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Anticipatory knowledge for 4th Order design: The diagnostic work of planning design actions

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ABSTRACT

Creating space for well-informed planning and preparation for design actions motivated Charles Owen to long ago separate concept development into a discrete stage at the front-end of design. In the decades since, design's concerns have expanded beyond signs, symbols, things, services and activities – reflective of Richard Buchanan's first three Orders of Design, and the matters of concern addressed by Owen in his writing. As design's concerns turn to thoughts, such as the intangible social constructs of systems and organizations, which Buchanan considers the 4th Order of Design, we are motivated to ask how might we re-orient the value of separating front-end planning from actual designing, as originally conceived by Owen, for this purpose. Our contribution of diagnostic work is discussed after an example of a 4th Order design planning study.

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Introduction

Long ago, Charles Owen separated concept development from design action to create space for well-informed planning and preparation in advance of subsequent design actions (Owen 1991, 1993, 2001). The aim of this initial stage was to explore design challenges in a holistic yet exploratory way so as to arrive at viable, feasible, and desirable concepts, that define new products for development planning (Owen 2001). However, Owen originally situated his concept design and planning stage to serve mainstream consumer markets, mass production, and the profit motive of corporations (Owen 1998), rather than societally oriented design initiatives meant for public goods and services. That is, it was conceived to serve the needs of First, Second, and

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Third Order Design, as conceptualized by Richard Buchanan (2001). Figure 1 illustrates Buchanan’s Four Orders of Design.

With its emphasis on systems, organizations, and environments, 4th order design is concerned with *thoughts* more than actions (3rd order), physical objects (2nd order) or signs and symbols (1st order). The notion of thoughts as the concern of design can be somewhat nebulous (Lee 2024), given the intangible and invisible nature of systems (Buchanan 2001), since they are themselves imaginary constructs i.e. ‘thoughts’ (Martin 2007). On the other hand, working with these imaginary human constructs has become the purview of design (Manzini 2015; Suoheimo, Vasques, and Ryttilähti 2021; Swan, Valentine, and Candi 2025). As such, design orients towards complex societal challenges, unstructured problem spaces, and social welfare and development (Valentine 2023). In this complex arena, the need for a separate stage to navigate the problem space and plan design actions at the front-end has become even more important. In Buchanan’s terms, Owen’s planning stage helps identify and organize 3rd, 2nd, and 1st Order design actions and required resources. The same logic can be extended to 4th Order design, albeit for systems and social structures. In this thinking, we echo Herriott’s (2019) argument that ‘the success of design approaches in the first three orders of design’ does not automatically transfer to Buchanan’s 4th order.

However, few guides exist for such work. The ‘product’ of Owen’s planning stage is far more comprehensive than a design brief (Owen 2001, 1998), although the need ‘to create an actionable view of the project’ during the

	1st Order Problems of Communication Signs	2nd Order Problems of Construction Things	3rd Order Problems of Action Actions	4th Order Problems of Integration Thoughts
Signs	Words Symbols Images			
Things		Physical Objects		
Actions			Activities Services Processes	
Thoughts				Environments as Organizations & Systems

Figure 1. The four orders of design redrawn from Buchanan (2019).

briefing process (Paton and Dorst 2011, 575) reflects Owen's intentions. Park-Lee's dissertation (2021), for example, explored contexts of briefing in design consulting, and the need for designers to navigate uncertainty and requirements during the procurement process. Although he recognized discontinuities between this upfront epistemic labour and the subsequent project, separating this work into a discrete design planning stage as Owen did remains implicit in his thesis (Park-Lee 2021). Bertão et al. found that when the briefing process is explored, it tends, as did Owen's original positionality, to orient on 'regular business practices' (2023, 189). Although they recognize the pivotal role of the design brief in public sector work – as did Park-Lee (2021) – they focus on product development strategies emerging from the briefing process (Bertão, Brum, and Joo 2023) rather than 4th Order concerns. Such gaps motivate us to ask:

- How might we re-orient the value of Owen's arguments for separating the initial planning phase from the actual designing phase to cater to the changes in motivations for design investments (with associated values, mental models, and world-views) and the paradigm change in methodologies this implies?
- That is, what would the front-end work of conceptualizing and planning design actions for 4th Order design look like?

Our paper begins with laying out a theoretical and conceptual backdrop to introduce our example of a 4th Order design planning study. The synthesis of the qualitative evidence leads us to discuss the nature of the epistemic labour involved at the front end of 4th Order Design. We suggest re-interpreting the design process in terms of thoughts, in order to align process with concerns for 4th Order design. This facilitates the diagnostic work of working with thoughts as our design concerns.

