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Transition co-design dynamics in high level policy processes

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Despite the increasing interest in bringing together the fields of sustainability transitions and design research, the ways transition design connects to earlier theories on design action have not been extensively studied. By using Buchanan’s (1992; 1998) ‘four orders of design’ and Young’s (2008) ‘complexity in design’ models as a framework, this article provides an empirical example of how to examine transition co-design dynamics. With a case study of a national sustainable development strategy creation in Finland, we argue that design does not only contribute to transition processes instrumentally but also from attitudinal and intellectual perspectives. Designing for transitions blends existing forms of design work for success, and it offers new agencies for design in supporting governance of highly complex policy processes.

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Keywords: design research, collaborative design, design practice, sustainability, transition design

Achiving sustainable futures requires a fundamental re-orientation of society and the economy (Haberl et al., 2011). Numerous global problems, such as the climate crisis, biodiversity loss, resource depletion and widening social inequality require institutional, organisational and
technological transformations, i.e., sustainability transitions (Markard et al., 2012; Köhler et al., 2019). There has been an increasing interest in design and co-design in transitions scholarship since the 2000s (Ceschin & Gaziulusoy, 2016; Hyysalo et al., 2019a, 2019b; Irwin, 2015; Tonkinwise, 2014). Similarly, transition scholarship has shown emergent interest in design research (von Flittner et al., 2022, Gaziulusoy & Erdoğan Özbek, 2019), and some researchers from both fields currently endeavour to bring the communities closer (see e.g. Erdoğan Özbek, 2022; Hyysalo, 2019a). We observe this current context manifesting a need to strengthen the theoretical basis of the common design-transitions playground. However, given the relative scarcity of empirical examples at the intersection of these fields, and the lack of empirically-informed, thorough theorising on how design is manifested in transition contexts, this has proved challenging.

In recent decades, design has been expanding its historically overriding focus on the creation of commodities of consumption in the service of the manufacturing industry. The new theory and practice areas of design cover the development of human-centred services for the private and public sector (Meroni, 2011; Bowen et al., 2013), facilitating community-driven social innovations responding to economic and environmental challenges (Chick, 2012; Manzini, 2014), designing businesses and business strategies (Siedels, 2000; Dorst, 2015; Keinonen, 2008), and assisting governments in designing policies for governance and management of complex societal problems (Chisholm et al., 2013). At the same time, the focus of design for sustainability action has moved from technologies (e.g., ecodesign) towards people (e.g., social innovation), and the approach to design action expanded from insular to support systemic transitions (Ceschin & Gaziulusoy, 2020). These focus levels from the artefact to systems and society have also been connected to process models of design (Joore & Brezet, 2014).

Sustainability transitions are also becoming increasingly institutionalised at the science-policy interface at the EU level (European Environment Agency EEA, 2019; Turnheim et al., 2020), and process-oriented transdisciplinary research is a promising approach to facilitate sustainability transitions (Bulten et al., 2021). Transition management (TM) is one of the most developed transition governance approaches, originating in the Netherlands in the early 2000s (Kemp, Loorbach, & Rotmans, 2007; Loorbach & Rotmans, 2010). TM studies long-term sociotechnical change and reorganisation of the systems involved. It aims at creating spaces for searching, learning, and experimenting on the transformation of the current system with frontrunner stakeholders (Kemp, Loorbach, & Rotmans, 2007; Loorbach & Rotmans, 2010), with further emphasis on the construction of pathways of change to meet specific transition goals (Loorbach & Rotmans, 2010).
One of the key co-design methods in TM — a transition arena (TA) — consists of a series of workshops in which the identification of challenges, vision building, and the construction of pathways of change take place within diverse stakeholder groups (Frantzeskaki et al., 2017). In the context of co-designing for transitions, pathways are envisioned and visually constructed timelines of systemically interrelated actions (and their enablers) towards desired social change (Hyysalo, Lukkarinen, et al., 2019). This consists of an intertwined combination of visualisations and a textual narrative of the change pathway and its dynamics as well as its policy implications. Traditionally, TA processes have been geared towards a long-term transition focus of 40–80 years (Frantzeskaki et al., 2017; Roorda et al., 2014). Presently the necessity to accelerate sustainability transitions calls for better means to address the 5–15-year mid-range dynamics. As a result, TA processes have been further developed towards a mid-range time-scale (Hyysalo, Lukkarinen, et al., 2019) echoing the recent developments in design becoming active in policy development and governmental processes (Junginger, 2013; Kimbell & Bailey, 2017) — i.e., in the strategic and tactical activities of transition management.

In this paper we contribute to the emerging literature at the intersection of design and transition scholarship by empirically studying a process in which tools and processes of designing for transitions were used in a high-level sustainable development policy process — the creation of a national sustainable development strategy by the Finnish Prime Minister’s Office (PMO). We use a design-theoretical lens to examine the process and first ask how a design-theoretical lens can support the analysis of transition co-design dynamics. Second, we explore the types of design and design competences that are required in TA projects and the circumstances these manifest. The first section presents our conceptual and analytical framework. The second section presents our methodology and the third section our findings. This is followed by a discussion and conclusions.

1 Conceptual and analytical framework
Design as a practice-relevant discourse has been distinguished from the discourses of natural science, medicine, engineering, and business (Cross, 2007; Gruber et al., 2015; Krippendorff, 2006). Unlike these approaches, design starts with a specific focus on humans and systems in their relational context, framing problems based on insights acquired with due emphasis on human experience and experienced meanings (Krippendorff, 2000). It has also been argued that the design approach is suitable for addressing ill-defined problems that have systemic properties and are political (i.e., wicked problems) (Buchanan, 1992; Dorst, 2003; Rittel & Webber, 1973). Therefore, the framing of design problems can accommodate not only technical issues but also socio-cultural and behavioural issues stemming from the dynamic interactions
between humans and systems, which together create system behaviour (i.e., physical properties) and meaning derived from it (i.e., experiential properties). Most sustainability challenges, with their complex, socially-relevant, politically-contested and systemic nature, are archetypal examples of wicked problems (see e.g. Lönngren & van Poeck, 2020).

