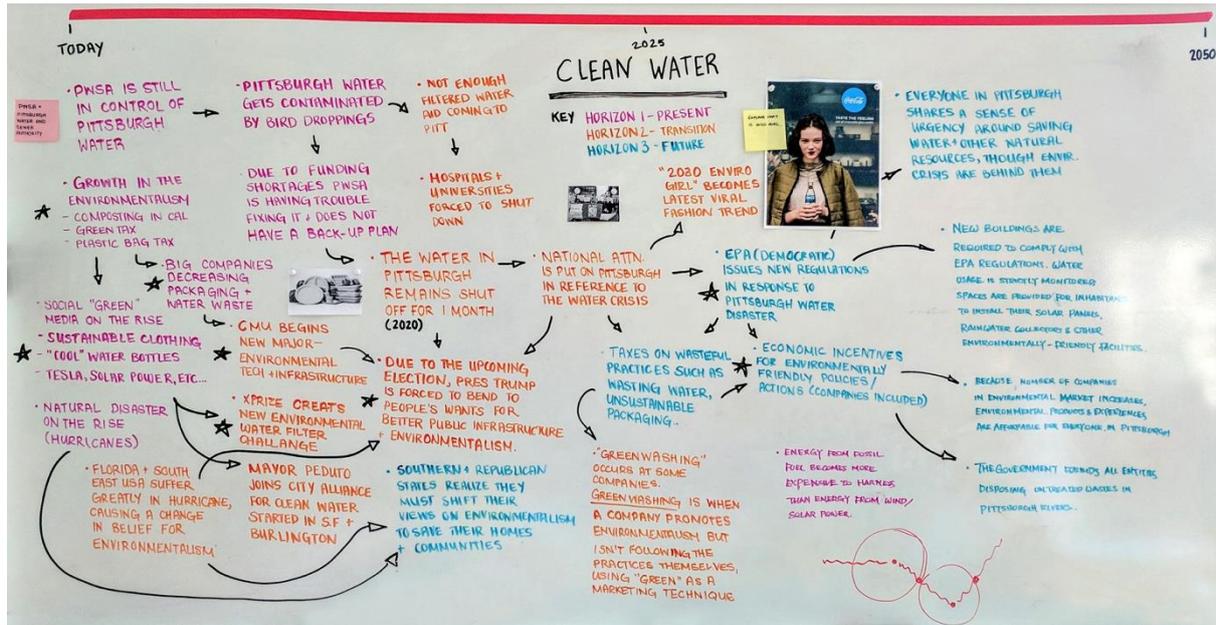
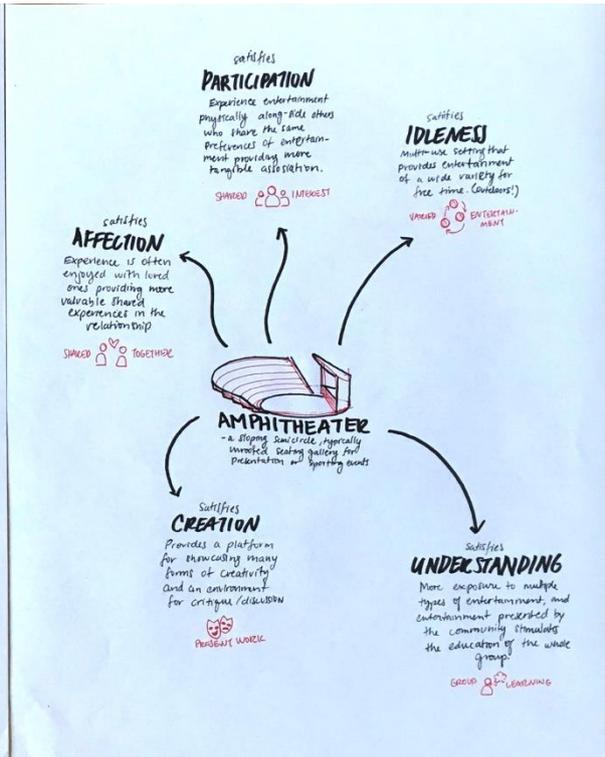
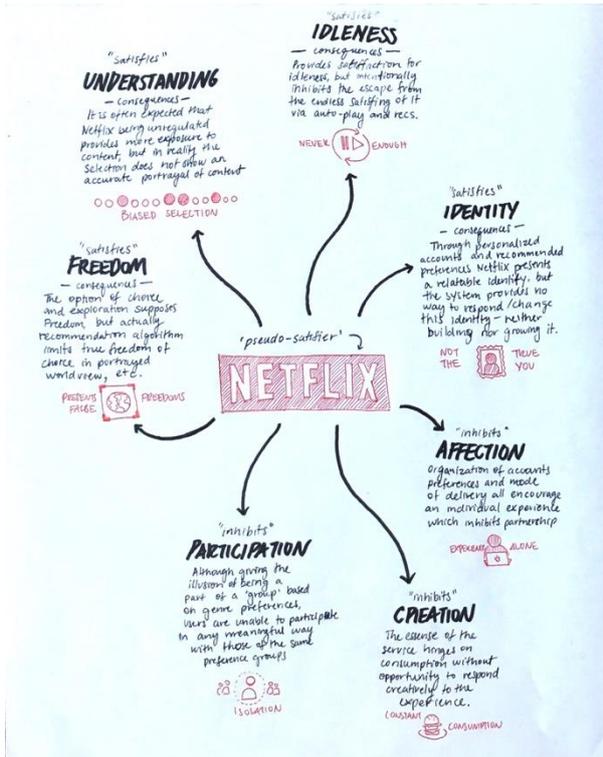


Figure 7. Students used the three horizons to define milestones along a timeline that lead to the vision they defined.

2.4 Exploring Theories of Change

Describing the Satisfaction of Human Needs through Design

In order to encourage the thoughtful design of products, communications, and environments, we used Chilean development economist Manfred Max-Neef's taxonomy of the classification of human needs (1991) to guide the students' progress. He argues that circumstances cause people to take action in response to a fundamental need, and that people are motivated by the same set of nine needs—subsistence, protection, affection, understanding, participation, idleness, creation, identity, and freedom—but the ways that they satisfy them are unique and infinite. It is important to note that not all satisfiers address needs in a sustainable manner. Some satisfiers address a single need, stimulate a false sense of satisfying, and/or inhibit satisfaction or destroy the possibility of satisfaction. Students used Max-Neef's taxonomy to study how the design of existing products, communications, environments and services satisfy or inhibit human needs. They defined and explored an object, environment, or service that they interact with often and another that they believed had few or no inhibiting satisfiers. (Figures 8, 9, & 10) In the class discussion that followed, students concluded that most examples designed by humans were void of inhibiting satisfiers.



NEEDS SATISFIED

- SUBSISTENCE**: Allows users to be warm in the winter and go about daily activities / rituals with ease
- PROTECTION**: Protects users from the harsh elements of the winter, reducing the likelihood of illness
- FREEDOM**: Exercising ones' rights / necessity for comfort and warmth during the winter

CANADA GOOS EXPE ON PA FILL: HCK DO S TRIM: COYOTE

NEEDS IMPAIRED

AFFECTION: May create conflict or reduce affection towards user if animal rights beliefs do not align
 UNDERSTANDING: May create conflict if user does not understand the repercussions / consequences, or beliefs of those who are against product
 PARTICIPATION: May isolate a specific user of majority of group has different beliefs
 CREATION: May have specific career or hobby "doors" if beliefs do not align
 IDENTITY: May disrespect other user's beliefs and cultures, creating a divide

NEEDS SATISFIED

- SUBSISTENCE**: Solar panels offer an energy source that is renewable, abundant and sustainable
- PROTECTION**: Solar panels offer an environmentally friendly source of energy that is available
- AFFECTION**: Shows importance of the planet / making conscious decisions for a more sustainable lifestyle
- UNDERSTANDING**: Shows how users are willing to change their lifestyle in order to create a stronger whole
- PARTICIPATION**: Possible to have shared solar panels in communities, solar panels also require low maintenance
- CREATION**: Many applications that can utilize solar energy
- IDENTITY**: Leads to ideologies of sustainability

SOLAR PANELS ORB SUNLIGHT S A SOURCE OF ENERGY

NEEDS IMPAIRED

SUBSISTENCE: Solar energy can be expensive allowing it to not be accessible by all, storing solar energy is also expensive
 PROTECTION: Requires space and materials that are sometimes difficult to acquire

Figures 8 & 9. Students investigated designed communications, products, environments, and services, learning how they satisfy or inhibit the satisfaction of human needs.

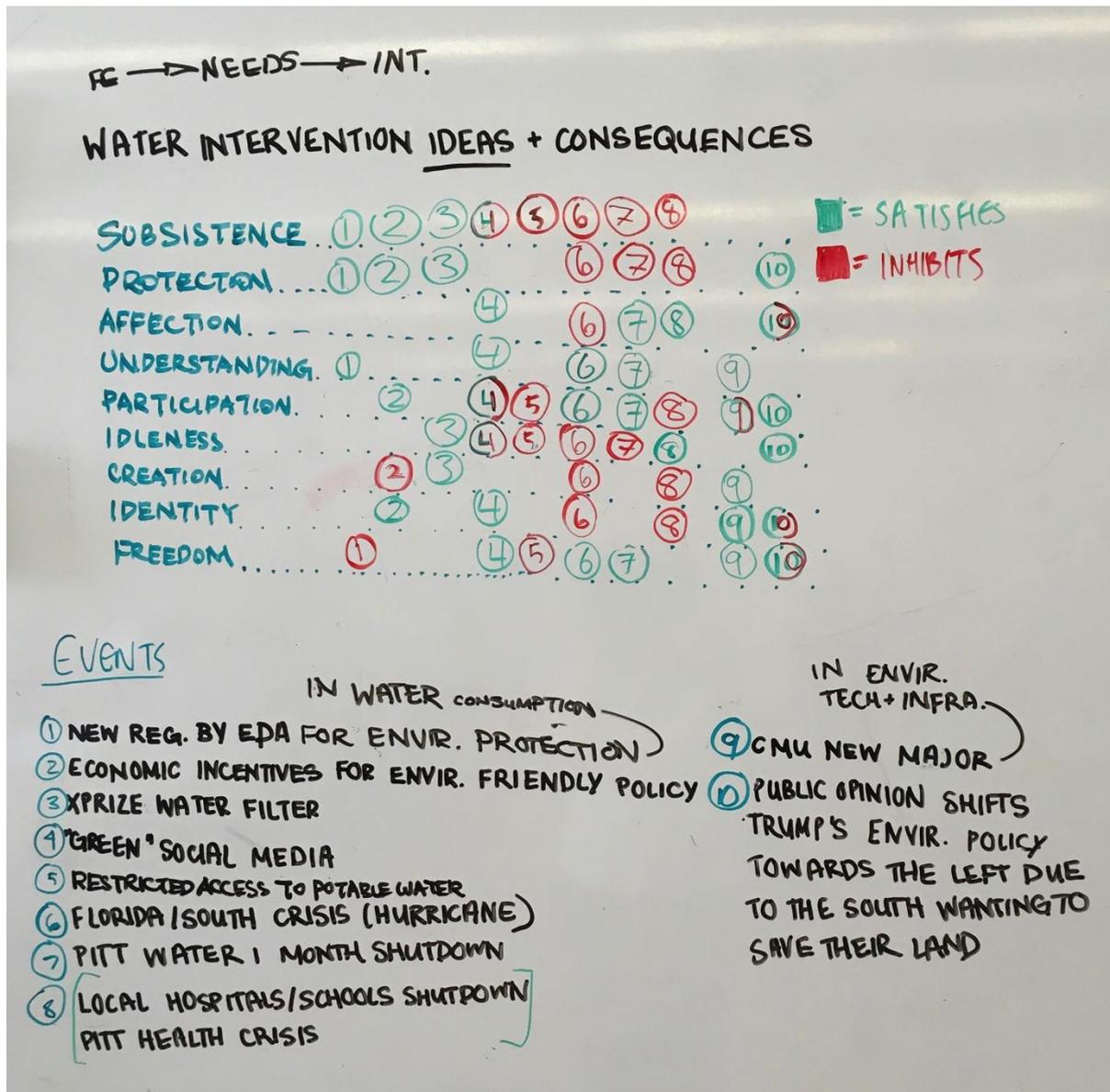


Figure 10. Students reviewed their ideas for possible design interventions, identifying how they satisfy or inhibit the satisfaction of human needs.

Once they had speculated futures and the human needs of relevant stakeholders and positioned them along a timeline, the students were poised to consider the role that lifestyles play in setting the context for an exploration of design interventions. Transition design posits that the examination of people's actions provides insight into how they satisfy their fundamental human needs. Students were asked to study the level of control that communities retain in satisfying their needs in the past and present day, examining possible tensions between centralized institutions and localized experience; as Kossoff, Tonkinwise, and Irwin argue, such transfers of control may have ecological, social, economic, and political effects (2015). Students were encouraged to consider the benefits of cosmopolitan localism, where communities are human-scaled and place-based in their activities, yet exchange information globally (Irwin, 2015). Students examined everyday life at various levels of scale as a means of understanding the relationships of community challenges, which helped them envision what sustainable communities in Pittsburgh might look like.

2.5 Defining Design Interventions

Proposing Opportunities for Design to Seed and Catalyse Systems-Level Change

We introduced students to service design and design for social innovation concepts in order to build on the transition design research that they conducted earlier in the semester and to aid their realization of design interventions in Pittsburgh. The students gained an understanding of the characteristics that define these areas of design focus and learned fundamental approaches that enable their practice.

Students explored the value of fostering relationships between customers and service providers to improve the quality of their interactions and the service that is rendered. Professor Molly Steenson, introduced service design concepts through a microscopic version of the Global Service Jam, in which students quickly brainstormed service scenarios and prototyped concepts for presentation to the class. (Figure 11)



Figure 11. Students quickly brainstormed service scenarios and prototyped concepts for presentation to the class.

The following week, students explored design for social innovation with Cheryl Dahle, a distinguished adjunct of professional practice with the School of Design. As Phills, Jr., Deiglmeier, & Miller write in an article Dahle introduced to the class, "A novel solution to a social problem that is more effective, efficient, sustainable, or just than existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals" (2008). Dahle presented a range of relevant businesses, services, and products, such as fair trade and a human-powered washing machine, as well as a social innovation case study that focused on the fisheries in Indonesia.

In the studio, we frame such social innovation interventions as components of transition design because collectively, they can lead to longer-term systems change. To that end, Dahle provided students with a four-quadrant framework aimed at helping them define the projected outcomes of intervention proposals. One axis focused on the scale of impact, while the other mapped the complexity of the concept. The students then used the Social Design Pathways to “see that broad terrain; to identify the skills required for action; to identify the kinds of partners needed for success; to preview the scales of engagement; and to foresee the possible impacts of social design projects” (2017). In this framework, one axis focused on the scale of engagement, while the other asked students to consider the range of expertise of parties involved. (Figure 12)

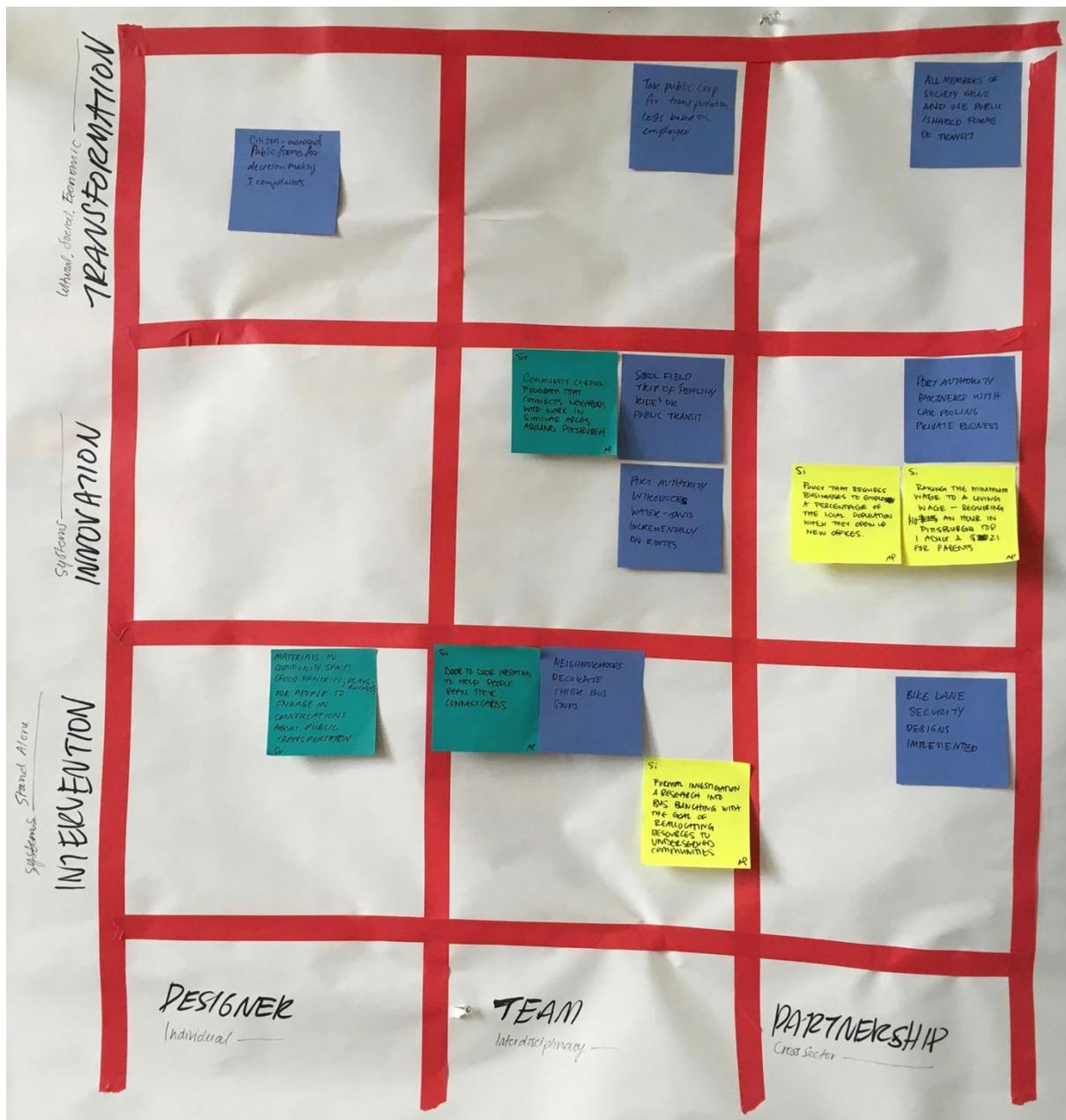


Figure 12. Students used the Social Design Pathways framework to foresee the possible impacts of their intervention ideas, identify scales of engagement, and propose partners.