Theoretical and conceptual backdrop

Addition of a planning phase in advance of the designing phase makes room for front-end epistemic labour in service of anticipatory design knowledge. There are enough similarities between research as a process and design for Breslin and Buchanan to suggest that 'the act of researching and writing a case study easily can be seen as an application of the design process' (2008, 38). That is, actions undertaken to understand complex problem spaces, when design is perceived as a socio-epistemological process (Peschl and Fundneider 2016), are a form of knowledge production. The design process itself can be used to navigate 4th order problem spaces where thoughts are the designer's concern (Breslin and Buchanan 2008, 40). One sees this in recent studies which explore the role of design practices to effect changes in

mental models (Vink et al. 2019) and world-views (Hillgren, Light, and Strange 2020), as well as mechanisms for inclusion of heterogenous knowledges in co-creation and collaboration (Nimkulrat et al. 2020; Oertzen et al. 2022). Common to all is the backdrop of complex societal challenges and public services. They depend heavily on the invisible social structures that underpin institutional arrangements (Vink and Koskela-Huotari 2021) and require continuous reflexivity and learning (Buchanan 2001; Owen 2001; Seravalli, Upadhyaya, and Ernits 2022). These 'contexts of use' encourage the label of 4th Order design. In this regard, these scholars work with 'the interiors of the mind, where we seek new ideas about how to create the organizations and systems' (Buchanan 2019, 11) towards the common purpose of societal transformations for sustainable futures. For them, transforming thoughts clearly precedes taking actions, making artefacts, or communicating with signs and symbols.

As a socio-epistemological process, 4th Order design integrates 'knowledge processes and social practices' (Peschl and Fundneider 2016, 405) where we learn 'from the future as it emerges and shape it accordingly' (402). Preparation and planning are recognized as anticipatory systems possessing intrinsic power imbued by using the future as a target (Bourgeois, Karuri-Sebina, and Feukeu 2024). Being able to 'use the future' requires pushing forward beyond preparation and planning (Miller 2015, 514). That is, the design actions mobilized according to the plan, as argued for by Charles Owen, are an example of using the future as a tool (Bourgeois, Karuri-Sebina, and Feukeu 2024; Miller 2015). Owen's separation of the concept stage from the design action stage provides a guiding structure for exploring the unstructured problem spaces at the 'fuzzy front end'. Established modes of design research may not always be viable and feasible for 4th Order design although they are eminently desirable, primarily due to the speed and scale of changes occurring in both the system-to-be-changed and the system-after-change, even as we plan our design interventions (Manzini 2009). Inquiry to generate design knowledge for the system-to-be-changed might indeed be called design research (Manzini 2009) but it is temporally flexible, unlike academic research for publication, and leverages the speculative properties of design as the mechanism to steer its discovery process (Arquilla and Barbieri 2017) until the moment of clarity arrived at through visualizing a concept which then drives a linear development strategy. That is, what Owen does is separate the work done in the period of uncertainty from the work done in the period of clarity, where arriving at the 'concept' is the stage gate between the two periods. Figure 2 by the designer Damien Newman captures these two stages punctuated by arrival at a concept.

A concept defines our understanding of the problem space and aims to visualize direction for design actions. 'Definitions serve strategic and tactical purposes in inquiry' (Buchanan 2001, 8). Definitions, then, in Buchanan's view,

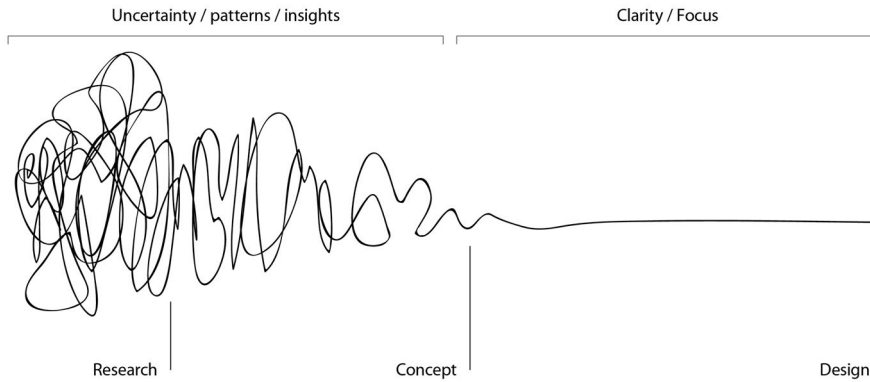


Figure 2. 'The Design Squiggle' by Damien Newman (2006).

act as hypothesis to guide future inquiry, and in the context of 4th Order design, definitions become a working hypothesis for the problem space. From Owen's perspective, design knowledge created during the period of uncertainty facilitates the journey towards clarity and provides focus and direction. It is anticipatory knowledge that is temporally flexible, since it is predicated on using the future as a tool for navigation. It defines our understanding of the problem space, helping us to identify 'the right mountain to climb'.

