

Transition Design: An Educational Framework for Advancing the Study and Design of Sustainable Transitions

Terry Irwin ⁽¹⁾, Cameron Tonkinwise ⁽²⁾ and Gideon Kossoff ⁽³⁾

Abstract: The following paper aims to purvey some of the design history and theory that is being used by the School of Design at Carnegie Mellon University in its effort to constitute the practice of Transition Design. It will explain how the profession and discipline of design is currently undergoing rapid expansion and transformation that afford a rich set of frameworks for transition design. This paper argues that not only can and should designers learn from transition studies, but that design can contribute reciprocally through new approaches to framing problems related to sociomaterial change within the context of complex ecosystems.

Keywords: Transition Design - Transition Studies - Design history and theory - Sociomaterial change - Complex ecosystems.

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⁽¹⁾ **Terry Irwin** is a Professor in The School of Design and the Director of the Transition Design Institute at Carnegie Mellon University, Pittsburgh. She has been a design practitioner for more than 40 years and was a founding partner of the international design firm MetaDesign. Her research focus is in Transition Design and how principles from living systems and Goethe's approach to understanding natural phenomena can inform more responsible and sustainable design approaches. The Transition Design Institute works with educators, researchers, communities and businesses to develop tools and approaches for seeding and catalyzing systems-level change. tirwin@andrew.cmu.edu

⁽²⁾ **Cameron Tonkinwise** is Professor and Director of the Design Innovation Research Centre at the University of Technology, Sydney, Australia. He was previously director of design studies and doctoral studies at Carnegie Mellon University's School of Design and before that, associate dean sustainability at Parsons. The New School for Design and director of design studies at the University of Technology Sydney. The focus of Cameron's research is Transition Design and sustainable design, in particular, design that enables transitions toward less materials-intensive ways of living, such as could be afforded by sharing economies. cameron.tonkinwise@uts.edu.au

⁽³⁾ **Gideon Kossoff** is a faculty member in the School of Design and Associate Director of the Transition Design Institute at Carnegie Mellon University, Pittsburgh. His research focuses on how the relationships between humans and between the natural environment, humans, and the built/designed world are the foundation for a sustainable society. Gideon holds a PhD in design from the University of Dundee, Scotland. His thesis was entitled “Holism and the Reconstitution of Everyday Life” through which he proposed Transition Design as a new approach to design. His argument is summarized in an essay-book “Grow Small, Think Beautiful,” edited by Stephan Harding and published by Floris. gkossoff@andrew.cmu.edu

Introduction

The emerging fields of sustainability transitions, transition studies and transition management now encompass a community of international researchers primarily from the areas of social and management sciences and related disciplines. However, contributions from the field of design and its relevant sub-disciplines (*communication, information, interaction, product, environmental, service and social design and design research*) are still relatively rare.

On one hand, this is not surprising since design is considered a relatively new discipline and a comparatively minor practice. Design is often marginalized as utilitarian and/or decorative largely due to its ubiquity –virtually everything we interact with everyday was designed by someone; the clothes we wear, the tools we use and the buildings we inhabit. It is only recently that disciplines such as anthropology and sociology have begun to study material practices, so it is not surprising that transition studies (like most social sciences) is not focused extensively on the realm of ‘things’.

On the other hand, the absence of design in transition studies is surprising given that design can be defined as “*devising a course of action aimed at changing existing situations into preferred ones*” (Simon, 1969). Though design is often perceived solely as the creator / form-giver of ‘things’ –products, communications and environments– we will show that design has a long and diverse history in aspiring to drive systems-level change. The modern profession of design arose out of the aspiration of European and American modernists, seeking to transition their societies from tradition-bound communities to universally rational modes of living through the redesign of dwellings, workplaces, furnishings, tools and clothing. Contemporary designers have tempered these imposing ambitions, but persist in the belief that design can enable significant changes in lifestyles and ways of working by making certain practices easier, more effective and / or more enjoyable. Good designs become our habitats and habits that can determine future pathways for our societies. *All this implies that design can play a more central role in the discourse of transition.*

There has been some recent convergence between design and transition studies. On the design side, the sub-discipline of sustainable design expanded from a focus in the 1990s on production-side issues (*pollution control, waste minimization, eco-efficiency, sustainable ma-*

terials selection etc.) to include questions of sustainable consumption in the 2000s (*which follows the lead of the UN's Marrakech agreements*). The aim was to design product service systems that would deliver more comprehensive sustained reductions in ecological impact. This focus on larger scale solutions led designers to develop strategies for 'systems level change' such as 'design for sustainable behavior' (Boks 2012) and has led to discourses and practices close to what is now called sustainability transitions.

From the transition studies side, there has been a recent focus on the everyday socio-materiality aspects of transitions, largely as a result of the incorporation of Social Practice Theory. This 'bridge-work' is associated with the work of Elizabeth Shove, who criticized sustainability discourses for their dependence on models of resource management and advocated instead for interventions into the dynamics of social practices. Along this trajectory, Shove undertook a sociology of the practice of designing (2007) which has prompted some interest in design within the field of transitions research.

It is clear however, that design has much more to contribute. The following paper aims to purvey some of the design history and theory that is being used by the School of Design at Carnegie Mellon University in its effort to constitute the practice of Transition Design (See Figure 7). It will explain how the profession and discipline of design is currently undergoing rapid expansion and transformation that afford a rich set of frameworks for transition design. This paper argues that not only can and should designers learn from transition studies, but that design can contribute reciprocally through new approaches to framing problems related to sociomaterial change within the context of complex ecosystems.

I. Why Design and Transition?

How Design Has Evolved

Design is in a period of unprecedented evolution and transformation and its importance in post-industrial economies is increasing. This rapid, pervasive change coupled with the increasing demand for design-led approaches to problem solving both afford and obstruct transition solutions.

Design's Approach for Solving Complex Problems

In 1972, planner Horst Rittel identified a class of complex 'wicked' problems that traditional design process was inadequate for addressing (Rittel and Webber 1973). Since then, design practitioners, theorists and researchers have worked to develop tools and methodologies better suited to these 'unsolvable' problems. In particular they have sought to integrate design's core competencies (visualization, prototyping and form-giving) with user-centered, social and generative research methods that continually evolve in parallel with a deeper understanding of the dynamics of social complexity (Dubberly 2008).

Within the contemporary design context, wicked problems can be understood as ill-de-

fined, complex systemic problems that emerge from multiple root causes and become interconnected and interdependent over time, coming to resemble complex, adaptive systems (Jones 2014; Irwin 2011a). Wicked problems are comprised of diverse constituencies and stakeholders with conflicting agendas and concerns and exist at multiple levels of spacio-temporal scale. This type of problem cannot be understood or solved from within a single discipline, and multiple interventions over time are not likely to result in a clear solution(s). Most of the problems identified by transition management researchers share these attributes and could therefore be termed 'wicked' or more accurately, 'ecologies' of wicked problems.

As designers' understanding of complex problems has increased, they have begun to contribute within transdisciplinary teams to address problems in areas such as transportation, community revitalization and resilience, energy systems, healthcare and policy design (Jones, 2014; Junginger, 2014; Hughes *et al.* 2009). Designers are now the drivers of strategy and innovation for business and are contributing within the social sectors of governance and policy sectors (Brown 2009; Thackara 2013; Junginger 2014). This evolution has sparked a proliferation of design-related sub-disciplines and new ways of working that include interaction design, experience design, participatory design, co-design, service design and design for social innovation. These new areas can be characterized as a shift from the design of discrete objects and 'things' to relationships, interactions and experiences for and within complex social systems.

Design has changed from an activity often undertaken by an individual professional designer to a highly collaborative, co-design activity that involves a variety of actors, including professional designers, experts from other fields and disciplines and users/co-creators (Manzini 2015). To explain design's expanded field of operation, Richard Buchanan developed a model called the *Four Orders of Design* (2001) (See Figure 1). Buchanan argued that design had evolved from two original 'orders' or placements for invention/creation; 1) *visual communication / graphic design* and 2) *product/industrial design*, to a third and fourth order; 3) *actions and interactions* and 4) *complex systems and environments* (which encompass the first three orders).

Although the landscape of design has continued to shift since Buchanan's model was proposed, it remains useful in framing and contrasting design's sub-disciplines (and their concerns and outputs) within a broad context. Jones (2014) developed a similar model (See Figure 1) which traces the evolution of several aspects of design including broad orientation, methods and influences and argues after Buchanan that design has moved from more reductionist, mechanistic mindsets and processes to a holistic, highly collaborative systems approach.

