Framing Across System Scales and Timeframes

Supporting designers in reasoning toward transition design interventions

Goss, Hannah M.; de Koning, Jotte I.J.C.; Tromp, Nynke; Schifferstein, Hendrik N.J.

Publication date
2025

Document Version
Final published version

Published in
Relating Systems Thinking and Design, RSD13

Citation (APA)
Goss, H. M., de Koning, J. I. J. C., Tromp, N., & Schifferstein, H. N. J. (2025). Framing Across System Scales and Timeframes: Supporting designers in reasoning toward transition design interventions. In *Relating Systems Thinking and Design, RSD13* RSD Symposium.

Important note
To cite this publication, please use the final published version (if applicable).
Please check the document version above.

RIVERS OF CONVERSATIONS
RELATING SYSTEMS THINKING & DESIGN
RSD13 | OCTOBER 2024

Framing Across System Scales and Timeframes: Supporting designers in reasoning toward transition design interventions

Hannah M. Goss, Jotte I.J.C. de Koning, Nynke Tromp, and Hendrik N.J. Schifferstein

In recent years, designers have been increasingly active in dealing with societal transitions, using design and social innovation to drive systemic change. Transitions are long-term processes of systems change toward more desirable alternatives. In transition design, designers conceptualise and implement transition interventions to influence people's and society's behaviours, practices, and lifestyles. However, little is known about the design processes that lead to such interventions or the reasoning patterns that support a design process toward conceptualising transition design interventions. In the present paper, we explore how a transition design rationale—a design rationale tailored to the complexities of transition challenges—supports designers in making design decisions and clear argumentations for how proposed interventions foster desired transitions. We present two studies that investigate the development and application of a transition design logical framework. The first study was a grounded theory study on design reasoning, in which designers in a consortium developed interventions to foster the transition of the Dutch food system to less food waste. In this first study, the designers applied the transition design logical framework to strengthen the design reasoning for intervention proposals. The second study consisted of two evaluative workshops with designers who applied the framework to design interventions that fostered desired systems changes. The findings indicate that our transition design logical framework supports designers in framing the transition context in a way that makes it manageable to design for, increasing confidence in the efficacy of

proposed transition interventions. We found that a key challenge for designers' reasoning toward transition interventions is articulating individual and system behaviour changes integrally. We conclude the paper by reflecting on avenues for methodological development to further support transition design reasoning toward interventions. Additionally, we call on the systemic and transition design communities to continue refining and expanding a shared repertoire of behaviour change mechanisms that can effectively drive systemic changes.

KEYWORDS: transition design, design reasoning, design expertise, systemic design, framing

RSD TOPIC(S): Sociotechnical Systems; Methods & Methodology

Introduction

Transitions are viewed as complex, long-term processes of systems change, evolving over decades and involving various actors and sectors to promote innovation at all systems levels (Loorbach, 2007). A core ambition of transitions research is to understand these processes and explore possibilities to advance and accelerate desired transitions (Loorbach et al., 2017). Transition management, a field within transitions research, is concerned with analysing transitions and formulating interventions and actions towards systems change (Loorbach, 2007). A key element of transition management processes is the practice and activity of creating a shared vision and formulating strategic pathways, as these are essential for building collective commitment and mobilising action towards shared and desirable futures (Loorbach, 2010; Mok & Hyysalo, 2018). As such, vision and pathway building are common first steps in transition design processes, reflecting the significant shifts needed in technological, social, organisational, and institutional structures (Gaziulusoy & Ryan, 2017b; Goss et al., 2024; Irwin, 2015).

Transitions result in mainstream practices becoming outdated and being replaced by new, ideally more sustainable alternatives (Gaziulusoy & Brezet, 2015; Scott et al., 2012). Practices are characterised as routinised behaviours performed in a large part of society (Reckwitz, 2002). They are made up of materials (objects and interventions),

competences (necessary skills and knowledge), and meanings (social and symbolic values) (Shove et al., 2015). To disrupt entrenched practices and facilitate new ones, interventions must consider and address routines in daily life (e.g., food provisioning) and not isolated actions (e.g., occasionally choosing near-expired food). By designing interventions that (re)shape and (re)configure practices, designers can have lasting effects on the behaviours, practices, and lifestyles of people and society.

The reconceptualisation and reimagination of whole systems towards desirable alternatives make transitions suitable design challenges, with design contributing valuable expertise (Dorst, 2019b; Gaziulusoy & Ryan, 2017a; Irwin, 2015; Loorbach, 2022; Vervoort et al., 2024). For instance, human-centred design practice is particularly valued for its ability to make change meaningful for people and society (Tromp & Hekkert, 2018; van der Bijl-Brouwer & Dorst, 2017). Other design skills, such as imagining and depicting futures others want to act upon, reframing and challenging existing practices, integrating diverse perspectives, and developing artefacts that foster systemic changes, are also valued in transition design challenges (Dorst, 2019b; Gaziulusoy & Ryan, 2017a; Goss et al., 2024; Hyysalo et al., 2019; Mok & Hyysalo, 2018). As such, over time, more designers are engaging in complex societal issues and transitions, requiring them to make informed choices, exercise judgment, and take responsibility for their interventions' effectiveness in achieving desired outcomes (Dorst, 2019a; Hekkert & van Dijk, 2011; Tromp & Hekkert, 2018).

However, proposing interventions is a challenging task in transition design challenges due to complexities like multi-stakeholder involvement, diverse knowledge fields, multiple problem owners, interconnected and dynamic problems, and the need to navigate multiple system scales (macro, meso, micro) and timeframes (now, near future, far future) simultaneously (Dorst, 2015; Goss et al., 2025; Loorbach et al., 2017). While design tools and methods exist to support conceptualising system-shifting interventions (Drew et al., 2022), they often fall short of supporting designers in bridging system understanding and conceptualising new interventions (Goss et al., 2021; Goss et al., 2025). Typically, they help in understanding the problem and context without supporting the conception of intervention proposals, or they focus on implementing, scaling, or optimising existing proposals for systemic change (Jones & Van Ael, 2022; Peeters et al., 2024). Although some studies have proposed concrete interventions

within transition design challenges (Gaziulusoy & Ryan, 2017a; Goss et al., 2025; Hyysalo et al., 2019), there is a need for further exploration of the reasoning and processes behind such proposals to support the conceptualisation of more effective interventions, especially as a strong transition design rationale can increase stakeholder alignment (Peeters et al., in review).

While transition processes ultimately aim for desirable alternatives, the tremendous scope allows for a variety of interventions to move through such processes and (temporarily) establish more desirable alternatives. The added complexities of transitions require more nuanced reasoning for how a proposed intervention with intended effects will contribute to desired transition values. The current paper presents two studies that explore how a transition design rationale—a design rationale tailored to the complexities of transition challenges—supports designers in making design decisions and developing clear argumentations for how proposed interventions foster desired transitions. In the first study, we investigated design reasoning, the findings of which supported the development of the logical framework presented in this paper. In this first study, designers applied the framework to strengthen the reasoning behind design proposals. This was followed by a second study, where we conducted evaluative workshops—one with design practitioners and another with design students—where participants applied the proposed framework to design interventions for transitions. Based on these studies, we offer avenues for methodological development to better understand how designers can be supported in conceptualising transition interventions based on a strong transition design rationale.

In the next sections, we present our transition design logical framework and the reasoning behind it.

Design reasoning

Designers engage in a reasoning pattern known as design abduction, which involves hypothesising how their design proposals will deliver specific value to users and/or stakeholders (Cross, 1982; Dorst, 2011; Schön, 1987). This process, depicted in Figure 1, comprises a what (design) and a how (mechanism/working principle) that together achieve a desired value (desired outcome) (Dorst, 2011). Typically, designers begin with the intended value they wish to achieve and work backwards to formulate the

intervention and its mechanisms. However, this becomes challenging when there is no predetermined formulation of *what* new intervention(s) to propose and no known or chosen *how* to achieve the value. To navigate this uncertainty, designers employ framing—a process of proposing if/then statements to predict how a mechanism will achieve desired values (Dorst & Cross, 2001). When filled in, the logical framework (Figure 1) reflects the reasoning, i.e., design rationale, behind a design proposal.