The development process must be changed from a one-step process, in which an already determined concept is turned into a specification, to a two-step process wherein a distinct development stage is devoted to exploration and determining the concept [...] The two-step development process, as a step toward reformation, adds a planning stage before the designing stage, formally separating the process of concept formation from the process of turning a concept into a specification. *Planning is where 'the right mountain' is discovered before the climb begins.* (Owen 2001, 31)

We emphasize Owen's words on planning in advance of designing to underline the importance of this front end work for mobilizing resources and initiating design actions (see Figure 3). It is through the process of answering his question of 'the right mountain' (Owen 2001, 31) that we arrive at the 'concept' for the 4th Order.

We now provide an example of a 4th Order design planning study conducted to illustrate and discuss our theoretical and conceptual arguments.

An example of a 4th Order design planning study

As the concerns of design shift focus to complex societal challenges, unstructured problem spaces, social welfare and development (Valentine 2023), the need for situation analysis to identify subsequent design actions and necessary resources to be mobilized becomes crucial. Given below is an example

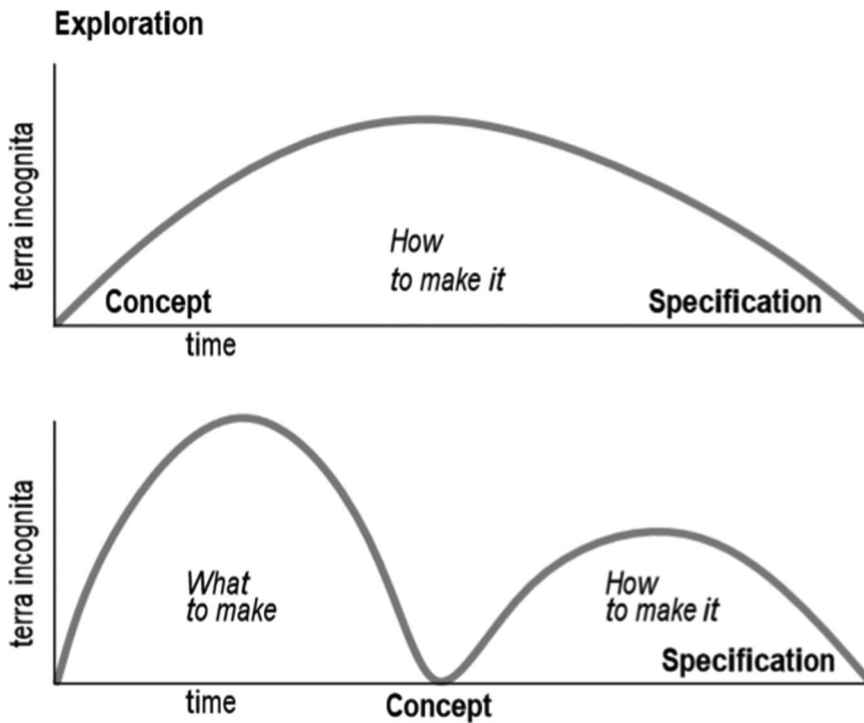


Figure 3. Above: 1-Step development designing; Below: 2-Step development planning and designing (Owen 2001).

of one possible approach to situation analysis, using the case of Finland, a Nordic welfare state to provide the operating conditions of the re-orientation of Owen's design planning stage to Buchanan's 4th Order Design concerns.

Context

Recently, the government of Finland initiated collaborations to examine how 'governance processes and mechanisms need to be transformed to deal with complex and future challenges in a systemic manner' (OECD 2022, 3). A blueprint was created to describe 'a broad-based capacity for active exploration of possibilities, experimentation, and continuous learning as part of a broader governance system' (ibid). Called 'anticipatory innovation governance' (AIG), this blueprint supports governance systems that 'proactively adapt to high levels of uncertainty linked to unforeseen events and new opportunities' (Tönurist and Hanson 2020, 7). AIG requires 'creating knowledge about the future (i.e. anticipation)' by drawing on a range of factors including assumptions, underlying values and worldviews, as well as existing contextual factors and emerging developments (OECD 2022, 25). The basis for anticipation therefore is concerned with 4th Order Design (Figure 1). Therefore, asking 'how well Finland is prepared for co-creating anticipatory knowledge with a

broad swathe of society?’ is a design planning study as conceived by Owen to provide space for exploration, discovery, sensemaking, and situation analysis during the period of uncertainty (Figure 2).