Design's Evolution: Sub-Disciplines, Attitudes, Methods

Four Orders of Design Based on Buchanan 2001				
<p>First Order Design</p> <p>Symbolic & Visual Communications (Symbol)</p> <p>Sub-disciplines: Communication & Graphic Design</p> <p>Concerned with: the problems of communicating information, ideas, arguments through a synthesis of words and images using a variety of media. Motivation through argument.</p> <p>Outputs: printed and digital communications of all kinds; logos & identities; simple websites; online forms & communications.</p>	<p>Second Order Design</p> <p>Material Objects & Artifacts (Object)</p> <p>Sub-disciplines: Industrial & Product Design, Fashion Design</p> <p>Concerned with: the form, function and appearance of everyday objects and explores the physical, psychological, social and cultural relationships between products and human beings. Usually mass produced.</p> <p>Outputs: appliances; furniture; vehicles; hand held devices; tools; medical equipment; packaging, etc.</p>	<p>Third Order Design</p> <p>Interactions & Process (Action)</p> <p>Sub-disciplines: Interaction Design, Experience Design, Service Design, Design for Social Innovation, Design Thinking, Strategy & Planning</p> <p>Concerned with: interactions and experiences that include communications and products. Includes mediating between the digital and the physical, managing logistics, combining physical resources, instrumentalities and human beings to achieve an organic flow of situated experiences that are productive, meaningful and satisfying.</p> <p>Outputs: product service systems, user/customer experiences.</p>	<p>Fourth Order Design</p> <p>Environments & Systems (Culture/Systems)</p> <p>Sub-disciplines: Interior Design, Architecture, Urban Planning, Co-Design, Transition Design, Facilitation</p> <p>Concerned with: complex systems and environments for living, working, playing and learning. Systems-level concerns involving analysis of 'parts' within complex wholes and ecologies of systems. Explores the role of design in sustaining, developing and integrating human beings into broader ecological and cultural environments and shaping/adapting these environments</p> <p>Outputs: redesign of patient/doctor conversations; shaping of new local or regional education policy; redesign of national voting system; redesign of a national tax system; design of niche transition experiments.</p>	
Evolution of Design's Characteristics From Dubberly et al 2008; Manzini 2015				
<p>Mechanical-Object Ethos</p> <p>Expert/Disciplinary</p> <p>Seeks Simplicity</p> <p>Audience: Customers</p> <p>Working Toward 'Finish'</p> <p>Solutions: Planned</p> <p>Proprietary Knowledge</p>		<p>Organic-Systems Ethos</p> <p>Diffuse/Transdisciplinary</p> <p>Embraces Complexity</p> <p>Audience: Co-Creators</p> <p>Beta-Friendly Iteration</p> <p>Solutions: Emergent</p> <p>Open Source Knowledge</p>		
Four Generations of Design Methods Jones 2014				
Generation	First	Second	Third	Fourth
Orientation	Rational 1960s	Pragmatic 1970s	Phenomenological 1980s	Generative 2000s
Methods	Movement from Craft to Standardized Methods	Instrumentality, Methods Customized to Context	Design research and Stakeholder Methods, Design cognition	Generative, Empathic and Transdisciplinary
Authors & Trends	Simon, Fuller, Design Science Planning	Rittel, Jones, Wicked Problems evolution	Archer, Norman, User-Centered Design, Participatory Design	Dubberly, Sanders, Generative Design, Service Design
Systems Influences	Sciences, Systems Engineering	Natural Systems, Hard Systems	Systems Dynamics, Social Systems, Soft Systems	Complexity

Figure 1. Design's Evolution: Sub-Disciplines, Attitudes, Methods.

Design Research

An important area for the expansion of design into ‘transition’ scale projects is the field of design research. Designers have evolved beyond their reputation as ‘inspiration-based creatives’ to work on higher order, increasingly ‘wicked’ problems that necessitate diverse, comprehensive and creative research methods. Design research has matured to scaffold design practice, enable transdisciplinary collaboration, and is supplementing research in a variety of other disciplines (Martin and Hanington 2012; Koskinen *et al.* 2011). Research approaches that originate in the social sciences tend to focus on people, their habits, their interactions with each other as well as social norms. Design research studies the qualities of interactions and behaviors that exist between designed artifacts, people and the natural world. In particular it looks at the way in which design can influence and shape human expectations, behavior and practices (Norman 2004; Verbeek *et al.* 2006) and tends to blur the lines between practice and research. A designer responsible for the concept, design and delivery of products and services often participates in the research to varying degrees.

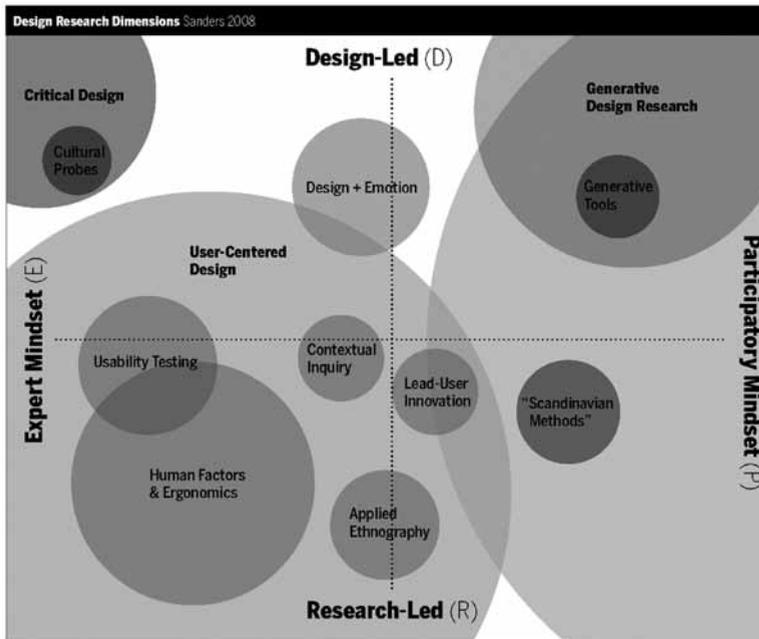


Figure 2a. Sanders’ model of design research approaches.

There is now a well documented body of methods that enable design researchers to collect user-centered data, synthesize and analyze the information, communicate results and design implications and serve to facilitate important conversations with stakeholders, team members, clients and the people who interact with designed products, systems and services. Sanders (2008) has developed a useful overview of design research that contrasts the research dimensions of mindset (*expert vs. participatory*) and approach (*design vs. research led*) (See Figure 2a). An overview describing the approaches mapped in figure 2a is provided in figure 2b.

Overview of Design Research Approaches Based upon Sanders 2008, Coyne 2006, Koskinen et al., 2011, Suri xxx 2008		
RESEARCH DIMENSIONS	RESEARCH APPROACH	SOURCES & INFLUENCES
<p>This overview of design research methods is based upon Sanders' map of research dimensions. One axis defines the opposing mindsets of "expert" vs. "participatory". The second axis defines participative, design led vs. research-led. Many of the approaches in the center column are situated within more than one quadrant. See figure x, Design Research Dimensions for placement.</p>	<p>Critical Design: D/E design experts evaluate the status quo and often uses design fiction and speculative design to challenge narrow assumptions, preconceptions and giveins about the role products play in everyday life. Aims to raise awareness, expose assumptions, provoke action and spark debate.</p> <p>Cultural Probes: D/E a methodology to gather data about people's lives, values, culture and thoughts that is aimed at inspiring design concepts and solutions. Situated within the critical design area, cultural probes are usually artifacts (maps, postcards, diaries etc.) that require participants to record events, feelings or interactions.</p> <p>Design & Emotion: D/E/P a research approach with a wide variety of tools and methods used to produce insights that support the involvement of emotional experience in product design. Because the topic of human emotion is complex, research groups in this area are often multidisciplinary and include industrial design, cognitive psychology, consumer research, social science etc.</p>	<p>In part a reaction against the dominance of research-led user-centered approaches with a focus on utility and usability. Popularised by Anthony Dunne and Fiona Raby.</p> <p>Originally developed by Gaver, Dunne and Pacantie in 1999 and inspired by the situationist art movement.</p> <p>Emerged in 1999 with the first Design and Emotion Conference in Delft, Netherlands. It has grown into a network of international researchers and designers: http://www.designandemotion.org/en/home/</p>
<p>Expert Mindset (E)</p> <p>The left side of Sanders' map. Design researchers are involved with designing for people, consider themselves to be experts and they refer to people as 'subjects', 'users', 'consumers' etc.</p>	<p>Participatory Design: D/P/R is situated in both the design-led/participatory and research-led/participatory quadrants of Sanders' model. Approach attempts to actively involve all stakeholders in the design process to ensure designed products and services meet their needs. Physical artifacts are used as "thinking tools" throughout the process. Aimed at understanding everyday practices, it enables the co-researchers to step back cognitively from familiar routines, forms of interaction and power relationships in order to fundamentally question and rethink established interpretations of situations and strategies.</p>	<p>Origins in the Scandinavian countries in the 1960s and 1970s through work with the trade unions. Ancestry includes action-research and sociotechnical design.</p>
<p>Participatory Mindset (P)</p> <p>The right side of Sanders' map. Design researchers are designing WITH people. They see the people as the true experts in domains of experience such as living, learning, working etc. Design researchers respect the expertise of the people involved and see them as co-creators in the design process.</p>	<p>Generative Design Research: D/E Generative design empowers everyday people to generate and promote alternatives to the current situation. Generative tools is a methodology within generative design research that focuses on the creation tools for non-designers that enables a shared design language that designers/researchers and the stakeholders use to communicate visually and directly with each other. This approach empowers people to express their 'visions'/'desires' for the future. Generative research tools for emergent patterns, challenges and opportunities that can be addressed by innovation with the objective of generative research is to promote alternatives to the current situation.</p>	<p>See Hartington 2007; McCormack et al, 2004; Suri 2008</p>
<p>Design-Led Research (D)</p> <p>Corresponds to the top half of Sanders' map and is the newest area of design research. It does not aspire to conform to scientific methods of assessing value or relevance, and uses tools and methods closely connected to design practice.</p>	<p>User Centered Design: R/E/D/P comprises the largest number of design researchers working to make new products and services better meet the needs of 'users'. This 'expert' approach collects, analyzes and interprets data in order to develop specifications or principles to guide or inform the design development of concepts, prototypes, products and services. Three types of approaches within the user-centered area come from: the applied social and behavioral sciences and/or from Engineering: Human factors/ergonomics: R/E is the study of how humans behave physically and psychologically in relation to particular environments, products, or services. Applied ethnography R/E/P constructs a qualitative description of cultures and cultural practices based upon observational research (borrows from anthropology). Usability testing R/E measures how well people can use something for its intended purpose (borrows from cognitive psychology and cognitive engineering).</p>	<p>Arose out of the products and software design disciplines.</p>
<p>Research-Led (R)</p> <p>Corresponds to the bottom half of Sanders' map and has the longest history. This approach is driven by applied psychologists, anthropologists, sociologists, and engineers.</p>	<p>Contextual Inquiry: R/E/D is most often used in software development. This area of research has been shifting to become more participatory and design led and recently design-led methods such as visioning and storyboarding have been added to the repertoire of contextual inquiry.</p>	<p>First referred to as a 'phenomenological research method' in a paper by Whiteside, Baner and Holzblatt (1988) and fully described as a method by Wixon, Holzblatt and Knowx (1990).</p>
<p>Lead-User Innovation: R/E/P this participatory approach is based upon the assumption that only a specific type of user is capable of participating. These are a few who are already innovating in the domain. This approach is effective for highly specialized domains of expertise, but it is not able to address the needs/aspirations of 'everyday' people.</p>	<p></p>	<p>introduced by von Hippel.</p>

