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Intermediate Codesigning in Transitions Governance: Catalysing and Channelling Participant Action

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ABSTRACT Design research is increasingly used in catalysing society-wide changes in futuring and in transition process-related deliberations. These processes underscore the role of 'intermediate designs' – the means, tools, and procedures that help participants to reach meaningful outcomes. Whilst intermediate designs are well recognized in collaborative design, the design of intermediate designs is a hitherto little studied area. To orient design researchers towards it, we analyse a codesign process of developing a transition pathway formation tool, and characterize its specific features and design considerations. The main finding is the continuous effort by designers towards the 'channelling of participant action' through design choices so that the outcomes and processual integrity of the collaborative envisioning is ensured while avoiding 'designing the participations', which would hamper participants' freedom to deliberate, express, create, and take ownership of the process and its results.

KEYWORDS: codesign, intermediate design, transitions, design process

Introduction

The design profession has expanded the scope of design objects throughout its history. Moves from industrial design to interaction design, from information design to service design, from ergonomics to user-centred design, and from codesign to open design have all been associated with new types of objects, competences, processes, and relationships with the clients and users of design (Valtonen 2007; Abel et al. 2011).

One of the recent key developments in the field of design has been the expansion of design activities into long-term transition processes towards, for instance, low-carbon energy systems and circular economies (see, e.g. Ceschin and Gaziulusoy 2016; Irwin 2015; Hyysalo et al. 2019a, 2019b). Such society-wide long-term changes are not 'designable' per se as they result from hundreds of intertwined actions that span regulation, technology development, altered consumer practices, taxation, and new business creation (and so on) (Geels and Schot 2007). At the same time, there is plenty that can be designed for sociotechnical transitions (see, e.g. Ceschin and Gaziulusoy 2016; Jalas et al. 2017).

An important strand of this work concerns the use of codesign in better connecting the relevant actors that are needed for bringing about societal change in liberal democracies: decision makers, experts, civil servants, citizens, NGOs, and business leaders (to name but a few). Codesign has a long tradition of creating contexts, tools, and procedures through which such diverse stakeholders can better deliberate and learn from each other (see, e.g. Schuler and

Namioka 1993; Bødker, Kensing, and Simonsen 2004; Botero 2013). However, when used for catalysing social change and sustainable alternatives, the outcomes of codesign may not result in further designs but in more open-ended, wider, and loosely defined outcomes–such as the envisioning of new organizations, regulations, and altered everyday practices–and the schematics of how these are tied together in fostering long-term systemic change (see, e.g. Jalas et al. 2017; Gaziulusoy and Ryan 2017a, 2017b; Hyysalo et al. 2019a).

Such use of codesign underscores the importance of 'intermediate designs' that are not carried into the final outcome production but help the codesign process to progress towards it (Eriksen et al. 2014). Previous examples of intermediate designs are tailor-made notational systems for work modelling, designs of workshops, design games, and models that are to push ideation further (see, e.g. Mattelmäki 2006; Vaajakallio 2012; Eriksen 2012). Intermediate designs differ from ready means–such as off-the-shelf prototyping software or stacks of sticky notes–which do not need to be designed for the project at hand. Intermediate designs also differ from the early versions of the outcome object as even the progressing prototypes may be key mediating means between users and designers (Botero 2013). This said, the borderlines between means, intermediate designs, and evolving final designs are blurry, particularly in cases where the outcome design is intentionally designed to allow further evolution (Hartswood et al. 2002; Abel et al. 2011; Botero 2013). Indeed, many outcome objects of codesign are built to serve as 'design seeds' and 'meta-designs,' created not to be used as such but to capacitate the user's further design efforts (Fischer and Gicciardi 2006; Botero, 2013; Hyysalo, Jensen, and Oudshoorn 2016).

Whilst intermediate designs merit more research per se, the specificities of 'intermediate designing' have attracted far less research than they deserve. It is common to report intermediate designs forming different strategies for codesign (see, e.g. Eriksen et al. 2014; Sanders and Stappers 2014), but the designing that goes into achieving them remains less reported.

To further this line of study, we describe and theorize a five-month long process of intermediate designing for the creation of a collaborative formation toolset for pathways of change in transitions. The toolset is comprised of a large metallic board on which workshop participants can move pre-formed magnetic elements; procedures for progressing in the work; a facilitator and participant guides; and a digital environment that allows the distributed refinement of pathways. This 'Mid-range transition pathway creation toolset' (MTPT) is used in the context of transition arena (TA) processes (Ferguson et al. 2013) to render them more effective, and it has thus far been receiving considerable success (Hyysalo et al. 2019a, 2019b).