The importance of co-creation, collaboration, and co-design in the Finnish public sector has only been increasing in recent years (Tuurnas et al. 2021). However, a closer look at descriptions of approaches and processes makes visible a gap:

Understanding the customer and collecting customer information means finding out and learning about the customer’s latent and conscious *needs*. It means also finding out about the context, and understanding what possibilities this context offers, or what constraints it places, in terms of new service and business opportunities. (Jäppinen 2015, 711)

People’s needs are emphasized, and no mention is made of their values as part of understanding the customer. A more recent paper reflects the same oversight:

... some common characteristics that could be described as the core competencies of design in the public sector [include] human-centeredness and sensibility to the diversity of user *needs*; a solution and innovation-oriented process; a participatory, collaborative, and cross-siloed way of working; a holistic and systems view of complex problems; the ability to give concrete shape to abstract concepts and ideas; creative, visual, and tangible tools; and skills in prototyping. (Pirinen et al. 2022, 3)

The authors explain that ‘user profiling and individual solutions contradicts the central ideal in public governance of developing services for all citizens’ (Pirinen et al. 2022, 5). However, there is a difference in co-creating public services for all taxpayers without profiling them and co-creating anticipatory knowledge with them. Helena Leino who studies policy, planning, and participation in the urban context raised exactly this issue long ago (2008). She said:

Goals like this are often related to traditional expertise, where the rationality of scientific, technical and administrative expertise is emphasized. The problem with this kind of expertise is that it tends to greatly simplify everyday practices and the complexity of social relations, so that the understanding of people and everyday activities becomes marginal. (Leino 2008, 42, *translated by second author*)

Leino’s opinion is mirrored in the AIG blueprint where expert bias and group think have been made explicit matters of concern (OECD 2022, 43). Expertise in the form of scientific knowledge subsumes all other ways of knowing (Kuokkanen 2007). Our values and beliefs (axiologies and ontologies) are inextricable from our knowledge system (epistemologies). Such discrimination wrongs ‘people in their capacity as knowledge holders’ (Arias-Schreiber, Chuenpagdee, and Jentoft 2022). Therefore, we looked for evidence of a gap between the values of a population group and the policies that impact them correlated to marginalization of their knowledges.

Methodology

Grant and Booth suggest ‘qualitative evidence synthesis’ (2009, 100) as the approach to integrate or compare findings from qualitative studies, where the process ‘may lead to the development of a new theory, an overarching ‘narrative’, or an ‘interpretative translation’ (Grant and Booth 2009, 99). The aim is to uncover themes across a number of individual qualitative studies and the goal is ‘interpretative in broadening understanding of a particular phenomenon’ (ibid). That is, a qualitative evidence synthesis may provide us with the empirical data points to construct a mental model of the situation at hand. The caveat however is that ‘debates about the legitimacy of synthesizing findings from multiple qualitative studies continue [and] many methodological challenges remain’ (Popay and Mallinson 2010, 3). Opinions differ on whether comprehensive search strategies are required when ‘what is being sought is a holistic interpretation’ (Grant and Booth 2009, 100). Confusions may arise due to use of ‘qualitative systematic review’, a historical legacy of the systematic review movement (ibid), which is not necessarily an accurate description of the kind of inter- and cross- disciplinary synthesis of knowledge we will have to undertake at the front-end of 4th Order design challenges. Due to the volume of Finnish studies used for our synthesis, the references used for the example study are appended as [supplementary data](#).

Evidence gathering strategy

Finnish social scientist Pekka Salmi and his colleagues identified incompatibilities between the mode of governance and the ‘system-to-be-governed’ (2023). Coastal fishers in the Baltic Sea region experience social injustice due to marginalization of their practical wisdom and local knowledge (Salmi, Arias-Schreiber, and Svells 2023; Salmi and Svells 2022). According to the authors, Finland’s top down mode of governance is better suited to a ‘simple, stable society’, one which realistically does not exist any more due to rapid societal, technological, economic, and ecological transformations of recent decades (Salmi et al. 2023). Policy conditions for social injustice were created by privileging scientific knowledge and expert advice over the practical wisdom and values of the fisher communities (Salmi and Svells 2022).