Figure 2b. Table describing Sander's design research dimensions and approaches.

Areas of Design Focus Particularly Relevant to Socio-Technical Transition Management

Within an expanded field of operation, there are three areas of established, maturing and emergent design focus that are of particular relevance in socio-technical transition management: *Design for Service*, *Design for Social Innovation* and *Design for Policy*. These areas evolved out of user-centered, participatory and co-design approaches used to understand how people meet their needs and interact with products and services. A growing body of tools, research methodologies and processes are being used by both expert and diffuse designers¹ in these areas to frame and solve problems at multiple levels of spacio-temporal scale.

Design for Service

The latter half of the 20th. century involved the transition of late capitalist societies from primarily industrial economies to postindustrial societies with strong service economies. Part of this transition involved the emergence of the practice of service design –the planning and organizing of people, infrastructure, communication and material (designed) components of a service to ensure it is user-friendly, productive and even pleasurable for users / customers and that is competitive, profitable and sustainable for the provider (SDN 2015; Saco and Goncalves 2010 ; Forlizzi 2007; Penin 2012; Parker and Heapy 2006; Meroni and Sangiorgi 2011; Polaine et al 2012; Penin and Manix 2012). Service design enables designers and researchers to visualize and prototype new service models in order to understand the functional, aesthetic, emotional, symbolic and social dimensions of the products and services being designed as well as the social behavior that couples and evolves within it. Service design frames problems within large socio-technical contexts that Forlizzi (2013) has described as ‘service ecologies.’ These are comprised of dynamic relationships between people, products, social activities and infrastructures.

The practice of service design has expanded recently beyond business and for-profit market sectors to not-for-profit and governmental services. Another key area of expansion concerns digital platforms, locational media and social software. These enhance the capacity of services to be automated and/or customized, and facilitate peer-to-peer interactions. In combination with trends toward increasingly dense urban living, service designed systems appear to be lowering material intensity through the decoupling of use and ownership (e.g. car share, etc.) (Manzini 2015; Ceschin 2014).

Design for Social Innovation

Design for Social Innovation shares and builds on this approach, but because it is explicitly aimed at improving human well-being and livelihood, it is often undertaken within community, non-profit and policy sectors. Manzini (2015) defines social innovations as

New ideas (products, services and models) that simultaneously meet social needs and create new social relationships or collaborations...they are innovations that are both good for society and enhance society's capacity to act.

Whereas service design tends to operate within business and for-profit models (there are of course exceptions), social design often leads to solutions and interventions that challenge the status quo through the exploration of new modes of exchange and the sharing and pooling of under-utilized social resources (Meroni 2007; Staszowski *et al.* 2014; Jegou 2015).

Design for Policy

Policy design evolved out of service and user-centered / participatory approaches in which all stakeholders and constituents are involved in the design process. Within the last decade, design as an approach to policy and service innovation in the public sector has been increasing (Boyer *et al.* 2011; Cooper *et al.* 2011; Bason 2013, 2014; Whicher and Swiatek 2015) and Bason has discussed three ways in which design can offer a different approach to policy:

1. Defining the problem space

Design research tools including ethnographic, qualitative, user-centered, probes, rapid prototyping and data visualization, can aid policymakers in better understanding the root causes of public problems and their underlying interdependencies or '*architecture of problems*' (Boyer *et al.* 2011; Siodmok 2014)

2. Developing concepts and ideas for policy

The collaborative aspects of design research and practice can enable a co-design process among policy constituencies such as interest and lobby groups, external experts and end users such as citizens or business representatives. Visual representations for service and use scenarios can open spaces for negotiation, mutual understanding and collective ownership of ideas. In addition, design approaches enable policymakers and constituencies to envision a desirable future together. Junginger (2014) argues

Designing becomes a means of inquiry and invention, of envisioning and developing new possibilities for useful, usable and desirable policies.

3. Articulating policy in tangible ways

Design can help give form to policy in practice through the prototyping and creation of artifacts and communications such as service templates, system maps, identities, products, narratives and the design of all types of information to clarify, direct and explicate. Because design emphasizes human experience in context, it has the potential to highlight values other than the economic and legislative indicators that policy managers typically focus on. Bason and Schneider (2014) have proposed a new role for '*policy designers*' and challenge design schools to integrate projects aimed at social change into curricula. They

also call for designers to begin to work alongside policymakers to develop new approaches aimed at positive societal change.

Designing for Complex Problems: Three Examples

1. A Model for Assessing Complexity of Design Problems/Solutions

With the arrival of practices like service design, design for social innovation and policy design, designers are now operating within much wider scopes and are developing what could be called ‘systems interventions’.

In 2013, the Winterhouse Symposium for Education and Social Change (2015) developed a model for mapping change ambitions for social innovation design (See Figure 3a) that can be used in several ways: 1) to envision, map and link projects, interventions and experiments at multiple levels of scale for greater impact; 2) to guide research, design and development; 3) as an index for specific skills, resources and partners necessary for a successful project/solution; 4) to assess project outcomes and impacts.

This model has also been useful in illustrating the evolution of design (with its origins in the lower left quadrant, evolving toward the upper right) and mapping the broad/expanding territories in which designers are now working. It also encourages designers to take a meta- level view of even small projects and see them as potentially small steps in larger transitions (from the lower left to the upper right).

Figure 3b shows how a complex problem such as childhood obesity can be addressed using the model. When existing projects and initiatives are mapped onto the matrix (based upon level of scale and range of expertise) new ideas and themes for connecting projects may emerge. A simple solution such as the redesign of a cafeteria tray that guides the portions of food is situated in the lower left where a single designer can contribute a relatively simple solution from within the discipline of product design. Solutions situated in the upper right hand side of the matrix require inter- and transdisciplinary skill sets and teams and are more systemic in their approach, leading to more significant degrees of change. Solutions in the upper right of the matrix often involve the redesign of regional or even national policies and infrastructure and designers contribute from within transdisciplinary teams where they act as catalysts/ facilitators, directing the application of design research approaches.

When existing projects are mapped onto the matrix, it can serve as a guide for designing linkages, replication and partnership for greater leverage. The matrix can also be used as a visioning device to aid teams in planning small interventions that are steps in a mid- and long- term, multi-phased process for change. In such cases, the matrix serves as a road-map for change at multiple levels of scale, over longer horizons of time.

Social Design Pathways

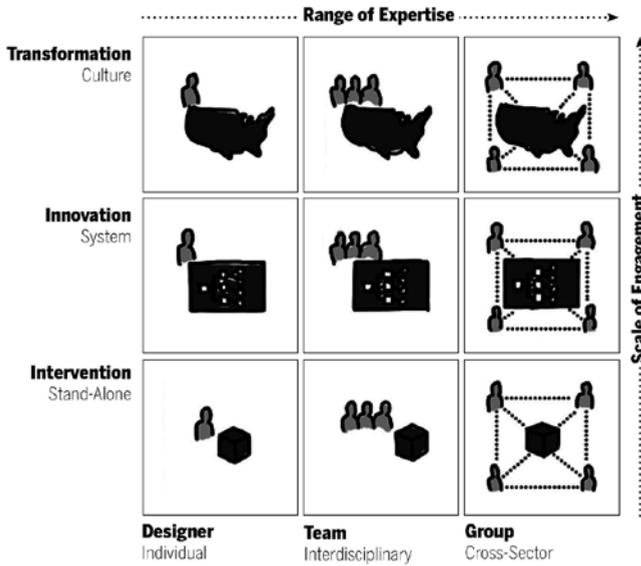


Figure 3a. The Winterhouse Social Design Pathways Matrix maps scales of engagement and the range of expertise required for projects that range from simple to complex.