Once the topic-based student teams had brainstormed design interventions through service design and design for social innovation lenses (Figure 13) that aligned to the futures timelines they created, we prompted them bring their ideas to fruition. Each team developed six intervention ideas that they believed had merit. Next, every student noted a few of the concepts that they wanted to

explore for the remainder of the term. The entire class then perused the ideas and interests of their peers and mapped possible connections between them. This step illuminated inherent relationships and opened doors for collaboration among the students. We then prompted the class cohort to engage in conversations that led them to reconfigure themselves into new teams of three to five students. The newly formed groups proposed ways of addressing obstacles they identified by using existing resources and leveraging the collective knowledge and skills they gained the first half of the term. Throughout the next six weeks, each student team selected and developed one intervention as a hypothesis that they used to receive school-wide feedback at the close of the semester. (Figure 14)

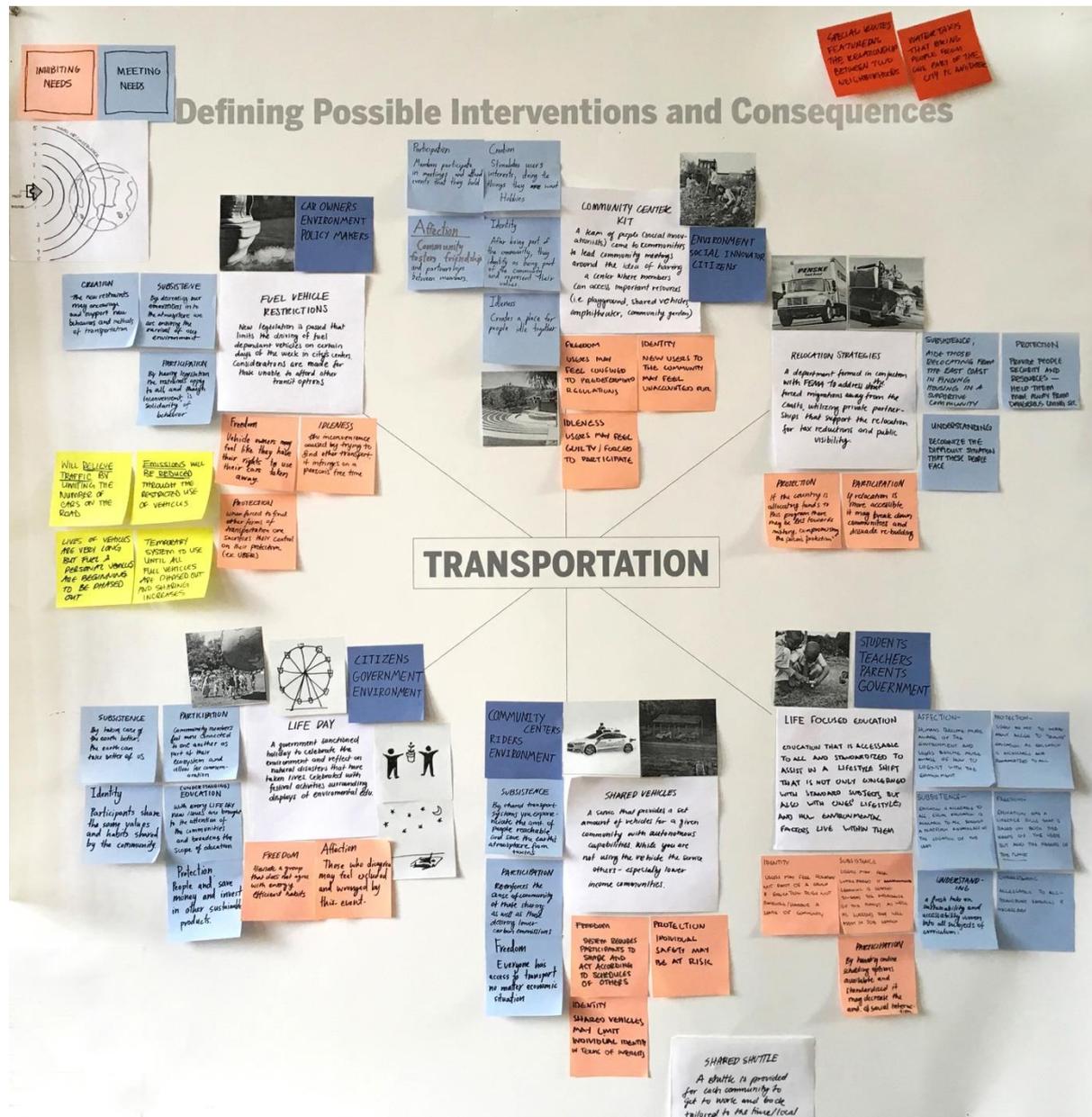


Figure 13. Students map their service design and design for social innovation intervention ideas that they believe have significant merit, in concert.

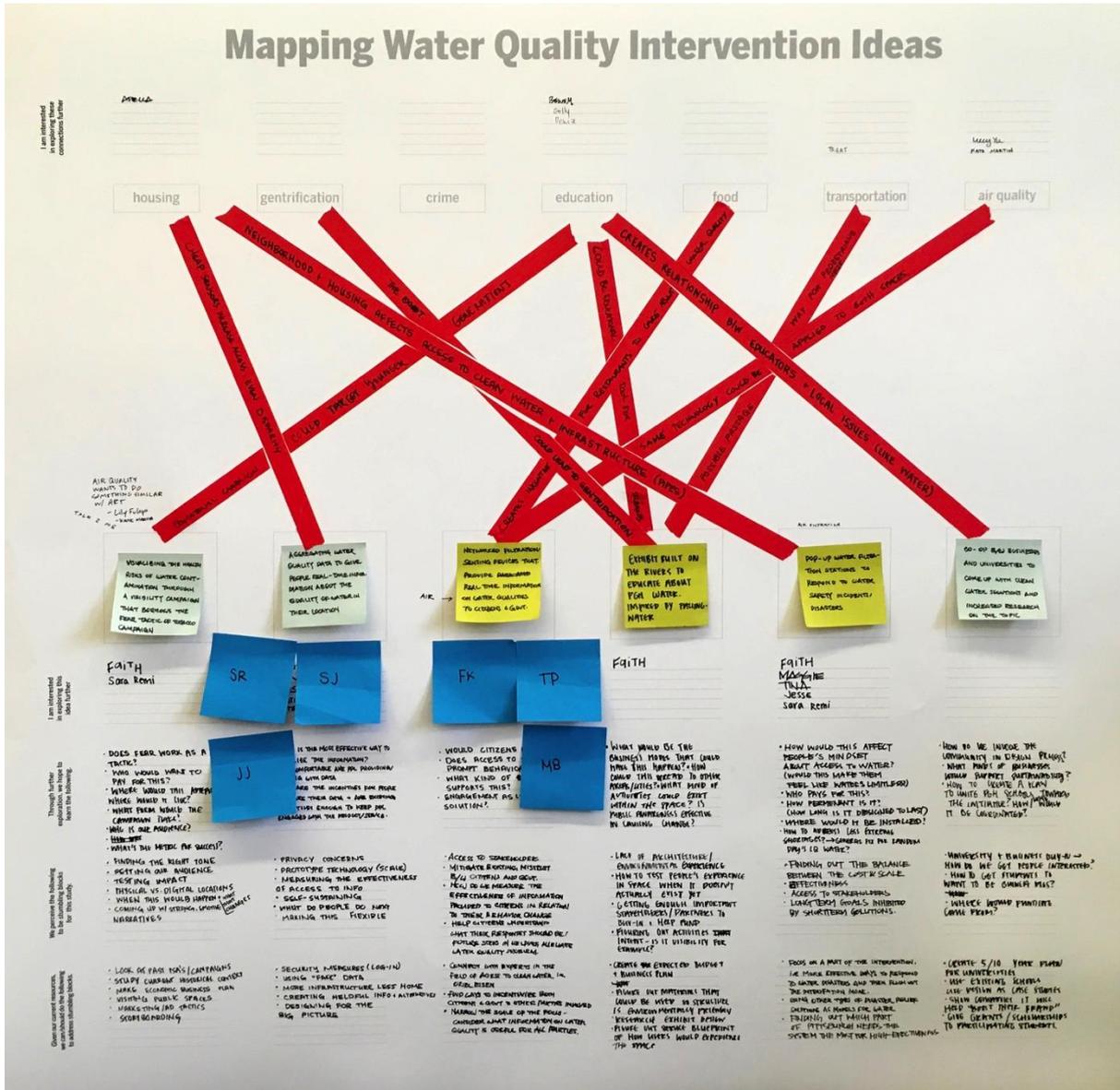


Figure 14. Student teams mapped possible connections between their intervention ideas and the other topics being investigated by their classmates, articulated research questions, and proposed plans for working through known obstacles.

3 Evaluation

As a means of evaluating the effectiveness of our approach, we observed students as they worked, paid close attention to their team conversations and working processes, and reviewed the outcomes of their efforts. We noted our findings and compared them to the learning goals we established at the start of the course. The successes and challenges we identified are based on this assessment. Although some of our discoveries may be evidenced in design education at large, we believe the set we present is particularly important to the teaching of transition design. These sections are followed by opportunities for improvement, which reflect the lessons we learned by teaching the course.

4 Successes

Transition design requires students to consider the broad ramifications that result from their actions. Few students were prepared to explore the vast impact design can hold or immerse themselves in a process where outcomes are unknown at the onset. Nonetheless, the students demonstrated significant growth in these areas throughout the term. Our interactions with them highlighted successes in our approach to teaching transition design in the context of the Design Research Studio.

4.1 Students grasped the facets of wicked problems and explored how to enter them

When students started to understand that wicked problems are systems problems residing within other systems, they began to shift their thinking from solving small-scale, immediate problems to seeing relationships among their topics at various levels of scale. Through mapping and diagramming exercises, students demonstrated confidence in defining and tackling manageable facets of wicked problems rather than simply becoming overwhelmed and paralyzed by their magnitude. They also learned to distinguish consequences of wicked problems by tracing their root causes through deeper levels of the systems. By starting the course with systems-thinking discussions and activities, we were able to lead students to alter their views of local challenges and propose appropriate ways of intervening. A quote popularly attributed to Albert Einstein states, “No problem can be solved by the same kind of thinking that created it.” Given that systems are so ubiquitous that they often go unnoticed, the curriculum helped students identify nested systems—a capability critical to the study and practice of transition design.

4.2 Students recognized the importance of stakeholders in the transition design process

Although this task proved to be difficult, the students began to indicate awareness for the connectedness of their topics and stakeholders, an appreciation for the complexity of the challenges they studied, and a cognizance of how little they knew about their stakeholder groups. Course activities caused the students to recognize pitfalls in stereotyping stakeholders and the importance of working directly with stakeholder groups. (See the Opportunities for Improvements section for further discussion.)

4.3 Students created visions of futures that informed their design actions in the present

After participating in several sessions that focused on envisioning futures, the students exhibited strength in working in a state of uncertainty. Course activities taught them how to toggle between short- and long-term thinking and the longstanding consequences of what they design. As a result, students showed mindfulness for futures when intervening in the present. They also noted that the design studies courses that they had taken in the past, which focused on cultures, systems, and futures, prepared them for speculative design and aided their learning of transition design.

4.4 Students learned the value of satisfying the needs of all living things through design

Given that class activities and discussions included mindfulness for all living things, students intuitively adopted a living-centered, rather than human-centered approach for design. In fact, when introduced to Manfred Max-Neef’s categorization of human needs (1991), students promptly pushed back, explaining the framework’s lack of inclusiveness relative to all living things. Nonetheless, his theory served as a tool that helped students understand how design satisfies or inhibits a range of human needs. Through their analysis and proposal of designed products, communications, environments, and services, students also illustrated a realization of the value of helping communities control the satisfaction of their human needs at a local level.

4.5 Students assembled a toolkit that aids their own proposals for design interventions

In order to move beyond theoretical discussions of large, long-term systems change, we prompted students to take the methods and approaches that they learned throughout the course and apply them to contemporary design interventions. Instead of seeing such design challenges as insurmountable, which is what many students expressed at the start of the semester, they demonstrated that they could articulate the characteristics of specific situations and suggest appropriate methods and tools to investigate known problems. They exhibited confidence and agility

in tackling ambiguous challenges rooted in service design and design for social innovation that reside within the larger umbrella of transition design. Early evidence shows that some groups are applying this knowledge to projects that they're currently conducting in the subsequent semester.

4.6 Students developed a mindfulness for their actions and experienced a mindset shift

After several weeks of intense work sessions with their group of peers, students described, practiced, and advocated collaboration as a critical component of transition design. Although the process was vastly different than what they experienced in the past, the students indicated an understanding of the value of designing a series of “interventions” over a long period of time instead of “solutions” that existed solely in the present. Their approaches often took a “less is more” approach to design, illustrating a soft hand in intervening. By the middle of the term, students were able to describe the potential impact design could have in seeding and catalysing positive change in the world and accepted important responsibilities in leading these efforts.

5 Challenges

Given that Fall 2017 marked the first delivery of the Design Research Studio, the instructors had spent several months prior to the term carefully planning the course. Nonetheless, its curriculum was based on lessons learned through the development of transition design theories, workshops, and a graduate seminar course. The differences in the course structure, its duration, and the nature of the cohort caused new challenges to arise for us to address.

5.1 Deciding not to work with stakeholders in context revealed significant challenges

Working with stakeholders and users is a means to question the designer's own bias and cultivate an understanding of others' concerns and aspirations, something that students recognized early in the course. At the same time, we believe as instructors that we have an ethical responsibility to do no harm. In design education, information is often gathered from stakeholders in local communities for short-term studies that are often devoid of symbiotic exchange—a situation that we did not want to support. This approach to research runs the risk of causing participants to become disenfranchised with the process as their engagement fails to lead to improvements in their communities due to the short duration of projects. However, this decision led to challenges in the classroom. Although some students observed stakeholders in context and took the initiative to meet with experts on their topics, several of them struggled to work within what they identified as a hypothetical context. They expressed a discomfort in basing design proposals on the limited information they gathered about stakeholders and sought to validate or negate their design interventions in realistic settings.

5.2 The course sometimes failed to situate students' learning within a broad and critical design context

Although students stated an appreciation for the content of the course, they explained the difficulty in it covering a range of approaches and methods. The students gained exposure to an array of topics that are critical to the study and practice of transition design. However, the course lacked ample time to frequently engage students in conversations that aided their deep understanding of the topics covered. As a result, the students expressed a frustration in not fully grasping the relevance of the course content to their immediate practice of design.

Many class sessions consisted of short lectures and discussions, followed by exercises that aimed to solidify students' learning of course concepts. Although the fast-paced nature of the format enabled us to cover a lot of information and sustain student engagement, it also caused them to sometimes lose sight of the big picture because we did not continually situate their incremental knowledge and skill acquisition in a larger context grounded in transition design. This is a challenge that designers and educators of service design face when moving between large contexts and small details.

The students also noted an appreciation for specific approaches introduced in the course but questioned how opposing theories may function. They sought comparisons that would prevent them from making ill-informed design decisions. Given the short duration of the course and the amount of information we aimed to cover, we chose to narrow the amount of content that we provided the students in order to avoid overwhelming them. However, in future deliveries of the course, we will find ways to include additional source material to address this concern.

5.3 *Students struggled to adopt behaviours that did not align with their prior experiences*

The senior cohort had participated in courses that encouraged them to learn and apply specific design approaches to clearly defined design problems. In contrast, the Design Research Studio asked students to consider a range of design theories and develop hypotheses for effective courses of action. Although common at the graduate level, this form of inquiry was foreign to the senior cohort. The inability to align current and prior design education experiences caused the students to have difficulty grasping the relevance of course activities.

Similarly, students spent most of the first half of the term working in teams of six on mapping and diagramming tasks that aimed to aid their understanding and practice of transition design. Several students expressed a frustration in the lack of making that took place in the course, which negatively impacted their motivation to fully engage in activities. This observation indicated students' narrow definition of making in design, as we had believed that all of the activities that they performed were a form of making common in design practice.