‘Typically across the country, such general knowledge production as schooling, Western religions, the enforcement of capitalistic-intensive resource economies, and mass media’ has rendered invisible all endemic knowledge built on local traditions, socio-cultural practices, and livelihoods, says Mustonen (2014a, 121). Finland’s mode of governance ‘dismisses cultural and social diversity, and replaces it with science and nation-state-dominated views’ (Mustonen 2014b). Equity is missing from the equation (Mustonen and Huusari 2020). Unexamined values are thus imposed top down on wider society creating misalignment of policies and governance.

What these scholars pointed us to in their studies were the inadvertent design drivers for social injustice and inequity, since this was not the intent of the government. Policy positions privileging scientific knowledge over all other epistemes seemed to be the culprit in Salmi et al.'s studies of coastal fishers and Mustonen's studies on inland subsistence fishers. It was logical to ask whether the case might be the same for other livelihoods such as farmers, foresters, hunters, and, for rural communities as a whole. Results of our findings are tabulated below in [Tables 1](#) and [2](#).

We deliberately exclude studies on minorities (for ex. Buchert et al. 2023), since focusing on the mainstream ([Table 2](#)) increases the robustness of the diagnosis.

Synthesis

When the mainstream feels excluded and ignored, perhaps then we can conclude that the operating system may not be fit for purpose. We see this play out in the various livelihoods evidenced in [Table 1](#). In the forestry sector, the misalignment between the values of forestry professionals, the policies of the forestry ministry, and the aspirations of the majority of forest owners were made obvious.

People are more heterogeneous. Forest owners are completely different today, and have a variety of interests compared to the old days when all of them came from the countryside... there's a totally different starting point [nowadays].

(Study participant quoted in Häyrynen et al. 2017, 16)

Researchers questioned whether policies are being implemented, and whether they ever would be, even as they recognized the irony of a heterogeneity of values being valuable for innovation. As our evidence piled up, we searched for any systemic reasons for these values-policy gaps coming to light in different regions and livelihood communities.

Attitudes to just recognition of the dynamic plurality of mainstream society and its heterogeneity of values and knowledges can be traced to the birth of Finland (Mattila et al. 2023; Merivirta et al. 2021; Roman et al. 2021). Very briefly, Finland gained independence from Russia in 1917, after existing as an autonomous political construct for more than a century (Paasi 1997). Before this, the Finns' lands were simply Sweden's easternmost province. At the time, there were 'no clear national identities, no general education system, ...no press' in effect, 'no institutional basis for representing or popularizing the symbols and discourses of national identity' (Paasi 1997, 7). Finland emerged as an 'imagined nation' (Keskinen 2019; Roman et al. 2021) through the systemic creation of an artificial narrative of an exceptionally unified people (Häkli 2005, 4), perpetuated through the education system (Paasi 1997), cultural institutions, literature, and other iconography (Häkli 2005).

Table 1. Evidence of policy-public values gap in various traditional livelihood sectors.