Framing is an essential design practice, occurring in the process of co-evolution between a frame and a solution (Dorst & Cross, 2001). To illustrate with an example: if a designer aims to create something to make people feel special (value) for a commercial internet provider, a birthday can be a frame to hypothesise what working principle might lead to this value, like receiving personal attention (how). This frame supports the ideation of interventions, for example, addressing people by their names in automated mailings (what). In simple design challenges, like in this example, evaluating a frame based on its ability to support the generation of a variety of new and original design ideas is likely sufficient. However, in the more complex transition design challenges, this quality is not sufficient as there are more considerations to take into account, such as multiple stakeholders, diverse knowledge fields, and multiple system scales (macro, meso, micro) and timeframes (now, near future, far future) (Dorst, 2015; Goss et al., 2023, 2025; Loorbach et al., 2017).

In a recent paper, van der Bijl-Brouwer et al. (2024) adapted Dorst's logical framework to support systemic design reasoning, adding the distinction between individual and stakeholder value, change mechanisms, and broader societal benefits (Figure 2). While this expanded framework accounts for multiple stakeholder values and relates to different system scales, it does not relate to different timeframes of systems change (Goss et al., 2025).

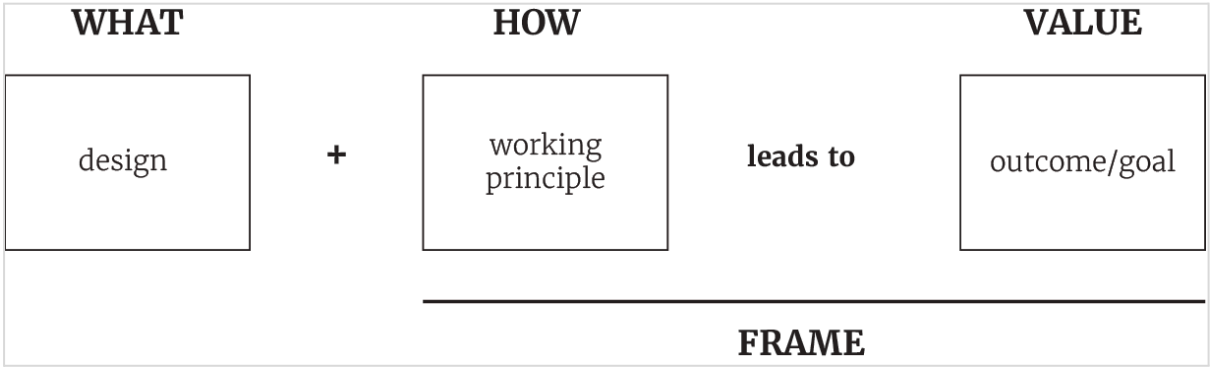

Figure 1: Design reasoning framework adapted from Dorst (2011).

Within transitions, multiple frames—ranging from the individual (micro), group (meso), and societal (macro) levels—coexist and interact (Peeters et al., in review). These frames also extend across timeframes, from immediate to long-term (Goss et al., 2025). Yet the challenge for designers lies in linking these frames—connecting the understanding of a desired transition to specific pathways and concrete interventions. This requires translating a vision and pathway into actionable interventions by identifying behavioural mechanisms that offer value to both individuals and the system.

Building on the work of Dorst (2011) and van der Bijl-Brouwer et al. (2024), the next section introduces our proposed logical framework to support the practice of transition design reasoning toward interventions.

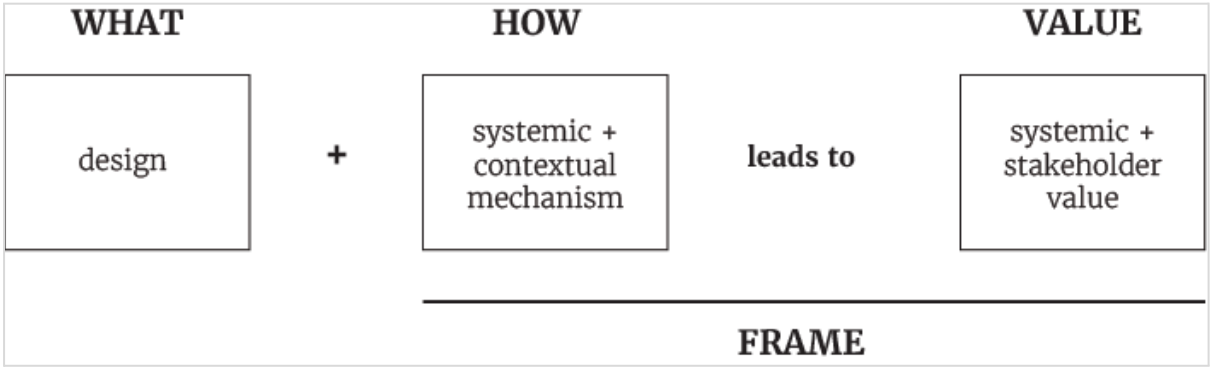

Figure 2: Logical framework for societal challenges adapted from van der Bijl-Brouwer et al. (2024).

Transition design logical framework

Our proposed framework, illustrated in Figure 3, supports designers in reasoning toward transition design interventions by temporarily simplifying the complexity of the design challenge. It makes the transition context manageable to design for while keeping the broader context and goals in mind. A distinction made in the proposed framework is the focus on behaviour at both an individual and systems level. This focus stems from the fact that transitions result in the adoption of new practices that offer new meaning, competences, and materials to people and society. As such, transition interventions should yield individual and system behaviour changes that offer value(s) to both.

In design projects, the desired values are often the only known variable. In transition design, the ultimate values or ambitions guiding the transition are usually conceptualised through a vision and pathway(s) toward a desired future. As such, our framework becomes applicable once the ultimate values (and perhaps also the pathways) are initially defined. It then helps the designers define the pathways and conceptualise interventions, aligning behaviours and values in a way that contributes to the transition.

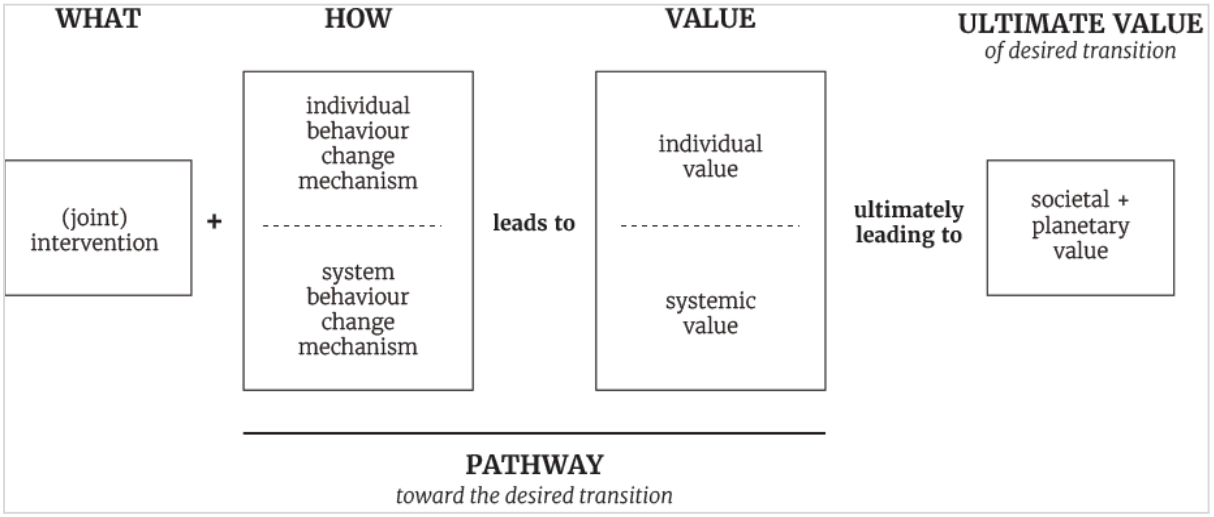

Figure 3: Logical framework for transition design challenges.