We proceed by first introducing transitions governance as a setting for intermediate designing, and then outline how we documented and

analysed the design process, with focus on the intermediate designing throughout the process. Consequently, we describe the eventual use of MTPT, followed by discussion and conclusions.

Transitions Governance as a Domain for Intermediate Designing

The need for thoroughgoing system transitions has become urgent in several areas, such as energy, in which climate change exerts pressure to replace the fossil-fuel–based systems (IEA 2018). Such transitions affect society widely, going beyond energy production to include housing, zoning, land use, taxation, mobility, consumer practices, and so on. Achieving thoroughgoing transitional shifts requires anticipatory action, societal experimentation, and policy changes (Geels and Schot 2007; Köhler et al. 2019). Transitions governance is an emerging area of concern among policy, business, and design practitioners, as well as among academic researchers (Köhler et al. 2019; Ceschin and Gaziulusoy 2016; Irwin 2015).

Transition management (TM) is one of the most developed transition governance approaches, originating in the Netherlands in the early 2000s (Loorbach and Rotmans 2010; Frantzeskaki, Wittmayer, and Loorbach 2014; Roorda et al. 2012). TM aims in creating spaces for searching, learning, and experimenting on the transformation of the current system with 'frontrunner' stakeholders beyond the political cycle of elections (Kemp, Loorbach, and Rotmans 2007; Loorbach and Rotmans 2010). TM further emphasizes the construction of pathways of change in order to meet a long-term vision and specific transition goals, and corresponding experiments that can lead towards chance (Loorbach and Rotmans 2010). The identification of challenges, vision building, and the construction of pathways of change take place in transition arenas (TAs), series of workshops conducted with diverse groups of frontrunners. TM and TA processes have been geared towards a long-term transition focus of 40–80 years and the means of creating scenarios and pathways have reflected this, remaining relatively broadscale, connected to present concerns with the identification of 'immediate actions' (Frantzeskaki et al. 2017; Roorda et al. 2012).

The increasing urgency to accelerate energy transitions after the Paris agreement and the latest IPCC report calls for better means to address the 5–15-year mid-range dynamics, forming the most relevant policy time frame considering the large gap to carbon neutrality around 2040 and the current state of affairs (IEA 2018). Shifting from long-range to mid-range visions and pathways, however, makes goals and pathway steps more concrete and potentially more difficult to reach consensus on. Furthermore, based on the available manuals and materials, the pathway construction process in TAs had previously proceeded with little more than pens, sticky notes, and facilitators and then analysts turning these into more coherent pathway depictions (Ferguson et al. 2013; Roorda et al. 2012). We considered

this wasteful on time and being potentially alienating for the participants who themselves were the best experts capable of directly constructing the pathways. Better intermediate designs would aide multi-actor deliberation and path formation in fast-paced workshops and allow for fast iteration and commentary of the envisioned pathways as part of the process (Hyysalo et al. 2019a, 2019b).

Our initial aim was for a relatively self-standing system of representation, but the MTPT design progressively incorporated more proceduralization in order to ascertain meaningful outcomes. In some respects, its final form resembled design games: it had a board, a finite set of elements, a proceduralized progression, and a loosely defined end state (cf. Torvinen 1999; Vaajakallio 2012). At the same time, it was purposefully not a game that could be 'played' but rather a set of elements that the participants could appropriate in order to elaborate and deliberate the change pathways and express their view of the pathway steps (Hyysalo et al. 2019a, 2019b).

Data and Methods

As part of the overhaul of TA processes to mid-range contexts, MTPT was designed through an iterative action research process by using collaborative design methods. The process had several stages, lasted for approximately half a year, and involved a wide group of people, ranging from students to researchers and experts (see Figure 1).

The reconstruction of the design process is based on interviews of the members of the TA core planning team, memos and discussions, and other documentation. Additionally, the first and second authors held and recorded biweekly reflection and anticipation sessions throughout the process in order to track insights without the potential retrospective bias that tends to result when interviewees weigh up or forget issues and concerns when interviewed after the fact.

The Intermediate Codesigning of a Mid-Range Pathway Formation System

From Initial Ideas to Concept Exploration and Mock-Ups: 2015–2016

The initial assumption was to simply adapt existing TA process templates for pathway formation, but as noted, these appeared too

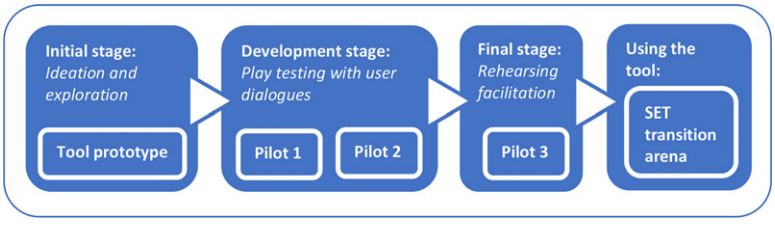

Figure 1.
The design process of Mid-range transition pathway creation toolset (MTPT).