Lastly, although the students were able to grasp the fundamentals of service design and design for social innovation relatively easily, applying the methods that we practiced in class using small-scale challenges to their transition design work that focused on wicked problems situated in Pittsburgh, proved to be difficult. The students seemed conflicted in maintaining the mind-set that their work should solve an immediate problem versus shifting their view of design to planting seeds that catalyse systems-level change over a long period of time. We continually discussed their stumbling blocks and referred to their work as interventions to help them adopt a design posture and mind-set that facilitates effective work in transition design.

6 Opportunities for Improvement

As we taught the Design Research Studio, we made small shifts to the course each week. We believe that it was critical for these shifts to take place and for us to share them with the students to demonstrate the importance of being agile, empathetic, responsive, and transparent when working in transition design. Nonetheless, some challenges were too large for us to address immediately. Therefore, we recorded ideas for overcoming obstacles in future manifestations of the course.

6.1 *Explicitly seed transition design approaches earlier in the undergraduate curriculum*

We believe it would be beneficial for design courses that precede the Design Research Studio to further highlight approaches that are relevant to transition design as a means of aiding students' deep dive into the topic during their senior year. For example, drawing students' attention to collaborative mapping as a form of making and describing the benefits of designing as a means of speculating rather than solving problems would help students adopt the mind-set and posture that is pertinent to the study and practice of transition design. Similarly, students noted the benefits of design studies courses that they had taken in prior years, which focused on cultures, systems, and futures, in aiding their current thinking in transition design. If we seed some transition design tools and methods earlier, students will be more familiar with them their senior year.

6.2 Build a comprehensive repository of materials in transition design

Several times throughout the course, we realized the importance of providing students with a range of readings relevant to the course content. In an attempt to not overwhelm the students, we introduced them to a few texts each week. However, as the term progressed, we discovered that the modest sampling failed to introduce students to a diverse set of perspectives, which we deem to be a critical component of thoughtful inquiry and debate. In the future, we plan to give students a list of required and recommended readings that include short descriptions of how they relate to each another. The nature of course activities also highlighted a need for case studies situated in the context of transition design, service design, and design for social innovation. We anticipate that these readings will help students understand the application of the theories we discuss, describe the characteristics of each area of design focus, and guide them through similar processes.

6.3 Gather a body of data on local transition design topic stakeholders for future study

Adhering to the ethical obligation to do no harm in communities by not taking advantage of stakeholders for research purposes, we sought alternative ways of providing students with pertinent information. In looking to practices in the field, we found that anthropologists often gather information from a large sampling of stakeholders that designers then use to inform the direction of their interventions. Although working directly with stakeholders creates a level of empathy that cannot be achieved by reviewing interview transcripts or field studies, this approach would give students a broad sampling of stakeholder input that they could not achieve by working with a few members of stakeholder groups. As a result, for subsequent deliveries of the course, we plan to build a body of data that students can use to ground their projects.

6.4 Continually connect course content to a broader context and practice of design

Despite having visualized the course as a set of interconnected elements, we inadvertently focused the students' attention on immediate tasks in subsequent sessions without reference to how they were situated within the broader context of transition design. As a result, students struggled to see the relevance of tasks and the connections among them. We will plan to build time for discussing and visualizing the connectedness of course content into the curriculum. Moreover, although we ask students to reflect on course activities and write about their thoughts, we believe students would benefit from well-articulated prompts that direct their attention and aid their development of a mental model for the course content.

7 Teaching and Learning Transition Design: Some Conclusions

Given that transition design is in its infancy, we are developing curricula based on emerging theories, borrowing relevant approaches from other disciplines, and learning while doing. Although we have outlined practices that we found effective and described discoveries we made, many questions have arisen that we believe serve as opportunities for improving transition design curricula.

7.1 See teaching and learning about transition design as a set of feedback loops

Our students have provided us with insights regarding the teaching of transition design that we had not foreseen. While some of their feedback reveals an anxiety for a new way of studying and practicing design, many of their comments describe successes or challenges in working with specific frameworks and obstacles they encounter when working with different teams of people for varying amounts of time. We believe it is critical to build opportunities for feedback loops in educational settings to aid the critical review of teaching approaches and inform appropriate revisions.

7.2 Create new tools for transition design practice

We have utilized approaches developed by adjacent disciplines that hold potential in aiding the teaching, practice, and research of transition design. Nonetheless, the application of many of these

methods indicates that although they hold merit, they require improvements to function effectively. Our students have identified problems with existing frameworks and are brainstorming ways of re-envisioning them to make them highly appropriate and useful to the tasks they encounter in transition design.

7.3 Develop ethical approaches for teaching transition design

The issue of ethical engagement with the public remains at the forefront of curricular discussions. Wicked problems are symptoms of other problems, and to engage in any aspect of them is to intercede in the problem itself, which produces an ethical dilemma for teaching. Do we use a hypothetical context to teach students methods void of interaction with stakeholders or do we strive to build relationships with community groups without knowing if the development of a long-term relationship is realizable? Both approaches are problematic. There is a need for new approaches that help students understand the contexts of transition design in which they are working that are effective and ethical.

7.4 Seed and catalyse systems-level change through all areas of design

Despite the challenges we encounter in developing teaching of transition design, we believe the integration of this new form of design is critical to the success of our students as they embark on lifelong careers in various areas of design. For our undergraduate students, the practice of transition design may seem unrelated to their post-undergraduate careers that often focus on designing products, communications, and environments. Nonetheless, we are confident that by exposing them to longer design futures, we are teaching them to be mindful about the long-term consequences of their actions as designers and the materials that they use.

8 Summary

In summary, we seek to educate the next generation of designers in a manner that empowers them to seed and catalyse positive systems-level change in design. In this paper, we outlined our endeavours in the context of an undergraduate design research studio, offered evidence of our successes and challenges, and interweaved our own reflections on this process. The activity of teaching and learning as a symbiotic process has facilitated a shift in our own mindset and posture as designers, educators, and researchers.

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Identifying the User in an Informal Trade Ecosystem

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How do we identify the right target beneficiaries within an informal economic ecosystem for development interventions designed to maximize benefits and value for money? This was our initial research question when we conceived the human-centred design research program for exploratory fieldwork to map informal trade in the borderland of Kenya and Uganda. This paper narrates our discovery process and analytical journey identifying a previously unknown segment of micro-entrepreneurs whose business practices lead to the organic development of an economic microsystem - a "value web" or established network of customers, suppliers, and service providers. The individual actors in these microsystems collectively form a value creation engine which we identify as the target beneficiary or end-user, for the design of interventions meant to trigger progressively transformational change in the borderland's informal trade ecosystem. We describe the factors leading to our decision to consider the value creator's entire value web as the end-user, rather than the individuals at the heart of each such microsystem, for optimal outcome of systemic design interventions.

systemic design, complexity studies, design research methodology, informal economy

1 Introduction

Traditionally, beneficiaries of international development programme design have been conceptualized as the passive recipients of charity, with little or no agency. With the shift in thinking from aid to trade, there needs to be a concurrent shift in the way we frame the concept of the end-user or beneficiary when we design such programmes. (Doorneweert & Bhan, 2013) Trade implies an exchange of value between two or more parties, rather than the one-way transfer of value from a donor to a beneficiary. Thus, end-users in a trading economy must necessarily be recognized as active agents of value creation within their commercial ecosystems.

Approaching exploratory user research to map the last mile of the farm to fork value chain for subsistence farmers in East Africa in 2013 from this perspective, we discovered that agricultural trade networks did not in fact resemble the textbook diagrams (Figure 1) used to illustrate the ecosystem.



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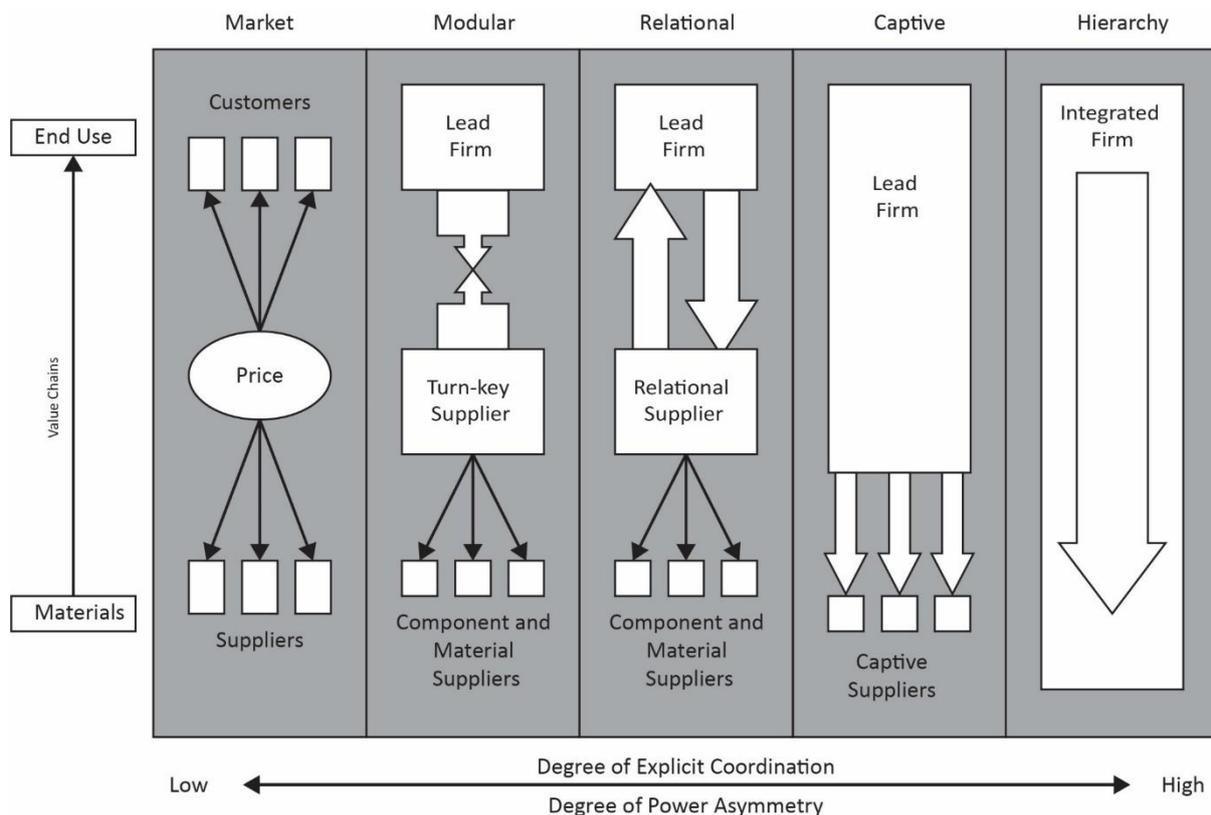


Figure 1 Five global value chain governance types (Gereffi, Humphrey, & Sturgeon et al., 2005)

Textbooks present orderly abstracted value chain models, also referred to as governance configurations, diagrammed in a manner that implies linear progression and a high degree of specialisation. The Kenyan 'farmer market' was not just a neat box in the formal structure of a value chain, but a flexible, multipurpose node in the rural economy's complex web of human interaction and exchange of goods, services and knowledge. The classic, orderly pattern of exchange in value chain form, based on assumptions of a structured, formal hierarchy of power residing downstream, does not, in fact, appear to exist. (Doorneweert, Bhan, Kimunyu, & Esko 2013, pg 12)

That is, what we were seeing were all the signs of a complex adaptive system. (Barder, 2011) Although this economic sector in developing countries is categorized as "informal" (Hart, 1973) implying an ad-hoc or casual contrivance, these flexible, multi-purpose nodes were, in fact, value webs with indigenous forms of structure and organization organically evolving in response to market conditions.

This discovery signalled to us that instead of rushing to design new tools or solutions to enable farmers to bridge the last mile of the agricultural value chain, we needed to take a step back in order to better understand the existing situation linking the harvest in the field to the customer who purchases it. It underscores our recommendation for comprehensive exploratory user research in this last mile, and the need to first uncover and understand all the ways by which information flows through the ecosystem (Doorneweert, et al., pg 13)

These discoveries subsequently informed our approach for framing the systemic design challenge and identifying target beneficiaries for pilot interventions aimed at social and economic development through increased trade.

Prior work in the last mile of the agricultural development value chain in rural Kenya has shown us that the linkages between activities and actors are not as linear nor as clearly

demarcated as textbook diagrams make them out to be. There is a complex value web of relationships and transactions - value flows such as information on supply and demand; exchanges of goods and services; as well as fiat currency and currency equivalents - that take place in the social and economic ecosystem. Given the relationships between markets and the known proportions of agricultural produce being traded in the region, we believe that a similar value web exists at the borderland. This will be our starting point to anchor our exploratory user research. (Bhan & Gajera, 2015)

Thus we began ethnographic fieldwork at the border of Kenya and Uganda to understand this phenomenon of the value web as the key node within the entire trading ecosystem. What we discovered throws open the entire field of understanding complex adaptive systems that are the target of international development programming (Ramalingam, Laric, & Primrose., 2014; Green, 2015).

While our fieldwork confirmed that there were indeed such value creating nodes in the ecosystem, we discovered that targeting them as individuals would not be sufficient for enabling progressive transformation through the design of interventions. We believe, for systemic impact, it is essential to include our users' entire economic microsystem as the focus for our intervention design in order to maximize the impact and benefits of the conceptualized borderland program - that is, we need to expand the scope of the user for our design process from the individual to the group. Below we describe our journey of discovery.

2 Scope and Methodology

The borderlands of the East African Community (EAC) are important for the trade and development sectors, as cross-border trade is a critical part of the region's food security system. Further, women make up more than 70% of the region's informal cross-border trade (UNIFEM, 2009), and tend to head the more economically vulnerable households. We were requested to discover and map the dynamics of informal trade for TradeMark East Africa (TMEA), a non-profit company whose mandate is to boost trade facilitation and business competitiveness in the EAC. Their objective was to discover how to position themselves to develop structured programmes aimed at growing and formalising informal trade in tandem with their objectives of inclusive, sustainable prosperity through increased trade (TMEA, 2015).

The outcome was intended to be custom-designed programme interventions for beneficial transformation of the borderland's informal trade ecosystem, within the guidelines of value for money (HM Treasury, 2004). The deliverables of the project included developing a robust methodology for borderland ecosystem mapping across the EAC. Thus, our design research task was two-fold:

1. We had to apply ethnography and human-centred design methods for exploration and discovery of the dynamics of the informal trade ecosystem, and identify the end users for whom we would conceptualize designs for pilot interventions.
2. And, simultaneously, we had to abstract enough understanding of these dynamics in order to generalize the ecosystem frameworks towards developing a robust qualitative methodology to cost-effectively map more such borderlands.

3 Approach to Framing the Problem

Cognizant of the fact that this study would break new ground by mapping the informal trade sector as an ecosystem in its own right, we scoped the boundaries of our study in such a manner as to provide flexibility for exploration and discovery while constraining the content for greater clarity. We had to combine the need for qualitative insights with the concurrent need to develop and iterate design research methods and tools in-situ.

We see the borderland as an ecosystem in its own right, distinct from the more agriculture dominated economy across rural East Africa, with greater emphasis on trade and services. The vast majority of this activity falls within the informal sector, as is the case with the bulk of the region's economy. Considering it an ecosystem allows us to take a holistic view rather than narrowing our focus on a particular demographic or specific activity. We step back from the details to take a broader view of the entire operating environment of the borderland economy.

Our second decision was to step back from the labels of informal economy and informal trade with all their contradictory definitions, categorization, and implications of illegality to consider only what is colloquially known as biashara. The Swahili word biashara can mean business, commerce, trade, the business enterprise itself as well as barter. This allows us to cover a far greater range of activities being conducted at the border than just the conventional meaning of the English word "trade". At the same time, it excludes the tax evasion by formal firms or other illicit activities at the border, since these are not considered biashara per se. (Bhan & Gajera, 2015)

We structured our initial discovery process to run both primary and secondary research in parallel, dividing ownership between each author and maintaining close communication in order to ground the findings from the field firmly in the context of the insights from literature review, and vice versa. Further, we paused for an internal midpoint review and analysis to frame our final round of fieldwork after the first two short rounds of immersion.

This means that our narrative thread of logical progression of insights shared below may not always follow a simple, linear path and may repeat points as we alternated back and forth between lines of enquiry and modes of research.

3.1 Framing the Context of the Operating Environment

For the purpose of framing the context for prototyping the research protocol as well as to understand the landscape of current thinking on both the informal economy in East Africa as well as the informal trade sector whilst maintaining a gender lens, we undertook a rigorous literature review (Bhan, 2016) that went back twenty years to the very first cross-border trade research and methodology explorations (Ackello-Ogut, 1996). The geographic scope covered the East African Community (Kenya, Uganda, Tanzania, Rwanda, Burundi and South Sudan), and the Democratic Republic of the Congo. The thematic scope covered the informal economy (Hart, 1973; Chen, 2007), the informal cross-border trade in the region (Little, 2007; Ackello-Ogut, 1996; Titeca & Kimanuka, 2012), the concept of a borderland economy (Khadiagala, 2010) as well as women in trade (UNIFEM, 2009; Spring 2009) and the final synthesis included just over 60 papers.