How can we address childhood obesity?

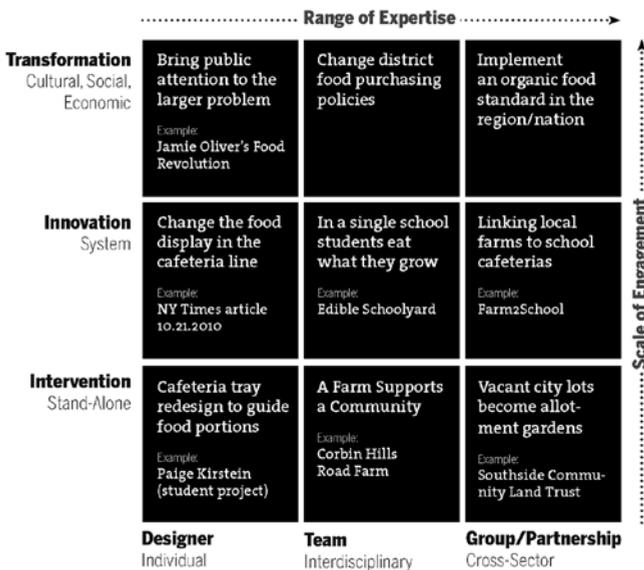


Figure 3b. Shows how designers can use the model strategically and systematically to address a complex problem such as childhood obesity.

2. Redesigning the Australian Tax System

In the mid2000s the Australian Tax Office (ATO) adopted a design-led approach to the development of a new tax administration system. Over the course of several years, design was leveraged in several important ways (Body 2007): to better reflect the government's policy intent; to serve as a bridge between strategy and action; to make paying taxes easier, cheaper and more personalized.

In referencing Buchanan's 4 orders of design, Body noted that the ATO focused on

...the third and fourth orders of design...to ensure that the products and services that it provides will be effective in their interaction with taxpayers... [and] ensure that the whole experience of a tax payer is coherent rather than a mixture of unrelated products and services.

In particular Body underscored the ability of user-centered design approaches to address problems with a high degree of complexity. The ATO went on to develop internal design capabilities and identified three key roles.

1. Design Facilitators who were charged with understanding and overseeing the entire design process and leading the team through discovery, invention and evaluation;
2. Information Designers who were able to work with the emerging data streams and communicate relevant points effectively to the participants via the design of visual representations of discussions, the design process itself and discussion papers;
3. User Researchers who conducted research to identify strategic context for design and user segments, apply techniques for eliciting ideas from users, and to evaluate and identify ideas that warranted further development and production.

Figure 4 shows a range of design tools and techniques developed by the ATO in the redesign of the tax system. The ATO project is an example in which large, infrastructural change was undertaken via a design-led approach. However both expert and diffuse design was present throughout the process and areas of specialty and expertise were continually changing.

3. Design for Democracy: Redesigning Government Communications

In the US national elections of 2000, a confusing ballot layout in the closely contested presidential election brought ballot design into the national awareness. According to Lausen (2007):

A government creates trust almost exclusively through communication –using words and images to convey meanings. Most of the communication between a government and its citizens consists of asking for and providing information. These interactions can be positive and engaging experiences, or they can be difficult, frustrating, disengaging ones. The difference is often a matter of communication design.

She argues that in the realm of government, nowhere is the impact of design greater than in the election process.

Design Tools & Techniques Used by the ATO Based upon Body 2007	
User Research	Conducted research with users early in the design process to better understand the underlying needs of the community and how the ATO should best segment them for design.
User Testing	Observed users interacting with products and services to see firsthand how they experienced aspects of the tax system.
Walk-throughs	Developed displays of how proposed legislation might work, and taking those displays to major cities with experts on the subject matter to explain and seek feedback from those who might be affected.
Co-design workshops	Ran half-day or two-day workshops with ATO staff, affected taxpayers, and other specialists to examine specific issues and develop solutions.
User pathway models	Represented the results of user research in a way that shows the pathway of a taxpayer group through the tax system. This usually was an annual pathway. Examples of pathways include youth, wage and salary earners, investors, retirees, and micro, small, medium and large businesses.
Prototyping	Involved making something early on that could be shown to people of gauge a response before making a major investment.
Design Blueprint	Created a document that reflected the high-level design of a project, including the intent of the proposed change, the users who would be affected, the new and existing products and services the users would need to interact with; and the processes, technology, and staff changes that would occur.
Core Design Teams	Were small groups of people chosen for their specialist knowledge and their predisposition to innovate. People who can think of all the reasons why something won't work have a role in the design process but not at the core design team stage. The core team was an incubator of fragile ideas, many of which might have seemed radical or unworkable at first. Five people was a good number on the team with some change of personnel occurring as new specialities were needed.
Intent Document	A document intended to produce and document a shared understanding among team members.
Integrated Tax Design Wheel and Stacker	Two diagrams developed to represent the process followed for a project and the way in which multiple projects are able to run concurrently.
Integrated Tax Design Guide	A guide that articulated the process of design in the ATO. It was not prescriptive, but gave some guidance and examples and put forward questions that each phase of the design process was aimed at answering.
Debriefs	Teams were encouraged to debrief after a design assignment.
Quality Assurance Reviews	Ensured that there was confidence that the process and principles had been followed with the completion of each phase of a design assignment.
Simulation Center	A simulation center was built in Brisbane that allowed the team to observe interactions between taxpayers and staff in order to rapidly prototype changes.

Figure 4. Shows the range of design tools and techniques used by the ATO during the redesign of the Australian tax system.

In the wake of the elections, the *American Institute of Graphic Arts* (AIGA), one of the nation's largest professional design organizations, launched an initiative to apply design principles to address the need for election reform. What began as a ballot design initiative evolved into the redesign of the entire voting experience. The project team was comprised of design professionals, educators and students as well as experts from many diverse fields. In partnership with the University of Illinois at Chicago's School of Art and Design and election officials in Cook County, Illinois and the state of Oregon, the group developed prototypes designed to improve election administration materials, voting equipment, the polling place environment, absentee and provisional ballots and voter education and outreach. Although communication design was at the heart of a project of this type it also involved the design sub-disciplines of product/industrial design, design research, interaction and service design and design thinking among others. These three examples attempt to show the levels of scale at which designers are working, the types of complex problems they are engaging with and the range of experts from other fields and disciplines with whom they are collaborating.

Systems Design

The modern practice of design now encompasses what systems analyst Donella Meadows (2008) has referred to as 'systems leveraging.' She observed that people who are deeply involved in a system often know intuitively where the 'leverage points' for change are but they often push them in the wrong direction because when viewed within our dominant, mechanistic worldview, systems operate in counter-intuitive ways. Meadows listed 12 leverage points for catalyzing change within complex systems and ranked them in reverse order of effectiveness.

Leverage point 12 (the least effective on Meadow's scale) is concerned with changing numbers (increasing / decreasing or doing more or less of something) related to constants and parameters such as subsidies, taxes and standards. Her model references regulating and buffering material flows and driving and balancing positive and negative feedback loops. She observes that once components of a system have taken material form (a highway system, buildings, etc.) it becomes much more difficult to introduce and manifest change. The leverage points with a higher degree of effectiveness have to do with the non-material aspects of a system such as information flows, properties of self-organization within social systems and the specified purpose and goals of the system.

Meadows ranks mindset/paradigm as the single most powerful leverage point for change because the goals, structure, rules and parameters of the system arise out of it. Although paradigms and mindsets are often slow to change Meadows observes

You could say paradigms are harder to change than anything else about a system...but there's nothing physical or expensive or even slow in the process of paradigm change. In a single individual it can happen in a millisecond (Meadows 2008:164).

Whole societies resist challenges to paradigms and Kuhn (2012) explored this phenomenon in “The Nature of Scientific Revolutions.”

Richardson, Irwin and Sherwin in a 2005 report for the UK Design Council, DTI and Defra, developed a continuum of leverage points based upon Meadow’s model. Design approaches, opportunities and government policy related to sustainable product design (SPD) in the UK were mapped along the continuum in increasing magnitude of potential impact for change (See Figures 9a and 9b). The authors identified 3 meta-level areas of increasing impact: *Changing the design of the products themselves, changing consumption patterns and changing lifestyles*. Moving from left to right along the continuum, the importance of future-casting and developing compelling quality-of-life narratives increases.