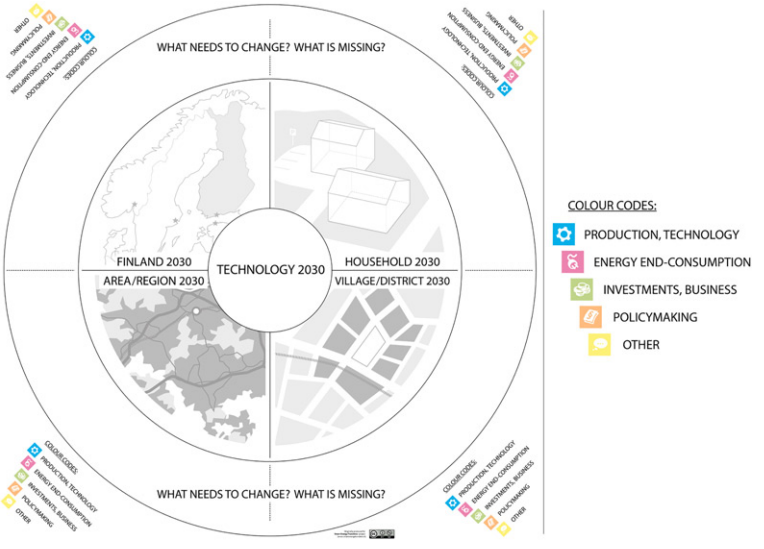

Figure 2.
The board that was used in 2016 forecasting workshop (translated by the authors).

broadscale for the mid-range. One of the first precursors to MTPT was developed for a technology-specific forecasting workshop that was held on June 2016, with focus on how different renewable energy technologies would develop in Finland by 2030. This was an A1-sized board (see Figure 2) that was divided into four different 'scales' (household, village, area, and national) to aid deliberations on how the technologies might be materialized and what would be required to proliferate them effectively. Eventually the technology-specific boards were filled by using colour-coded sticky notes in a three-hour facilitated process, performed by eight participant teams.

Whilst the workshop got appreciative evaluations, the board was considered too simplistic for forming the technology-independent pathways needed in the TA, where participants would need to:

- formulate steps which would form a transition path for each transition goal;
- perceive the interrelationships between steps and the timing of needed actions;
- evaluate the realism of the suggested steps and the actions with which the essential steps can be supported;
- recognize the most critical steps in which societal choices have to be made;
- consider the actions from the perspectives of different societal sectors;
- become better capacitated in understanding what potential actions people should be prepared for, and what could be the means for achieving a transition.

The open questions and uncertainties were manifold at this stage, with multiple 'goods' needing consideration, such as the quality of deliberation, the legitimacy of the arena process, the quality and integrity of the outcome pathways, the 'insight value' that pathways would have outside the arena, participant ownership and commitment, the pace of work, and the number of pathways that could be pursued.

The MTPT development was next elaborated on a master's level course held in late 2016. Two student groups developed a mutually complementary design based on a honeycomb structure. The first group departed from the June 2016 workshop design and elaborated how the round board could include a sectorial inspection of different scales of the path steps (see Figure 3). The paths were created by movable magnets to allow use of a vertical surface.

The other group examined resilience and contingency factors related to pathways and pathway steps. They developed a notation system of four different elements that could structure deliberation over how to improve the resilience of the solutions through 'what if' elements, adaptive measures, concrete actions, and the