Framework elements

The Ultimate Value(s) & Pathway:

Our framework asks designers to articulate the *ultimate societal and planetary values* aimed for in the transition, along with defining a promising direction or *pathway* to achieve these values, thereby setting boundaries within the design context. Ideally, this process is supported by a vision of the desirable future. For example, in the Dutch food waste transition, if a designer adopts a future vision with enough food for all with minimal waste, they might prioritise food security and reducing the food system's greenhouse gas emissions as key values. A potential pathway, such as *celebrating the food journey,* could be defined to enhance the appreciation and value of food, thus reducing food waste and achieving desired systems change (Goss et al., 2024).

The How(s) and Value(s):

Transitions aim to reconfigure and evolve practices toward sustainable alternatives, requiring a deep understanding of how individual behaviours and broader systemic actions are interlinked. Daily behaviours shape practices, and thus, changes at the individual level can affect and be affected by system-level changes (Kuijer & de Jong, 2012; Liu & McCarthy, 2023). As such, designers using our framework are tasked with identifying mechanisms that can change behaviours at both individual and systems levels, evaluating how each contributes value in light of the ultimate transition values

and pathway. For instance, if a designer identifies *celebrating the food journey* to increase the appreciation and value of food as promising toward the food waste transition, the challenge is defining what this means for individuals and the system and determining how it can facilitate desired behaviour changes.

The What(s):

Addressing complex systems change requires more than isolated one-time interventions within organisational silos. It requires a collaborative approach involving various stakeholders and organisations to create diverse, coordinated, and continuous strategies for change (Loorbach, 2007; van der Bijl-Brouwer & Malcolm, 2020). This involves viewing interventions as parts of a larger and interconnected ecosystem, enabling the development of an intervention portfolio that can address the behaviours and values relevant to transitions (Loorbach, 2007; van der Bijl-Brouwer & Malcolm, 2020). Therefore, a portfolio approach allows several interventions to be explored, selected, and amplified based on their impact. The type of interventions can vary—ranging from policies, products, services, campaigns, and proposing new actors—depending on who is implementing them and their location in the system. Diversifying the type of interventions supports onboarding diverse stakeholders and positioning them as drivers of the transition (van den Bosch, 2010). Additionally, diversifying interventions across a portfolio increases the likelihood of achieving desired outcomes and resilience of the future system, even if some of the interventions face challenges or do not facilitate desired changes in the portfolio. Given these qualities, our proposed framework promotes the design of joint interventions within a portfolio, positioning stakeholders and organisations as central drivers of transition.

General methodology

We conducted two studies to assess the efficacy of the proposed logical framework (Figure 3) in supporting designers in making informed design decisions and developing clear argumentations for how a proposed intervention will contribute to a desired transition. The first study was a grounded theory study on design reasoning. In this study, designers in a consortium working on transitioning the Dutch food system toward sufficiency developed interventions to reduce food waste in Dutch households. These designers applied the resulting framework to strengthen the design reasoning for

intervention proposals (Study 1). In the second study, we applied the framework in two workshops. The first workshop involved design practitioners addressing a societal challenge, and the second workshop included design students tackling a transition case (Study 2). Below, we describe each study and its outcomes.

Study 1: Grounded theory study within a research consortium

This study was executed as part of the FETE research project ("From Excess To Enough"), involving three Dutch universities and eight organisations from the food system. FETE is focused on reducing food waste by transitioning from a system offering abundant (and unnecessary) choices to one offering sufficient choices. The study, which helped develop the transition design logical framework, consisted of two stakeholder sessions and design ideation held over two weeks. Below, we focus on the activities undertaken by the designers in this process.

Study 1, set-up and procedure

In a first stakeholder session, five of the eight FETE partners—including a national nutrition centre, a food waste foundation, a food manufacturer, a waste collector, and a meal delivery service—explored their roles in the transition, identified innovation pathways, and developed two intervention concepts. The session built on a vision previously developed with input from all FETE partners, so participants were already aligned with the transition goals (Goss et al., 2024). The vision presented a future Dutch food system that provided enough food for all while minimising food waste by supporting new roles and relationships between the actors—consumers, producers, and retailers—and through developing new skills and behaviours.

Building on the session outcomes, the designers involved in FETE (first and third authors) conceptualised a new practice called Adaptable Consumption over three meetings. Adaptable consumption refers to a new practice where households have the ability to modify their food acquisition, preparation, and usage practices based on changing circumstances and available resources and sustain these practices over time as conditions evolve (Goss et al., 2025). In this process, the designers used the framework to strengthen the design reasoning for each intervention proposal. To communicate the practice, the designers developed a scenario depicting a consumer

engaging in the new practice in multiple situations over a one-week period and visualised seven interventions to support the consumer.

A second stakeholder session evaluated Adaptable Consumption from societal and business perspectives to enhance its effectiveness and feasibility. During the session, the same five FETE partners reviewed which behaviours and interventions were strongest and weakest to foster the transition. The session concluded with a collective discussion about the most promising interventions for FETE (Goss et al., 2025). Following the session, the FETE designers applied the framework to each intervention proposal again to strengthen the design reasoning, thereby increasing each proposal's (potential) contribution to the transition.

Study 1, findings and discussion

This section presents findings related to the design reasoning applied to the proposals by the FETE designers. The findings are organised around how the designers applied the framework and its elements. For a detailed overview of this study and the stakeholder sessions, see Goss et al. (2025).

The Ultimate Value(s) & Pathway:

The vision developed for FETE indicated the goal of the transition as *"having enough food for all with minimal waste"*. Additionally, it defined four potential pathways to this goal: 1) prioritising vitality and governing illness prevention, 2) embracing and highlighting flexibility, 3) celebrating and valuing the food journey, and 4) utilising technology to learn about ourselves as individuals and society. In the first session, FETE partners selected *'Embracing Flexibility'* as the preferred pathway, focusing on realigning food safety, quality, and sustainability.

The How(s) and Value(s):

With the Embracing Flexibility pathway defined, the designers decided to intervene in consumption behaviours to support food waste-free and flexible behaviours in daily life while also driving wider systemic change. They began conceptualising interventions by defining what behavioural changes at the individual and system levels might mean while considering the values these changes contributed. For example, individual behaviours were identified, such as storing leftovers effectively, assessing food quality with the

senses, and mixing and matching ingredients. Navigating between the individual and systems level behaviours and values, and the ideas for interventions was done simultaneously. Once the framework was filled in, each aspect was refined for coherence and persuasiveness. To explore and articulate the impact of the behaviours, the designers developed a scenario in the form of a comic strip depicting a consumer going through their week while engaging in the behaviours that supported flexibility toward less food waste.

The What(s):

The designers conceptualised a portfolio of interventions as part of Adaptable Consumption that addressed different moments in the consumer's food management journey, from planning to disposal, and different stakeholder contributions such as providing ingredients, composing recipes, waste collection, and education. All the interventions were household-focused, sensitive to the FETE partners who focused on the household context rather than agricultural production or retailing. To communicate the interventions, the designers visualised an innovation portfolio of seven concepts (Figure 4). The interventions were designed to have synergy and work together to enhance the overall effectiveness of Adaptable Consumption by offering complementary skills and meanings. For example, to learn to mix and match ingredients, the ingredient-less recipe book (intervention) can be supported by storing partially used food effectively (intervention).