Furthermore, there is a need for structural changes in society covering socio-ecological-technical system transformations to achieve sustainability; processes that are now widely referred to as ‘sustainability transitions’ (Loorbach, 2010). Recently, Gaziulusoy and Ryan (2017) framed these structural changes as threefold design problems, with creative, technical, and political dimensions, while instrumental — or ‘traditional design’ — roles were found to be less significant compared to a vast array of roles played by designers which included strategic and engagement-related roles. Recent case studies (see e.g. Jalas et al., 2017; Mok and Gaziulusoy, 2018; Mok and Hyysalo, 2018) have further demonstrated that design can in fact act as a tool for mediating conflicting stakeholder values and aspirations in transition processes. These studies provide evidence that design can play a multiplicity of roles in sustainability transitions, including but not limited to instrumental roles (see also Tonkinwise, 2019).

With references to Manzini’s (2015) conceptualizations of expert design (design activity that is performed by professional designers) and diffuse design (design is a natural human cognitive capacity and everyone can undertake design activity), Gaziulusoy and Ryan (2017) also observed that both diffuse and expert design were significantly evident and occurred both individually and in dynamic interaction. Similarly Hyysalo et al. (2019a, b) underscore the necessity of intertwining expert design competencies with in-depth policy and change domain expertise in achieving viable and legitimate designs and outcomes. In studying the value of design in the context of urban sustainability transitions, the findings by De Koning et al. (2018) also indicated that the role of designers in transition projects is not one of leading but instead infrastructuring, drawing on designerly skills to develop actions that challenge incumbent regimes. In some cases, diffuse design might be a key driver in transitions. In support of this, Heiskanen et al. (2014) and Hyysalo et al. (2017) have provided ample evidence of user involvement in the design and diffusion of new technologies in transition projects (Hyysalo, 2021). These findings imply that design roles and roles of design in sustainability transitions can be fluid.

To study further design in the context of sustainability transitions, a design-theoretical construct is needed with the following characteristics: 1. It operates at a level of abstraction allowing design activities, roles and outputs to be studied at the meta-level of design and not at the level of specific design disciplines; 2. It accommodates the associated complexity of studying design in the context
of sustainability transitions; 3. While not being reductionist, it still enables systematic analysis of design activities, roles and outputs. These criteria are important in choosing a theoretical construct so that the knowledge generated through the research is aligned with the epistemology(-ies) of design, findings can be embedded in design theory, and communicated and translated for relevant users of knowledge in practice.

Traditionally, design studies have concerned procedural aspects; design action connecting systemic operation across various levels in complex contextual settings has not been at the focus. However, some obvious exceptions can be found, for example Archer’s ‘three levels of design’ studying different types of design research (Magee, 1987), Buchanan’s ‘four orders of design’ concerning the focus areas of design action (Buchanan, 1992, 1998), and Young’s (2008) ‘complexity in design’ models that develops Archer’s model further, and where the contextual setting for design is studied.

Buchanan’s model (1992; 1998) meets the above-mentioned criteria and therefore seems suitable for the purposes of this research. Buchanan discusses the expanding scope of design practice in a design-historical context with references to four orders: 1. communication (design of symbolic and visual communication), 2. construction (design of material objects), 3. strategic planning (design of activities and organised services) and, 4. systemic integration (design of complex systems and environments for living, working, playing and learning). Whilst these orders can be perceived to point to specific designer skills (see for example Nylén et al., 2014), Buchanan also argues that the activities associated with each level do not point to specific design disciplines; that all design specialisations may undertake activities across all these levels. In connection with the higher orders, however, the focus in design action becomes increasingly integrative, supporting interaction of actors from various interacting communities (Golsby-Smith, 1996). Similarly, we understand that the succession of these orders does not necessarily imply that the designer’s influence becomes more significant or that the disciplinary skills improve. Rather, as design practice moves towards the higher orders, the scope and complexity of the context in which design activity takes place increases, the diversity of stakeholders broadens, and the activity of design shifts increasingly from performing expert design actions to supporting diffuse design actions by other actors. In parallel, towards the higher orders the design activity becomes less about making but more about transforming. Buchanan’s model has been refined further and also acknowledged as a functional basis to think of the systemic and transformative focus of contemporary design action (Tonkinwise, 2014).

As designer roles develops in transition projects from the artefactual orientation towards infrastructuring and the setting of contexts for work, and as other arena participants also become designers of the transition agendas and
pathways, the analytical focus needs to also be put on the development of the contextual setting for the work, and the way the roles are structured. In addition to the ‘four orders of design’ model, we use the ‘complexity in design’ model by Young (2008). Young conceptualises three embedded levels of design: design in context (design at the level of products and artefacts), designing context (design at the level of systems and services), and design of context (design at the level of policy, ideology, purposes, values and norms). With references to this framework, it can be inferred that transitions cannot be succeeded solely by design in context or designing context. There is a need for design of context, meaning high-level problem solving and sense-making to be able to create solutions that tackle the numerous environmental and social challenges and challenge settled rationales.

In the analytical framework of this study, we analyse the case process both with regards to Buchanan’s design orders and Young’s design levels (see the analytical framework in Figure 1). Through the framework, we further assess the different phases of the process to identify how and through what type of activities are different participants in the process involved in the overall ‘design’ and implementation of the arena work and its outcomes. In addition, we analyse the roles of different actors of design in different phases of the process to further reflect on how they are set in the design for transitions work.

2 Case study: the 2030 Agenda Transition Arena in Finland

2.1 The 2030 agenda TA as a continuation to previous arenas

In the recent years, there has been a resurgence of TM-related activities in Finland’s science-policy interface, as the Finnish Strategic Research Council (SRC), established in 2015, redirected state funding towards transdisciplinary research with strong stakeholder interaction across society (e.g., policymakers, civil society and industry actors) with a direct policy relevance (topics including digitalisation, sustainable energy, food system, governance renewal) (Heino & Hautala, 2021). In this process, the mid-range adaptation to the TA process with its supportive facilitation and co-design toolset (Hyysalo et al., 2019a; 2019b; 2019c) has been used and developed in several research projects (e.g., Hyysalo et al., 2019a; Lähteenoja et al., 2022; Lukkarinen et al., 2023; Marttila et al., 2022).