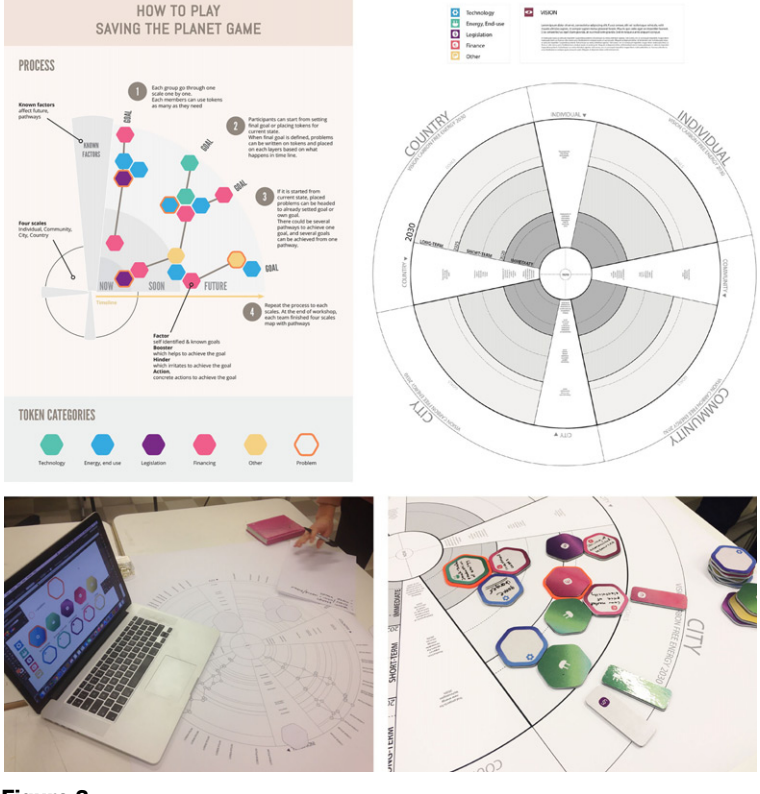

Figure 3.
Magnets with different themes and acrylic additional frames that allowed indicating if a step had multiple types of action (e.g. technology, regulation, business actions). Sketches for the magnetic notation system.

Figure 4.
Visualization of a pathway as a puzzle on a square board. Note the larger size of the hexagons and the open 'playing board'.

involvement of other actors. They further described a protocol for how these resilience deliberations could be organized in a hexagon form surrounding a particular pathway action (see Figure 4).

The TA design team concluded that movable magnets in a hexagonal grid would have several benefits compared to cardboard elements or sticky notes. Also, the way to agglomerate actions as additional elements around each pathway step was deemed good. In this way each pathway could have 5–10 steps and a few branches–still likely to be insufficient. However, structuring the work into four separate scales was considered difficult to manage (as pathways could evidently include actions on several scales) and a linking system could hamper the fluidity of the work in fast-paced workshops.

As a result of admitting that an encompassing multi-scale pathway construction was unlikely to work, design was shifted to a system for adequately representing one pathway. The TA team adapted the hexagon design, and qualifier elements designed for resilience work into the pathway formation board itself. The separation of 'pathway step' and 'what actions are needed for the step?' elements was a clear solution, and this relatively simple design appeared versatile for the rather large uncertainties regarding how participants might work together. The second author joined the TA team to develop her thesis project after having been a member in one of the student groups.

The element sizes and text visibility required some minor adjustments and with those in place, the size of the hexagon grid board could be specified such that 10–20 steps could be placed on it with several branchings, together with clusters of 'step actions,' resulting in a 150 cm x 240 cm board. In this design the hexagon elements, not locations on the board, would indicate the information, scales, timing, and the main actor for each step (see Figure 5). For 'pathway step actions' nine further pre-coded variations were created: pilots

Figure 5.
A pathway-step element and an example of a filled-in pathway step.

(green); operating models/business models (grey); investment (yellow); energy end use (red); energy production (orange); regulation (violet); technology (blue); and other actions (brown).

Instead of drawing lines on the pathway board arrow magnets were used as connectors. The team had also a suite of ideas that could be included, such as markers for pathway steps that converge with another path and ideas about how to mark (sub)pathways that contribute to several transition goals.

Up to this point the intermediate designing of the MTPT system focused on designing the physical elements. The subsequent design strategy was to proceed in iterative cycles of designing, prototyping, and testing, mixed with ideas from playtesting (Zimmerman 2003) and user dialogue (Buur and Bagger 1999). The designers collected ideas for a prototype and, when satisfied, built the prototype with which to run tests. This was followed by dialogue sessions with the test participants.

From the Internal Pilot to Expert Pilots: Playtesting Mixed with User Dialogue during January–April 2017

The first internal test session of MTPT (pilot 1) was held on 20th January 2017. Each element had been tested and iterated individually before, but a realistic testing session with real content required a complete mock-up of the system. Henceforth the team manufactured all the elements from cardboard (see Figure 6) and selected two transition goals from the Finnish Energy and Climate strategy likely to feature in the arena.

The first test was illuminating in several respects: it verified that the design of elements and the board required just minor tweaks, but it also raised new issues. First, it became evident that the pathways could require as much as 20 steps and become more complex than first expected, for instance, containing several converging and diverging optional paths. Also, the step interrelations could become more varied than what could be marked with just plain arrows, and hence arrows with a writing surface were designed.