	9	8	7	6	5	4	3	2	1
	Designing for greater efficiency and less waste	Design with biodegradable/non-toxic materials	Redesigning the product/service mix	Measuring and feeding back impacts into product redesign	Information provided in advertising and packaging	Leveraging relationships between government, business, consumers and design	Designing products and messages that change aspirations and social norms	Designing to include user preferences and needs, making it socially inclusive	Designing products based upon sustainable lifestyle aspirations
	Can products be more efficient?	Will redesign make it more sustainable?	How can products become flows of services?	How is feedback incorporated?	How is information conveyed?	Who are the players involved?	Can design help change 'the rules'?	How can design be bottom-up?	How can design create sustainable lifestyles?
Degrees of change	Changing products				Changing consumption			Changing lifestyles	
Examples of government policy	WEE, ELVs, Batteries, RoHS Directives			IPP and EUP	Product labeling schemes and standards		Sustainable procurement	Participatory design of public services and infrastructure	
Opportunities for design/designers	Product design to improve resource and energy efficiency and reduce waste	Redesigning products eg new materials, durability, design for durability	Designing service and ownership solutions (eg design for strengthening)	Full lifecycle impacts feedback into product redesign	Communication and packaging design to promote sustainable products	Raising awareness of different constituent groups that influence product design	Branding and marketing design to influence social norms and lifestyle aspirations	Bottom-up design processes based on involving users and consumers	Creative inputs into envisioning future scenarios for sustainable everyday life
Examples of design approaches, methodologies & principles	- Hierarchy of waste management - Factor X eco-efficiency		- Product service solutions (puroow) - Despoite product-services	- Dynamic lifecycle analysis - Cradle to Cradle				- User-centred design	- Minchin's principles - Biomimry (extended) - Product Service Systems (extended)

Figure 9a. Richardson, Irwin, Sherwin 2005; “Design and Sustainability: A Scoping Report.” Commissioned by the UK Design Council, Defra and DTI. Available at [https://www.academia.edu/4655832/ Design_and_Sustainability_A_Scoping_Report_UK_Design_Council_DTI_2005](https://www.academia.edu/4655832/Design_and_Sustainability_A_Scoping_Report_UK_Design_Council_DTI_2005)

Leverage Point		How it applies to SPD	
9. Amounts/quantities	Changing physical quantities then can be measured and quantified. Much of the environmental agenda has focussed on this level.	Can products be more efficient?	This is concerned with reducing amounts of waste, energy and material resources. Many products' design approaches begin at this level through efficiency, end of pipe and single issue solutions.
8. Redesign the structure	Redefine products and production processes, which determine materials use, emissions and waste.	Will redesign make it more sustainable?	This level of change would look at the materials and structure of a product in order to make it more recyclable/non-toxic/biodegradable.
7. Stocks relative to flows	Changing the ratio of stocks to flows can influence system flexibility and stability.	How can products become flows of services?	Redefining products as flows of services can enhance efficiency through increased flexibility and durability.
6. Feedback loops/reduce delays	Working with feedback is about working with information (consequences/impacts) rather than the physical part of the system. Feedback loops are more flexible, fluid and responsive than earlier leverage points.	How is feedback incorporated?	Environmental and social impacts are measured and treated as feedback loops to inform redesign of products, services and processes. ICA is an example of visualising impacts to inform product design.
5. Information flows	Can be thought of as missing feedback loops and providing missing information flows often takes the form of visualizing consequences and impacts.	How is information conveyed?	Information about products is conveyed through advertising/marketing and on packaging. It forms a primary interface with customers.
4. Critical nodes	Locating critical nodes in a network is crucial for determining the effectiveness of intervention. Understanding what/who constitutes key nodes within a network can help to focus change or leverage opportunities within webs of relationships.	Who are the players involved?	Understanding who the key players are in product development (consumers, government, business and designers) and their push/pull relationship to each other will enable designers to take advantage of opportunities/challenges.
3. Changing the rules of the system	Formal and informal rules define the parameters about how the system works. They can be formal regulations, economic incentives as well as informal social norms and practices.	Can design help change 'the rules'?	Brand positioning can create perceptions/trends that affect economic parameters and social norms and affects what a business' product/service offer will be.
2. Self-organisation	Systems do not always respond to changes (such as government policy) in predictable ways. They have the capacity to learn, adapt and respond creatively – in other words, self-organise.	How can design be bottom-up?	Bottom-up participatory design processes that involve users/consumers can be creative ways to shift awareness and behaviour.
1. Paradigm shift	Paradigm refers to the collective 'mind set' of the system which carries with it powerful assumptions. Paradigms can change systems at a fundamental level and can happen in a millisecond.	How can design impact sustainable lifestyles?	Creative design inputs into envisioning future sustainable lifestyles can lead to a complete shift in perception about what is possible and desirable – with consequent impacts on demands for services and goals.

Figure 9b. Richardson, Irwin, Sherwin 2005; “Design and Sustainability: A Scoping Report.” Commissioned by the UK Design Council, Defra and DTI. Available at https://www.academia.edu/4655832/Design_and_Sustainability_A_Scoping_Report_UK_Design_Council_DTI_2005

II. Transition Design

It is within the context of design's expansion into systems level change that we proposed the notion of Transition Design. Because of this lineage, the 'transition' of Transition Design attempts to draw a more diverse set of precedents than the 'transition' of Transition Studies. The concept of transition is central to a number of contemporary discourses and initiatives concerned with how change manifests and can be catalyzed/directed in complex systems. These discourses are found within academia, non-profit and community sectors but are often unrelated to each other and the field of design. These include sociotechnical transition management and sustainability transitions, the Transition Town Network (Hopkins 2008), The Great Transition Initiative (Raskin *et al.* 2002) and the concept of transitions in complex systems (Capra 1997; Prigogine and Stengers 1994) to name a few. Transition Design acknowledges and draws from many of these approaches and aspires to be an integrative agent among them. It is proposed as a new area for design research and practice as well as an area of higher education that aims to prepare a new generation of designers qualified to work in transdisciplinary teams on transition solutions.

Transition Design acknowledges that we are living in 'transitional times' and takes as a central premise the need for societal transitions to more sustainable futures. It argues that design has a key role to play in these transitions and applies an understanding of the interconnectedness of social, economic, political and natural systems to address problems at all levels of spatio-temporal 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. A focus is placed the need for 'cosmopolitan localism', (Manzini, 2009; Sachs, 1999) a lifestyle that is place-based and regional, yet global in its awareness and exchange of information and technology. Everyday life is viewed as a potentially powerful, transformative space (Lefebvre, 1984; Gardiner, 2000) where transition designers explore ways in which basic human needs are satisfied locally, within economies that exist to meet those needs (Max-Neef, 1992; Illich, 1987; Kamenetsky, 1992). This is in contrast to the dominant economic paradigm that is predicated upon unbridled growth and an imperative to maximize profit (Korten, 1999. 2010; Mander, 2012; Douthwaite, 1996).

The transition to sustainable futures calls for new ways of designing that are based upon a deep understanding of how to design for change and transition within complex systems (Irwin, 2011). This knowledge and the new skillsets it will inform must be integrated from areas outside design such as science, philosophy, psychology, social science, anthropology and the humanities. This will therefore challenge existing design and design education paradigms.

Transition Design Influences

Transition Design also draws upon diverse streams of thought from varied fields and disciplines that are relevant to sustainable transitions. These form a fluid and evolving body of knowledge and include:

Living Systems Theory

Within the last few decades, scientists within the ecological and biological fields have proposed general principles for how all living systems work (Capra & Luisi, 2014; Briggs & Peat, 1999; Prigogine & Stengers, 1994; Wheatley, 2006). Instead of examining phenomena by attempting to break things down into components, living systems theory explores phenomena in terms of dynamic patterns of the relationships between organisms and their environments. Principles such as self-organization, emergence, resilience, symbiosis, holarchy and interdependence, among others, can serve as leverage points for initiating and catalyzing change within complex systems (Irwin, 2011).

Futuring

Transition Design proposes that more radically new ideas and compelling visions of sustainable futures are needed. There are myriad approaches to developing future-based narratives that come from the field of science fiction, narrative and storytelling, future-casting / futuring and speculative and critical design to name a few. Transition Design argues that design solutions in the present can be informed by longer-term visions of sustainable futures (Candy, 2014; Dunne & Raby, 2013; Porritt, 2013; Manzini & Jegou, 2003).

Indigenous Wisdom

Indigenous pre-industrial societies lived sustainably in place for generations, informed by 'slow knowledge' that was place-based and embedded within local cultures (Orr, 2004; Papanek, 1995). Transition designers have much to learn from these approaches to designing and their symbiotic relationship with the natural environment.

Cosmopolitan Localism

Coined by German activist, author and educator Wolfgang Sachs, the term 'cosmopolitan localism' describes a place-based lifestyle in which solutions to global problems are designed for local circumstances and tailored to specific social and ecological contexts whilst being globally connected/networked in their exchange of information, technology and resources (Sachs, 1999; Manzini, 2009, 2015).

Everyday Life Discourse

Everyday life is an important yet often overlooked context for understanding society and the forces which mold it (Lefebvre, 1984, 1991; Highmore, 2002; Gardiner, 2000). Transition Design proposes that everyday life, and lifestyles, should be the primary context within which to design for sustainable futures and improved quality of life.