The 2030 Agenda Transition Arena (later named A2030 TA) differs from the previous arena work in two significant ways. First, this was, to our knowledge, the first time globally that a TA process was directly linked to a national-level strategic policy preparation. The co-designed pathways formed a basis for the 2030 Agenda roadmap, which was turned into a national sustainable development strategy for Finland. Our TA process, even in its online mode, was able
to expand the conventional hearing and consultation procedures. The facilitation tools allowed the participants to involve themselves better in the actual co-design of pathways and they were able to identify where they have a role in implementing the strategy. The online TA process with thematic subgroups was able to develop into a deliberative space in which it was possible to also discuss difficult topics that raised conflicts among the participants. Examples of problem emergence and initial phases of agenda-setting that were raised in this strategy include the need to reduce the overall natural resource consumption as well as the need to shift attention from economic flows to economic assets (PMO Finland, 2022, p. 15). The final strategy raises them as important topics for further work, even if it does not provide solutions to all of them.

Second, the A2030 TA is an example of a strategic co-design at one of the most comprehensive levels and with the largest number of participants so far. The process brought together 58 members of the National Commission on Sustainable Development. For this case, the mid-range TA methodology (Hyysalo et al., 2019a) was further redesigned in three ways. First, the level of details (exact years and responsibilities) were removed from the pathway steps so that it was possible to take over large and complex topics in a limited space. Second, a new phase of cross-examining synergies and coherence between different pathways was added between the two pathway creation workshops (see Figure 2). This phase became important in the process and involved the organisers, the facilitators, the participants and their background organisations as well as the Expert Panel for Sustainable Development. Third, the results were written as short future narratives which provided direct input for the national sustainable development strategy. These developments were built on the earlier iterative toolset development in 2015–2020 in different contexts, as detailed by Hyysalo et al. (2019a; 2019b; 2019c). Due to the COVID-19 pandemic, the work was fully conducted online with the support of digital
tools and platforms (e.g., Miro boards). Next, we will present the case TA process with a short background to the context of sustainable development policy.

2.2 Background: sustainable development policy in Finland

The 2030 Agenda calls for sustainability transformations and mechanisms to support nations towards sustainability. At the mid-point on the way to 2030, no country has yet reached the SDGs (O’Neill et al., 2018; Sachs et al., 2022). Finland is at the forefront of many international sustainability comparisons and studies and close to reaching many of the SDGs related to social and economic sustainability (PMO Finland, 2020a; 2020b). Finland’s key challenges are related to consumption and production patterns, climate action and the state of biodiversity (Sachs et al., 2022).

In Finland, like in many European countries, sustainable development policy is coordinated by the PMO. In 2018–2019, a comprehensive evaluation of Finland’s sustainable development policy was conducted (Berg et al., 2019; Lyytimäki et al., 2021, Lähteenoja, Berg, & Korhonen-Kurki, 2019; Salo et al., 2022). One of the main recommendations of the evaluation was that Finland should draw up a national 2030 Agenda roadmap to pave the way to achieving all the SDG goals by 2030 while supporting the achievement of the goals globally. This recommendation was adopted in the government programme in 2019.

In 2020, the government gave the task of preparing a 2030 Agenda roadmap to the Finnish National Commission on Sustainable Development (later the
Commission). This is a forum led by the Prime Minister of around 80 significant societal actors together representing a broad spectrum of sectors and stakeholders in our society: ministers, MPs and national government bodies, ministries, municipalities and regions, industries, trade unions, NGOs, church, as well as science and research. The Commission promotes cooperation to achieve the SDGs and strives to integrate the strategic objectives of sustainable development into the national policy, administration and social practices. The Commission is not directly involved in political decision-making, but its long-term strategy is independent of electoral cycles and guides national sustainable development work.

In early 2021 the Commission decided to use the mid-range TA process and tools to support the creation of the national 2030 Agenda roadmap. From the beginning, the idea was that the roadmap would turn into a new national sustainable development strategy of Finland (which is why we later discuss both the roadmap and strategy). Therefore, the Commission wanted to have a highly interactive and future oriented co-design process with a scientific basis and the opportunity to involve all its members.

2.3 Transition arena process to support the national 2030 agenda strategy creation

The 2030 Agenda strategy development process consisted of a preparatory phase followed by a TA process (A2030 TA) including four workshops and finalisation meetings (see the structure in Figure 2). The TA structure and content was based on the mid-range approach to TA work, progressing from shared vision and goal-setting to pathway work in smaller groups.

Based on the earlier indicator analysis and studies (PMO Finland, 2020a; PMO Finland, 2020b), the Commission decided to focus on six key systemic areas for change to achieve the 2030 Goals in Finland (PMO Finland, 2022, p. 1) Economy and work promoting well-being and sustainable consumption; 2) Education, competence and sustainable lifestyles; 3) Well-being, health and social inclusion; 4) Food system promoting well-being; 5) Forest, water and land use promoting biodiversity and carbon neutrality; 6) Sustainable energy system. One transition pathway was created for each of these topics.

Each TA group had a technical facilitator and an expert facilitator. The three technical facilitators were from Aalto university and also co-author this article. The six expert facilitators were from other universities and research organisations. The facilitators had different responsibilities during the workshops: the technical facilitators, who were designers, were in charge of the technical features of visual pathways. The expert facilitators were in charge of facilitating the content creation into the visual pathways and later in charge.
of the written change narratives that describe the same content. In practice, the facilitators worked in close pairs, co-designing the content together throughout the process. The participants of the TA were all members or deputy members of the Commission, including 21 ministry representatives, 13 NGOs, 13 trade unions, five regions, one MP and four representatives of other institutions (church, social security, think tank). The participants were divided into six groups based on their interests, keeping in mind background, expertise and gender balance in each group. The Commission membership and common history of working in it effectively reduced the social hierarchies among the participants, all of whom were also otherwise accustomed to working with high level decision making and decision makers.