When presenting the interventions to the FETE partners, some stakeholders suggested adjustments to better align with their organisational context. For example, one proposal was an app and a smart bin to offer insight into food waste data (Figure 5). The national nutrition centre noted that the intervention was high-tech, excluding some households. They advocated for re-evaluating the intervention's format (such as a physical bin insert) to maintain inclusivity without compromising the design reasoning, which was evaluated positively.

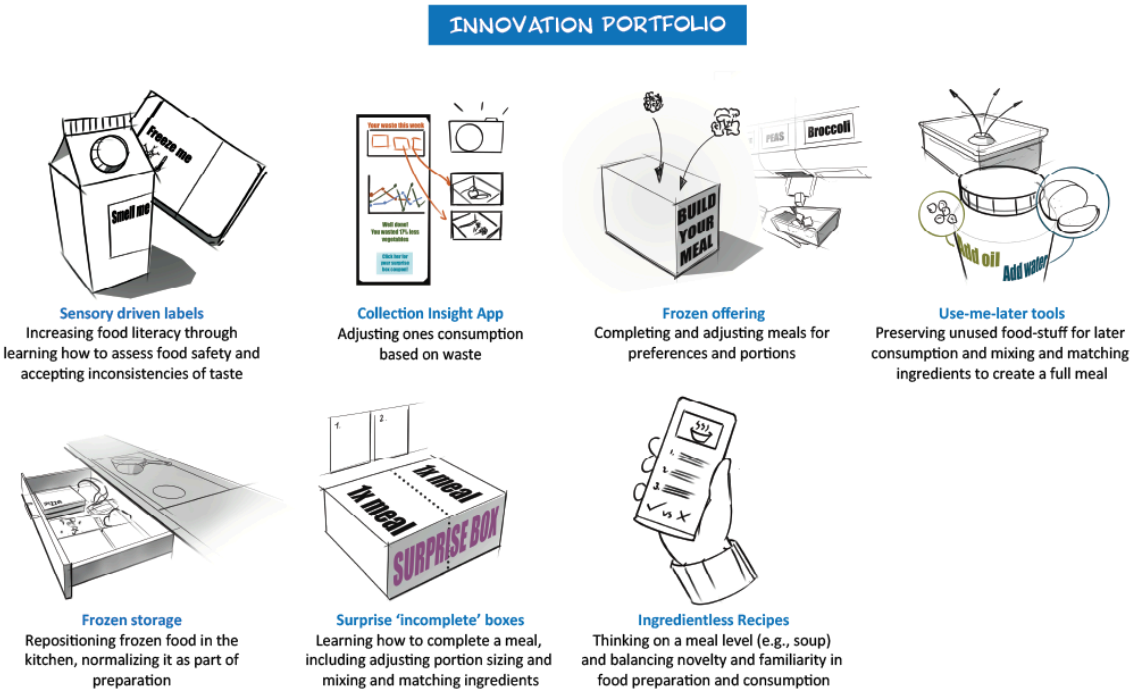

Figure 4: Intervention portfolio supporting Adaptable Consumption (drawings by Maria Sofia).

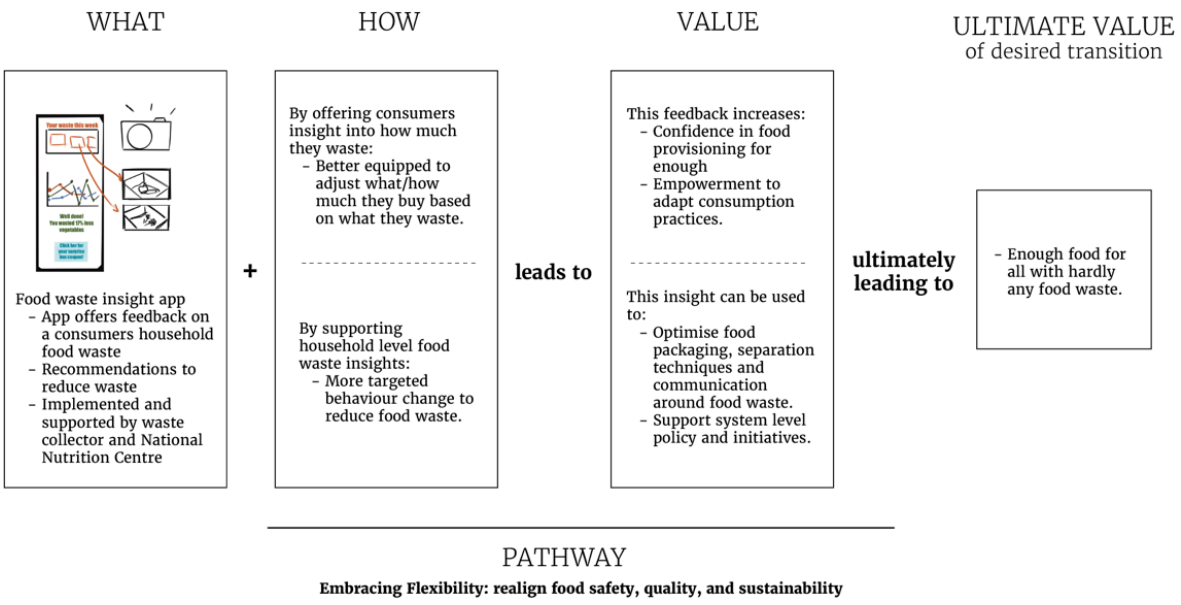

Figure 5: Framework for a food waste insight App.

Study 2: Evaluative workshop with designers

In Study 2, we conducted two workshops where participants applied the logical framework to develop design proposals. The workshops at the Faculty of Industrial Design Engineering at TU Delft focused on different participant groups and design challenges. For both workshops, participants provided oral consent for the audio recording of presentations and discussions and for photographing completed frameworks.

Study 2, set-up and procedure

Workshop 1 design practitioners

The first workshop involved 18 design practitioners during a two-day Systemic Design Masterclass at TU Delft. On the first day of the masterclass, participants developed systems maps of a complex challenge they were working on. This included developing a giga-map (Sevaldson, 2011) and an iceberg model (Stroh, 2015). Our workshop was held on the second day of the masterclass and lasted approximately 90 minutes. This workshop began with an introduction covering transition design concepts, focusing on challenges related to time and scales, and introducing the logical framework. Participants were divided into four groups of four to five people. They applied an empty framework (Figure 6) to the case they were working on. Two groups focused on designing for youth public participation in Europe, and two on youth eco-anxiety in the Netherlands. After applying the framework, the groups presented their interventions, describing how their design contributed to the societal challenge, their navigation through the framework, and any challenges.

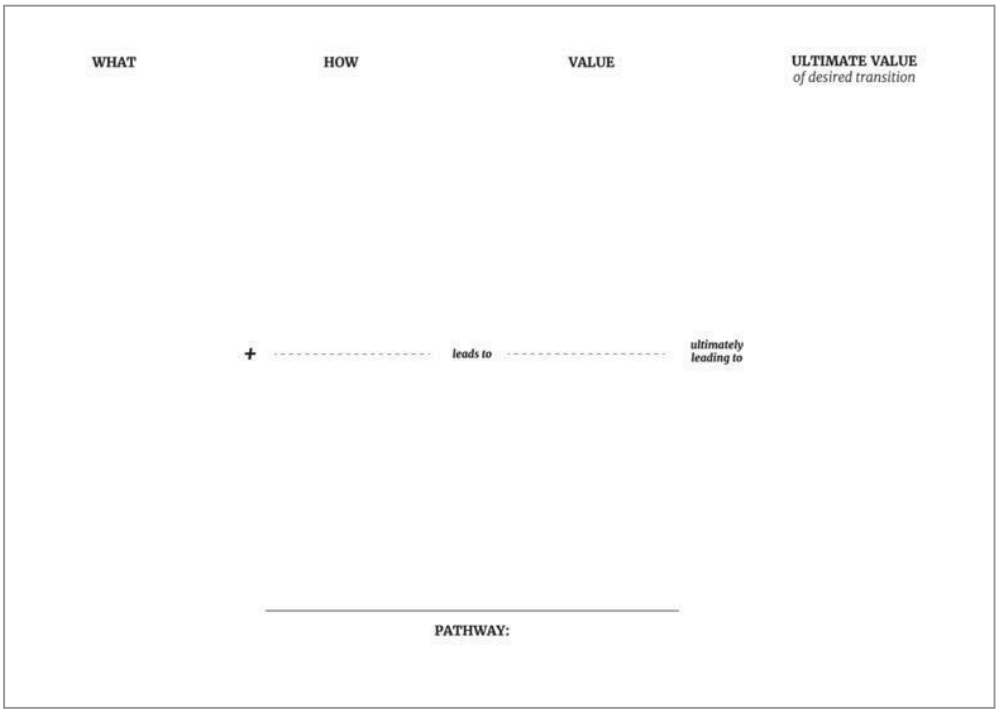

Figure 6: Empty framework applied in workshops.