Post Normal Science

Post normal science is a method of inquiry for addressing long-term issues when relatively little information is available, facts are uncertain, values are in dispute and urgent decisions and outcomes are critical (Ravetz, 2007).

Needs

Within the context of lifestyles and everyday life, understanding how people go about satisfying their needs is a key strategy for developing sustainable solutions. Manfred Max-Neef's theory of 'needs and satisfiers' (1992) proposes that needs are finite and universal, but the ways in which people meet those needs are limitless and unique to their era, culture, geographic location, age and mindset. Transition Design argues that everyday life is more likely to be sustainable when communities are self-organizing and therefore in control of the satisfaction of their needs at multiple levels of scale: the household, the neighborhood, the city, the region etc. (Kossoff, 2011).

Social Psychology Research

Since the Rio Earth Summit in 1992, sustainability researchers have tried to establish how best to encourage people to live in more sustainable ways. Social psychology based research, drawn from work on Health Behavior Change (Prochaska and Velicer, 1997), aimed to establish the connection between information and awareness, attitudes and values and behaviors and built environments. Heuristics from this work included 'stages of change,' 'self-efficacy,' 'small steps lead to big steps,' and 'spill-over effect' (Kasser, 2011; Hargreaves *et al.* 2012).

Social Practice Theory

Social Practice theory looks at constellations of devices, skills, actions and meanings that form the slow-changing/inertial habits and habitats of everyday life. It designs immersive ethnographies to help identify opportunities for innovation in existing practices, and to facilitate the design of multiple interventions that can help create new, more sustainable forms of everyday life (Shove, 2009, 2010).

Alternative Economics

The transition to sustainable futures will require the development of new kinds of equitable and integrated economic systems in which most needs can be satisfied locally while some remain reliant on global networks. Exploring alternative modes of exchange (*outside the dominant economic paradigm*) whose objective is the satisfaction of needs for everyone (*as opposed to the generation of profit for a few*) is an important cornerstone to developing transition solutions (Korten, 1999, 2010; Douthwaite, 1996; Mander, 2012).

Worldview

Living in and through transitional times requires a new way of 'being' in the world. Environmentalist and physicist Fritjof Capra has argued that the myriad problems confronting society in the 21st century are interconnected and interrelated and can be traced to a single root problem which is a 'crisis in perception.' He defines this crisis in perception as a mechanistic / reductionist worldview, inadequate for understanding the nature of complex systems. A shift to a more holistic/ecological worldview is one of the most powerful leverage points for transition to sustainable futures (Capra, 1983; Capra & Luisi, 2014; Clarke, 2002; Toulmin, 1990; Tarnas, 2010; Meadows, 2008).

Goethean Science & Phenomenology

Artist and poet Wolfgang von Goethe developed a phenomenological approach to understanding the 'wholeness' of natural organisms, particularly plants. This understanding focused on the temporal dynamics of growth, maturation and demise and looked at the symbiotic, holarchic relationship between part and whole (Bortoft, 1996, 2012; Amrine *et al.*, 1987; Hoffman, 2007; Seamon, 1998).

The Transition Design Framework

The Transition Design Framework is a fluid, evolving body of knowledge and ideas, often from outside design, whose objective is to provide designers with new tools and methodologies to initiate and catalyze transitions toward more sustainable futures. The framework outlines four mutually reinforcing and co-evolving areas of knowledge, action and self-reflection: 1) *Vision*; 2) *Theories of Change*; 3) *Mindset & Posture*; 4) *New Ways of Designing* (See Figure 5).

1. Vision for Transition

Transition Design proposes that more compelling future-oriented visions are needed to inform and inspire projects in the present and that the tools and methods of design can aid in the development of these visions. Transition Studies researchers draw on the work of Future Studies research (Dator 2002), especially the process of backcasting – building consensus around a sustainable future vision and then planning backwards to determine how best to get to that objective from our current state. Design has a rich history of future vision-directed designing, especially in the North American tradition (see the work of the Streamliners, Raymond Loewy and Norman Bel Geddes, especially at the New York World's Fair of 1939). However, the contemporary practice of design brings three distinct qualities to Vision for Transition. The first is that designers envision not only desirable futures but also playful or thought-provoking futures. A special practice known as '*Speculative Critical Design*' builds plausible but unlikely futures in order to help communities explore what is possible and desirable. The second is that designers build scenarios around near-futures in

which participants can try out (or imagine themselves trying out) new practices. There is an important relation between niche experimentation in Multi-level Transition Theory and the enactment of design scenarios that needs further research. Thirdly, designers work iteratively, modifying visions of prospective design solutions as they develop a deeper understanding of the problem and detail aspects of the solution. In this way, future visions are motivating, and can even serve as frameworks within which to evaluate design moves, but they nevertheless remain modifiable rather than fixed (situated in the language of Lucy Suchmann 2006).

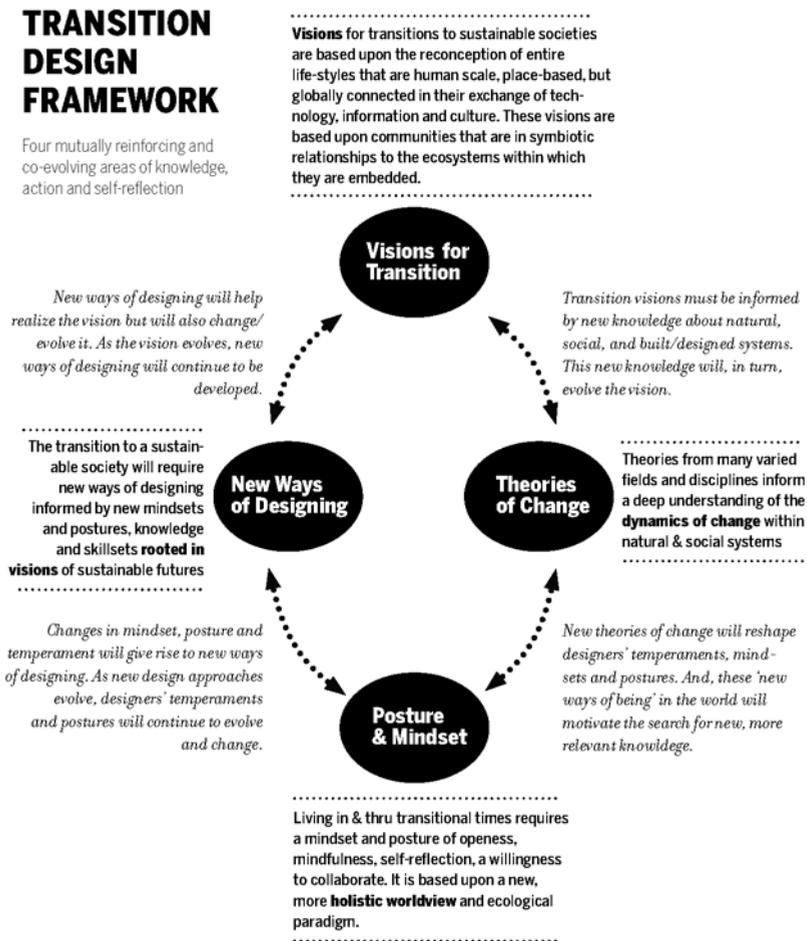


Figure 5. The Transition Design Framework: Irwin, Tonkinwise, Kossoff.

Transition Design proposes the development of future visions that are dynamic and grass-roots based, that emerge from local conditions vs. a one-size-fits-all process, and that remain open-ended and speculative. This type of visioning is a circular, iterative and error-friendly process used to envision radically new ideas for the future that serve to inform even small, modest solutions in the present. Visions of sustainable futures can provide a means through which contemporary lifestyles and design interventions can be assessed and critiqued against a desired future state and can inform small design decisions in the present. Various design approaches have diversified our ability to imagine the future, and inspire short, mid- and long- term solutions. Examples include Critical and Speculative Design (Dunne & Raby- 2013; Pierce *et al.*- 2015; Bardzell *et al.*- 2014; Michael- 2012) and backcasting and scenario based initiatives such as Manzini and Jegou's Sustainable Everyday (2003) and Jonathon Porritt's "*The World We Made*" (2013).

2. Theories of Change

Never in history has the need for change been more urgent (Max-Neef 2011). Yet, transfor- mational societal change will depend upon our ability to change our ideas about change itself –how it manifests and how it can be catalyzed and directed. Systems-level, ongoing societal change is inherently transdisciplinary– it must be informed by ideas, theories and methodologies from many varied fields and disciplines.

As a relatively recent discipline, design tends to be practice-based rather than informed by established principles/theory. We have indicated that as design expands its scope into the territory of 'transitions' it has become more research-based. Given the complex and political nature of sociotechnical change, it is important that designers learn to be more explicit about the rationales for their interventions. We therefore insist that Transition Designers work with well-articulated 'Theories of Change.' Theories of Change is a key area within the Transition Design Framework for three important reasons:

1. A theory of change is always present within a planned/designed course of action, whether it is explicitly acknowledged or not;
2. Transition to sustainable futures will require sweeping change at every level of our society;
3. Our conventional, outmoded and seemingly intuitive ideas about change lie at the root of many wicked problems (Irwin, 2011; Scott, 1999; Escobar, 1995).