The TA work started with drafting visions and goals for each thematic area. Each group formulated a vision that described a future in which the 2030 Agenda has been met and formulated 5–8 specific goals that concretised the vision. The transition pathway creation work was conducted in separate groups for each systemic area, allowing 58 members or deputy members of the Commission to participate in the workshops. After the first transition pathways workshops, all Commission members were able to comment on the draft pathways. In addition, a cross-examination workshop was held to look at the links, synergies, contradictions and possible overlaps between the different pathways. After that, the thematic groups addressed the comments received and finalised the transition pathways. They also discussed the principles of sustainable development policy and how to ensure their implementation along the pathways.

2.4 Data and analysis

In the analysis, we look both into the development of the mid-range TA method adapted to support the broadscale policy focus in A2030 work, and the actual outcomes of the pathway work. By tracking down important design decisions in this process, we analyse where, by whom, and on what conditions these decisions took place, to reflect on contexts of interest for design types (Young, 2008), and levels of design action (Buchanan, 1998). In the analysis, we zoom in to two levels of detail. The results of these analyses are presented in section 3. We map these decisions to the analytical framework as presented in section 1. We used multiple sources of data, such as interviews, meeting notes, workshop recordings and documents, to confirm findings (see Table 1 for details). The analyses were conducted together by two authors with a continuous peer-debriefing and reflection. The findings were assessed among all authors as well as in a larger research group to gain different perspectives and ensure the quality of the analysis. Appendix 1 presents documentation of key design decisions with references to orders of design and levels of design.
3 Results: Design’s context relation and orders of design in the agenda 2030 transition arena

3.1 Main phases, contextual aspects and focus orders in design in the A2030 transition arena

To analyse design in the key phases and events of the A2030 TA process, we mapped them regarding context relation and orders of design (see section 1). In Figure 3, the vertical columns represent the three different focus levels of design action, as discussed by Young (2008). The numbered items connected with arrows are the different main phases of the TA work. The activities along the TA process are also analysed in relation to their connections to the orders of design (cf. Buchanan). The numbered circles (orders I-IV) represent the orders of design by Buchanan (1992; 1998).

As evident (see Figure 3), in different phases of the process the focus in design action shifts from studying and assessing the context (DoC), to developing improvements to actor-networks, socio-technical systems, and collaborative process (DC), and, to support further work in the developed context (DiC). The beginning, when the decision to create a roadmap was included in the government programme, was manifested as design at the level of ideology (DoC; see step 1 in Figure 3). In the second phase, the creation of six relevant areas of change is a good example of design at the level of systems thinking (DC). Adapting the existing mid-range TA method to the context of the A2030 TA work and in online form happened mostly at the level of product development (DiC). Furthermore, co-designing visions and developing pathways for each thematic area brought us back to design of context, and when the

Table 1 Data used in the analysis of this study

<table>
<thead>
<tr>
<th>Material</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparatory meeting notes</td>
<td>Meeting notes from 15 meetings with organisers and facilitators, held before and after the workshops in March–October 2021.</td>
</tr>
<tr>
<td>Workshop notes and recordings</td>
<td>Recordings and notes from four online TA workshops (with several breakout rooms).</td>
</tr>
<tr>
<td>Interviews</td>
<td>12 semi-structured interviews conducted with the facilitators and the organising team after the workshop series. The interviews aimed to elicit facilitators’ and organisers’ perceptions on the process and, with respect to the research questions, elaborate the transition co-design dynamics in each pathway creation workshop.</td>
</tr>
<tr>
<td>Pathways and transition narratives</td>
<td>Six finalised transition pathways from 2022 to the 2030s with transition narrative descriptions.</td>
</tr>
<tr>
<td>Technical report of the TA, the 2030 Agenda Roadmap and the renewed national sustainable development strategy</td>
<td>Technical report of the TA was published as an annex of the 2030 Agenda roadmap in Finnish (Lähteenoja et al., 2022). The national sustainable development strategy is published as a report (PMO Finland, 2022).</td>
</tr>
</tbody>
</table>

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11
<table>
<thead>
<tr>
<th>Timeline</th>
<th>Actions and events in the development of A2030 TA work</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>1a. Background: Decision to create a roadmap and a strategy to the 2030 Agenda</td>
</tr>
<tr>
<td>2021</td>
<td>1b. Decision to utilize TA process and use the mid-range TA method in the strategy process.</td>
</tr>
<tr>
<td>February</td>
<td>2. Adapting mid-range TA to context of 2030 agenda work</td>
</tr>
<tr>
<td>March</td>
<td>2a. Development of thematic areas for the work</td>
</tr>
<tr>
<td>April</td>
<td>2b. Facilitator and participant selection</td>
</tr>
<tr>
<td>May</td>
<td>2c. Thematic background studies</td>
</tr>
<tr>
<td>June</td>
<td>2d. Adapt the online tools for A2030 work</td>
</tr>
<tr>
<td>July</td>
<td>3. Developing change vision and setting goals</td>
</tr>
<tr>
<td>August</td>
<td>3a. Co-designing visions for each thematic area</td>
</tr>
<tr>
<td>September</td>
<td>3b. Developing visions and setting goals for the thematic areas</td>
</tr>
<tr>
<td>October</td>
<td>4. Developing pathways</td>
</tr>
<tr>
<td>November</td>
<td>4a. Co-designing mid-range transition pathways to six thematic areas (actions, their relations, important steps)</td>
</tr>
<tr>
<td>December</td>
<td>4b. Cross-examination and commenting (policy coherence, synergies, overlaps)</td>
</tr>
<tr>
<td>2022</td>
<td>4c. Revising the pathways</td>
</tr>
<tr>
<td></td>
<td>5. Reporting pathway/work results</td>
</tr>
<tr>
<td></td>
<td>5. The pathway work results (visions, goals, change narratives, visual pathway figures) were summarised in a (not public) report</td>
</tr>
<tr>
<td></td>
<td>6. Discussions in panels and boards</td>
</tr>
<tr>
<td></td>
<td>6. The main results were presented and discussed in different panels and boards (e.g., climate panel, development policy committee)</td>
</tr>
<tr>
<td></td>
<td>7. Output: a basis for the new sustainable development strategy</td>
</tr>
<tr>
<td></td>
<td>7a. Output: the 2030 agenda roadmap</td>
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<tr>
<td></td>
<td>7b. Output: renewed national sustainable development strategy 2022-2030</td>
</tr>
<tr>
<td></td>
<td>Orders of design (Buchanan, 1998): 1st order: Communication 2nd order: Construction (of things) 3rd order: Strategic planning 4th order: Systemic integration</td>
</tr>
</tbody>
</table>