This review shed light on a number of unsubstantiated assumptions being perpetuated over the years, and acting as barriers to development, such as the conflation of unrecorded trade with the illicit or illegal. Women traders have borne the weight of the consequences of these assumptions. According to UNIFEM (2009) over 70% of all cross-border trader in Africa are women, and they face frequent and periodic harassment and abuse (Friedrich Ebert Stiftung & the Collaborative Centre for Gender and Development, 2006), often accompanied by official confiscation of their goods with the concomitant loss of income that implied.

Further, there was no regulatory recognition of either retail or wholesale trade as a profession or full-time occupation, nor were there any attempts at segmentation of these women traders by any commercially relevant attribute. All were lumped together as livelihood actors struggling to sell their produce by the side of the road. Informal cross-border traders (ICBT) were thus portrayed as economically vulnerable women on the margins of society, and new studies, relying as they did on previously recorded data, continued to perpetuate this stereotype with each new report.

Our challenge was that Women in Trade programmes were currently being designed targeting the *assumed* needs of this stereotypical beneficiary, rather than the real world needs of actual traders. Initial reports from the first field survey made it clear that not only did this stereotype need to be unpacked with better qualitative analysis but a more up-to-date representation of the “woman informal cross-border trader” was required to be synthesized with tangible evidence from the field.

Across the board, the literature spent far more time focusing on the definitions of the informal economy, the informal trade sector, and various degrees of legality, than on the human actors themselves. There was no recognition of their agency in developing regional business networks (Walther, 2015) and supply chains for cross-border and regional trade. Keen to shift emphasis back to the user, we reframed the entire context of informal trade as “biashara” – the Swahili word for commerce and trade, as opposed to “magendo” - the Swahili word for contraband and smuggling. This released our research resources to focus on the people themselves that made up the borderland economy.

These findings broadened the focus of our first fieldwork immersion to be more inclusive. Our aim was to widen the range of data points to assist us in mapping the informal trade ecosystem, as well as identify participants for the subsequent in-depth ethnographic study.

3.2 Discovery Driven Design Research Methodology

We took a systems’ thinking approach (Jones, 2014) to understanding the landscape of informal trade at the borderland, having framed it as an economic ecosystem in its own right at the outset. Our research protocol was based on methods and tools from human-centred design, (Kumar, 2012; Keeley, Pikkell, Quinn, & Walters, 2013; Kimbell, 2014) adapted for the constraints and conditions of the data-scarce, infrastructurally challenged parts of the developing world, such as prevalent on the border of Uganda and Kenya.

The ethnographic fieldwork was designed to include three iterations over a duration of two months. The first two were shorter explorations, whilst the third was planned as an in-depth ethnographic study with pre-selected participants identified from earlier rounds of fieldwork. The aim was to discover the relationships and value flows between the roles, and identify the key archetypes in the ecosystem.

The first survey was semi- structured and intended to broadly sample a wide variety of economic actors involved in cross-border trade. We had one team member on site conducting a short questionnaire, and responses were shared in real time with both authors thus integrating findings from the literature review into the feedback for research protocol design iterations. This approach permitted an iterative refining of the focus in the second short round of immersion which was to shortlist users for the third stage of in-depth study.

For instance, although the brief was to study informal traders, our discoveries in the first round of fieldwork led to the inclusion of support services actors such as transporters, brokers, money changers, mobile currency agents, etc., and host of other services such as mobile charging or rent a storage per night. They were deemed such an integral part of each trader's daily commercial activities that we expanded our scope of user research accordingly. Subsequently, the fieldwork for the third and final round was designed to include mapping out the commercial relationships - the value webs (Kumar, 2012; Doorneweert, et al., 2013) - of the selected primary end-users (the informal traders) in addition to understanding aspects of their daily life.

Primary methods for context immersion were ethnographic observation and in-depth interviews supported by exploratory market and spatial analysis by means custom-designed tools and guides to trace linkages between urban and rural, and formal and informal, as well as map trade routes in the region.

Over 60 participants were interviewed in-situ, spanning both sides of the border in Kenya and Uganda, between the border market towns of Malaba and Busia. Most informal trader participants

were female and those offering support services were male, and this was found to be proportionately true in the region per the literature review.

There was an explicit understanding that there would be a high degree of ambiguity in this, the first borderland exploration, which we later codified as an additional phase of discovery in the design of our borderland mapping methodology. This design and process will not be described within the scope of this paper.

4 Insights from Fieldwork

The goals set for the first phase were to discover the value webs of informal trade and identify and describe the archetypes representative of this activity for more in-depth and structured qualitative research that would inform and inspire the conceptual design of the pilot programme/s.

4.1 Patterns of Biashara

As we surveyed traders operating across a range of scale of operations, goods sold, and geographic reach in the first iteration of fieldwork, we saw patterns emerge in the borderland economy. Not only was it a self-contained system with regard to all the necessary services for cross-border trade, regardless of distance, but there was a rhythm and meaning to the pattern, not simply the first impression of chaos that informal markets tend to convey. It was this insight that led to expanding the scope of users surveyed as mentioned in the methodology section above.

The first thing we noticed was that the majority of full-time traders in this borderland economy were not merely scraping by at subsistence level, these women were professionals and business owners, and their demeanour conveyed it. There was a distinct difference between them, and the women who thronged the weekly market selling fresh produce. These produce sellers were the stereotypical informal cross-border traders the literature had described, but as we discovered, they in turn didn't always think of themselves as full-time traders. Rather, such petty trading was considered a part-time activity to supplement incomes, and these traders were either fulltime farmwives, or worked only during the school year.

Two elements from this initial survey stood out as being of interest. First, the informal trade sector seemed to signal a certain degree of commercial success by moving visibly to establish new lines of business. At a certain stage of business growth, a second person would be brought in to manage day to day operations, freeing the trader to explore new opportunities for revenue generation, and multiply their income streams as a risk mitigation strategy. In fact, more than half the traders surveyed in Busia and Malaba markets were running more than one line of business. And, a handful had as many as four different income streams, including non-trade related entities such as a copy center offering business services to customs agents. This behaviour also offered us insights on the economic potential of this borderland, as well as its stability in a region where neighbours were prone to conflict.

The second element was that most of the ambitious retailers aspired to become wholesalers. That is, we documented their intent to shift from purely business to consumer (B2C) sales to increasing proportion of business to business (B2B) sales. Such traders often helped newcomers entering retail trade – through such means as direct apprenticeship, supplying them goods to be sold on commission, and through advice and guidance. In fact, as it turned out, such mentoring had economic value in the eyes of the traders, and this attribute helped us distinguish such value creators in the ecosystem.

This behaviour went counter to conventional modes of supply chain and distribution channel structures which rarely blend individual consumer facing sales with global trade in bulk shipments. Marketing to B2C and B2B customers tends to be separated at the business plan stage, and runs in parallel with different organizational structures and strategies.

What we discovered was that these were two of the main business development strategies for micro-enterprises that were organically evolved to cope with the limitations and constraints of their operating environment.

First, the need to diversify lines of business was necessary for two reasons:

1. There is a natural limit to how much one trader can grow the local customer base for goods such as clothing, footwear, household goods, etc. Unlike food, which is a consumable needing frequent replenishment, traders know that to increase their revenue streams they need to increase the size and value of each sale rather than rely on footfalls alone.
2. At the same time, without any decent safety nets or support from formal financial institutions, traders tend to mitigate risk by diversifying their income streams. This could be in the same product category or in a very different one. We noticed traders of all sizes experimenting with new items distinctly different from each other, such as selling day-old chicks and toilet paper. Or converting an observed need into a profitable income stream, such as renting out sacks to truckers to de-humidify their grain before crossing borders. Their aim was to identify demand for a profitable new line of business, through experimentation and iteration.

Second, the necessity of managing working capital requirements in an environment characterized by volatile cash flows and seasonality (Bhan, 2009), meant that planning and forecasting for business development required increasing the stability and predictability of their revenue streams. A proven tactic was the investment in mentoring newcomers, and nurturing a cohort of even smaller scale B2C traders, as described above. This ensured the trader had regular access to a relatively stable customer base, one that could be relied upon to provide periodic and consistent sales orders. This, in turn, provided an established revenue stream from a trusted network (Hart, 2000) whose day to day operations could be delegated, thus giving the business owner ample opportunity to focus on launching a second or third line of business.

That is, what we were discovering was evidence of a segment of traders falling outside the documented categories of either formal small and medium enterprises (SMEs) or the stereotype of the marginalized and vulnerable livelihood actors living on the edge. For narrative purposes, we labelled them the "Hidden Middle". These so called "informal" cross-border traders were, in fact, highly respected value creators within their micro-communities - building trusted relationships, mentoring the less experienced, and establishing supply chains in the form of stable networks.

This discovery helped us identify the user participants for in-depth observations, interviews and day in the life shadowing conducted subsequently.

4.2 Framing our theoretical approach for the design of iterative programming meant for complex adaptive systems in the context of international development

Initial insights had invalidated many of the assumptions implicit and explicit in the literature review, and pointed to the existence of segments of traders who were undocumented. The discovery phase had provided enough evidence of nodes of value creation composed of multiple stakeholders, not just the primary target beneficiary of the informal cross-border trader per our project's terms of reference.

The evidence pointed to an existing ecosystem that had organically evolved to create value by building stable, trusted networks of cooperation in cross-border trade, based on relationships between people. All it needed, from the perspective of intervention design, was fine tuning for boosting productivity, efficiency, and improving ROI (return on investment), not the kind of top down disruption that traditional programmes caused by disabling the flows of value in their attempts to impose pre-built ecosystems without ever questioning if there was already an existing one.

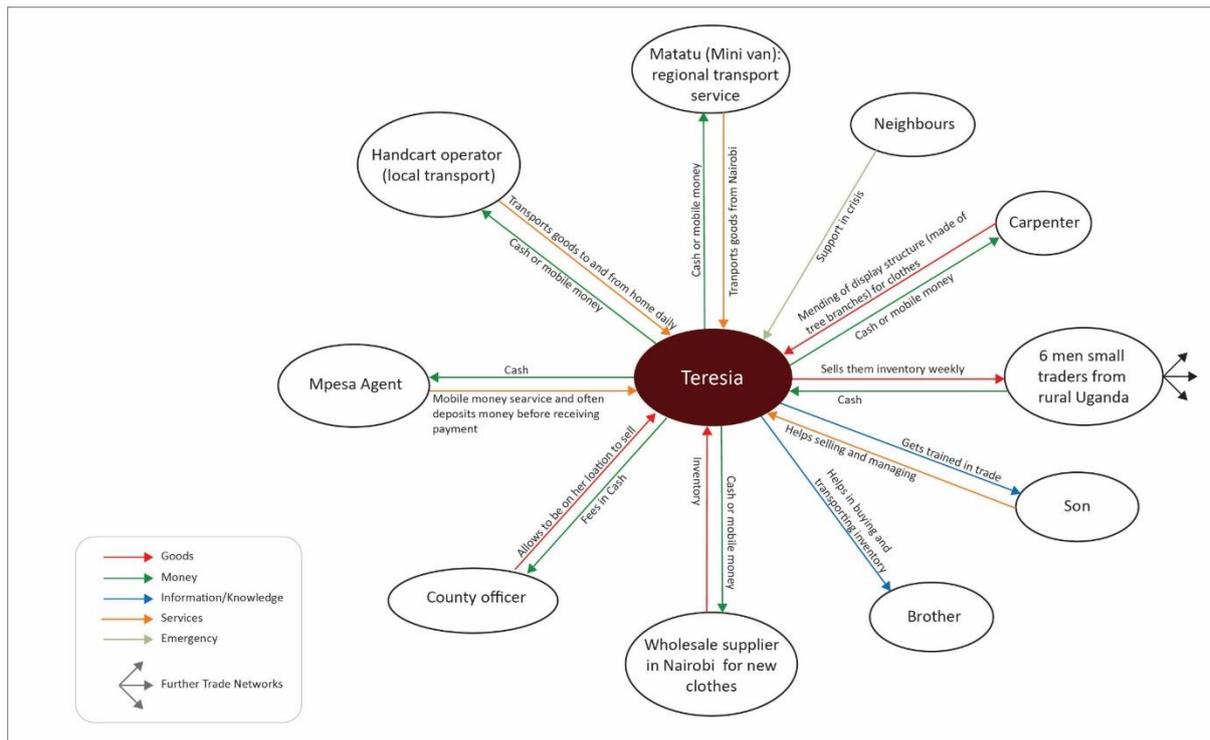


Figure 3 Teresia's value web as captured during the fieldwork

Teresia has not yet achieved Alice's scale of operations, having only recently begun establishing a wholesale network to supply a group of six Ugandan men. Teresia is a single mother and has been bootstrapping her business, failing to get a loan for working capital at the bank. But this has not stopped her from building and maintaining her micro-system, including support services such as transport and mobile money.

The task of synthesizing microsystems into value webs gave us a tool to distinguish between trader segments, and the subsequent analysis and synthesis provided us with fodder for selecting attributes for each segment. Since this was the first borderland, our aim was to seek generalities in trader business characteristics that could be applied as a lens to segment and evaluate the economic distribution of small scale and woman traders for any given borderland, given the dual-purpose nature of our fieldwork. Once defined, the attributes could be used as a foundation for a census level Trade Survey. Comparative analysis of the value webs provided visual evidence of differences in commercial operations even within the value creator segment. At the same time, we knew that this would only be prototype segmentation since validation would only occur after implementation in more borderlands.

4.4 Segmentation attributes and the "Hidden Middle" in the trading economy

Profit margins and income streams are difficult to estimate in the volatile conditions of the cash intensive informal sector and price is negotiable between the buyer and the seller. However, every experienced trader knows their pattern of investment in inventory, including seasonality of demand over the course of the natural year (Bhan, 2009). Thus, to estimate the scale of operations, two simple questions were asked – how many lines of business have you established? And, how often do you buy new inventory and for how much?

Table 1 Indicative Segmentation Range for Borderland trading economy

Monthly Inventory Purchases	Less than USD 600	USD 600 to USD 1000-1500	USD 1500 to USD 2500-3000	USD 3000 and upwards
Trader Stage	Part time trader and/or farmer; Apprentices	Entry level fulltime traders, Proto employer	Value creators, Established traders	Pre-formal SMEs, Business owners with multiple lines

At this borderland economy, the barest minimum requirement to keep business running as a fulltime trader – that is, relying solely on the cash flow from sales of trade goods, including perishables – was a monthly investment capacity in inventory of around USD 600. A business was considered established enough for the trader to start considering business development strategies for revenue growth after her investment capacity in trade goods began to exceed 1000 US dollars every month. This kind of distribution by periodic investment capacity offered us the means to capture the economic distribution for each borderland's trading economy.

In addition to their estimated average monthly inventory investment capacity, there was a natural correlation of education level to increasing sophistication of trade. With education, and the advent of affordable smart phones and data plans, along with ubiquitous mobile money solutions, trade had been disrupted at the borderlands. This was one of the reasons for the stereotype of the subsistence level woman trader as they were the only ones seen visibly trading in the marketplace and counted while crossing the border posts.

The Hidden Middle were hidden due to the transformative capacity of the personal mobile phone in a sector as heavily dependent on communication as trade. Value creators traded far more extensively, geographically speaking, and their deals were of higher value. But due to the discreet nature of making deals by phone, these traders and their activities remained invisible to the traditional researchers at the borderlands, and in the informal economy in general. It was only by diagramming their entire value webs were we able to see and communicate the full scale of their activities.

Giving personalities to traders at different phases of their entrepreneurial journey allowed us to craft a representative narrative of how the informal trade dynamics played out in the context of first, the trader's own value web, and secondly, how these microsystems networked with each other to build up the regional trade ecosystem. And, we could begin crafting personas to represent trader segments, such as Teresia who has the capacity to invest between USD 1000 to 1500 monthly, and Alice whose three lines of business may require investments of around USD 3000 each month as working capital.

5 Design Implications for an Ecosystem Approach to Policy and Programmes

Our fieldwork confirmed and further deepened our understanding regarding the existence, and identification criteria, of influential nodes in the informal trade ecosystem, that could be designated the primary beneficiary for the systemic design of programmes and interventions (Kimbell, 2011) meant to trigger positive, transformational change.

The informal trade ecosystem's business development strategies were such that investing in the highest grade of professional traders with extensive value webs outside the mainstream economy would have far more impact than simply focusing on subsistence level livelihood actors without an established or stable trading network. Interventions designed for an Alice as the target end-user would have ripple effects throughout her entire micro-system as a whole, including support services such as local and regional transportation, mobile money agents, brokers and other intermediaries. Growth strategies for boosting trade and revenues could thus be optimized based on the economic distribution pattern of each such borderland.

Our discoveries lead us to posit that simply targeting each trader segment with customized programmes will not be enough to enable systemic change of the whole borderland informal trading economy; we will have to address their entire value web as the target beneficiary of an integrated set of programmes.

5.1 *The Node is the Value Creator's entire Microsystem*

Rather than considering the discrete individual as the active node in the informal economic ecosystem, our findings lead us to expand our scope to consider their microsystem as the node to target with our interventions. From the theoretical perspective, such a concept design prototype

would act as the pilot to see how many of the microsystems centred around each value creating trader change in response to the interventions, and by what degree and scale. This approach to iterative programme design for complex adaptive systems also offers us the opportunity to rapidly design and test ecosystem scale pilots far more efficiently and affordably.

Shrinking the scale of systemic design down to selected handfuls of such microsystems would provide a more manageable scale of inputs to monitor and evaluate for iterations in programme design. By sampling microsystems from the range of trader segments, we would not only be able to identify the optimal stage of a business's development journey for interventions to boost trade related growth, but the data gathered would assist in developing a generalized framework of an economic microsystem, which we think may be the basic building block of the informal economic ecosystem. This is due to having identified such value webs in both the last mile of the agricultural value chain as well as the informal trade ecosystem. That is, we have begun laying the foundation for developing a reasonably accurate working model of the informal economic sector in East Africa.