A new, transdisciplinary body of knowledge is emerging that explains the dynamics of change within complex systems and challenges our current paradigms and assumptions. These ideas have the potential to inform new approaches to design and problem solving. Ideas and discoveries from a diversity of fields such as physics, biology, sociology and organizational development have revealed that change within open, complex systems such as social organizations and ecosystems manifests in counter-intuitive ways. And, although change within such systems can be catalyzed and even gently directed, it cannot be

managed or controlled, nor can outcomes be accurately predicted (Capra & Luisi, 2014; Wheatley, 2006; Meadows, 2008; Briggs & Peat, 1990; Prigogine & Stengers, 1994).

3. Posture and Mindset

Living in and through transitional times calls for self-reflection and new ways of 'being' in the world. Fundamental change is often the result of a shift in mindset or worldview that leads to different ways of interacting with others. Our individual and collective mindsets represent the beliefs, values, assumptions and expectations formed by our individual experiences, cultural norms, religious and spiritual beliefs and the socio-economic and political paradigms to which we subscribe (Capra, 1997; Kearney, 1984; Clarke, 2002). Designers' mindsets and postures often go unnoticed and unacknowledged but they profoundly influence what is identified as a problem and how it is framed and solved within a given context. Transition Design asks designers to examine their own value system and the role it plays in the design process and argues that solutions will be best conceived within a more holistic worldview that informs more collaborative and responsible postures for interaction. Transition Design examines the phenomenon of mindset and worldview and its connection in wicked problems (Kearney, 1984; Linderman, 2012; Tarnas, 2010; Capra and Luisi, 2014; Irwin, 2011a). Figure 6 contrasts the dominant worldview/mindset with a more holistic one that would inform new postures and approaches to designing.

4. New Ways of Designing

When the three previous areas (visions, theories of change and new mindsets/postures) are brought to bear on Service Design, Design for Social Innovation and Design for Policy, it constitutes 'new ways of designing' for transitions.

Transition Designers work in three broad areas:

1. They develop powerful narratives and visions of the future or the 'not yet' (Bloch, 1995; de Sousa Santos, 2006).
2. They amplify and connect grassroots efforts undertaken by local communities and organizations (DESIS, 2009; Manzini, 2003, 2015). Service design or social innovation solutions can be steps within long-term transition solutions.
3. They collaborate in transdisciplinary teams to design new, innovative and place-based solutions rooted in and guided by transition visions.

Although Transition Design can be considered a distinctive way of designing, it is complementary to other design approaches such as design for service and design for social innovation. Designers have the ability to contribute along a spectrum that ranges from design within existing paradigms (in which design is practiced primarily within the commercial marketplace) to design of and for radically new paradigms that challenge the status quo and are based upon equity and quality of life.

Mindset (Worldview & Values)		Posture (Approach)
Dominant	Holistic	New
World Metaphor: World as a machine, 'parts' and are separate and independent of each other.	World Metaphor: World as a living organism, 'parts' are self organizing, interdependent, mutually influencing and reinforcing and co evolving.	Posture of humility, reverence for nature and acknowledgement of human ignorance (we can never fully understand or 'manage' complex natural or social systems); any action may have unseen short and long term ramifications. Actions and solutions are conceived with welfare of the natural world and future generations in mind.
Human Presence: humans are viewed as separate from, and superior to, other forms of life and the natural environment.	Human Presence: humans are viewed as part of an interdependent web of life that includes other species and the natural environment.	
Nature: is viewed as a storehouse of resources for human use and consumption.	Nature: is viewed as the context for human life; human health is directly connected to the health of the natural environment.	
Timeframe: Conceives actions in short horizons of time with the welfare of self and present generation in mind.	Timeframe: Conceives actions in long horizons of time with the welfare of present and future generations in mind.	
Environmental & Social Crises: (if acknowledged) are viewed as things that can be fixed within existing socio economic political paradigms through technology, economic growth and 'business as usual'.	Environmental & Social Crises: are viewed with optimistic grumpiness, dissatisfaction with status quo and a sense of urgency combined with the belief that positive change is possible but only within new, alternative paradigms.	Posture of action and sense of urgency tempered with patience to carefully observe short term ramifications of actions and consider their long-term implications . Commitment to the development of radically alternative socio economic political forms.
Individual vs. Community: focus is placed on the individual and their own self fulfillment with an emphasis on material wealth/possessions.	Individual vs. Community: focus is placed on community and fulfillment through interdependence, reciprocity and belonging.	Willingness and desire to collaborate and foster positive interactions among groups is seen as an essential skill.
Business & Economy: are viewed as the context for everyday life. Focus placed on career, earning power and personal identity/reputation. Disciplinary expertise and individual achievement is highly prized.	Business & Economy: everyday life is viewed as the primary context for problem solving. Business and the economy exist to satisfy human needs, without compromising the ability of other species/ future generations to meet theirs. Focus placed on quality of life and the bonds of community. Disciplinary expertise is best realized through trans/cross disciplinary collaboration.	Commitment to balance in one's own life and others' lives. Ability to collaborate effectively in transdisciplinary groups is seen as a vital skill and source of satisfaction/reward.
Problem Solving: focuses on individual parts (de contextualization), emphasizes and values disciplinary expertise, strong belief in linear cause and effect outcomes, predictability and control and privileges quantifiable and replicable results.	Problem Solving: focuses on understanding the whole system (context) in order to solve for a part, emphasizes transdisciplinary collaboration and understanding the emergent (and therefore unpredictable) properties of social and natural systems, privileges qualities and values.	Embraces transdisciplinary knowledge and collaboration as the optimum basis for coordinated action and problem solving. Involves posture of tinkering or 'shepherding' solutions into existence.
Competition vs. Cooperation: belief in competition and proprietary knowledge as the pathway to success. Effective action and solutions take place within the dominant, single bottom line economic paradigm/marketplace.	Competition vs. Cooperation: belief in cooperation and open source information/knowledge ('the commons'). Effective action and solutions are conceived within alternative economic models.	Commitment to sharing information and knowledge as the basis for improving conditions of the whole (so city and the environment). Generosity and sharing are seen as essential attributes.
Predictability & Control: sees lack of order and chaos as a problematic and something to be 'fixed'. Pre conceived solutions based upon predicted outcomes are 'imposed' within top down, often centralized structures.	Predictability & Control: sees chaos as a rich bed of possibilities where new forms of order and behavior arise spontaneously and unpredictably at the grass roots level. These dynamics can be leveraged/amplified in the formulation of solutions but change cannot be predicted or controlled.	Posture of watchful anticipation and willingness to look for the clues for how to act in the system itself. Trust that the seeds of solutions are already present in what is perceived as chaos
Ambiguity & Uncertainty: viewed as an undesirable state and/or as a problem to be solved.	Ambiguity & Uncertainty: viewed as a natural component of the process of change within social and natural systems.	Posture of flexibility and comfort with uncertainty combined with a desire to be grounded, yet open to new ideas and ways of acting
Designers' Role: designers see themselves as expert practitioners and problem solvers, working alone or in positions of leadership within cross disciplinary teams.	Designers' Role: designers see themselves as change agents and catalysts for positive social/environmental change in a co design process that involves both leadership and followership.	Posture of humility and an openness to both lead and be led, commitment to be aware of when one has stepped out of one's domain of expertise .
Pace: emphasis on face paced processes that arrive at solutions quickly and efficiently; time is money.	Pace: emphasis on a slower, mindful approach and consensus building with multiple constituencies. Focus on development of longer term solutions.	Posture of patience and a willingness to learn and acknowledge what one doesn't know.

Figure 6. Irwin, Design and Culture Journal, July 2015. Contrasting existing vs. new postures & mindsets.

Figure 7 shows three areas of design focus (Design for Service, Social Innovation and Transition Design) situated along a continuum in which project horizons of time, depth of engagements and socio-economic and political contexts increase as we move from left to right. Service Design is situated on the left and involves expert designers working on short-term, multi-stakeholder projects, primarily within the business and consumer marketplace. Social Innovation occupies a position further along the continuum where projects are usually situated within social and community contexts, engagements are ideally longer and solutions begin to challenge existing socio-economic and political paradigms.



Figure 7. Continuum of design approaches. Irwin 2015.

Transition design can be positioned at the right end of the continuum where speculative, long-term visions of sustainable lifestyles fundamentally challenge existing paradigms and serve to inspire and inform the design of 'short' and mid-term solutions. Transition design solutions have their origins in long-term thinking, are lifestyle-oriented and place-based and always acknowledge the natural world as the greater context for all design solutions. Transition visions could serve as 'leverage points' within projects undertaken in the service and social innovation sectors by networking and linking them together so that they form steps within a longer transition toward a desired future.

Distinguishing Features of Transition Design(ers)

Designers working within the social innovation space have developed important new approaches drawn from sociology, organizational science and business (to name a few) and these can and should be expanded and deepened in the emerging area of transition design. This type of work requires a commitment to on-going learning and personal change as well as a kind of 'stick-to-itiveness'; a commitment to change the system through multiple, iterative interventions and the tenacity to persist and change with it, over time. Transition design is distinct from service design or social innovation design in its deep grounding in future-oriented visions, its transdisciplinary imperative, its understanding of how to initiate and direct change within social and natural systems and its emphasis on the temporality of solutions.