Workshop 2 design students

Workshop 2, which lasted approximately six hours, involved 11 design students as part of a master's course at TU Delft. It began with an introduction, covering the concepts of transition design, focusing on challenges related to time and scales, and introducing the logical framework. Participants were briefed on two cases: designing for net-zero households in the Dutch energy transition and designing for food waste reduction in the Dutch food system transition. Each case provided visions, pathways, barriers, and key stakeholders. Students were grouped into five pairs or trios and chose one case to focus on. Next, participants received partially filled-in templates based on design reasoning from Study 1 (Figure 7) to help them understand the framework and design reasoning. Following this exercise, they applied the empty framework (Figure 6) to their selected case. After applying the framework, the groups presented their interventions, describing how their design contributed to the transition, their navigation through the framework, and any challenges.

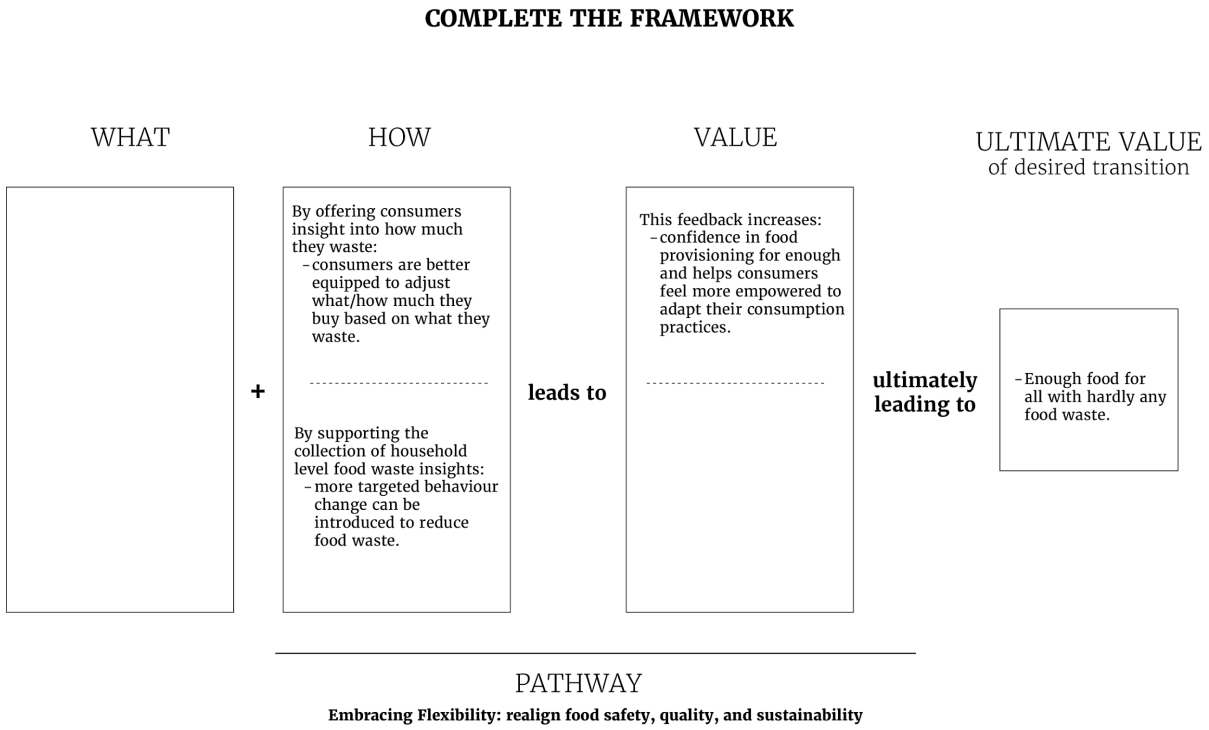

Figure 7: One of the partially filled-in templates to be completed by the students.

Study 2, findings and discussion

This section presents findings from design practitioners' and design students' workshops. In each workshop, groups applied the framework to develop design proposals for the case they were working on. The findings are organised around how the groups applied the framework and its elements.

Navigating through the Framework

This section presents findings from design practitioners' and design students' workshops. In each workshop, groups applied the framework to develop design proposals for the case they were working on. The findings are organised around how the groups applied the framework and its elements.

Navigating through the Framework

All groups began by articulating the ultimate values of their challenge—yet their progression through the framework varied from that point onwards. Around half the groups immediately brainstormed interventions after defining the *ultimate values* and then defining the statement for the *pathway*. However, without articulating the values

and behaviours (i.e., HOW) underlying that pathway, the design space remained too large, leading to several proposals with uncertainty about their contribution to the transition. One participant noted, *"as designers, coming to a HOW and VALUE of an intervention happens subconsciously. Yet when making this explicit by labelling it on the framework, it becomes less clear how [we came to] the conclusions about the VALUE and HOW, and how [these actually] related to the transition."* In this way, making the reasoning explicit highlighted the gaps in their rationale. In contrast, two practitioner groups in Workshop 1 defined their ultimate values and pathway, then explicitly or roughly determined the values and behaviour change mechanisms. These groups reflected that moving through the framework in this way meant that each step focused the design space until they came to an intervention proposal, either intuitively or through refinement (Figure 8).

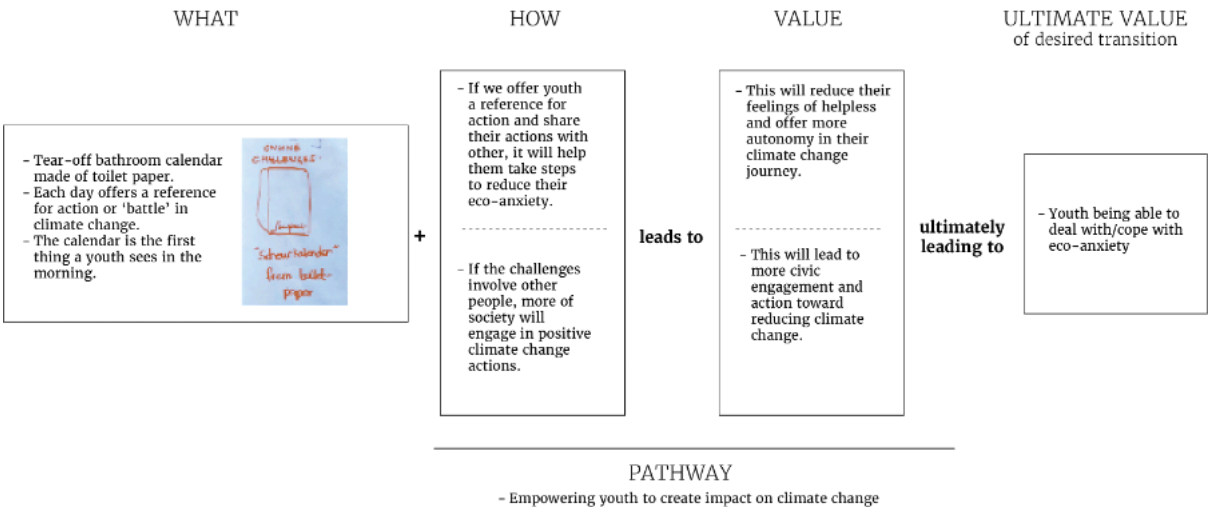

Figure 8: Completed framework of a group from Workshop 1.