Second, the order by which the pathways would be constructed on the board was subject to ambiguity, potentially calling for a more structured process rather than leaving the progression to the participants

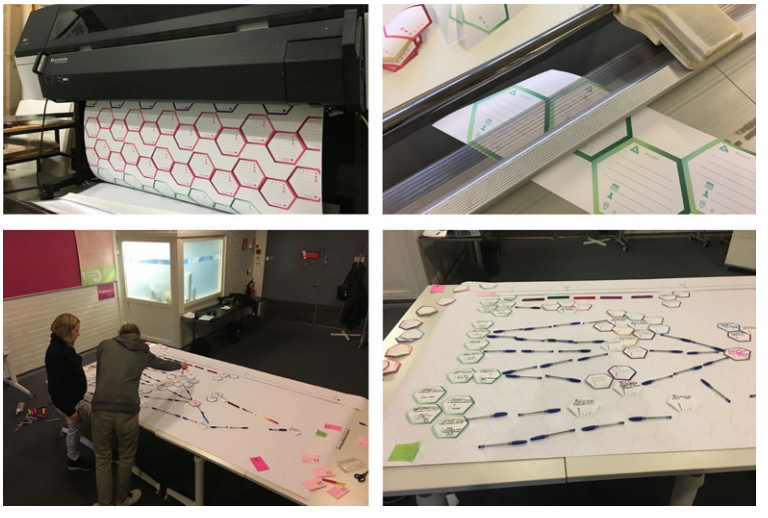

Figure 6.
The prototype for pilot 1 was prepared by printing the MTPT elements on cardboard. Pathway board and hexagons were printed, and pens were used as arrows.

and the facilitator as originally envisioned. At the same time, the guidance was to retain enough openness to make working more empowering, effective, and fun.

Third, the pathway construction was slower and more complex than anticipated. The TA team had assumed that the steps would have been relatively well known to all and thus just deployed on the board, and that the real new insights would follow from pathway interrelationships. The first testing session, however, included the fourth author who was an expert on the Finnish energy system, and she pointed to many areas that were likely to be shrouded with uncertainty and thus take time from the participants.

Fourth, following on from the above, the amount of fact checking needed during the test suggested that pathway-specific facts had to be condensed into an information package beforehand. The assumption that participants would just deploy steps was proving further unrealistic by the complexity of different change measures. However, the most obvious impact and target calculations could be done beforehand.

Finally, it became evident that considerations about the feasibility of the suggested actions might require some type of focalization for each pathway. To aid this, future cast personas were created, encouraged by the Melbourne resilient futures project (Gaziulusoy and Ryan, "Shifting Conversations," 2017b).

Most of these issues were not related to the physical notation system per se but to how the process and procedures were to take place. It became clear that the pathway board and its elements paired with a facilitator would leave the process too vague given that the participants were busy and high-profile people, such as members of parliament, city

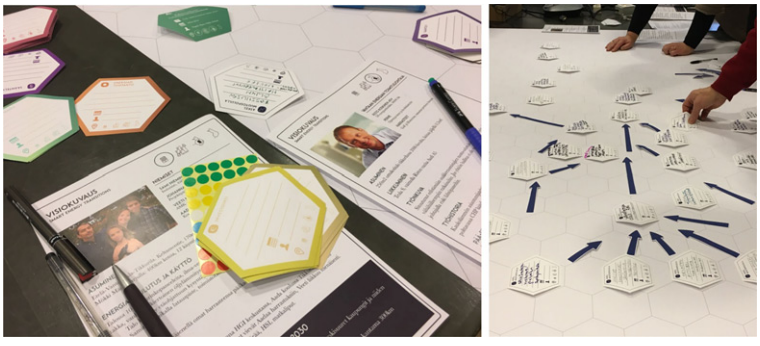

Figure 7.
Pilot 2, with cardboard hexagons and arrows, printouts of the vision profiles, and stickers to mark prioritizations, enablers, and hindrances.

mayors, CEOs, and civil society actors. Hence, the design responses were primarily 'social' and 'procedural' rather than changes to physical elements, effectively creating another layer in the intermediate design: dividing the work into several phases, creating facilitator and participant guides, and introducing background memos.

After implementing the iterations to MTPT indicated by the first pilot, the TA team scheduled a second testing session (pilot 2), with four experts on energy systems transition working in the same research consortium. The path creation was facilitated according to the planned run-through, performed on a horisontal cardboard pathway board, and it featured cardboard step elements, vision persona, goal description, a background memo, and a participation guide (see Figure 7). Three note takers tried different recording and note taking options.

For the test participants, the usage of the steps and arrows seemed to come naturally. After twenty minutes of writing up several pathway steps, they started to arrange these on the board. When this first phase was finished, pictures of the whole pathway were taken in order to simulate actual workshop documentation. Subsequently, the participants moved on to the second phase of identifying the change actions related to prioritized steps, which took 45 minutes. During this phase the participants used more time to ponder the possibilities, and the process was clearly more exploratory. Eventually 'pathway step action clusters' were created with the help of the facilitator. The pathway creation session lasted for 1 hour 15 minutes, in other words three times as long as initially anticipated.