5.2 Framing the Problem and Identifying the User for Informal Ecosystems

Our methodology is grounded in the first principles of human centred design (HCD) customized for operating environments where legacy consumer insights are scarce, and data flows unreliable. The selection of the primary “user” for whom we will design is a critical decision, as context and profile will subsequently act as a filter for evaluating concepts for best fit. Traditionally, the word user, in user centred design, or the word human, in human centred design, has denoted the individual, in the singular. However, due to the complex and volatile nature of the informal ecosystem the needs of the design process itself can best be served by expanding our scope of “the user” from the individual to the group – in this case, the trading economy's microsystems.

This is a group that would not be immediately recognizable or visible to a casual visitor. It is not an existing social organization such as a farmer’s association or a cooperative, nor a women traders’ self-help group. It is a micro-system composed of the entire supply and demand network of goods and services that generates revenues for established traders.

Selecting the entire group would be far more influential for the spread of new ideas and provide visible evidence of the beneficial outcomes of planned interventions. This would help in on-boarding more of this segment after the pilot programmes. The slower start implicated in the design and prototyping process by working with groups rather than individuals offers more time to refine the system design prototype at the micro level thus helping create a firmer foundation for interventions to take root.

Rural and informal economies are far too closely interdependent due to the people-centric nature of their transactions and any intended systemic change must occur on a significant enough scale for programmes to achieve their intended goals within the timelines set for their financial support. The need for exit strategies requires triggering self-sustainable change that can organically evolve and spread, and addressing each value creator’s entire web as the beneficiary changes the way we would approach the design of pilots and programmes. It also transforms our perspective of the economic contribution made by these value creators with significant impact on poverty alleviation programmes (Bhan, 2017).

6 Conclusion

Design research methods in collectivist societies as compared to individualistic societies have a different approach and implications (Hofstede, 2001). As discussed above, the need to consider a micro-system rather than an individual end-user as a unit of investigation proved to be context appropriate for the rural and informal market and trading economy in East Africa.

Though dependent on the conditions of the client brief, this approach has scalability. We were able to build in a flexible phase of discovering and exploring in this first such project, and now have codified this need for liberty in research planning into our design methodology.

Finally, for social innovation purposes, in the resource constrained environments, interventions may not always take the form of tangible products or services neatly wrapped in a great user experience. It depends on what is actually required and what is the strategy for adaptation. The authors observed that even the “most logical” solutions such as bank accounts did not fit the requirements of the participants. Solution design must take the perspective of optimal triggers for progressively beneficial transformation, be it a policy, product or simply enhanced understanding of the context.

7 Next Steps

We have developed a theoretical framework for triggering progressively beneficial transformation in an informal economic ecosystem based on our discoveries in this project. This theory of change will be validated through pilot programmes, and the methodology prototyped for mapping borderland economies iterated with each subsequent location. The borderland described in this paper is located in a stable region with impressive trade facilitation at the border post. How we customize our framework and approach for more fragile conditions, or comparatively analyze value flows in thicker borders will be our next research task.

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Catalysing Pathway Creation for Transition Governance

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Transition management is one of the key governance methodologies for catalysing vision building, experimentation and pathway construction for sustainability transitions. Its adoption in new country contexts may, however, require redesign. Finnish energy and climate policy already features wide experimentation, visioning and long-term roadmaps. Yet transition arenas could help connect these existing instruments, particularly if redesigned for a mid-range timescale. We improved the path creation toolsets and procedures to create more detailed pathways and analyses of pathway step interrelations. Our path creation system uses magnetic elements that could be easily moved around a large metallic board, a set of procedures and a digitalized counterpart of the board for out-of-the-workshop commentary and reporting. The system was used to create eight mid-range transition pathways and was reported to have facilitated and anchored well the discussions by participants with cross-sectoral backgrounds. Overall, the redesigned system underscores the potential that codesign for sustainability transitions holds, for instance, in developing transition governance instruments further.

transitions; design research; collaborative envisioning; energy

1 Introduction

The need for thoroughgoing system transitions has become urgent in several areas such as energy, transport and water use. Climate change and advancing resource scarcity exert growing landscape pressure on the dominant sociotechnical regimes in these sectors. At the same time, alternative technologies and social arrangements are maturing in many sectors and offering alternatives that can begin to reconfigure or replace the dominant sociotechnical regimes (Geels, 2004; Geels & Schot, 2007).

In the energy system, improved energy efficiency and the replacement of fossil fuels with increasingly cheaper renewable energy are changing the ways in which energy is produced, distributed and used in all sectors. For example, an increasing share of intermittent electricity production creates the need for new market models, products and services: demand response, storage and flexible production. The need to anticipate and investigate the forms and timing of the



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needed changes as well as their impacts on different sectors thus becomes evident. Transition requires change in the current dominant regime as well as new technologies, business models, competencies and institutions. Many of these changes benefit from (or require) anticipatory action, societal experimentation and policy changes and thus require localized forms of governance (Heiskanen, Kivisaari, Lovio, & Mickwitz, 2009; Sovacool, 2016).

The steering and governance of systemic transitions has been investigated since the late 1990s in several multidisciplinary lines of research. The nurturing, empowering, shielding and expanding of alternative niche innovations has been researched in strategic niche management and the social embedment of technology (Hoogma, Kemp, Schot, & Truffer, 2002; Rene Kemp, Schot, & Hoogma, 1998; Kivisaari, Lovio, & Väyrynen, 2004; Smith & Raven, 2012). Policies, policy mixes and rationales for interventions that disrupt dominant sociotechnical regimes and make room for change have been investigated (Kivimaa & Kern, 2016; Weber & Rohracher, 2012). Among the longest lines of transition steering is transition management (TM), which originated in the Netherlands in the 2000s and has developed through a Dutch energy transition initiative (René Kemp, Loorbach, & Rotmans, 2007; Loorbach & Rotmans, 2010) and a range of regional and city-specific transition projects (Frantzeskaki, Wittmayer, & Loorbach, 2014; Roorda, Frantzeskaki, Loorbach, Van Steenberghe, & Wittmayer, 2012).

In recent years design for sustainability transitions has entered onto the transition research and governance scene. Design research has engaged the field in various ways, for instance, it has generated experiential future scenarios and change pathways (Gaziulusoy & Ryan, 2017a, 2017b), and has pursued long-term local experimentation engagements aimed towards low carbon transition have drawing from community design and practice theory (Jalas et al., 2017; Manzini & Rizzo, 2011). It has further built anticipatory strategic design initiatives in order to target the critical aspects of evolving transitions (Mok & Hyysalo, 2017). Design agendas have also been proposed that resonate with sustainability transitions research, such as transition design (Irwin, 2015; Irwin, Kossoff, Tonkinwise, & Scupelli, 2015) and design for environmentally sustainable social innovation (Jégou & Manzini, 2008; Manzini, 2014). Through all these engagements the potential of design research has been begun to be noted by other disciplines, for instance, it is visible in codesign being seen as one of the contributing fields to TM (Ferguson, Brown, Frantzeskaki, de Haan, & Deletic, 2013).

Our work is positioned in the above developments to advance the governance of transitions in a specific country context (Finland) in the mid-range (to 2030). It stems from the design work package of the larger Smart Energy Transition (SET) consortium and is focused on multidisciplinary governance experiments between the public sector, private companies and citizens. Our particular interest has been to redesign transition management tools to suit the Finnish context. The political cultures and dynamics of non-state actors differ from one country to another and ‘transferring’ the TM methodology to new country contexts involves necessary translation – which can be seen as a source of innovation in itself. The translations may vary heavily, ranging from different hybridizations to more profound implementations that question and rework the methodology pervasively (Heiskanen et al. 2009 p.213-415), and in doing so they can make useful contributions to theoretical development as well (ibid. p. 425).

Regarding the Finnish context, there are over one hundred experiments related to energy transition and relatively established parliamentary long-term climate roadmap (running to the year 2050) as well as mid-range climate roadmap and governmental energy and climate strategy for mid-range planning (running to the year 2030). However, what is currently missing is the means to connect the visions and goals with experiments on the ground in the mid-range, in other words, the means to deliberate over the change pathways, which is one of the core aims of *transition arenas* within the TM methodology.

Transition arenas are deliberative settings where groups of societal stakeholders can envision and build pathways of change to transition goals. On beginning to implement transition arenas in the Finnish context, it became evident that the available path creation toolsets were geared towards a long-term focus of 40–80 years (Frantzeskaki, Broto, Coenen, & Loorbach, 2017; Roorda et al., 2012) and, consequently, they were too broadscale and unspecific to guide mid-range concretization. Given our mid-range focus that only extends to 2030, our pathway creation tools needed to become considerably more specific as well as supportive of multi-actor deliberation in fast-paced workshops.

In the next sections we contextualise the pathway creation tools and their design challenges, along with our research through design methodology. We then introduce the final pathway creation system, the outcomes of its use in the transition implementation arena in Helsinki in 2017, and the participant and facilitator evaluations of the system. Conclusions and further research avenues follow.

2 The rationale and design challenges for pathway creation tools and methods

The focus of TM is on long-term policy design with relevant groups of “frontrunner” stakeholders. TM practices happen through creating spaces for searching, learning and experimenting on the transformation of the current system. It aims, on the one hand, to capacitate frontrunners with visions, concepts and seeds for thought that can be utilised in political decision making beyond the political cycle of elections. On the other hand, TM focuses on identifying settings for sociotechnical experiments and learning from them so that the experiments can be strengthened and scaled up, and eventually displace the problematic aspects of previously dominant regime (René Kemp et al., 2007; Loorbach & Rotmans, 2010).

TM further emphasizes the process of constructing pathways for meeting the long-term vision and specific transition goals. A further aim lies in creating a perspective on intersectional dynamics that can encourage transitional change: “The general approach is one of nurturing and growing rather than planning and controlling long-term societal change.” (Voß, Smith, & Grin, 2009 p. 277). In order to plan for long-term change, the focus is not only on the positive expectations for change, but also on negative ones that may prevent or hinder the change goals from unfolding (ibid p. 280). The schematic overview of TM is as follows (Loorbach & Rotmans, 2010; Voß et al., 2009):

1. Establishing a transition arena (or arenas)
2. Developing a common vision
3. Pathway development through backcasting techniques
4. Experimenting with pathway options
5. Monitoring, evaluation and revisions to pathways and experiments

TM as an approach for long-term policy design has faced some challenges over the years it has been practised. Voß et al. (2009) provide an overview of the policy design challenges TM faces. The common denominator that Voß et al. (2009) identified in TM challenges is that “TM as a concept for policy lacks effective provisions for inclusive participation and fair deliberation within ‘transition arenas’”. They further argue that the original TM principles have veered, in practice, towards the domination of powerful incumbent actors in arenas, a somewhat instrumentalist focus, and limited width and depth of civil deliberation. Voß et al. (2009) seek to remedy these aspects through increased civil society participation and ensuring a broader sustainability focus.

Our response seeks to address some of the critique of Voß et al. through seeking to anchor the transition arena vision and goal setting phases in the parliamentary long-term climate roadmap for 2050, a mid-range climate plan for 2030, and energy and climate strategy for 2030 in order to foster higher legitimacy for the process in conjunction to existing democratic processes. We further explicitly link the pathways of change to the many experiments that are already running so as to give

voice and visibility to civil society, the public sector and business actors who are already active in transitions. The frontrunners who participated in the arena were carefully selected from among 90 Finnish change makers, known through an SET-consortium's wide networks in energy and climate governance. The final selection was based on participants' competences and complementarity regarding the Finnish energy system. The selected 23 persons formed a group that covered well the frontiers of Finnish political, civil servant, business, and civil society actors regarding energy transition and together they provide a wide variety of angles with which to examine the topic.

The transition arena process in Helsinki was carried out over six three-hour workshops held at one-month intervals, during which participants could comment on refined results from the previous workshop in the closed website of the arena. The schedule was as follows:

- Workshop 1. The drivers, challenges and contingencies for transition
- Workshop 2. Vision and transition goals for 2030
- Workshop 3. Formation of pathways, part 1
- Workshop 4. Formation of pathways, part 2
- Workshop 5. Immediate actions for launching the pathways
- Workshop 6. Completing the results and commenting on the final report

The design challenge regarding mid-range path creation tools and procedures for workshops 3, 4 and 5 comprised of six interlinked aims and seven further specifications:

1. To allow a small group of 3–7 co-located participants from different walks of life to deliberate and effectively form a path to a mid-range transition goal from the current state
2. To provide participants with clear means to analyse the interrelationships between pathway steps and the timing of needed actions
3. To help participants to evaluate the realism of the suggested steps and the range of actions (regulatory, investment, business, technology development, civil society, research, behavioural change etc. actions) through which the pathway steps can become realised or their realisation supported
4. To help participants to recognise pathway and step interlinkages and the most critical steps in which societal choices have to be made
5. To help participants to highlight alternative transition paths with respect to the most important change drivers and uncertainties
6. To consider the effects of the most important uncertainty and contingency factors in the pathways and the steps therein

The chosen arena implementation method set the following specifications for the final design of the pathway creation tool:

- a. The working time with one pathway is limited to one or two half-day workshops
- b. The participants should be busy, and they should quickly understand how to use the tool
- c. The tool should be flexible so that it can be modified during the pathway creation process if needed; the openness of the arena process may lead to goals and directions that were not planned beforehand
- d. The elements of the path creation should be easily recognizable so that the participants do not confuse them with each other, even in the hectic pace of the arena workshops
- e. The materials should be easily movable over the game board
- f. The materials should enable feeding the needed information into the process as well as incorporating the information created during the process without truncating it
- g. The contents should be easily digitized
- h. Game boards should allow at least four persons to work on an individual pathway at a time

3 Research through design in creating the path creation tool

In designing the pathway creation tools we drew from designing tools for codesign (Ehn & Kyng, 1991; Muller, Wildman, & White, 1993), participatory design games and their development (Eriksen, Brandt, Mattelmäki, & Vaajakallio, 2014; Vaajakallio, 2012) and game design (Zimmerman, 2003). Our design decisions were based on several testing and codesigning sessions within the design team, within a broader set of colleagues who were not involved in the design and with a yet broader set of transition arena team members. The very final iterations were made between the two workshop sessions of the transition arena process. Each time the pathway tool prototype and instructions were enacted akin to playtesting (Zimmerman, 2003), and the designers observed the situation, made notes, and asked questions and design ideas from the participants. After the testing sessions they adjusted the design to get to the next prototype version. The design team had a further division of responsibilities in testing and iterative design. Author 1 held responsibility over the overall concept development and balancing of different priorities in each iteration. Author 2 was responsible for the detailed design and productization of the pathway creation tool and, with Author 3, Author 2 explored the material choices and ideated design alternatives to be tested in iterations. Author 4 acted as substance expert on energy systems and relayed information about issues and participants to the rest of the team. The design team was further helped by a public deliberation expert who participated in all testing sessions and kept a continuous eye on the quality of the deliberation that the tool and its procedures may foster, as well as the on the validity of the design with respect to more traditional backcasting methods in futures research. These different competencies and perspectives fostered productive dialogue about the solutions and issues to be considered in the process.

4 The outline, elements and procedures of the path creation tool

4.1 Outline and key elements

The pathway creation tool is premised on a set of predefined forms and categories. These are used in constructing change pathways and were designed to give sufficient visibility to both content and form for all the participants during the process and also to both ease the movement of the elements and transforming the pathway in the course of the pathway construction.

The pathway creation work takes place on a 240 cm x 150 cm metallic board, onto which only a white print with light hexagonal grid has been permanently printed to give structure. All other elements are magnetic to allow flexibility in moving timelines and elements around as pathway construction progresses. The magnetic elements – pathway steps, arrows and pathway step realization actions – all have a writing surface on which participants can add content with markers. The magnetic elements allow the easy manipulation of pathway interrelations and the markers allow the easy modification of content as text can be wiped out with wet cloth. The size and height of the vertical board is designed to allow 3–5 people to work effectively on elements, both independently and in a group, and to allow them to reach to the top of the board (at 230 cm) and the bottom (at 79cm, see Figure 1).