Reference	Keywords (by author)	Evidence
Sorvali et al. (2021).	Finnish farmer survey Nationwide 2018 mixed methods Follow up two years later on farmer values and beliefs re: climate change	Farmers have very differing beliefs concerning climate change.. understanding farmers' beliefs, views, and also values is elemental for success in mitigation and adaptation in agriculture. Without this understanding, it is impossible to draft policy measures that will be accepted and thoroughly implemented by farmers. (2021:49) The region in which the farm was located was weakly associated with values. (2022:221)
Puupponen et al. (2022).	Dairy farmers Perceptions of justice public values transitions carbon neutral	...the feelings of blame experienced by farmers are highly relevant ... If .. consumers and the media perceived farmers as more active participants in the fight against climate change, farmers' public image could be improved. This might lead to multiple positive effects, if they feel less blamed and, as a result, are more willing to engage in practices that support their image as climate actors. Thus, farmers could play a more active role in climate policy. ... if the program somehow contributes to farmers' experiences of guilt and public blame, opposition to the program could increase pg. 110 However, private and public regulation and guidance must work together to create the appropriate appreciation for farmers' work. pg. 111 ...no literature has been published on forest owner involvement in new product and service development in the context of the forest sector. In Finland forest owners comprise a significant proportion of the entire population (almost 14%) (2017:6) 'People are more heterogeneous. Forest owners are completely different today, and have a variety of interests compared to the old days when all of them came from the countryside.... there's a totally different starting point [nowadays].' (2017:16) ...an increasing share of Finnish forests owners cannot be reached by current forestry service markets [due to] ongoing structural changes in NIPF ownership and changing institutional and market environment of forestry organizations (2015:31)
Häyriäinen et al. (2015) Häyriäinen et al. (2017)	Finnish foresters NIPF – non industrial private forest owners as bioeconomy users and co-creators transformation of customer and public values	Difference between forest policy and practice in the field is evident. In general, the pluralistic goals set in several policy processes seem to have been accepted by forest professionals... The question is whether these goals have been adopted in practice. pg. 898 How government policy... is implemented very much depends on those who ultimately do the work in field.... strategy may or may not be realized depending on the local forester's attitudes, behaviour, and capacities. pg. 898-899 In general, all value differences may raise some internal controversy within an organisation. However, these should not be seen as unfavourable by any organisation because they boost innovation and development. pg. 899 Our conclusion is that the present governance system is incompatible with the small-scale fisheries context, and propose creating new co-governance arrangements where small-scale fishers' interests, values and local knowledge are better integrated into a governance system. pg. 296
Rekola, Valkeapää, and Rantala (2010)	Coastal Fishers, small-scale fisheries Context of policy and governance Values ignored	The governance challenges are substantial as the system-to-be-governed has become more diverse, complex and dynamic along with arrival of new interests and values, such as those of the environmental movement and recreational users. pg.311 Finland remains in many ways an under-investigated geography in terms of ... endemic knowledge systems. This paper focus on the ethnically and linguistically Finnish population. The Indigenous Sami people have their own knowledge system.... The coastal Swedish population has mostly maritime and Baltic-associated endemic knowledge.... pg. 700 Decision-making at the science-policy interface relies on expert knowledge that informs a range of governance levels by presenting Finnish knowledge in its heterogeneity, we wish to enter into a rigorous debate on how to refer to the 'real', lived-knowledge situation [...]
Salmi, Arias-Schreiber, and Svends (2023); Salmi and Svends (2022)	Traditional knowledge holders Multiple endemic knowledge systems in Finland expert bias ignores, silences, and erases contributions to sustainable society equity social justice knowledge systems	What is missing from the power-associated science-policy framework today is ... a long historical continuum that would contain multiple ecological indicators and human knowledge (oral histories, community-based observations, catch locations and changes), pg. 701 Inclusion of [plural] knowledge streams also will address an often silenced and dismissed element – equity. pg. 701

Table 2. Evidence of rural-urban policy-public values gap in digitalization.

Reference	Keywords (by author)	Evidence
Räisänen and Tuovinen (2020)	Rural Entrepreneurs Digital Innovation	It is important to inform the politicians that the rural-urban digital divide is a critical issue. pg. 24
Verma and Taegen (2019)	Elderly, rural Small municipality, Digitalization	Our study shows that digital services were only considered important by 10% of all respondents. For age category 65 years and older, 6 % of local residents and 10% of the second homeowners considered the development of digital services important.
Stjernberg and Salonen 2022	Rural digitalization	Research on the entire knowledge economy from a rural perspective is required due to a significant digital divide.

Creating unity that surpasses various kinds of differences is not an easy task... deeply rooted distinctions such as occupational, regional, ethnicity, kin and status differences, had to give way to a new layer of modern collective identification: the Finnish nation as ‘an imagined community’. (Häkli 2005, 4)

More than a century later, this systemic intervention to portray Finland as a homogeneous monolith (one could call it a legacy attempt at 4th Order Design, see Junginger 2015) continues to be perpetuated, as observed in teacher training curricula (Mattila et al. 2023), in history and geography textbooks (Kohvakka 2023; Paasi 1997), as well as the national archives (Mikkola et al. 2019) regardless of long established evidence of endemic heterogeneity (Keskinen et al. 2019; Roman et al. 2021). The myth of the monolith creates a systemic blindspot. Endemicity of traditional livelihoods; recognition and rights of the Indigenous Sami; unique epistemes of every traditional minority (Old Russians, Tatars, the *Kaale*, etc.), were all suppressed by the expert-driven rational, scientific discourse of the academy (Kuokkanen 2000; Mustonen and Huusari 2020). Häkli (2005) calls this narrative a ‘root metaphor’ where what was an artificial creation has come to be understood as the reality. This results in a dominant mental model of society where it is ‘understood’ that all share the same exceptionally homogeneous values, and thus, obscures the need to examine them. This is visible in the literature on design processes as previously cited. The pattern set by the originating imperative for top down imposition of the narrative (Häkli 2005; Paasi 1997) continues to manifest itself in the marginalization of local knowledges, endemic heterogeneity, and values.