After the session, the design team held a reflection session with the test participants, resulting in minor modifications in MTPT, and a decision to add an illustration of a finished pathway in the participant guide in order to give participants a sense of the eventual outcome. Yet, most discussion now revolved around what exactly the pathway construction was to achieve. It was evident that the elaboration could take two to three hours per pathway. The question was whether to aim for a few well-elaborated paths or to aim for a meaningful share of the potentially about 30

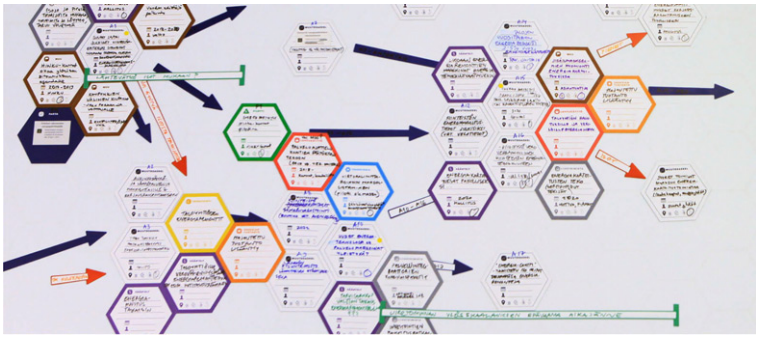

Figure 8.
A detail from a completed transition pathway created during the TA workshops wherein two green uncertainty lines have been used, as well as four red arrows, to mark alternative progressions of the pathway.

different paths required to depict an entire Finnish energy transition. It was eventually concluded that this had to be left for the participants to decide after they had set the transition goals. Three possible modes for the overall pathway formation were specified: 1) 'Timing of key events'–placing just the most obvious onto each path, which would allow 12–18 paths to be constructed; 2) 'Pathway step actions'–examining how the most important steps could be realized with 6–12 paths; and 3) 'Alternatives'–where the three most important pathways would be examined in depth, each by two groups separately in order to cross compare the results. Regardless of which of the three modes was selected, the interdependencies of the paths would need to be examined in retrospect.

The question of alternatives further underscored how to duly address contingencies and alternative pathways to transition goals. The eventual solution was to extend the pathway creation process from two to four phases, proceeding to mark, in phase 3, how much uncertainty there was in timing or actualizing an individual step with the help of uncertainties elaborated in the background materials. Phase 4 would consist of creating alternative paths (see Figures 8 and 9).

These iterations to MTPT were worked into the participant and facilitator guide, with added emphasis on how to deal with uneven levels of expertise among the participants–without, for example, limiting experts' 'air time,' all participants needed to be guaranteed enough space to voice their views and to deliberate over the steps and actions in the pathway.

The test also revealed that note takers could not record the rapid conversation, which meandered between deliberation and discussing what to write on each pathway element. The documentation thus shifted to having video shoots after each phase of the process as this would give participants a clearer voice in explaining the logic of the envisioned pathway. Short videos would also punctuate the phases, helping progress in the overall work.

Figure 9.
The vision and pathway goals elaborated by the TA participants, pathway design process in action, and one of the finished pathways.

The third, and last, testing session of MTPT (pilot 3) was arranged approximately one month prior to the first pathway formation workshop. Now the magnetic pieces and the metallic boards were ready, and participants were given a walk-through of the elements and the process. Regarding the material design, the session resulted only in minor edits to guidelines, and to the documentation procedures.

However, two tensions that had run through the design process remained. The first was between time use and the quality of deliberation. By the third testing session the working time for each pathway had become extended from the original 20 + 20 minutes to 3–4 hours.

As the time slots for workshops were fixed, this limited how many pathways could be constructed. The second tension concerned the resilience analysis–how resilient the pathways and pathway steps would be under the key uncertainties and drivers of change that were identified in the earlier part of the TA process. Already the earlier student work had elaborated a concept for such examination, but in doing so, they had made it clear that it would take at least two to three hours per pathway (i.e., longer than the time frame would permit). The eventually adopted solution, with resilience and alternative pathways' construction phases incorporated to the MTPT main process, was debated in regard to credibility and validity.

All in all, the iterative prototyping and testing of MTPT focused mostly on the balance between multiple competing 'goods'–such as elapsed time, the quality of outcome pathways, the amount and kind of interactions and deliberations between participants and freedom they would have in constructing the paths–in how the physical elements were to be put into motion through procedures and facilitation, and through minor modifications to the physical elements.