The Ultimate Value(s) & Pathway

Defining ultimate values proved challenging. In both workshops, groups struggled with the scope at which ultimate values should be articulated, such as envisioning a more democratic society or totally reimagining citizenship. In Workshop 1, some practitioners found that outlining ultimate values and defining pathways simultaneously helped to scope the design space and understand the intended changes over time. One participant noted, *"thinking from the individual to the system, through the pathways, helps to understand how changes on a wider scale can be achieved over time".* Several practitioner groups noted that their previously developed systems maps helped them identify which pathway to focus on, clarifying the design context. One participant reflected, *"the gigamap helped because we could relate what we discovered to certain pathways experienced in reality that we could design for."*

In Workshop 2, despite having a vision expressing transition goals and potential pathways, the student groups struggled more than the practitioners to define these elements in the framework. While this might have resulted from less experience with complex problems compared to the practitioners, it might also have resulted from the lack of time for the students to understand how and why the specific future was envisioned. In the case of the practitioners, the participants previously explored the challenges they were addressing and developed systems maps. Additionally, we observed that the students wanted to align goals and pathways with their personal or design interests rather than drawing them from the provided content.

Several student groups in Workshop 2 only defined a statement for the pathway at the end of their design process, as discussions on the ultimate values inspired intervention proposals. As such, the pathway did not inform or support the framing of their design context and was included as an afterthought in the design rationale, leading to poor coherence. Additionally, student groups that signalled new system dynamics within their pathways, such as through new roles, were better able to adopt a generative mindset, allowing these dynamics to be unpacked and explored in terms of their implications for people and society. For instance, within groups addressing the energy transition, framing the pathway as *"households actively engaging in the energy transition"* guided the design exploration while maintaining openness to various solution

directions, unlike the framing of *"by offering sustainable heat pumps,"* which provides a solution direction.

The How(s) and Value(s)

Both workshops revealed difficulties in articulating behaviours and values. In Workshop 1, practitioner groups found defining the HOWS and VALUES on individual and system scales the most challenging part of the framework. This was due to difficulty in determining what constitutes appropriate values and behaviours for systems change, and that they considered these elements in interaction rather than isolation. This perspective differed from the student groups, which focused on the individual and system levels in isolation—first addressing the individual level and then the system level—without considering their interaction. We observed that practitioner groups that referred to their systems map could define the values and behaviours at the systems level more easily because problematic behaviours were already outlined, which they then used to inform their design reasoning. One group, who did not reference their systems map, reflected that they assumed they already had the necessary systems knowledge, so they did not look at their gigamap for their reasoning. However, this assumption was incorrect and impaired their ability to decide on values and behavioural change mechanisms that effectively link their interventions to desired system changes.

In contrast, student groups in Workshop 2 showed confidence in identifying behaviours and values on the individual level, yet faced challenges in articulating systems-level behavioural mechanisms. Additionally, when they began completing the framework, all student groups confused system behaviours with systemic values. For example, one group initially described the systemic value of an intervention in supporting the transition to less food waste as "retailers choosing to offer products based on sufficiency rather than excess." This reflects a system behaviour rather than a value, as it does not express the underlying drivers of this action.

Many groups in both workshops used a common strategy of postponing detailing the HOW until after drafting interventions. This approach, arguably typical for designers, allowed for better articulation of behaviour change mechanisms by understanding the interplay between the design and desired outcomes.

The What(s)

In both workshops, the formulation of the proposals remained conceptual, with no groups clearly defining who should implement the intervention and why—likely influenced by the limited time. Nevertheless, we found that groups focusing on fewer, clearly defined values were more successful in developing intervention proposals with strong reasoning for how they contributed to the transition. In general, groups that articulated more than two values struggled to integrate them into a coherent intervention proposal, as more values did not support narrowing the design space, making it harder to articulate behaviours that could be supported through a single intervention. Additionally, groups that made the intervention proposal more tangible, such as by drawing or sketching the interaction, were better able to move back and forth between the different elements of the framework more easily than groups that only used words to define the intervention.

In Workshop 2, many student groups, although filling in the framework elements (i.e., ultimate values, pathway, how, and value), failed to use these elements to inform their design proposals. This led to groups either becoming paralysed by the complexity of the framework elements and unable to translate these higher levels of abstraction into proposals, or producing proposals with partial rationales only aligning with the ultimate values and not the other elements of the framework.

Form of the framework

Participants expressed that the framework, at times, restricted their analytical and creative processes. Half the practitioner groups in Workshop 1 reported that the labels WHAT and HOW did not align with their interpretations, complicating their analytical thinking. Some perceived the WHAT as the behaviour they aimed to support and the HOW as the method for implementing it. Student groups in Workshop 2 felt the framework's rigid structure forced them to narrow their focus to fewer values and did not support exploring conflicts between individual and system levels, resulting in overly optimistic rationales. Yet when tensions in the design reasoning surfaced, the student groups did not actively iterate upon the frameworks to develop stronger rationales or improve their proposals. Nevertheless, participants in both workshops found the framework supportive in contextualising interventions within broader transition aims.

They expressed that they would engage the framework iteratively with more time, refining behaviours and values for greater coherence.

Workshop 1 participants appreciated how the framework facilitated abstraction across system scales and timeframes, linking planetary considerations to human-centred design. They felt the framework's tangibility *"allowed us to make some quick decisions, keep the ball rolling, and tweak it afterwards. Otherwise, you stay in this state of discussion instead of having a more tangible thing to extend your knowledge and further refine the intervention."* Workshop 2 participants noted how completing the framework gave them more confidence in the potential impact of the design proposals, but expressed a need for clearer guidance on iterating and refining the design rationales.

General discussion

In this discussion, we reflect on avenues for methodological development informed by the insights gained from the two studies in the present paper. Our focus is on identifying opportunities related to transition design reasoning, particularly in the context of conceptualising interventions that facilitate desired transitions. Additionally, we examine the application of the proposed logical framework, detailed in Figure 3.

Mechanisms for systemic change

Designers' ability to effectively navigate and integrate individual and systemic behaviour changes is crucial for ensuring coherence and alignment within transition design contexts. Moving beyond reductionist approaches that focus on isolated behavioural levels within interventions (Maier & Cash, 2020), our transition design logical framework advocates for an integrative approach that addresses the interconnections between values and behaviours at multiple levels of the system. Adopting a complex, multi-level understanding of behaviour change extends human-centred design knowledge to incorporate strategic and systemic viewpoints. This, in turn, adds complexity to articulating even individual behaviour change (e.g., Goss et al., 2024; van der Bijl-Brouwer & Dorst, 2017). While designers experienced in systemic design processes are better equipped to iteratively navigate between intervention proposals and their broader implications across behavioural levels, they still lack adequate support for addressing these interactions. Transition designers must situate individual behaviour

change within its systemic context to design new practices that align with desired transitions, emphasising the need for cultivating an integral behaviour change capability within systemic and transition design education and practice (Goss et al., 2025; Irwin, 2015).

While individual behaviour change has a rich repertoire in design (Maier & Cash, 2020), the lack of systemic behaviour change mechanisms limits designers' ability to ground interventions in robust rationales reflective of complex design contexts (van der Bijl-Brouwer et al., 2024). Given that transition design processes are intensive learning experiences requiring designers to challenge entrenched practices and devise solutions for complex, interconnected problems (Irwin et al., 2022), developing a shared repertoire of systemic behaviour change mechanisms is imperative. This repertoire should be built through transparent articulation, documentation, and reporting of both effective and ineffective transition design interventions. These reports must explicitly detail the behaviour change mechanisms and design rationales underpinning each intervention. Such transparency would enhance the collective understanding of transition design reasoning and foster the iterative learning and adaptation processes necessary to steer complex systems change effectively. By addressing this gap, transition designers will be better equipped to navigate the complexities of systemic behaviour change and contribute to the broader goals of sustainable transitions.