**Figure 3** The process of the A2030 TA initiation and implementation mapped onto the analytical framework

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pathway visualisations were revised and finalised, the designers worked again in a context. Subsequently, the focus again traverses from the findings of work in context (DiC) back towards implications in the higher levels of focus in policy formation and ideology (cf. Young, 2008).

As the dynamics show, the process of TA design including the preparations and the dissemination of results flows across all levels of focus (cf. Young, 2008) several times during the process. From a design perspective, the process is complex and in many phases, it is impossible to implicitly define to which level a certain phase belongs to. That is why several phases are placed in between different levels. The same applies to design orders (cf. Buchanan, 1992, 1998): two or three out of four orders are present in most of the phases. Fourth-order design particularly takes place in the beginning and at the end of the process and when working at the level of design of context, and less in the level of design in a context.

In Figure 3, it becomes visible that the phases of the process navigate from one context and resolution to another: certain activities are formed on one boundary, and then taken to another boundary. However, in the intense TA process, these phases need to be interlinked and feeding to another, and the emerging depository of shared understanding needs to be channelled (cf. Hyysalo, Perikangas, et al., 2019c) from the organiser to the workshop materials, to the participants, and back from participant perspectives to guide consecutive activities and eventually lead into pathway studies that are then packaged into deliverables. Furthermore, as the analysis points out, there are certain key moments in which many contextual boundaries need to be connected into a certain phase. An example of such a moment is the pathway co-design, where alternative solutions and their interlinkages need to be discussed together to reach the goals, even if all possible solutions may not be presented. This calls for specific design expertise that enables rapid operations in the TA setting to connect to processes and materials on all four orders of design.

It is worth noting that in our case TA, as usual in TAs, several actors are involved in a process, of whom only a few are professionally trained designers. In our case, the technical facilitators were situated in a design department of a university, are trained in design research, and are experts in the processes and tools of the TA. They also had content knowledge but were supported by expert facilitators of each specific field. The sustainable development experts at the PMO had the overall responsibility of the outputs and they were actively involved in co-designing both the content and the arena. Augmented by the design tools and technical and content facilitation, the pathways were constructed by the Commission members, who represent different fields of expertise and interest groups (see more about the roles of the different actors in appendices 2 and 3). A setting like this is challenging to create and facilitate, but it can later foster societal acceptance of the agreed steps in the strategy.
3.2 Zoom in: contextual aspects and design orders in the pathway creation workshops

In addition to analysing the whole TA process, we zoom in to one of the pathways and two important events in the process to give an example of what was actually co-designed in these events and what happened in terms of design orders and actions (see Figure 4).

The participants of the pathway group ‘Economy and work promoting well-being and sustainable consumption’ consisted of nine members of the Commission, representing trade unions, business associations and industry confederations. In addition, the group included one city and one ministry representative. Three of the experts were directors or deputy managers and six were senior advisers and specialists. The group produced a significant statement that was novel in Finnish governmental discourse:

‘We must undo structures that cause overconsumption in order to create human wellbeing within Earth’s limits, and thus achieve the goals of sustainable development. To do so, we must place natural capital and human capital at the heart of economic thinking and adopt impactful measures to adopt and mainstream more sustainable consumption and production methods (PMO Finland, 2022, 17).’

The statement can be considered transformative. The fact that overconsumption structures need to be changed has been stated already in the previous policy programmes, but before this it has been stated with very few solutions related to economy. However, through the TA process this TA pathway group discovered how to start tackling the challenge in the economic context. Placing natural and human capitals at the heart of economic thinking requires developing procedures for managing these capitals the same way financial capitals are managed.
The starting point for the pathway co-design work was a vision and eight goals for 2030 (see PMO Finland, 2022, p. 15). The pathway co-design work started within the already-set context, as the participants individually ideated steps needed to reach the goals (DiC; see Figure 5 step 4a1). This was followed by a facilitated discussion round to refine the context of work (DC; step 4a2), where topicically connected steps were grouped and links between them were made visible with arrows. The facilitators located two subtitles under which they organised the steps: circular economy and wellbeing economy (DiC; step 4a4). At the end of the workshop there was a second round where participants added new steps as well as detailed the steps with actions, referring to, for example, policy, technology, and business (DiC; step 4a5). After the workshop, the technical facilitators worked to better arrange and visualize the pathway constructed by the participants in the Miro-based pathway board and expert facilitators wrote a draft version of a change narrative.

In the cross-examination phase (step 4b), the PMO as well as the participants and facilitators of the other groups commented on the pathway and the change narrative drafts. They were asked to consider the coherence, the adequacy of the proposed steps as well as possible synergies, trade-offs and overlaps with the other pathways (DC). The main outcome of the cross-examination was that the pathway and the narrative described was deemed a good start but not seen as enough to reach the goals. Furthermore, other pathways were found to depend on the success of the economy pathway.