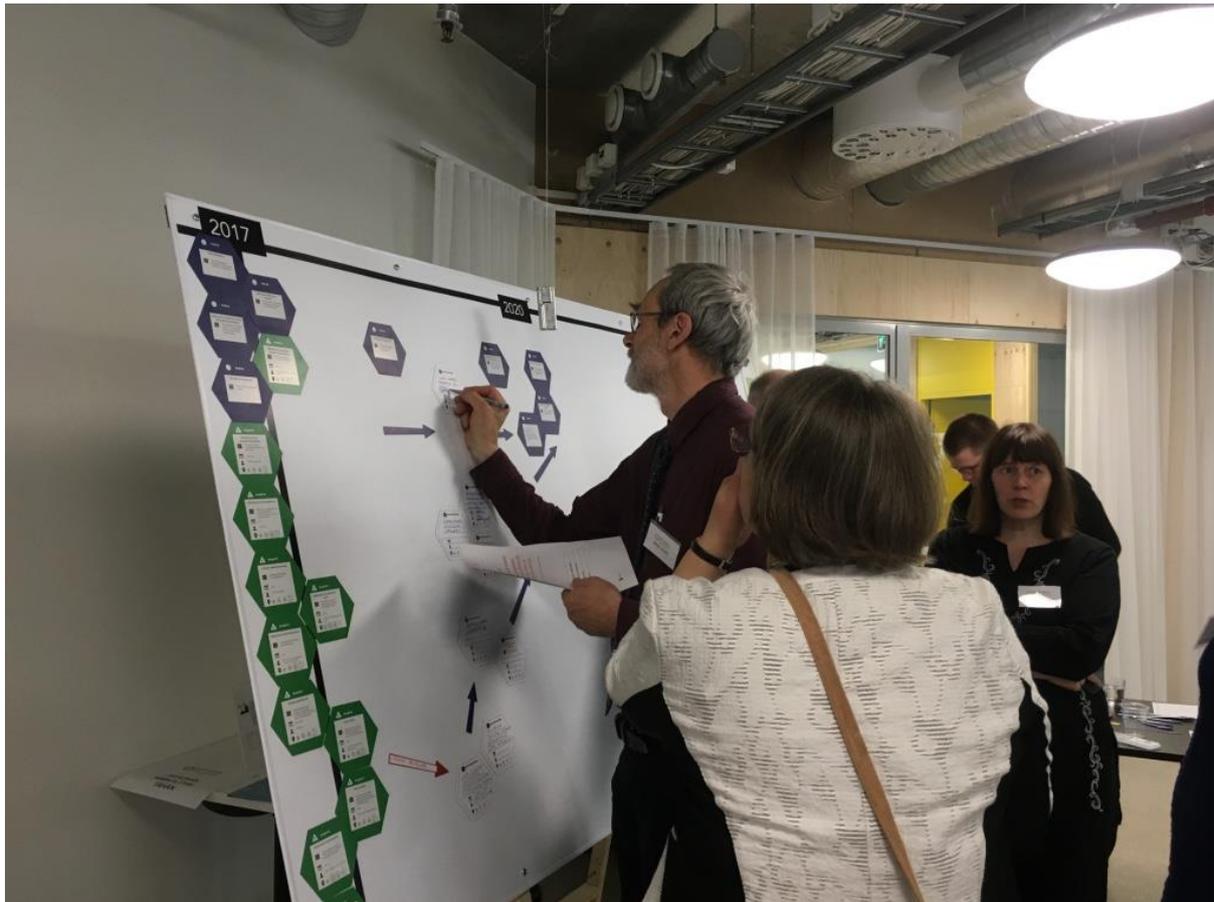


Figure 1. Pathway creation in its early stages.

The primary elements of the pathway creation system are the “pathway step” and “pathway-step action” elements. Both have the same structure: upmost, the designator of the form (e.g. *pathway step* or *investment*), then four rows for describing the step content, followed by timing (in years), the key actor(s), and the scale(s) which this element concerns: a national issue, a regional issue, on the suburb/village scale or concerning individual buildings and consumers (Figure 2). To differentiate the elements a combination of distinctive symbol, text and colouring is used for each.



Figure 2. A pathway-step element and an example of a filled-in pathway step.

The pathway-step action elements concretize how each pathway step can be realised or facilitated. The ones created thus far are specific to energy transition: energy production, business, end consumption, regulation, investment, other, technology, pilot (Figure 3, left-hand side). We also

designed a set of organizer elements to guide the work. “Fact elements” are used to render visible key milestones and facts about the pathway (see more below) and the question mark, exclamation mark and quotation mark are used to point out missing or insufficient pathway steps regarding change targets, critically important areas and needs for new research respectively, with the aim of focusing participant attention on these areas (Figure 3, right-hand side). The choice of hexagon-shaped elements, descriptive labels and colour coding was based on their common use in countless board games and ideation systems (Hodgson, 1992).



Figure 3. On the left are pathway-step action elements: energy production, business, end consumption, regulation, investment, other, technology, pilot. On the right are organizer elements: a fact, an attention marker, a missing action marker and a research marker.

The interrelations between elements can be clarified with magnetic arrows (which allow writing onto them) to show how one pathway step leads to another. Once the pathway is completed on the board it is rendered digitally, which allows further commentary, cleaning and the opening of all content to full sentences that are understandable to those beyond the participants in the path creation (see Figure 4 for a completed pathway).

Prior to the pathway construction, participants are given a 4–6 page information package related to the current state, the envisioned pathway goal and known challenges. The information in the package is also partially rendered visible on the board in a data-derived “persona” (Cooper, 2004) sheet of a family living in 2030, implicated by the pathway (Figure 5), as well as through placing key facts and pilots tentatively on the board as prefilled fact and pilot elements (see the block green and blue elements in Figures 3 and 4).

VISION PERSONA

Smart Energy Transition



FAMILY KUKKONEN & JOKINEN

SOFIA KUKKONEN: 48 years
Teacher, 3600€/month

ARI JOKINEN: 46 years
Teacher, 3500€/month

LINDA KUKKONEN: 8 years
Grade schooler

LIVING

Centre of Oulu, Torikatu, 82m² apartment building, built 1972.

Sofia is in the board of housing cooperative together with Erkki 74 years, Markku 78 years and Lasse 55 years.

ENERGY CONSUMPTION AND USAGE

Heating: District heating, indoor air temperature 22-24C

Electricity: 2400kW per year

FREE TIME

Each family member has their hobbies in the centre of Oulu.

TRANSPORTATION

Own car and public transport in the centre of Oulu

INTEREST

- Improve the real estate energy efficiency cost-effectively.
- Save in expenses, support climate friendly energy.

ASSUMPTIONS RELATING TO PATHWAY IN 2030

"Reducing household energy consumption by change in behavior by 15%"

A) Pipe and roof repairs planned for the house, window repair in 10 years' timeframe. Sofia has suggested the housing cooperative that everything should be done simultaneously. She has also proposed for 20m² solar panels, 30m² solar heat collectors, extra insulation, forced ventilation and connecting the house in remote controlled demand response system for heating. The rest of the board is doubtful about how can the residents finance big repairs. The middle age of residents of the house is 63 years.

B) Sofia has ordered a preliminary review from ESCO company, but the role of its actions in the middle of other repair projects is unclear.

Picture 5. One of the final personas implicated in the envisioned mid-range 2030 goal.

4.2 The procedure of pathway construction

From the starting position, the participants begin by discussing the target and pathway on a general level. The facilitator urges them to write down their thoughts about pathway step elements whenever an obvious step is identified. As steps cumulated, discussions begin to include their interrelations and potentially missing steps. In all the paths created thus far, the elements were rearranged several times and sub-pathways emerge, either from the onset or through the branching of the paths. At some point, the deliberation tends to veer towards considerations of whether each step is needed, whether some steps are realistically attainable and whether all the steps in all the sub-pathways together amount to sufficient change regarding the transition goal.

Once the main pathway steps have found a more or less steady and mutually agreed on form, the participants move to identifying the most important and most crucial steps and marking them with yellow stickers, and correspondingly marking where blocking points may reside in the pathway with black stickers.

This constitutes the first phase in the pathway construction. At this point the first documentation round happens through participants being asked to explain to the video camera the pathway and its key features and new insights they gained during the path construction.

The second phase of the pathway creation process is a more detailed examination of all steps, or at least the most important steps. The actions needed to realize each pathway step (technology development, regulation, changes in consumer behaviour, pilots, investments et cetera; see Figure 2) are discussed and marked down. At this point it is common that some pathway steps become merged and some new steps are added in. Also, some pathway steps may now be considered to actually be the actions for realizing another step (Figure 6). At the end of the second phase, the participants video the detailed concretizations to ensure that the ideas written down on cards are sufficiently elaborated.

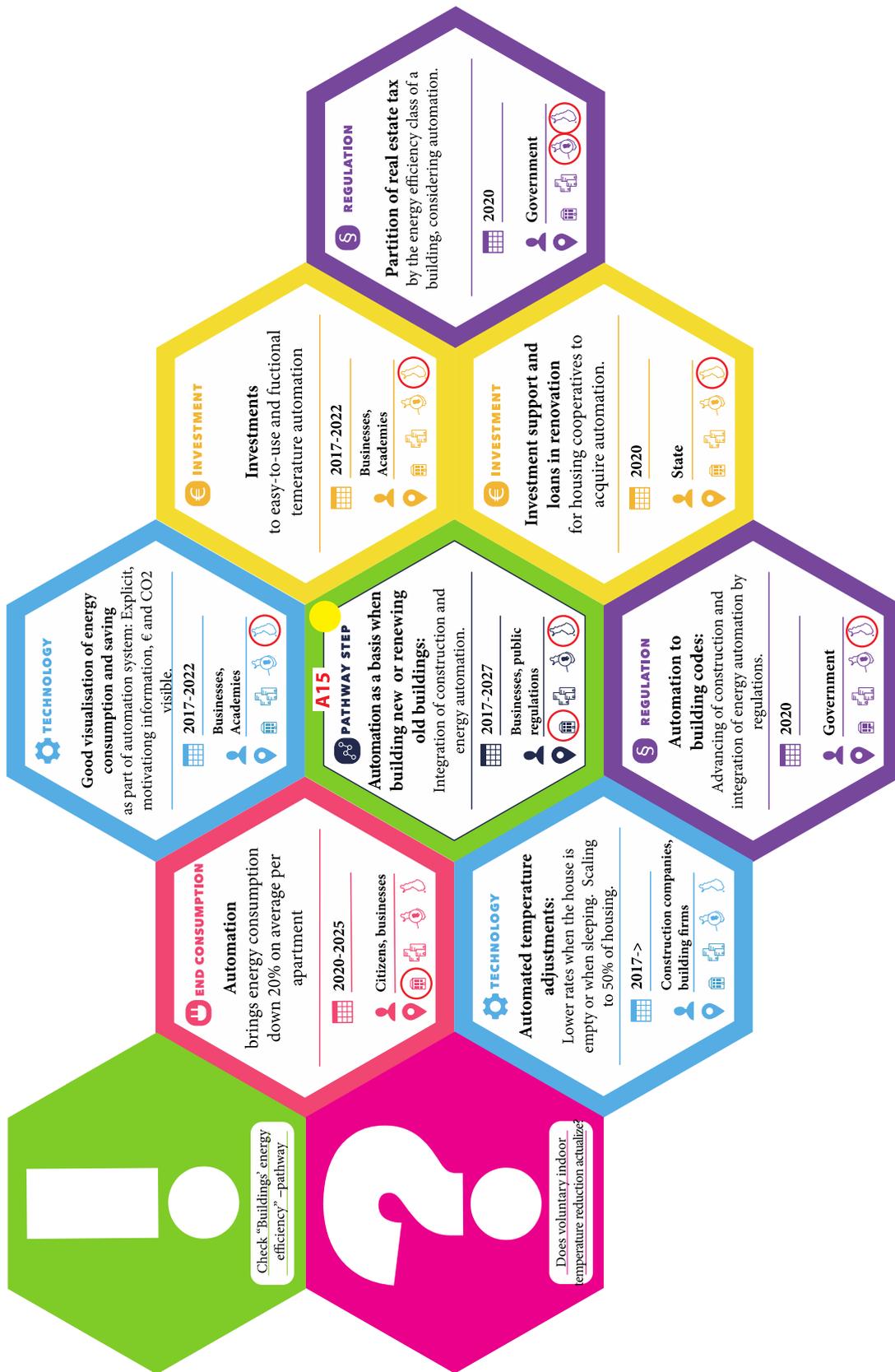


Figure 6. An example of a pathway step for which the facilitating actions have been explored in detail (translated by the authors).

The third phase of the process moves into uncertainties and contingencies. At this point the facilitator changes from blue marker pens and blue arrows to green ones and adds in probability markers of varying lengths (Figure 7). The participants then go through each step and examine the likelihood of the steps; can they occur sooner or later and how uncertain are they? The overall uncertainty factors are already identified in the second workshop of the series and can now be used to gauge the uncertainties related to specific pathways. The participants then add potential contingency responses, which are marked with green arrows, and green-stickered and green-written pathway steps. The outcome is again videorecorded. The very final phase is that of considering the alternative, mutually exclusive change pathways to the original pathway. These are identified with red-stickered steps, red texts and red arrows. This step is done last because alternative paths typically require rearranging the original paths and thus the originals must have been first documented without interference from mutually exclusive paths or steps.

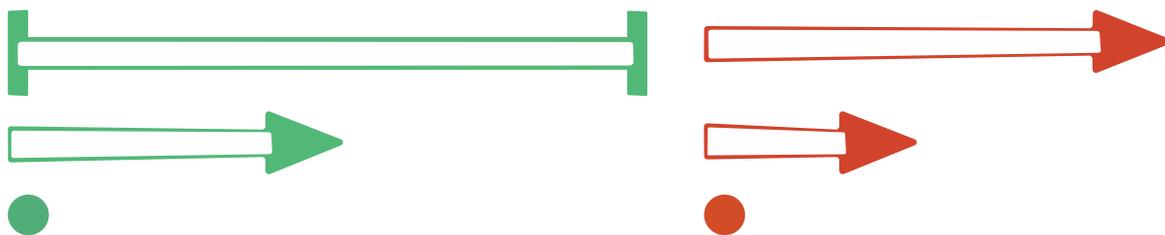


Figure 7. Uncertainty arrows, probability markers and stickers (left) and alternative arrows and stickers (right).

Once the entire pathway is complete it is digitized and uploaded on the password-protected support website of the transition implementation arena. If pathway construction is spread to multiple workshops, incomplete pathways can also be digitized and shared in the platform to allow between-sessions commentary.

Pathway creation relies heavily on following the procedures, facilitator assistance and her or his actions to keep both the participant discussion and path construction actions on track. To aid this, both detailed participant instructions and facilitator instructions were created, along with a guide for how to transfer the physical board's state into a digitized environment in a unified way. We found it useful to use two separate people for each board – one working as facilitator and the other as a note taker – who both participated in digitizing the contents. The digitalization was done using InDesign's and Illustrator's ready-made templates that could, in turn, be directly used in the final reporting format of the arena process.

5 The outcomes and participant evaluation of the path creation process and tool

5.1 Process outcomes

The transition implementation arena succeeded in creating a range of outcomes: articulating a more ambitious and inspiring energy and climate vision for Finland in 2030; creating an understanding of the change drivers, impediments and uncertainties in achieving an ambitious energy vision; identifying thirty intermediate goals for 2030; and, most importantly for us here, creating eight detailed pathways of change for the most important transition goals and identifying over one hundred immediate actions to be taken along these pathways. The amount of information which the transition implementation area creates is considerable. Even when heavily condensed, the Helsinki process amounted to a 200-page report (HYYSALO et al., 2017).

The 2030 pathways that were created were as follows: coal is phased out by 2030; creating 2000 MW in demand–response capacity in electricity; creating 2000 MW in demand–response capacity in

heating; halving building net-energy use; reducing household energy use by 15% with behaviour-change measures; having 750 000 alternative energy vehicles on Finnish roads by 2030; reducing total mileage by 10% through mobility as a service; and doubling the clean energy technology exports of Finland. Some of these transition goals were such that there was a fair amount of background studies that could be used to ground the work and the participants had already made exercises related to some of them, such as the promotion of electric cars. Some others, such as the ambitious 15% energy consumption reduction through behaviour change and the doubling of cleantech exports, featured greenfield aspects. These paths thus included new ideation over what pathway steps might be sufficient and feasible (even in principle) in order to reach the transition goal. This took more time than anticipated and in such paths the resilience analysis based on contingency factors had to be reduced.

The final report was released in November 2017. It was handed over to a Minister of the Finnish Government and its key messages were discussed in a panel by four members of Finnish Parliament and the head of the board of the largest Finnish public financing agency in an event in which one hundred invitees from ministries related to energy transition, businesses, civil society and academic organisations participated. The report was featured on headline TV news, morning TV and in 16 newspaper articles, which basically covers all the relevant major Finnish media. It further received 250 posts in a “new energy policy” social media discussion group and 30 related blogs and several columns appeared.

Decision to launch three new transition arenas has already been made. The participants in the 2017 Helsinki arena also wanted to hold a monitoring meeting in May 2018 to see if any further coordinated actions were needed and could be ideated among them. There has also been considerable interest from other actors and several discussion invitations from both regime and niche actors have followed. Whilst this is promising, it is too early to speak of the research’s societal impact apart from it evidently having gained some attention and interest.

5.2 Path creation tool evaluations

The path creation tool was evaluated by both by the arena participants and the facilitators after the arena process. Twelve statements and an open commentary field were used. The most positive aspects received an average of 4 or above on a 1–5 scale from both participants and organizers; and these were for statements 1, 4, 6, 8, 9 (see Figure 8), which all deal with the overall experience and quality of deliberation in using the pathway creation system. The statements least agreed with were 12, 11, 10 and 5 (see Figure 8 and the discussion below). Statement 7 featured high variation in participant responses and we suspect this to have resulted from ambiguity in the Finnish wording as open-ended questions received mostly affirmative responses on this topic.