The Pathway Workshops Wherein Intermediate Designs Were Put into Action

The workshops for transition pathway formation (see Figure 9) were eventually held in in May and June as half-day sessions, with some two hours of additions still made in August. Earlier in the workshop series the participants had already proposed 30 energy transition goals and prioritized them. Twelve goals had been chosen for elaboration and background memos (6–15 pages) had been created for each. In using MTPT, the participants were divided into six parallel pathway groups of four to five people with high domain expertise and a mix of policy, business, and civil society actors (for documentation of the use of the tool, workshop results and evaluation, see Hyysalo et al. 2019a, 2019b).

Eventually eight transition pathways were created in a 3–8-hour process (per each pathway), divided into 1–3 workshop days, with feedback in between (see Figure 9). All groups departed from identifying the most important steps (phase 1), but from there onwards their ways of working varied owing to the differences in transition goals, differences in how directly influential any potential measure would be in realizing the goals, group composition, and the style of facilitation. The documentation included photos, audio recordings, and video recordings of the pathway phase outcomes (which worked beyond expectations in capturing participants' views of the most important steps, insights, and policy lessons, as well as in articulating the logic and interconnections of the pathways). The results were further refined and digitalized for participants' commentary and the final reporting.

Participants' ability to formulate and deliberate pathways with the toolset was evident in both their actions and in their later evaluation. Many explicitly underscored how the toolset helped to see the

Stage of iteration	Participants involved	Development of the tool	The focus of the intermediate design process
Initial stage	The TA team with student teams	- Basic ideas for the board and play materials are introduced - Initial ideas for path creation activity	- Iterations of existing TM methods - Materials and their contextual and physical qualities
Second stage (pilot 1)	The TA team and some colleagues as test participants	- The board and material mockups are introduced - Initial "rules" for playing are introduced	- The complexity of pathways, slowness of working - The need for a more structured process of working and pre-structured information
(pilot 2)	The TA team with SET project experts as participants	- A play guide is introduced; four phases of work are introduced - Uncertainties and alternatives are introduced - Structured documentation takes place	- What is to be achieved by TA? - Addressing contingencies and alternative pathways - Ensuring space to voice all views
Final stage (pilot 3)	The TA team with SET project experts as participants	- The process and play guide are revised with minor iterations	- Final iteration of the tool - Managing the facilitation load

Figure 10.
The stages of iteration in the MTPT development.

systemic nature of the needed changes, to perceive interrelations between pathway steps, and to share expertise across the small groups (Hyysalo et al. 2019a, 2019b). The identification of the most critical steps also worked well, forming clear spearheads for action amidst the over one hundred actions identified the final 200-page report. The eventually formed pathways featured variations that reflected the different goals, ways of working, and facilitation styles.

Pathways remained mostly within the parameters that the design team had tested and designed for: less than 25 steps, several parallel sub-pathways that came to affect each other at some point, less than seven prioritized steps in which actions were specified, and 10–40 pathway actions. This variation in pathways and the robustness in accommodating different types of systemic changes were perhaps the clearest evidence that the intermediate design did what it was supposed to do. It capacitated the participants to form ambitious yet viable pathways of which they took ownership as a group, which reflected the social changes in the examined domain rather than impose a pre-conceived notion of change onto the system (Hyysalo et al. 2019a, 2019b). Yet the time use remained an issue, being 3–8 hours per pathway.

Discussion

An Overview of Intermediate Codesign in Different Stages of the Process

The process of developing MTPT included three main stages (see Figure 10) from early ideation within the team and with students to several iterations with materials and phases of work, and three testing sessions that preceded the first use of the tool.

The early design stages concentrated on developing a robust and flexible enough path formation system within the core parameters as the designers could not tell in advance how exactly the participants would work use the system particularly as this would depend on transition goals they would define during the arena process. This robustness was, however, at odds with the likely complexity of the pathways and the fast pace of working, requiring quick learning from participants in order to ensure that they would all have equal capacity to contribute. This also pushed the design team to determine what prefilled elements and prompts could be included.

The design work featured a relatively large amount of open questions, which required prototyping and testing to settle:

- *Outcomes*: What will be the nature and kind of the 'ready' pathways? How many steps and interrelations will the pathways have? What is the total meaningful number of pathways?
- *Participants*: How would they collaborate? What level of knowledge will they have? How much time are they willing to devote? How much ownership of the process will they take?
- *Process*: How long will one pathway formation minimally take? Can it be expedited or should slower progress just be accommodated?
- *Materials*: What are good material forms to support pathway formation both in and outside of workshops? What elements need to be included? How much pre-structuring should be introduced?

What resulted from these open questions was a series of design decisions that ensured that the participants would have enough room to manoeuvre while still making enough progress towards the desired outcomes by using similar enough processes to allow comparison. In other words, the open questions evident in the early stage became designed-in parameters through the intermediate design process.