Defining pathways of change

The integration and interpretation of transition values and pathways are central to supporting a generative position in transition design processes (Sevaldson, 2022). Findings from the present studies reveal that while specifying transition pathways provides necessary boundaries to the design space, articulating these pathways is crucial. Pathways that foster a generative mindset successfully narrow the design space while preserving openness to diverse solution directions. For instance, articulating new roles and relationships within pathways that signal future system dynamics supports creativity but also ensures pathways remain adaptive to evolving systemic needs (Gaziulusoy & Ryan, 2017b; Goss et al., 2025). Nonetheless, further exploration into the qualities of effective transition design pathways is necessary. Identifying the attributes that enable pathways to frame and guide design processes effectively would

significantly enhance their role in transition design. This includes understanding how pathways can integrate future-oriented dynamics while maintaining coherence with current systemic contexts. By addressing these gaps, transition design research can strengthen pathways' critical role in framing, ultimately supporting designers in navigating the complexities of systemic change more effectively.

Portfolio-level design rationales

The interventions from the studies in the present paper remain purely conceptual. Nevertheless, the proposals highlight how multiple values relevant to individuals and the system (e.g., stakeholders) may require different behavioural mechanisms to achieve desired outcomes. By developing multiple interventions for the same transition challenge, as in Study 1, transition designers can address various behaviours and values and align these with organisational contexts needed for implementation (Goss et al., 2025). While Study 2 lacked the time for this, the next step could involve bringing together the groups addressing the same challenge to explore how their proposals might be iterated upon to reinforce each other. This portfolio approach challenges typical design reasoning, focusing on single intervention rationales to also develop a rationale across multiple interventions. The development of this overarching design rationale encourages a deeper understanding of the interplay between design proposals and their broader societal impacts. It also allows designers to narrow the scope of individual proposals while maintaining an overview of how they support wider change processes (Goss et al., 2025). This approach is essential for addressing the multidimensional nature of transition challenges (Gaziulusoy & Ryan, 2017a; Geels, 2002; Goss et al., 2025). Therefore, transition design education must teach students to conceptualise not one but a portfolio of interventions based on strong rationales that lead to synergy, reinforcement, and complementarity between interventions in pursuit of desired systems change (van den Bosch, 2010).

Limitations of the framework

The current study has several limitations that may inspire further research. First, the framework was applied in two ways, influencing how the designers engaged. Study 1 used the framework in a more reflective design practice, where designers drafted rationales for intervention proposals and applied the framework to evaluate and enhance these rationales. Conversely, Study 2 used it within a generative design practice to develop new intervention proposals, necessitating formulating of all the framework elements from scratch. Additionally, we recognise that the framework operates between a canvas, a tool, and a method. Future research should explore how the form and interaction with the framework can be adapted to suit various design practices (e.g., generative or reflective), applications (e.g., workshops, projects), and formats (e.g., canvas, tool, method). For instance, if used as a canvas, adding descriptive subtitles that offer cues for each element, such as adding “WHAT is designed”, “HOW it influences change”, and “what VALUE is gained”, would help clarify the focus of the different elements. Moreover, the study suggests that projects applying the framework should allocate ample time and resources for designers to comprehend system dynamics to develop transition design interventions with sound design reasoning and the potential to contribute to the transition.

In its current state, the framework facilitates designers in reasoning toward interventions that promote short-term changes with the potential for long-term systemic impact. Although its distinctions—the What(s), How(s), Value(s), Pathway, and Ultimate Value(s)—facilitate abstraction across system scales and timeframes, it should not be considered a standalone method. Effective application requires designers to propose, reflect, iterate, and critically examine the consequences of proposed interventions and the tensions between individual and system scales. We underpin what Fitzpatrick et al. (2024) and Vink (2023) found: designing for transitions necessitates strong systems reflexivity and requires sensitivity to the systemic context. To support designers intervening in complex societal transitions, we must deepen our understanding and application of transition design reasoning, enabling designers to envision and navigate meaningful change across different scales and times.

References

1. Cross, N. (1982, 1982/10/01/). Designerly ways of knowing. *Design Studies*, *3*(4), 221-227. https://doi.org/10.1016/0142-694X(82)90040-0
2. Dorst, K. (2011). The core of 'design thinking' and its application. *Design Studies*, *32*(6), 521-532.
3. Dorst, K. (2015). *Frame Innovation: Create new thinking by design*. MIT Press.
4. Dorst, K. (2019a, 11/01). Co-evolution and emergence in design. *Design Studies*, *65*. 10.1016/j.destud.2019.10.005
5. Dorst, K. (2019b, 2019/06/01/). Design beyond Design. She Ji: The Journal of Design, Economics, and Innovation, 5(2), 117-127. https://doi.org/10.1016/j.sheji.2019.05.001
6. Dorst, K., & Cross, N. (2001). Creativity in the design process: co-evolution of problem–solution. *Design Studies*, *22*(5), 425-437.
7. Drew, C., Robinson, C., & Winhall, J. (2022). System-shifting design: An emerging practice explored. *Relating Systems Thinking and Design Symposium*, *RDS11*. https://rsdsymposium.org/system-shifting-design-an-emerging-practice-explored/
8. Fitzpatrick, H., Luthe, T., & Sevaldson, B. (2024). Methodological Pluralism in Practice: A systemic design approach for place-based sustainability transformations. *Contexts—The Systemic Design Journal*, *2*. https://doi.org/10.58279/v2000
9. Gaziulusoy, İ., & Brezet, H. (2015, 2015). Design for system innovations and transitions: a conceptual framework integrating insights from sustainablity science and theories of system innovations and transitions. *Journal of Cleaner Production*, *108*, 558-568. https://doi.org/10.1016/j.jclepro.2015.06.066
10. Gaziulusoy, İ., & Ryan, C. (2017a). Roles of design in sustainability transitions projects: A case study of Visions and Pathways 2040 project from Australia. *Journal of Cleaner Production*, *162*, 1297-1307. https://doi.org/10.1016/j.jclepro.2017.06.122
11. Gaziulusoy, İ., & Ryan, C. (2017b, 2017/07/28). Shifting Conversations for Sustainability Transitions Using Participatory Design Visioning. *The Design Journal*, *20*(sup1), S1916-S1926. 10.1080/14606925.2017.1352709
12. Geels, F. W. (2002, December). Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *Research Policy*, *31*(8), 1257-1274. https://doi.org/10.1016/S0048-7333(02)00062-8