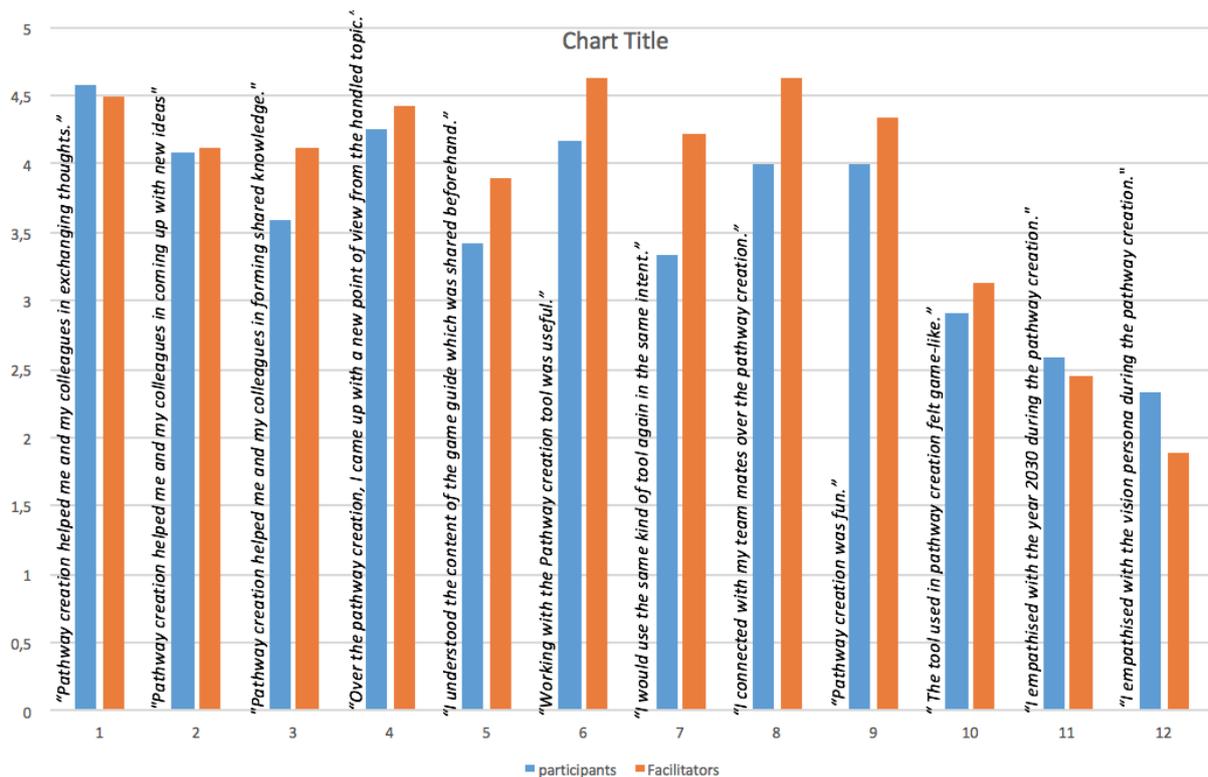


Figure 8. Participant and facilitator evaluation averages of twelve statements about the path creation tool.

The relatively low scores given to statements 11 and 12 regarding envisioning 2030 and empathizing with the vision personas reveal that our attempts at generating a more experiential near future were either not either experiential enough or not seen as relevant given that the focus of the arena was on system-wide actions and the whole mid-range time span. Also our primary aim with the personas had also been to convey cognitive information about the goal state in 2030 rather than generating empathy.

Responses to statement 10, about the pathway creation tool being experienced as a game by and large matched the design team’s intention: to borrow elements from game design but retain the path creation tool as a collaborative envisioning tool that would not become too playful or seen as a simulation game. This could have curbed the openness of deliberation among participants. Finally, the averages between 3.5–3.7 for statement 5 (on the provided manuals for the process) draws attention to the time limits that some the busy, highly positioned participants had when familiarizing themselves with the tasks beforehand – the design team’s pictorial guide received positive feedback from many participants but it could not be internalized in just two minutes, as some clearly expected to do.

In the final feedback discussion and in open-ended responses, the participants emphasized that the real innovation in the pathway creation tool was that it had forced them to create concrete pathways and be able to notice how difficult it is to carry out such a process and prioritize single, truly relevant steps. The participants were happy about the facilitation of the process and regarded the pathway creation as good facilitation technique which did not feel like ‘traditional workshopping, but focused work’ (as one participant phrased it). The facilitators’ insistence on coming up with documentation instead of talk and on concrete solutions was seen as valuable, as well as the emphasis on identifying causal connections and system interrelations. Several participants also suggested that the process could be applied for several other purposes if it could be somewhat tailored.

[The path creation tool] illustrated the complexity of issues outstandingly, as well as the need for a concrete operation path along with a long-term vision in order to take things in the right direction. The pathway creation tool could/should also be utilized in policy and strategy planning. (participant feedback)

Also, some critical considerations were raised. One participant felt the pathway building process took longer than expected, another felt that the goals, steps, means, immediate changes and measures resulted in too much complexity and a somewhat disorganized way of working. A final critical remark concerned the division work: could the participants not just give short, insightful presentations to each other and then just use free conversation among each other? This implies that the pathways would then be constructed by the organizers for the participants' commentary.

The organizing team members appraisal of the tool was mostly positive, and the tool was voiced to be logical, visually ambitious and pleasant. One facilitator thought that possibly the biggest end result for pathway creation was the new way of working. The qualities of the tool were seen as inseparable from the overall process though:

[Visualizing the pathways] worked well, although it was important that the structure supported iterations since some structuring had to be made. Often success was thanks to the good facilitators and well-selected participants. (an organizational team member)

This also pointed to difficulties in the facilitation process in two groups in which the whole structure of the pathway changed several times, causing plenty of work for the facilitator and note taker. It was also sometimes difficult to distinguish which actions were supposed to be categorized as *pathway steps* and which as actions supporting those steps. Finally, some facilitators were concerned that maybe the pathway creation did not support raising 'extra innovations'.

Overall, the feedback indicates that the pathway creation tool was appraised positively and that it helped the pathway concretization process, the sharing of expertise and the generation of new insights. The limited time frame for creating complex pathways led both the participants and organizers to recognise that some steps and ideas required more refinement, and whilst some refinement could be made for the final report (through rounds of commentary), the participants continued to express willingness to go deeper into the topics after the process. The high level of expertise among the participants and facilitators was a key aspect to successful work in a very fast-paced process, but, at the same time, these same qualities led to a scarcity of time for the process for some participants.

6 Conclusions

In many countries energy policy is undergoing a thoroughgoing shift from ensuring supply capacity to managing system transitions. The dominant energy system, based on fossil fuels, relies on large centralized production units that respond to fluctuating demand. With the increase in intermittent renewable wind and solar energy, energy efficiency measures, demand response and storage solutions, and active prosumer roles the energy system is moving towards far higher distribution and interactivity. The real question is of how each country and region can move from the current system to the future one – not only is the transition complex to manage but the policy and business cultures in the energy sector are not geared towards transitional thinking.

To catalyse the needed changes, methods of transition governance provide an important alternative. In the course of the current paper we have discussed how codesign for sustainability transitions can help improve the means used in transitions governance. The redesign of the path creation toolsets and procedures rendered the transition arena work better suited for mid-range planning, they aided more effective participant interactions and deliberation, and they elaborated one way to adjust transition governance to the specificities of country contexts (contexts which feature important variation).

The design challenges for the pathway creation system outlined in Section 2 were mostly well addressed by our design when judged by the participant and facilitator feedback. The notation, elements and procedures we developed were sufficient for fast-paced multidisciplinary teamwork in the arena. Embedding these into templates and materials that could be easily and flexibly altered appears to have been a good solution too. Regarding shapes, hexagons are used in countless board games and their affordances for combinations (as well as potential future alterations) are thus well known. The dimensioning of elements and the metallic board also worked well and produced the kind of conditions for small group work that we envisioned. Opting to use off-the-shelf materials that could be easily altered, shared and ordered (basically 2 mm thick refrigerator magnet material, plain iron sheets with a taped pattern on top, the WordPress based website, forms and digital easily adjustable templates made with InDesign, Illustrator and MS-Word) worked well by and large. The easy production of elements currently allows ongoing tailoring of the arena elements for different contexts. To aid documentation and commentary, the physical tools were paired with digital templates to which the form and content could be relatively easily transferred, and these digital elements worked sufficiently for documentation and commentary. Regarding the procedures and facilitation, the creation of a clear procedure for the pathway creation process allowed for creating participant and facilitator guides, which proved useful the arena process. At the same time, the pathway creation system does not work as a stand-alone kit (at least, not yet) and requires facilitator training and domain-specific background info package creation, and it is greatly helped if facilitators have domain knowledge that allows them to take the initiative in shaping the unfolding path on the pathway canvas. Video tutorials could potentially be made to lessen the training needs in the future. Overall, both participants and organizing team members found the path creation system to improve interaction, the quality of discussions and in particular to anchor the discussion in concrete changes.

This work has implications for both design for transitions and design for governance more generally. Regarding designing for transitions, our work illustrates that there is plenty of important work designers and design researchers can pursue to enhance the main avenues of transition governance that have been set in motion by social scientists. Whilst transitions governance has a considerable multidisciplinary community and a history of analysing and fostering long-term systemic change (and it may well be illusory for design researchers to seek to ideate replacements for these models), the means used to facilitate these complex processes benefit from more targeted design.

Sustainability transitions affect wide constituencies of society and, as Voss et al. (2009) point out, this calls for wide civil society engagement, in other words, it calls for various forms of designing for governance. Codesign for sustainability transitions can take many forms, such as means created to aid multi-sectoral deliberation. At the same time our experience underscores that designing for governance is most effective as a multidisciplinary team effort in itself. The Helsinki transition arena redesign was pursued together with the SET-consortium policy and innovation scholars who have experience of years of interaction with relevant civil servants, politicians, business people, NGOs and so on. The in-depth domain understanding of policy cycles, remits, and persistent and current challenges in different governance institutions was vital for the success of our design. The domain knowledge was used to anticipate the issues that needed particular attention, tuning facilitators in the workshops, estimating participants' available time allotments, attainable goals and so on. Storming in with just the design team would have been far less likely to succeed.

Even though the pathway creation system worked well in the arena process, there are some clear avenues of further design and experimentation. Firstly, in the future the documentation procedures should be developed further to ease the transfer of content and form from the pathway boards to the digitalized environment. Illustrator and InDesign templates were found to be somewhat alien by anyone other than designers, and hence more commonly used programs could be explored for the purpose as most arena facilitators will not be designers. Ultimately, automatic digitalization would be preferred. Secondly, the transition arena process and tools should next be given to a city, regional or ministry "owner" who would take the main responsibility for the process and its documentation,

and the design researchers would only facilitate the process and be consulted about it. This may foster higher ownership of the results and reduce the workforce demands that were high in the current arena process. Third, the current pathway formation processes ended up varying facilitation techniques, ranging from a relatively structured one implicated by our facilitation instructions to loose, iterative and more discussion-heavy processes. Thus far it seems that the more structured facilitation is, the more effective it is and the less it sacrifices the quality of deliberation, but this should be tested in the future by running same pathways construction tasks with varying facilitation styles.

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Design as a Catalyst for Sustainability Transitions

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Transitions towards sustainability need for radical and structural changes in the social, cultural and organisational dimensions in addition to technological innovations and infrastructural changes. Sustainability transitions have been a research and practice agenda for several decades. Currently, a new area in design for sustainability field is emerging that bridges the theories and practices of sustainability transitions with theory, education and practice of design. In this paper, we investigate the emergence and evolution of this new area through a literature review of selected publications that represent the current approaches of integrating the theories of sustainability transitions and design. We provide an overview of the current status of the field as well as a comparative analysis of the main contributions regarding their theoretical groundings, sustainability definitions/measures, framings of role of design(ers) and methodological propositions.

sustainable design, design for sustainability, transition design, sustainability transitions

1 Introduction: Sustainability Transitions and There Comes Design

We are going through quite troubled times. This is not the first time; even if we forget about our struggles through millennia with wars, plague and other epidemics, natural disasters, brutal emperors and several other ailments that has shaken our civilisation (and caused the demise of some others') and focus on the last 100 years there have been many moments of existential anxiety for us, "humanity". In the past 100 years, we have been through two World Wars, witnessed horrifying genocides, survived the Great Depression (and few other global financial crises), lived under the threat of a potential nuclear holocaust, been through the long and shivering winter of the Cold War, witnessed two major nuclear plant -one in Chernobyl and one in Japan-, and several severe chemical plant accidents. None of these troubled us - at least in retrospect - as much as the current complex of globally significant, some of which mutually reinforcing, socio-ecological problems. The earlier problems were either human-induced-trauma-on-human, or, in the case of natural disasters, were more or less spatially and temporally contained, even if devastating. Today we are more troubled than ever. For example, we know that the impact of anthropogenic climate change on oceans may last longer than modern human settled societies have been on Earth (Norris



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et al., 2013). If the state of oceans in some hundred thousand years into the future is not a sufficiently cathartic framing of how troubled we are, let's put things into more of a perspective that we can hopefully relate to.

The "Planetary Boundaries" framework (Rockström et al., 2009; Steffen et al., 2015) sets out precautionary boundaries -a safe operating space- for nine critical processes of human-driven environmental change. According to this framework, currently two (biosphere integrity and biochemical flows) out of nine boundaries have been severely breached posing high risk, two of them (climate change and land-system change) breached these boundaries posing increasing risk and two boundaries (novel entities and atmospheric aerosol loading) are yet to be quantified. Only three of the nine boundaries (freshwater use, ocean acidification and stratospheric ozone depletion) are currently not breached. Beyond these nine boundaries, we all face the possibility of abrupt, large-scale changes in Earth system functioning and significant risks to societies and economies worldwide. In addition, emission reduction targets that are required to reduce the risk of severe climate change are still not being met and the window to limit average global temperature rise between 1.5 to 2 degrees centigrade compared to preindustrial levels is closing (Raftery et al., 2017, UNEP, 2017). Raworth (2012), developed the concept of social foundations to complement the planetary boundaries framework and argued for a "safe and just operating space" which lied between the environmental ceiling and social foundations. The social foundations she identified include food security, water and sanitation, health care, education, energy, gender equality, social equity, voice, jobs, resilience. She demonstrated through illustrative indicators that humanity is currently falling below these social foundations for which data are available.

These and numerous other studies triggered the acknowledgment of an urgent need for radical and transformative restructuring of socio-technical systems that meet our needs (Ryan, 2013). Stemming from the acknowledgement of this urgent need, starting from early 1990s, a new area of research emerged out of science and technology studies field and matured over the past two decades. This field is often referred to as system innovations and transitions to sustainability, or shortly, sustainability transitions (Geels, 2005; Loorbach 2010). Sustainability transitions require institutional, social/cultural, organizational as well as technological change (Loorbach, 2010); that is, they need to take place at societal level. Recently, Gaziulusoy and Ryan (2017a) have argued that transitions are creative, technical and political design challenges that require imagining new systems, evaluating system concepts and developing those that are promising and, designing participatory deliberation processes to attend to the political nature of transitions. Ceschin and Gaziulusoy (2016) have analysed the evolution of design for sustainability (DfS) field over a couple of decades since its early conception. Their analysis indicated that the field has enlarged its scope both in terms of timeframes and with references to complexity of problem and solution contexts over the years and moved from a palliative position to one that is strategic. They have identified a new research and practice area emerging in the DfS field since the beginning of this decade responding to the acknowledged urgency of action and the requirement for structural societal transformations, partly influenced by the then maturing system innovations and transitions theories. Ceschin and Gaziulusoy (2016) categorised the contributions in this emerging DfS area under socio-technical innovation level in the hierarchical evolutionary framework they developed. In this framework, socio-technical innovation category resides at the top-most level and subsumes spatio-social, product-service system, and product innovations.

In this article we present a comparative analysis of the main contributions into this new DfS area focusing on their theoretical groundings, sustainability definitions/measures, and proposed methodologies and methods with the purpose of providing an overview and current status of this emerging area and establishing ground for identifying future research directions

2 Design and Sustainability Transitions: A Short History

It is difficult to pin point an exact start for evolution of thought in an area for the same reasons that it is not possible to put an exact date on when a particular species emerged; evolution is a continuum. The best dating practices investigate tangible evidences -traces, remains - left behind to identify the earliest time of appearance. In the case of thought, those evidences consist of text; pieces of writing materialising thought through words. Therefore, we investigate the emergence and evolution of this new DfS field integrating sustainability transitions and design as reflected in writing. Our method of gathering together the written material has two parts. First, as contributors of this emerging area we already have in-depth knowledge of the published work, particularly in the academic fora. This set of publications establish a link between design and sustainability transitions. Second, in order to account for work we may not be aware of and also to include grey literature, we followed a systematic search in google and in main academic databases which cover design titles. As we tried to find those work that integrate design (as a discipline) and sustainability transitions we searched for these and close variants in title, abstract and keywords. We have filtered the search results for disambiguation. Table 1 provides the final list of publications as relevant for our purpose.