Implementation of policy that requires any form of intercultural interaction (Pitkänen 2008; Saukkonen and Pyykkönen 2008) makes visible the vulnerabilities created by this systemic blindspot Pitkänen questioned the dissonance between the values idealized in Finnish policymaking and the ambivalence exposed during implementation in her survey of the authorities dealing with the foreign-born:

It is evident that Finnish authorities are aware of the aims presented in the policy documents, and that they have a strong interest in conducting their work as well as possible. Why are there still problems in fulfilling the current policy goals in Finland? (Pitkänen 2008, 36)

Analysis of Helsinki's cultural policy vis a vis an increasingly plural society reveals that 'the cultural identity of immigrants is not valued as an independent phenomenon in and of itself, but rather as an instrument for achieving/facilitating societal integration' (Saukkonen and Pyykkönen 2008, 60). That is, we see continuation of the historical imperative to assimilate (Häkli 2005) in the system even though Pitkänen's research shows 'that implementation of political goals in public sector work is rather assimilative while, in Finland, in the last decade the general tendency has been towards an integrative policy implying cultural diversity and pluralism' (2008, 36). These internal contradictions reflect Salmi et al.'s contention that the system of governance has become incompatible with the 'system-to-be-governed' (2023). That is, the mental model of society governing Finland today is in need of renewal. At the same time, so do the design mechanisms available for understanding users. The myth of the monolith has also led to gaps in methodology.

When an organization fails to offer something that at least some people find meaningful and relevant, useful and usable, the organization becomes irrelevant and eventually obsolete. (Junginger 2015, 210)

Hyökki et al. (2023) recognized that increasing diversity and plurality of Finnish cities needed a renewal of design approaches, although their proposal to use empathetic methods may not help with recognizing and engaging with heterogeneous values and a plurality of knowledges. On the other hand, empathy opens the door to increasing trust and relations where none may have otherwise existed (Leino and Puumala 2021). For AIG in Finland's participatory democracy, effort will be required to ensure values and world-views are representative of the population distribution since the blind-spot also interferes, on a meta-level, with development of inter-cultural skills.

Inter-cultural interaction as an everyday experience requires multi-cultural awareness and skills to manage anxiety caused by cultural differences in interaction with people who see the world from perspectives which may be different or even in conflict with one's own personal values and beliefs. (Pitkänen 2008, 39)

The artificial narrative of an exceptionally homogeneous society was extremely valuable a century ago, however in today's world it hinders rather than helps co-creation of viable, feasible and, importantly, desirable futures. Instead, as described in our situation analysis, it has become a systemic vulnerability.

Discussion

Restating our motivating question initiates our discussion: How might we re-orient the value of separating the initial planning phase from the actual designing phase for 4th Order Design?

Design knowledge created for the 4th Order can only be temporary and functional for that moment in time when the system of interest is captured

in the form of a narrative which aims to articulate possible points of intervention, modes of intervention, target audience for that intervention ('users'), and identify rationales for 'Why these are the actionable insights for What design will do, i.e. our design actions'. Manzini describes this temporality in great detail previously (2009).

When faced with anything out of the ordinary, faulty or suspicious, the work of determining and categorizing the trouble, and scoping for what to do about it (if anything) often go hand in hand – this is diagnostic work. (Büscher, O'Neill, and Rooksby 2009)

What we are doing here as human-centered designers is diagnostic work at the front-end to identify opportunities where design can intervene in a system, environment, organization, or other social structures to improve its 'fit for purpose', where the purpose holds the role of the design goal for 4th Order Design. A system might be diagnosed as requiring renewal in its components, such as the mental models and the design mechanisms we identify in our empirical study; but very rarely are we tasked with designing the whole system from scratch. That is, in 4th Order design, Owen's notion of a discrete phase for exploring the problem space and arriving at a 'concept' may actually be diagnostic work rather than concept design as understood for 1st, 2nd, or 3rd Order design.

'[Paradoxically] diagnostic work does not always produce definite diagnoses, nor is it necessarily designed to do so.' say Büscher, O'Neill, and Rooksby (2009, 111). Instead, 'a good enough or implicit diagnosis' is sufficient 'to explain or move work forward' (Büscher, O'Neill, and Rooksby 2009, 111). This aligns with Buchanan's view of definitions, whether formal or descriptive, which serve as working hypotheses to move work forward and provide direction and scope for further inquiry (Buchanan 2001, 9). When undertaking this anticipatory process of design knowledge-making from uncertainty to concept, we may never be wholly certain that the 'right problem' has been identified or even that there is any one singular 'silver bullet' that will transform wicked problem spaces into idealized visions. However, it is possible to identify the *thoughts* that dominate the narratives i.e. the mental models that influence and shape these spaces. 'The idea or thought that organizes a system or environment is the focus of fourth-order design' (Buchanan 2001). Our thick narratives, our attempts to describe the problem space, our 'working hypothesis' (Buchanan 2001) – in whichever form our outcome at this stage manifests – all are aimed at guiding our next actions, and thus can represent the 'concept' at the end of Owen's planning phase (see Figure 3). In this way, we can re-interpret front end inquiry for 4th Order design, by weaving together strands from both Buchanan and Owen's thinking. Büscher, O'Neill, and Rooksby (2009) concur:

[Diagnostic work] requires individuals to process large amounts of diverse sensory and discursive information and form a mental model of the situation. (Büscher, O'Neill, and Rooksby 2009, 111)

That is, in the context of 4th Order Design, where thoughts are the matters of concern for design, it is the mental model of the situation which is analogous to Owen's notion of 'concept' to drive design planning and to identify resources to be mobilized. The outcome of our example study, which used secondary data gathered through a search for evidence of gaps in user values-policy implementation, was a 'thick narrative'. The mental model at the end of the diagnostic work is captured succinctly as the 'myth of the monolith': the national imperative to create an exceptionally unified people fighting to establish an independent nation-state more than a century ago, now traced as the inadvertent design driver of a systemic blindspot. This also speaks to gaps seen in design methodology. At the moment, Finland is very well prepared for 1st, 2nd, and 3rd Order design (Ryttilähti, Miettinen, and Vuontisjärvi 2015). However, mechanisms will require development for 4th Order design concerns. For an example, see Wahlström et al. (2016, 869) use of psychological and social science theories at the front-end as a means to reconfigure conceptualization of complex working environments.

Re-interpreting the design process may also help. If thoughts are of concern for design at the level of the 4th Order, then describing the design process from the perspective of our thinking may contribute more nuanced understanding. In its essence, the design process can be re-articulated as *sensemaking*, *manifesting*, and *iterating*. While there is a certain element of path dependency in that one cannot iterate until something has been manifested and we need to sensemake before we can manifest, in practice it is understood that these processes are non-linear at the fuzziest of front ends that Owen's concept development stage is concerned with (see Figure 2). Nevertheless, one can use these three verbs to describe the epistemic work in design, either by a single designer, a design team, or a selected group of stakeholders. Details of the number of stakeholders involved and the team or group composition generate additional layers of complexity to this essential epistemological process, which are then given various design labels (Stappers, Sleeswijk Visser, and van Boeijen 2024).

Articulating the designerly process as forms of thought can create value at the highest order of design where complexity and plurality – epistemological, ontological as well as axiological – describe operating conditions. We cannot work with thoughts as our design concern without considering our process in the same form. Re-articulating design as phases of epistemic labour where we sensemake before we manifest an outcome and then iterate on this outcome in order to generate improvements on our manifestation and to refine our original sensemaking of the object of our inquiry helps us focus on the thinking involved in the process.

This approach also downscales the design labels that Stappers, Sleeswijk Visser, and van Boeijen (2024) identify as problematic for clarity and communication in their analysis. One could argue that this downscaling helps breach epistemological barriers for sensemaking and meaning-making, since it

emphasizes the commonality of designerly thinking rather than the differences in outcomes such as actions, things, or signs and symbols.

Conclusion

Research for 4th Order Design (Breslin and Buchanan 2008) can be considered as equivalent to the epistemic labour undertaken in Charles Owen's planning stage to navigate the period of uncertainty in order to arrive at a concept that subsequently provides clarity for planning design actions and mobilizing resources and investment. As we found by conducting our sample study in the Finnish context, the outcome of a concept is interpreted as a mental model or a thick narrative of the situation analysis, both being forms of diagnostic work (Büscher, O'Neill, and Rooksby 2009). Thus, we answer our questions that motivated this paper. Our re-articulation for the complexities of Buchanan's 4th order design discards Owen's legacy of epistemic positionality within themes of business, profits, consumers, and markets. This inspires fruitful avenues for future research such as: operationalizing diagnostic work, methodological innovations that support mental model co-creation within diverse epistemic contexts as well as build epistemological bridges across (incommensurable) knowledge traditions and their paradigms (e.g. Bhan and Tedjokusumo 2025). Some scholars may also consider the role of AI and foresight tools in the diagnostic work for 4th Order Design, particularly in the example context of anticipatory innovation governance.

Authors contributions

CRedit: **Niti Bhan:** Conceptualization, Data curation, Investigation, Methodology, Visualization, Writing – original draft; **Piia Rytilahti:** Conceptualization, Methodology, Supervision, Validation, Writing – review & editing.

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