Characterizing Intermediate Codesigning

Openness towards how eventual participants would appropriate the design is a key marker of intermediate designing, and makes it differ, for instance, from game design. At the same time, intermediate designing in this kind of codesign is not just 'building block design' but includes careful consideration of both the avenues or channels within which the participant action is to predominantly remain and the attainable range of outcomes. The codesign process of the MTPT system emphasized various forms of progressive prototyping as a strategy to deal with the tensions and pervasive characteristics of intermediate designing in this kind of settings:

1. The intermediate codesigning of deliberative governance tools blends the design of physical elements, the designing of and for interactions among participants, procedures, principles, facilitation, and documentation. None of these can be designed in isolation and without testing how their interactions actually play out.
2. Multiple and potentially conflicting 'goods' and design goals are common in most design, but the goal conflicts are particularly salient in intermediate designing that is to feed into final outcomes and also engage the participants in the process, seeking to foster preferred types of interactions.
3. The distribution of agency between designers and participants is a core consideration. In deliberative settings where the prime people to act on the results are the participants, designers need to extensively invest in thinking about what results would be actionable for the participants and in which form they would then need to be. At the same time, the designers need to consider how the ownership of the process can become adequately distributed: which aspects of the deliberation and outcome production can be pre-set prior to the process and which are best left to participants during the process?
4. Adequate, and preferably in-depth, knowledge of the target domain and participating actors is key to achieving intermediate design that works for the task and for these participants. This may require multidisciplinary collaboration as in the creation of MTPT where the specific area of energy system warranted involving specialist as a part of the design team and as testers.
5. Reducing the complexity of the intermediate design within the minimal complexity required is another core facet. High simplification would allow easy learnability, easier workshop design, etc. but would also run the risk of producing trivial or shallow results. For instance, in the pathway creation process it became evident that the mid-range energy transition pathways featured more steps that were more complex, more numerous, and more difficult to construct (even for the experts) than had been anticipated. In developing MTPT, this resulted in continued efforts to cater for this complexity, yet keeping it from overwhelming the process: first moving into depictions of individual pathways instead clusters of pathways, then reducing the systematicity in resilience analysis, then sequencing the pathway construction process into four distinct phases, and finally moving to pathway interrelation analyses only after the workshops.
6. Continuous blending and trade-offs between elaborate ideals and unimpressive mundane considerations is equally part of intermediate designing. For instance, in the MTPT system, ideals of high-quality deliberation and rigor in resilience analysis not only

competed for time with each other but also with the attainable time from participants, as well as the manageable number of people per pathway board, facilitator manpower regarding how many boards can be worked on simultaneously, and the effort and time participants needed to expend on learning alternative notations and procedures.

Overall, the nature of design under these conditions can be best characterized as designing to *channel participant action.* In this case, the TA team kept on balancing between design choices that would give decision-making power and ownership to the participants and between ascertaining that the outcome pathways would likely become concrete, considered, and plausible enough in the eyes of outsiders. One could say that a requisite level of openness was being pursued in the design of MTPT. However, the *channelling of action* metaphor is more telling in that the considerations were not about openness per se, but focused on ensuring that the participants had enough room to find direction–yet not to the extent of being diverted, distracted, or diffracted from the desired outcomes.

Conclusions and Implications for Codesign Practitioners

Collaborative design is increasingly used in catalysing society-wide changes in futuring and transition process-related deliberations. These processes underscore the role of 'intermediate designs' that help participants to reach meaningful outcomes in the face of high complexity and divergent participant perspectives, and where the key objective is to give participants' freedom to deliberate, express, create, and take ownership of the process and its results (rather than resulting in a finished design or the designers taking a centre stage in the realization). Intermediate designing in such processes, and potentially beyond, is aptly characterized as channelling of action.

For practitioners our analysis underscores how creating a well-working intermediate meta-design requires an iterative process, with efforts at channelling action, and refraining from unduly designing-in users or their participations, yet ensuring that the design elements and process will create the needed quality and quantity of outcomes. This requires careful balancing of ideals of participation and mundane practicalities; reducing the complexity of the intermediate design within the minimal complexity required by the target system; adequate target domain knowledge; distribution of agency between participants and facilitators; catering for multiple potentially conflicting goods and goals; and blending the design of physical elements, procedures, interaction patterns, facilitation measures and documentation requirements. Failing any one of these facets is likely to result in collapses in the use of the intermediate design, or in unsatisfactory results. This new breed of social design thus presents an intriguing yet challenging area for design practitioners and researchers.

As for further research, the characterizations of intermediate designing of MTPT underscores how the nature of intermediate designing needs to be studied more. We need better understanding of the nature of objects in new types of social design such as those targeting transitions governance as well as deepen our understanding of the dynamics and outcomes that follow from using such toolsets as well as how they relate to more traditional social science and policy instruments in governance.

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