Table 1. List of publications used in constructing a history of integration of design and sustainability transitions

Resource (by year)	Title	Type of document
Brezet (1997)	Dynamics in ecodesign practice	Journal article
Young et al. (2001)	Exploring sustainable futures through 'Design Orienting Scenarios' – The case of shopping, cooking and eating	Journal article
Cipolla & Peruccio (2008)	Proceedings of the Changing the Change: Design Visions, Proposals and Tools, An international conference on the role and potential of design research in the transition towards sustainability	Edited conference proceedings
Ryan (2008a)	Climate Change and Ecodesign	Journal article
Manzini (2009)	New design knowledge	Journal article
Dewberry & Johnson (2010)	Design interventions, prediction and science in the sustainable transition of large, complex systems	Conference article
Gaziulusoy (2010)	System Innovation for Sustainability: A Scenario Method and a Workshop Process for Product Development Teams	PhD thesis
Joore (2010)	New to Improve, The Mutual Influence between New Products and Societal Change Processes	PhD thesis
Kossoff (2011)	Holism and the Reconstitution of Everyday Life: a Framework for Transition to a Sustainable Society.	PhD thesis
Ceschin (2012)	The introduction and scaling up of sustainable Product-Service Systems: A new role for strategic design for sustainability	PhD thesis
Gaziulusoy, Boyle & McDowall (2013)	System innovation for sustainability: a systemic double-flow scenario method for companies	Journal article
Ryan (2013)	Critical Agendas: Designing for Sustainability from Products to Systems	Book chapter
Ceschin (2014a)	The societal embedding of sustainable product-service systems. Looking for synergies between strategic design and transition studies	Book chapter

Ceschin (2014b)	How the Design of Socio-technical Experiments Can Enable Radical Changes for Sustainability	Journal article
Heiskanen et al. (2014)	User involvement and radical innovation: The case of heat pumps in Finland	Book chapter
Gaziulusoy (2015)	A critical review of approaches available for design and innovation teams through the perspective of sustainability science and system innovation theories	Journal article
Gaziulusoy & Brezet (2015)	Design for System Innovations and Transitions: A Conceptual Framework Integrating Insights from Sustainability Science and Theories of System Innovations and Transitions	Journal article
Irwin (2015a)	Transition Design: A Proposal for a New Area of Design Practice, Study, and Research	Journal article
Irwin (2015b)	Transition Design: A new area of design research, practice and study that proposes design-led societal transition toward more sustainable futures	Monograph
Irwin, Tonkinwise & Kossoff (2015)	Transition Design: An Educational Framework for Advancing the Study and Design of Sustainable Transitions.	Conference article
Joore & Brezet (2015)	A Multilevel Design Model: the mutual relationship between product-service system development and societal change processes	Journal article
Kossoff, Irwin & Willis (2015)	Transition Design	Editorial for a journal special issue on Transition Design*
Kossoff, Tonkinwise & Irwin (2015)	Transition Design: The Importance of Everyday Life and Lifestyles as a Leverage Point for Sustainability Transitions	Conference article
Mateu (2015)	Design in Transition, Transition Design	Conference article
Ceschin & Gaziulusoy (2016)	Evolution of design for sustainability: From product design to design for system innovations and transitions	Journal article
Gaziulusoy & Ryan (2017a)	Roles of design in sustainability transitions projects: A case study of Visions and Pathways 2040 project from Australia	Journal article
Gaziulusoy & Ryan (2017b)	Shifting Conversations for Sustainability Transitions Using Participatory Design Visioning	Journal article
Gaziulusoy & Ryan (2017c)	Imagining Transitions: Designing a Visioning Process for Systemic Urban Sustainability Futures	Conference article
Hyysalo, Johnson & Juntunen (2017)	The diffusion of consumer innovation in sustainable energy technologies	Journal article
Mok & Hyysalo (In Press)	Designing for energy transition through Value Sensitive Design	Journal article
*This special issue has 10 articles which are not separately listed here		

The list of publications in the table is indicative of emergence of ideas and themes that now constitute the accumulated knowledge informing the ongoing integrations of design and sustainability transitions. It is not possible for us to discuss each entry in this list in detail within the

scope of this article. Nevertheless, we would like to go over what could be considered as “key points” in the publications timeline that can assist with establishing a historical understanding of origins and development of thought at the intersection of design and sustainability transitions.

Brezet (1997) is the earliest resource that mentions system innovation in the context of design. In this now very difficult to find print article, he identifies four types of *ecodesign innovations* with increasing potential of environmental improvements: product improvement, product redesign, function innovation and system innovation. He explains system innovations as changes that are required in infrastructure and organisations as a result of new products and services. This resembles to an early, perhaps somewhat premature definition of system innovations that is now one of the core terms in sustainability transitions literature. As defined by Geels (2005), system innovations are transitions from one socio-technical system to another. Brezet (1997) refers to The Dutch National Inter-Ministerial Programme for Sustainable Technology Development (Weaver et al., 2000) which took place between 1993 and 2001. This program was then yet-to-be the precursor of system innovations and transitions research. Brezet (1997) states that in this program scenarios and back-casting is used to “develop a vision for sustainable function fulfilment by systems in the year 2040” (p. 23).

Another key point is when the first conference on design and sustainability transitions - Changing the Change Conference - was held in Turin, Italy (Cipolla & Peruccio, 2008). In this conference 138 papers were presented from 27 countries. The conference highlighted that radical change in lifestyles and ways of meeting needs was required and that sustainability had to become the meta-objective for all design research activity. Although not separately listed in Table 1, among these 138 papers, as indicative examples of the content, Ryan (2008b) argued for design-visioning for paradigm change, Vezzoli, Ceschin & Kemp (2008) established a link between design and transition management and Boehnert (2008) discussed what designers can learn from the Transition Towns movement.

Between 2010 and 2012, first PhDs that established a link between design and sustainability transitions were completed. Gaziulusoy's (2010) work was situated at the intersection of sustainability science, system innovations and transitions theories and design theory. Joore (2010), on the other hand, situated his work tightly within industrial design engineering, exploring the mutual influence of new products and societal change processes. Ceschin (2012), situated his work within the maturing research area of sustainable product-service systems (SPSS) and argued SPSS can be considered as system innovations as they require changes in user practices, organisational structures, regulatory frameworks and culture. These three PhDs were similar in the sense that they all referred to and used multi-level perspective of system innovations (Geels, 2005) and other models and theories of system innovations and transitions literature in constructing their theoretical/conceptual frameworks. They also focused on product (understood in a broad sense) development and each differently demonstrated how the work of designers is or can be linked to societal change processes for sustainability. Kossoff (2011) on the other hand followed a very different path. He argued that it is the everyday life that needs to be sustainable. He referred to contexts within which most pre-industrial societies satisfied their needs as *domains of everyday life* and argued that the relative sustainability of those societies stemmed from their control over satisfaction of needs (rather than top-down control of needs satisfaction in modern societies) in holistic ways. His understanding of design - particularly transition design - should be an activity of everyone and should constitute facilitating emergence of nested domains of everyday life and make them *whole*.

Building on ideas of Kossoff (2011), Irwin (2015a) published an article presenting a transition design framework for design education, research and practice. This article has coined the term transition design and popularised it within the broader community of design academics and practitioners. She situated transition design as an emerging area at the end of a design continuum, following service design and design for social innovation, thereby, making links between transition design and other

new areas of DfS. In 2012, Carnegie Mellon University, School of Design have started to implement curriculum formulated using transition design as an umbrella framework across all levels of design education (Irwin, 2015c). In 2015, the first journal Special Issue on transition design was published (Kossoff, Irwin & Willis, 2015).

The other key points include a first, exploratory study on the roles of design in transition processes (Gaziulusoy & Ryan, 2017a), explicit use of particular design approaches in transition projects (Mok & Hyysalo, In Press), and investigations of evidences of user involvement in the design and diffusion of new technologies in transition projects (Heiskanen et al., 2014; Hyysalo et al., 2017).

3 A Comparative Analysis of Contributions at the Intersection of Design and Transitions

According to the analysis presented in the previous section, we observe that origins of integration of design with sustainability transitions goes as far back to late 1990s. At the time, the thinking was situated in ecodesign - the dominant framing at the time of design dealing with sustainability challenges - and predominantly focused on resource related challenges imposed by production-consumption systems. We observe early endeavours of situating *the social* and *everyday life* at the core of DfS dealing with radical system changes in the work of Young et al. (2001). It was inevitable this expansion of scope has come about as, even in the very early connection Brezet (1997) made with design and system innovation, there is acknowledgement that such large-scale changes cannot be addressed solely at product development level but there is a need for infrastructural and organisational changes. This realisation is evident in the work of Gaziulusoy (2010), Joore (2010) and Ceschin (2012) who, although focused on product development, saw this activity as systemically situated in the larger context of societal changes. The geographical diversity of Changing the Change Conference of 2008 is evidence that sustainability transitions related thinking in design across the board was well underway before the first PhDs in the area were completed. Late 2000s and early 2010s have seen a significant influence of system innovations and transitions theories (Geels, 2005; Loorbach, 2007; 2010) in DfS work. These theories provided *some foundations* on how socio-technical transformations happen and how they can be steered so that design researchers could start to establish links between design theory and practice and sustainability transitions. The three PhDs mentioned above, although fundamentally based on system innovations and transitions theories, generated a set of theoretical (and operational) frameworks with similarities but also differences. Kossoff (2011), on the other hand, situated his work in philosophy, social ecology, and everyday life discourse without any reference to system innovations and transitions theories.

Table 2. Theoretical foundations of selected work

Contributions	Theoretical foundations
Gaziulusoy (2010); Gaziulusoy, Boyle & McDowall (2013); Gaziulusoy & Brezet (2015)	Sustainability science; complex adaptive systems; system innovations and socio-technical transitions theories; futures studies (scenarios)
Joore (2010); Joore & Brezet (2015)	Industrial design; systems engineering; sustainable product development; system innovations and socio-technical transitions theories
Ceschin (2012); Ceschin (2014a; 2014b)	Product-service systems; strategic design; system innovations and transitions theories; strategic niche management
Kossoff (2011); Kossoff, Tonkinwise & Irwin (2015); Irwin (2015a); Irwin (2015b); Irwin, Tonkinwise & Kossoff (2015)	Chaos and complexity theory; Goethean science; holism; needs theory; everyday life discourse; indigenous knowledge; post-normal science; social psychology; social practice theory; alternative economies; socio-technical system innovations and transitions theories

Following this line of thought, in this section we provide a comparative analysis of contributions selected from Table 1 that are representative of the current diversity of work that builds bridges between design and sustainability transitions. In this comparative analysis, initially we try to delineate theoretical origins of these contributions. As all of the work under analysis are highly integrative in their nature, it is not easy to single out a body of literature as *the* foundational theory each contribution is based on; they are situated in or make use of a multiplicity of disciplinary lineages and bodies of literature. In addition to the multiplicity of theoretical foundations of each contribution, there are also overlaps between contributions. Some of the contributions are either based on or incrementally expand earlier contributions. We have grouped these together. Table 2 presents theoretical foundations of selected contributions.

In addition to delineating theoretical foundations, we also tried to understand how sustainability is framed and measured, how the roles and agency of design are framed or implicated, and what kind of methodological frameworks and methods are proposed by these contributions.

3.1 Framing and Measures of Sustainability

Gaziulusoy's (2010) work (see also subsequent publications, Gaziulusoy, Boyle & McDowall, 2013; Gaziulusoy & Brezet, 2015) is significantly influenced by the ideas of sustainability science, particularly by complex adaptive systems theories. According to her framing, sustainability is a systemic property therefore talking about sustainability at product level is not possible without references to the system the product is embedded in. Sustainability is not an absolute property; it can only be established relative to the nominal lifespan of the system to be sustained. Whether the subject system has reached its nominal lifespan can only be assessed *ex post facto*. Therefore, sustainability cannot be measured (at least in absolute terms) but sustainable systems can be envisioned and enacted upon across relevant system levels and timeframes. She argues for adoption of the strong sustainability model in system innovations and transitions projects as well as in company strategies which informs product development. Her central focus for intervention is companies because, she argues, companies are critical actors in sustainability transitions; they influence and are influenced by societal visions of sustainability and they frame the direction of product development through strategy.

Joore (2010) does not take up a mission for developing an elaborate frame for sustainability. Instead, he simply adopts a definition from an earlier work by Tukker and Tischner (2006); that is causing minimum negative environmental impact while maximizing social well-being and maximizing economic added value. Because his aim is not to propose alternative theories, but instead through an integrated reading of existing theories, to investigate the role new products can play in societal level change, and it is only consequential that the context his work is embedded in deals with sustainability transitions, it is understandable he does not confront the challenge of dealing with elusiveness of sustainability as a research term. Ceschin (2012) on the other hand, although minimal, provide some discussion touching on some overarching themes in sustainability discourse such as growth, equity and limits. He argues that sustainability can only be achieved by drastically reducing consumption of environmental resources, at least by 90%, compared to the average consumption by mature industrialised contexts, and by equally distributing them.

Kossoff (2011) is critical of the work of *mainstream* academic work on sustainability as being more about preserving the status quo than challenging the fundamental assumptions upon which our current society has been established. He argues that sustainability requires not only ecological, social, economic, but also cultural, political, existential problems to be addressed so that *everyday life* becomes sustainable *again* across its all *domains*. He is against quantitative framings of sustainability and advocates qualitative understandings that incorporate non-utilitarian, in addition to utilitarian, human activities. He defines sustainability as *wholes of everyday life* and counts self-organization, participation, emergence, multiplicity in unity, intrinsic relatedness, and meaningfulness in the everyday life of specific places as indicators of sustainability. It is understood that the work of Kossoff (2011) has influenced the subsequent discussions and framings in Kossoff,

Tonkinwise & Irwin (2015); Irwin (2015a); Irwin (2015b); Irwin, Tonkinwise & Kossoff (2015) as these do not discuss in detail theories that inform framings of sustainability but reflect the ideas elaborated in Kossoff (2011). The position adopted in these works can be summarised as sustainability being a place-based property of globally networked communities, informed by evolving visions which propose whole lifestyles and diffuses in everyday practices.

3.2 Agency and Role of Design(ers)

In Gaziulusoy's (2010) framing, designers are significant actors in sustainability transitions as they are going to create the new products, services, and meanings within new socio-technical systems. But, despite this significance, they have partial agency in influencing change at societal level. This is partly because their work takes place in the operational timeframe of transitions so they are bound by short-term requirements that are imposed on through company strategy. Therefore, in her theoretical framework, company strategy plays an intermediary role translating diffuse, long-term, societal-level visions of sustainability into concrete decisions at design level in the short-term. Similarly, company strategy plays an intermediary role for design level to take part in societal-level vision-making. According to Joore (2010), the role of design(ers) varies at different system levels from *normal* product design to visualiser and co-thinker of visionary future solutions. This, in a way, is similar to indirect agency as framed by Gaziulusoy (2010). In Joore (2010), the agency of designer is high and direct at product development level but as the scope of the system get larger, the agency decreases and the role becomes indirect or diffused. According to Ceschin (2012), designers can (and should) play multiple roles in sustainability transitions. These include designing sustainable product-service systems, designing transition paths for societal embedding of these and designing socio-technical experiments within which new sustainable product-service system concepts be ideated and developed.

Gaziulusoy (2010), Joore (2010) and Ceschin (2012) draw pictures of designers who are more or less similar to current generic designer archetype with somewhat expanded skills and knowledge base as well as implied attitudes and values aligned with sustainability. It is not difficult to imagine these designers being educated in our present university programs. However, the same cannot be said for the picture Kossoff (2011) draws. According to him the fundamental task of the transition designer – and everyone can be one – is to facilitate the emergence of domains of everyday life which have gone into decline through modernity and protect or repair the relationships at all levels of scale that exist between people, nature and artifacts. A transition designer discusses, conceives and plans, for example, a compost heap at the household, a citizen assembly at the city or ecological education at the regional levels – he/she is a multi-faceted, place-based activist. Irwin (2015a), Irwin (2015b), Irwin, Tonkinwise & Kossoff (2015), rather than the role of design(ers) in detail, qualities of a mindset and posture that transition designers should adopt that are aligned with imagining and bringing into existence place-based sustainable everyday lives.

3.3 Methodological Frameworks and Methods for Design

Gaziulusoy (2010) (also see Gaziulusoy, Boyle & McDowall, 2013; Gaziulusoy & Brezet, 2015) developed an operational tool for the use of design and innovation teams to align their day-to-day decisions and strategic outlook with unfolding and upcoming sustainability transitions. This operational tool - a scenario method - integrated explorative and backcasting scenarios approaches in order to causally link present reality with future aspiration. Ceschin (2012; 2014) also developed a very elaborate tool set for practicing designers. This tool set included tools to formalise SPSS concept visions, tools to develop and formalise transition strategies, tools to manage the network of actors and, tools to monitor and evaluate the transition process.

4 Conclusions

In this paper we reviewed the short history of an emerging DfS area that deal with sustainability transitions. We found that the history of the area goes as far back as to late 1990s, initially influenced by the The Dutch National Inter-Ministerial Programme for Sustainable Technology Development. The maturation of system innovations and transitions theories facilitated the emergence of sustainability transitions thinking in design. Currently, there is a diversity of theories influencing theoretical development and practice in this new area including sustainability science, complex adaptive systems theory, systems innovations and socio-technical transitions theories, futures studies, product-service systems, strategic niche management, needs theory, social practice theory, Goethean science, holism, indigenous knowledge, post-normal science, social psychology and alternative economies. This diversity indicates a lack of unified foundational theory on one hand, on the other hand it presents a picture of potential directions the field can evolve towards. In the coming years, there will be a need for putting effort into developing rigorous theoretical foundations for the field that will support, improve and complement the ones that already exist. There is still a need for further delineating the roles design can play in transitions processes as the work undertaken so far has been mostly exploratory or speculative. The observed preliminary adoption of the field in practice can provide fruitful empirical input into these theoretical developments and also can assist with development of practice-relevant models and tools. Empirically informed theoretical developments can be instrumental in testing the foundational assumptions that seem to have informed some theoretical models proposed so far and can assist in scientific development of this area to potentially become ground breaking in parts of design theory and practice that deal with sustainability in general and sustainability transitions specifically. The implications of this emerging area on research, education and practice of DfS specifically and design in general is thus significant.

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