13. Goss, H., Tromp, N., & Schifferstein, H. N. J. (2021, November 2 - 6). Mapping Transition Readiness: A model for identifying how and where design can intervene in system transitions. *Relating Systems Thinking and Design*, *RSD10*. https://rsdsymposium.org/mapping-transition-readiness/
14. Goss, H. M., Tromp, N., & Schifferstein, H. N. J. (2023, October 9-13). Designing adaptable consumption: a new practice to foster food system transitions I *ASDR 2023: Life-Changing Design*, Milan, Italy.
15. Goss, H. M., Tromp, N., & Schifferstein, H. N. J. (2024, March). Design capability when visioning for transitions: A case study of a new food system. *Design Studies*, 91-92, 101246. https://doi.org/10.1016/j.destud.2024.101246
16. Goss, H. M., Tromp, N., & Schifferstein, H. N. J. (2025, April). Framing system dynamics for designers innovating in transitions. *International Journal of Design* (19).
17. Hekkert, P., & van Dijk, M. (2011). *Vision in Design: A Guidebook for Innovators*. Laurence King Publishing. https://books.google.nl/books?id=1Mt4PAAACAAJ
18. Hyysalo, S., Marttila, T., Perikangas, S., & Auvinen, K. (2019, July). Codesign for transitions governance: A mid-range pathway creation toolset for accelerating sociotechnical change. *Design Studies*, *63*, 181-203. https://doi.org/10.1016/j.destud.2019.05.002
19. Irwin, T. (2015, April). Transition Design: A Proposal for a New Area of Design Practice, Study, and Research. *Design and Culture*, *7*, 229-246. 10.1080/17547075.2015.1051829
20. Irwin, T., Tonkinwise, C., & Kossoff, G. (2022). Transition design: An educational framework for advancing the study and design of sustainable transitions. Cuadernos del Centro de Estudios en Diseño y Comunicación. *Ensayos* (105), 31-72.
21. Jones, P., & Van Ael, K. (2022). *Design Journeys Through Complex Systems: Practice Tools for Systemic Design*. BIS Publishers.
22. Kuijer, L., & de Jong, A. (2012, 2012/01/01). Identifying design opportunities for reduced household resource consumption: exploring practices of thermal comfort. *Journal of Design Research*, *10*(1-2), 67-85. 10.1504/JDR.2012.046140
23. Liu, H., & McCarthy, B. (2023). Sustainable lifestyles, eating out habits and the green gap: a study of food waste segments. *Asia Pacific Journal of Marketing and Logistics*, *35*(4), 920-943.

24. Loorbach, D. (2007). *Transition Management. New mode of governance for sustainable development* [Doctoral Thesis, Erasmus Universiteit Rotterdam]. Rotterdam.
25. Loorbach, D. (2010). Transition Management for Sustainable Development: A Prescriptive, Complexity-Based Governance Framework. *Governance*, *23*(1), 161-183. https://doi.org/10.1111/j.1468-0491.2009.01471.x
26. Loorbach, D. (2022, 10/07). Designing radical transitions: a plea for a new governance culture to empower deep transformative change. *City, Territory and Architecture*, *9*. https://doi.org/10.1186/s40410-022-00176-z
27. Loorbach, D., Frantzeskaki, N., & Avelino, F. (2017). Sustainability transitions research: transforming science and practice for societal change. *Annual review of environment and resources*, *42*, 599-626.
28. Maier, A., & Cash, P. (2020). Designing for Human Behaviour in a Systemic World. In A. Maier, J. Oehmen, & P. E. Vermaas (Eds.), *Handbook of Engineering Systems Design* (pp. 1-34). Springer. https://doi.org/10.1007/978-3-030-46054-9_16-1
29. Mok, L., & Hyysalo, S. (2018, January). Designing for energy transition through Value Sensitive Design. *Design Studies*, *54*, 162-183. https://doi.org/10.1016/j.destud.2017.09.006
30. Peeters, A.-L., Tromp, N., & Hekkert, P. P. M. (in review). *Transition Design Frame: A reasoning model to foster transformative strategies for intervention*.
31. Peeters, A. L., Tromp, N., Bulah, B., van der Meer, M., van den Boom, L., & Hekkert, P. P. M. (2024). Framing for the Protein Transition: Eight pathways to foster plant-based diets through design. *Environmental Innovation and Societal Transitions*, *52*. https://doi.org/10.1016/j.eist.2024.100848
32. Reckwitz, A. (2002, 2002/05/01). Toward a Theory of Social Practices: A Development in Culturalist Theorizing. *European Journal of Social Theory*, *5*(2), 243-263. 10.1177/13684310222225432
33. Schön, D. A. (1987). *Educating the reflective practitioner*. Jossey-Bass. http://catdir.loc.gov/catdir/enhancements/fy0706/86045626-d.html
34. Scott, K., Bakker, C. A., & Quist, J. (2012, 05/01). Designing Change by Living Change. *Design Studies*, *33*, 279-297. 10.1016/j.destud.2011.08.002
35. Sevaldson, B. (2011). Giga-mapping: Visualisation for Complexity and systems thinking in design. *Nordic Design Research Conference*, Helsinki.

36. Sevaldson, B. (2022). *Designing Complexity: The Methodology and Practice of Systems Oriented Design*. Common Ground Research Networks. https://books.google.nl/books?id=L4iyzgEACAAJ
37. Shove, E., Watson, M., & Spurling, N. (2015, August). Conceptualizing connections: Energy demand, infrastructures and social practices. *European Journal of Social Theory*, *18*(3), 274-287. 10.1177/1368431015579964
38. Stroh, D. P. (2015). *Systems thinking for social change: A practical guide to solving complex problems, avoiding unintended consequences, and achieving lasting results*. Chelsea Green Publishing.
39. Tromp, N., & Hekkert, P. (2018). *Designing for Society: Products and Services for a Better World*. Bloomsbury Publishing.
40. van den Bosch, S. (2010). *Exploring societal changes towards sustainability* [Doctoral Thesis, Erasmus University Rotterdam]. Rotterdam. http://hdl.handle.net/1765/20714
41. van der Bijl-Brouwer, M., de Koning, J., Tromp, N., Celik, S., & Nieuwborg, A. (2024, June 23 - 28). *Systemic design reasoning for societal transitions DRS 2024*, Boston, USA.
42. van der Bijl-Brouwer, M., & Dorst, K. (2017, November). Advancing the strategic impact of human-centred design. *Design Studies*, *53*, 1-23. https://doi.org/10.1016/j.destud.2017.06.003
43. van der Bijl-Brouwer, M., & Malcolm, B. (2020, 2020/09/01/). Systemic Design Principles in Social Innovation: A Study of Expert Practices and Design Rationales. *She Ji: The Journal of Design, Economics, and Innovation*, *6*(3), 386-407. https://doi.org/10.1016/j.sheji.2020.06.001
44. Vervoort, J. M., Smeenk, T., Zamuruieva, I., Reichelt, L. L., van Veldhoven, M., Rutting, L., Light, A., Houston, L., Wolstenholme, R., Dolejšová, M., Jain, A., Ardern, J., Catlow, R., Vaajakallio, K., Falay von Flittner, Z., Putrle-Srdić, J., Lohmann, J. C., Moossdorff, C., Mattelmäki, T., Ampatzidou, C., Choi, J. H.-j., Botero, A., Thompson, K. A., Torrens, J., Lane, R., & Mangnus, A. C. (2024). 9 Dimensions for evaluating how art and creative practice stimulate societal transformations. *Ecology and Society*, *29*(1), Article 29. 10.5751/ES-14739-290129
45. Vink, J. (2023, 10/01). Embodied, Everyday Systemic Design - A Pragmatist Perspective. *Design Issues*, *39*, 35-48. 10.1162/desi_a_00731

Acknowledgements

This publication is part of the project Food Waste: From Excess to Enough, file number 403.19.209, of the research programme Transitions and Behaviour, which is (partly) financed by the Dutch Research Council (NWO) under the grant Creatieve Industrie Transities en Gedrag TG 2019.

We appreciate the participation and feedback received from our consortium partners during and after this study. The views expressed in this manuscript are the sole responsibility of the authors and do not necessarily reflect the views of NWO. We would also like to thank Evert van Beek for his support during the workshop with design students.

Authors

Hannah M. Goss, PhD Candidate, Delft University of Technology, Faculty of Industrial Design Engineering, h.goss@tudelft.nl and hannahmgoss@gmail.com

Jotte I.J.C. de Koning, Assistant Professor, Delft University of Technology, Faculty of Industrial Design Engineering, Jotte.deKoning@tudelft.nl

Nynke Tromp, Program manager Public Design Practice (PONT), nynke.tromp@dutchdesignfoundation.com

Hendrik N. J. Schifferstein, Associate Professor, Delft University of Technology, Faculty of Industrial Design Engineering, h.n.j.schifferstein@tudelft.nl