In the second pathway creation workshop (step 4c) the group systematically reviewed the comments and co-designed new, more ambitious steps (DiC). After brainstorming and adding smaller topics, the group introduced the concept of nurturing and managing our natural and human capital (based on the idea of Dasgupta, 2021). This concept and related actions were considered as prerequisites for the success of other steps (DoC). After the workshop, the facilitators finalised the pathway structure and the change narrative (DIC; for results, see Lähteenoja et al., 2022).

4 Discussion

The rising interest in using design in furthering long-term sustainability transitions has created ambiguity with respect to what this new area of design is comprised of, what kind of designing it involves, and what new designer roles and engagements emerge through it. To clarify these matters we focused on a case of, to our knowledge, the hitherto highest policy level process conducted within designing for transitions. To guide our analysis from a design-theoretical perspective, we developed a framework integrating two models: Buchanan’s (1992; 1998) ‘four orders of design’ and Young’s (2008) ‘complexity in design’ models. The resulting integrated analytical framework assisted us to examine transition co-design dynamics at a level of abstraction.
suitable for design-theorising. This enabled us to expand our understanding of
design in the context of transitions beyond outputs and processes traditionally
attributed to design, and without the limitations of the perceived boundaries
and forms of established domains of professional design practice. Our analysis, assisted with this integrated analytical framework, resulted in new, empirically-supported knowledge on the capabilities put on the table by designers in transition contexts, in addition to design’s already acknowledged instrumental value. The integrated analytical framework is both a theoretical and a methodological contribution at the intersections of the two fields in which this research is situated: sustainability transitions and design research. Using the framework, we were able to analyse the presence and significance of various design activities across the complex contexts of sustainability transitions and we have expanded the understanding of design in transition contexts beyond its instrumental value.

Our findings indicate firstly that designing for transitions consistently blends different forms of design work to succeed. Whilst designing for transitions requires a new orientation for designers as elaborated by, for example, programme outlines for transition design (Irwin, 2015; Tonkinwise, 2019), its successful empirical realisation is not limited to new design skills on systemic integration and designing of context, or covered by a new design discipline specialised just on these aspects. The need for expertise in ‘lower orders’ of design and designing in and for context has not disappeared anywhere (see Figures 3 and 5). Secondly and just as importantly, our findings equally indicate that designing for transitions is not just another application area for any existing...
design expertise and methods. Designers work in novel ways and in new relations to other organisers and participants in transition endeavours.

Thirdly, similar to findings by Gaziulusoy and Ryan (2017) and Hyysalo et al. (2019a), our analysis underlines the concurrent and overlapping presence of expert and diffuse design (cf. Manzini, 2015), and limited evidence of expert design in ‘pure’ form. There were instances where expert design played a significant role, as for example in the further designs to the pathway toolset and workshop procedures and the working board used. However, in these instances also, design expertise was complemented by content and context knowledge from transition domain experts (cf. Hyysalo et al., 2019b), necessary for accommodating the complexity of transition processes in the tools, workshop designs and technical facilitation. Diffuse design, on the other hand, was widely present in the process, most notably in the contributions by the participants and expert facilitators who formed the pathways and formulated the narrative and policy recommendation outcomes with the help of expert design produced tools and procedures. Yet diffuse design was present just as well in the codesign that happened between domain experts and ‘expert’ designers regarding procedures and redesigning of tools. These findings are significant both from a theoretical perspective, but also in regard to implications for professional identities of design and transitions practitioners alike.

Perhaps a fruitful approach to theorising about design in transition processes would — rather than simply focusing on the professional designers’ and participants’ roles in the process — instead focus on the agencies of design that enable governance of highly strategic and complex policy processes as transitions require, by whomever the agency is channelled to at any given time, but with support from professional design (see Table 2). In this process, the assessment through the orders of design by Buchanan (1998; 1992) helps to identify how ‘higher orders’ call for an increasing amount of diffuse design participation, but this is only enabled by the increased support by expert design actions. Such theorisation is also important given design for transitions appears to be a hybrid expertise situated at the intersections of two fields of inquiry and practice, requiring careful consideration of implications of this ‘in-betweenness’ on future educational and professional development activities in both fields.

Examining the agencies of design in transition management and sustainability transitions indicates that the design for transitions field involves several possible (often even necessary) design agencies for professional designers and for other actors alike. In addition to more conventional design skills on communication and (visual) construction, there is a special type of orientation needed in facilitating activities and phases in transition projects. This orientation focuses not only on preparation of materials and communication (signs, words, materials; cf. Buchanan, 1998), but also in facilitating co-design workshops (action), connecting outputs to guide further action (strategic planning),
and in key phases of the process they are also able to integrate and ‘weave’ the contextual and material boundaries together (systemic integration). These people can be professional designers as in many ways professional design education prepares for some such domains of action, but some of this type of expertise can also be attained through experience in deliberative facilitation and in accumulated domain expertise from various topical fields. Regardless of the starting point, be it from design or from the topical transition field, the challenge remains in sufficiently bridging the requisite expertise areas. In effect, in transition design, this makes a multidisciplinary team composition a (practical) necessity.

In all, there are good reasons to conceptualise design for transitions as an emergent and hybrid expertise area, not belonging to the current disciplinary boundaries of design nor of transitions. On the basis of this observation, seconding Gaziulusoy & Erdogan Öztekin (2019) we argue that designing for transitions is a scholarship and practice residing at the intersections of both, and that this has been going on since the long-term, systemic and structural societal change processes for sustainability have started to be a focus on research programmes in the EU at the turn of the millennium.

5 Conclusion
This article contributes to the emerging literature at the intersection of design and transitions scholarship in two significant, interrelated ways. First, we developed an integrated analytical framework by using Buchanan’s (1992; 1998) ‘four orders of design’ and Young’s (2008) ‘complexity in design’ models. We then used this framework to analyse a case study of a TA process supporting the national 2030 Agenda strategy creation in Finland, to illustrate how the framework allows us to assess the dynamics between design actions and agencies of actors in connection to the contextual complexity of a TA process. Secondly, we assessed different types of actions and their connections to different types of design action, to better understand the different ways design can connect to and support agencies to promote sustainability transitions. Our results show that design is omnipresent in transition processes both instrumentally as well as from procedural, attitudinal and intellectual perspectives. Design for transitions offers new agencies for designers as well as for participants involved in the processes.