Transition Design is also characterized by:

- Leveraging living systems theory as an approach to understanding wicked problems and designing solutions to address them.
- Designing solutions that protect and restore both social and natural ecosystems through the creation of mutually beneficial relationships between people, the things they do and make (design) and the natural environment.
- Privileging everyday life and lifestyles as the fundamental context for design solutions.
- Advocating solutions that are place- and ecosystem-based, but connected to global networks to leverage an exchange of knowledge and technology.
- Designing solutions for short, medium and long horizons of time and all levels of scale of everyday life.
- Looking for emergent possibilities within problem contexts and amplifying grassroots solutions already underway (the seeds for solutions are always within the problem space/ context).
- Linking existing solutions together for greater leverage and to serve as steps in a larger transition vision.
- Distinguishing between 'wants/desires' vs. genuine needs and basing solutions on maximizing and integrating satisfiers for the widest range of needs (Max-Neef 1992)
- Viewing the designer's own mindset and posture as an essential component of transition designing; understanding how worldview and posture influences problem finding, framing and solving.

- Calling for the reintegration and re-contextualization of diverse transdisciplinary knowledge.

Educating for Transition Design

In fall, 2015, The School of Design at Carnegie Mellon University launched new programs and curricula that begin to integrate Transition Design at the undergraduate, graduate and doctoral levels (See Figure 8).

Design for Interactions is the over-arching programmatic theme and refers to design for the interactions between people (social), the built (designed) world and the environment (natural world). These interactions involve the design of communications, products and physical/digital environments (sub-disciplines). Students apply their sub-disciplinary skills on projects situated within three areas of design focus: Design for Service, Design for Social Innovation and Transition Design. All programs and curricula acknowledge the social and natural worlds as the larger context for all design problems and solutions. A unifying design studies track runs through undergraduate, graduate and doctoral curricula and in addition to history and theory, introduces values, ethics, sustainability and the topic of transition. The School also offers a PhD and professional doctorate (DDes) in Transition Design.

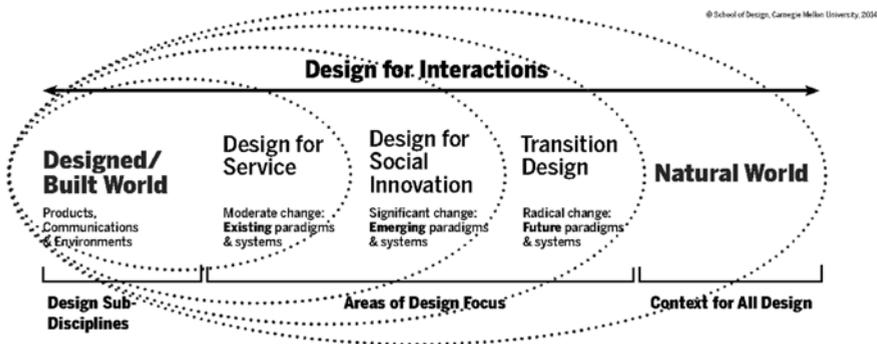


Figure 8. Framework for new design curricula at the undergraduate, graduate and doctoral levels at the School of Design, Carnegie Mellon University. Launched Fall, 2015.

Transition Design is introduced at the undergraduate level through readings, lectures and studio-based exercises. Masters students conduct design research that informs projects situated in either Design for Service or Design for Social Innovation areas, but within the context of the continuum in figure 7. Doctoral students undertake research in or related to Transition Design and all masters and doctoral students are required to take a semester-long seminar in the subject.

Teaching Materials

Within the past year, a number of teaching materials have been developed and are being shared with other design programs around the world with the aim of creating an international network of Transition Design educators. These include a course syllabus and outline for a graduate and doctoral seminar in Transition Design, an extensive bibliography, templates for developing transition design case studies and a number of articles on the subject (Irwin, 2015; Kossoff, 2015; Tonkinwise, 2015). Case studies are based upon the analysis and critique of existing projects/solutions. Using Transition Design principles, designers can evaluate existing projects as the basis for conceptualizing new Transition Design solutions. Part one of the case study critiques an existing project from a transition point of view and part two proposes a transition solution using the original project as the springboard. Transition Design approaches for the critique and design of new solutions include:

Re-conceiving

The case study is used as the jumping off point for reconceiving the project. Although it may retain many of its original features, the new concept has evolved significantly enough to appear 'new'. The case study's purpose in this example is to spark new thinking that leads to a transition solution.

Connecting/Integrating

The case study becomes the starting point or 'node' in a network of other projects and relationships that create new synergies and that may spawn new products, services or systems. This approach is akin to seeding and growing an 'ecosystem' in which complementary and symbiotic relationships between entities are part of the act of designing as demonstrated in permaculture design and Zeri Clusters (Capra, 2021 p. 445). In ecosystems, principles of self-organization, emergence and diversity are keys to health and growth. The transition designer looks for and leverages these principles when connecting previously unrelated projects and monitors the system over time to shift, change or refine the connections as needed.

Amplifying/Leveraging

The case study is used to create what the philosopher Bakhtin called “the buds and shoots of new potentialities.” The transition designer is prompted to look for trends and similar or complimentary projects that already exist that can be connected to leverage or amplify and create a tipping point (Gladwell, 2000; Manzini, 2015) in a planned transition. The “Amplify” project undertaken at Parsons the New School, NYC is an example of how amplifying grassroots efforts can be the foundation for significant change at varying levels of scale (DESI 2009).

Scaling

The transition designer sees potential for a project to be scaled in one or more dimensions (up or down), for greater impact. For example, scaling the project over time toward a desired future (through strengthening, expanding, resourcing, etc.), or scaling up from a local to a regional and/or global level or scaling down to become place-based and networked.

Protecting/Restoring

The case study is used as a lens through which to diagnose the health of relationships present in a project or initiative and its larger context (system). Transition designers assess relationships in the social and environmental spheres and look to improve, protect and/or strengthen them over time. An example might be designing interventions to restore a local polluted ecosystem or watershed in order to improve the lives of the people in the immediate area. Such a solution must unfold over time (at the speed at which ecosystems are capable of restoring themselves). Small interventions/restorations would be connected to a long-term vision with goals and metrics to measure health, biodiversity, vibrancy of the culture, renewal of local economies, etc.

Case study templates also ask students to map existing projects/initiatives/situations according to project sector, the area(s) of initial design focus, the levels of spatiotemporal scale at which it is designed to exist and assess its potential to become part of a transition solution. Students also map the connections to wicked problems at higher levels of scale and evaluate whether the solution is meeting genuine needs or is based upon pseudo satisfiers or inhibitors (Max-Neef, 1992).

Conclusion

This paper has argued that designers and the research methods and problem solving approaches they employ have the potential to contribute to solutions in the fields of transition studies and transitions management. The authors have proposed a new area of design study, practice and research—Transition Design. A Transition Design Framework has been developed to enable the introduction of the concept of transition at the undergraduate, graduate and doctoral levels and is being shared with design educators around the world.

The authors welcome feedback and propose that opportunities for collaboration and research be explored between the design and transition studies/management communities.

Notes

1. Manzini (2015) makes a distinction between 'diffuse' and 'expert' design. Diffuse design is performed by non-experts with their natural designing capacity, often within the context of other fields and disciplines. Expert design refers to the tools and methodologies that professional designers bring to finding, framing and solving problems.

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Resumen: El siguiente documento tiene como objetivo proporcionar algo de la historia y la teoría del diseño que se está utilizando en la Escuela de Diseño de la Universidad Carnegie Mellon en su esfuerzo por constituir la práctica del Diseño para la Transición. Explica cómo la profesión y la disciplina del diseño están experimentando una rápida expansión y transformación que permiten un rico conjunto de marcos para el Diseño para la Transición. Este artículo argumenta que los diseñadores no solo pueden y deben aprender de los estudios para la transición, sino que el diseño puede contribuir recíprocamente a través de nuevos enfoques para enmarcar problemas relacionados con el cambio sociotécnico dentro del contexto de ecosistemas complejos.

Palabras clave: Diseño de transición - Estudios de transición - Historia y teoría del diseño - Cambios sociotécnicos - Ecosistemas complejos.

Resumo: O documento a seguir tem como objetivo fornecer um pouco da história e da teoria do design que está sendo usada na Escola de Design da Universidade Carnegie Mellon em seu esforço para constituir a prática do Design for Transition. Explique como a profissão e a disciplina de design estão passando por uma rápida expansão e transformação que permite um rico conjunto de estruturas para o Design for Transition. Este artigo argumenta que os designers não apenas podem e devem aprender com os estudos de transição, mas que o design pode contribuir recíprocamente por meio de novas abordagens para enquadrar problemas relacionados à mudança sociotécnica no contexto de ecossistemas complexos.

Palavras chave: Projeto de transição - Estudos de transição - História e teoria do projeto - Mudanças sociotécnicas - Ecosistemas complexos.