Design for transitions, especially at the level of design of context (cf. Young, 2008), requires hybrid expertise that covers different design levels as well as understanding the transformation needs in the content that is being co-designed. Future research could bring in theoretical and methodological perspectives from, for example, systems science and science and technology studies, to further understand agencies of design action in contexts of transitions, focusing on emergence from such agency across networks of various expertise and professional domains involved in TAs, rather than trying to figure out who does what in regard to design and designing. While we have identified design competencies required in
complex sustainability transitions contexts through our analysis, we also observed that “expert” design almost never operates independently; it either supports diffuse design by transition actors or takes the form of diffuse design by deviating from roles and practices that are traditionally attributed to design profession. Therefore, we argue that trying to delineate ‘expert’ designer roles and competencies in the context of sustainability transitions is mostly a futile effort and likely to be limited by existing, historically established boundaries of the profession and the professional identities that define themselves in those boundaries. Clearly, there is a need for more empirically-grounded research to further theorise what constitutes designing in transition contexts and thereby who legitimately could claim being a ‘transition designer’ and what implications this presents for education and professional development of ‘new generation’ hybrid experts whose practice is situated at the common design-transitions playground. A logical next step in research to characterize transition design competencies, therefore, is to better understand agencies of design in transition contexts and how, under what circumstances, and by which actors these agencies materialise. This calls for collaborative inquiries from design and transition scholarships to open up epistemological, methodological and theoretical frames from both fields to achieve creative, interdisciplinary integration that will shape and define this hybrid expertise emerging at the intersections between the two fields.

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**Declaration of competing interest**
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**Data availability**
The authors do not have permission to share data.

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**Appendix 1. Examples of design actions’ different contextual settings (Young 2008) and different orders of focus**
<table>
<thead>
<tr>
<th>Stages of the TA process</th>
<th>Design actions in TA process</th>
<th>Contextual focus and setting (Young 20)</th>
<th>Reflections on design actions of different actors</th>
<th>Focus orders of design action (Buchanan, 1998)</th>
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</thead>
<tbody>
<tr>
<td>1. Background and decision to use TA process</td>
<td>1a. Decision to create a roadmap and a strategy for the 2030 Agenda.</td>
<td>Design of Context (DoC): The government included a roadmap to 2030 Agenda in the government programme in 2019, based on the evaluation results.</td>
<td>Policy-makers: Strategic decision after the government programme negotiations in 2019. PMO: Implemented the government programme, wanted to use participatory transition methods to involve the whole Commission, frontrunner role globally, too. Others: Researchers, actors involved in earlier TA processes, evaluators of the earlier work (Berg et al., 2019)</td>
<td>Based on strategic planning in the PMO, roadmap work for A2030 was initiated (3rd order); This was based on the decision to bring the 2030 Agenda to policy formation (4th order).</td>
</tr>
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<td></td>
<td>1b. Selection of mid-range TA as a method</td>
<td>Designing Context (DC): PMO and university discussed the possible tools and PMO decided to use the TA method.</td>
<td>PMO: Familiarised themselves with the different science-based transition design and facilitation options; allocated resources for the work (time, people, financial costs). Design team (university): Introduced, negotiated and modified the TA process to fit into the given resources and time.</td>
<td>At this stage, the focus was on finding means to facilitate the A2030 roadmap process. The mid-range TA process was chosen for use in the A2030 roadmap activity, linking to the planning of activity (3rd order) and supportive materials (2nd order).</td>
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### Stages of the TA process:

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<tr>
<td>2. Adapting mid-range TA methodology to the context of A2030</td>
<td>2a. Development of thematic areas for the work</td>
<td>PMO: Led the development of the thematic areas. Researchers: Gave scientific input for the development of the thematic areas. Design team: Set the number of thematic areas based on resources, the number of participants, and facilitation design. The Commission (led by the Prime Minister): Commented and finally approved the thematic areas.</td>
<td>The PMO secretariat set the context and the specific six areas for the whole work. This work spans from setting the materials (i.e., described elements in each area; 2nd order) to consideration on process dynamics and inclusion (3rd), to also considering potential to integrate outcomes of the work to a new sustainable development strategy (4th).</td>
</tr>
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</table>

#### 2a. Development of thematic areas for the work

- **DC**: PMO secretariat together with the scientific panel and selected researchers organised a workshop to set the context and the specific areas of change.
- **Design in a Context (DiC)**: The areas were selected to align with the 2030 Goals, and identified areas of development (based on earlier work).
- **DoC**: For the participants in each thematic group, the phase set the system boundaries for the pathway work.

#### 2b. Facilitator and participant selection

- **DiC**: Selection of facilitators and participants by the PMO secretariat.
- **DC**: Participant group selection was mainly based on interests (selected two areas) but group dynamics were also considered by the organising team.
- **PMO**: Invited the expert facilitators, divided the participants into six thematic groups.
- **Researchers**: Provided support in finding the facilitators.
- **Design team**: Three technical facilitators designed the process and the timeline to enable each person to facilitate two groups in the given timeline.
- **The core team performed strategic selection of the groups, participants and facilitators (3rd order); When expanding from PMO and the core team to the outside expert facilitators and later also the participants, also the ways of discussing the topic (1st order) was opened up.**

#### 2c. Thematic background studies

- **DC**: Clustering and prioritising systemic areas based on earlier research; Summarising the status quo of the topics and existing policies.
- **PMO**: Supported the background study writing, checked facts, provided cases etc.
- **The core team and selected experts prepared a material package to guide the pathway work in each area (2nd order).**

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### Stages of the TA process:

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<tr>
<th>2d. Adapting the online tools for A2030 pathway creation</th>
<th>DiC: The core team facilitated the modification of the online toolset to fit with the areas of the A2030 arena, creating pathway templates.</th>
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<tr>
<td>3a. Co-designing visions for each thematic area</td>
<td>These stages sum up the work in two workshops, where visions and goals were formulated. DoC: The participants in each group discussed and developed visions for the 2030’s, with the support of the secretariat and facilitators. DC: Based on the background research, earlier work, political priorities and the 2030 Agenda, the participants developed goals that support and concretise the vision, with the support of the secretariat and facilitators.</td>
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<tr>
<td>3b. Developing visions and setting goals for the thematic areas</td>
<td>The core team and expert facilitators: Drafted the first vision versions, iterated and made final suggestions after the workshops. Participants: Co-created the visions and goals further.</td>
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<tr>
<td>3. Developing change vision and setting goals</td>
<td>In two workshops, visions of change for each of the six thematic areas were developed, expanding from the identified elements in each area (2nd order), to possibilities to study them as a whole with strategic interconnections (4th level), to also support pathway work in the subsequent workshops (3rd order).</td>
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<tr>
<td>4. Developing pathways (participant comments, cross-examination and facilitator/team revisions)</td>
<td></td>
<td></td>
<td>The pathway work in thematic sub-groups developed details and structures to pathways (1st and 2nd order), as well as their dynamics and interplay (4th); However, constant iteration on activity was needed from the core team (3rd order).</td>
</tr>
<tr>
<td>4a. Co-designing mid-range transition pathways to six thematic areas (actions, their relations, important steps)</td>
<td>DiC: The pathway work began in each thematic group by the ideation of pathway steps to bridge the gap towards the identified goals, and continued in facilitated rounds to increase details on identified steps.</td>
<td>Technical facilitators: Led the co-design of the transition pathways. Participants: Co-designed the pathways. Expert facilitators: Made sure all the relevant aspects were covered, proofed facts. PMO: Commented especially from the SDG point of view.</td>
<td>The cross-examination of the first part of the pathway work aimed to integrate elements and find synergies across the work of different thematic groups (4th order).</td>
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<tr>
<td>4b. Cross-examination and commenting (policy coherence, synergies, overlaps)</td>
<td>DoC: In the second pathway work session, the groups as well as the scientific panel cross-examined the initial results, and further work in each group was assessed from the perspective of contextual relevance and synergy.</td>
<td>Participants: Commented on the work of the other groups, received comments from the others. Scientific panel: Commented on the pathways. PMO and facilitators: Checked and resolved overlaps, added missing pieces, brought in the received comments.</td>
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<tr>
<td>4c. Revising the pathways</td>
<td>DiC: To finalise the pathway work, thematic sub-groups continued with final revisions to the pathways and to reporting.</td>
<td>Participants: Discussed the open questions, negotiated on difficult topics, co-designed the online pathways. Facilitators: Facilitated the co-design work. PMO: Supported the work, found compromises to difficult questions.</td>
<td>The finalisation of pathway work took place in thematic sub-groups, where elements of the pathway were revised (1st and 2nd order), and final integrated action points were worked out (3rd and 4th order).</td>
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Stages of the TA process:

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<tr>
<td>5. Pathway work results (visual and report)</td>
<td>5. The pathway work results (visions, goals, change narratives, visual pathway figures) were summarised in a report (not yet public but shared internally with the Commission)</td>
<td>DiC: The technical facilitators put together the report and finalised the visual pathways. The expert facilitators wrote the narratives and participants commented and approved the work. This stage also included bilateral negotiations based on participants’ comments. At the end of this stage, the pathway work was closed and no more changes in visions, goals and steps were accepted.</td>
<td>Expert facilitators: Wrote the pathway narratives. Technical facilitators: Designed the final pathways. Participants: Commented on and approved the final pathway figures and narratives.</td>
<td>From each thematic sub-group, the pathway work results (1st and 2nd order) as well as suggested strategic action for the future (3rd order) were compiled into a single report, where cross-thematic connections and policy principles were also assessed (4th order).</td>
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<tr>
<td>6. Discussions in panels and boards</td>
<td>6. The main results were presented and discussed in different panels and boards (e.g., climate panel, development policy committee)</td>
<td>DC: The boards and panels discussed the linkages of the results to their own field as well as the five cross-cutting principles guiding the implementation of the work. Principles include “leave no one behind” as well as ensuring justice, equal treatment and gender equality (see PMO Finland, 2022).</td>
<td>PMO and other ministries: Led and organised discussions with different expert boards and roundtables. Board and roundtable members: provided input to policy principles and linkages to their work.</td>
<td>This stage disseminated the outputs of the TA work to further audiences, representing strategic actions (3rd order) to promote the main results to have a systemic impact (4th order); In this process also communication and the packaging of the main elements was reconsidered (1st and 2nd order).</td>
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7. Outcome: a basis for the new sustainable development strategy

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<tr>
<td>7a. Outcome: the 2030 Agenda roadmap</td>
<td>DoC: After editing and fine-tuning the pathways and narratives, the Commission published the 2030 Roadmap in February 2022. The Commission decides that the roadmap will transfer into a new sustainable development for Finland.</td>
<td>PMO: Created summarised the main outcomes of each pathway to figures describing the six thematic areas. They also collected final comments (verbally and written) and incorporated them to finalise the roadmap. The Commission made final comments to the roadmap and approved it.</td>
<td>The 2030 Agenda roadmap includes systemic change areas (4th order) as well as strategic step suggestions (3rd order).</td>
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<tr>
<td>7b. Outcome: Renewed national sustainable development strategy 2022–2030</td>
<td>DoC: After final edits, the Commission published a new strategy in April 2022: “Strategy of the National Commission on Sustainable Development 2022–2030: A prosperous and globally responsible Finland that protects the carrying capacity of nature”.</td>
<td>The PMO finalised and published the strategy. The Commission for Sustainable development is responsible for implementing the strategy.</td>
<td>The renewed sustainable development strategy in Finland opens up the needs for systemic level change needs in policy formation and throughout the society (4th order).</td>
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(Buchanan, 1998), in relation to design agencies in the A2030 TA and strategy development.

References


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