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Survey

## Practices in transitions: Review, reflections, and research directions for a Practice Innovation System PIS approach

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### ABSTRACT

Social Practice Theories (SPT) can contribute to transition studies by deepening our understanding of the key social mechanisms and dynamics underpinning transitions in everyday life and the role of agency and collective action in processes of social change. Several studies have applied SPTs with concepts from transition studies, and these connections merit attention. The review presented here shows five ways how SPT are applied in studies of system change in transition studies by (i) considering change and continuity in practice elements, niches and regimes, (ii) connecting consumption and production, (iii) going beyond user practices, (iv) mapping diffusions of innovations in daily life and (v) examining policy implications and interventions. Reflecting on this, I argue that the studies in the review show promises of using SPT for transition studies to study system change by linking consumption and production, normality and novelty, stability and instability, micro and macro change, social and technical change, and flat and hierarchal levels. Based on this and a discussion of the need for a practice paradigm of local actions in the MLP, I propose concretising the connections between SPTs, MLP and innovation systems approaches to form a *Practice Innovation System* framework for future research directions.

## 1. Introduction

### 1.1. Practice paradigm for local actions

Sustainability transition research seeks to explain how radical changes can occur in ways enabling them to fulfil societal functions. As the unit of analysis is situated at the ‘meso’-level of socio-technical systems (Geels, 2004), the focus of research on sustainability transitions differs from sustainability debates at the ‘macro’-level (e.g. changing the nature of capitalism or nature-society interactions) or the ‘micro’-level (e.g. changing individual choices, attitudes, and motivations) (Köhler et al., 2017). The Multi-level Perspective (MLP), for example, conceptualises sustainability transitions as a shift from a dominant socio-technical regime to a new regime, formed by interactions between the three levels of landscape, regimes, and niches relating to environmental performance, economic prosperity, and societal equity (Truffer and Coenen, 2012).

Similarly, Social Practice Theories (SPT) have been proposed to avoid the pitfalls of the individualist and systemic paradigms that have dominated sustainable consumption research (Spaargaren, 2011). This is based on the argument that we need a more balanced approach that pays attention to both agency and structure, which makes room for (combining) the bottom-up and top-down dynamics of change, and which recognises the mutual influencing and co-shaping of human actors on the one hand, and objects and

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technological infrastructures on the other (Spaargaren, 2011: 815).

SPT and the MLP have emerged as approaches for understanding the complexity of socio-technical changes (Hargreaves et al., 2013). Combining SPT and MLP can be controversial, but there are nuances in this debate; several studies have applied SPTs with concepts from transition studies, and these connections merit attention. We need to understand how SPTs are used in transition studies and what opportunities exist for further integrating SPT in transition studies. This article offers a review of research on practices in transition, asking: ‘How are social practice theories applied to study system change in sustainability transition research, and how could this be further developed in future research?’.

The paper is not only a review but also aims to provide reflections and research directions. Despite the many fruitful studies that apply SPT in transition studies, concretization is still lacking. I use the synthesized results drawn from the review, relate them to innovation system approaches, and suggest future research directions by presenting the Practice Innovation System PIS approach. I do this to give a contribution that can fill the research gaps of the lack of a concrete, conceptual connection between MLP and SPT and as a way to suggest promises for future research. This paper aims to explore how the application of SPT in transition studies feeds into the innovation system thinking and helps to develop existing concepts and models thereof. Based on how the studies in the review show possibilities for using SPT for transition studies to study system change by overcoming controversies and linking consumption and production, normality and novelty, stability and instability, micro and macro change, social and technical change, and flat and hierarchical levels, and the discussion of the need for a practice paradigm of local actions in the MLP, I propose concretising the connections between SPTs, MLP and innovation systems approaches to form a Practice Innovation System framework.

According to Geels and Schot (2007), a rule-based model of action, on which the MLP is based, incorporates several ways of conceptualizing agency, with four foundational paradigms of rational, interpretative, power-based and routine types of rule-based actions. Agency in the rule-based model of action thus makes the foundation for the practice paradigm suggested in this paper. With the PIS approach, the practice-paradigm is suggested as an action paradigm, an alternative to these other four paradigms. The MLP, with the rule-based paradigms, was initially intended to systematize pathways of transitions that had been merely empirically observed. Thus, as the MLP with the other four rule-based action paradigms provides an overall ‘global’ framing, I hold SPT can help account for past, present and future *local actions*.

In Section 5, after the review, I propose the Practice Innovation System approach to conceptualize the practice paradigm for innovation studies and sustainability transition research. The approach is aimed at not only studying practices but also studying innovations and system change through a practice-theoretical perspective. Joining the other Innovation Systems approaches in breaking with the linear model of innovation, it goes beyond the boundaries and perspectives of the other IS approaches, making it possible to study cross-national -regional, -sectoral and -technological practices. I hold that the PIS approach can provide a concrete conceptualization of the practice paradigm in transition studies.

The paper is organised into six parts. The following section presents the theoretical context where I present the theoretical framing for the articles in the review and explain the background for extensions of the MLP with SPT. I elaborate on the action paradigms in the MLP, social practice theories, and innovation system approaches. In Section 3, the methodological approach of the literature review and analytical process is presented. Section 4 presents the results with a review of the research. Here I explain how the articles in five ways use SPT in studies of system change. I do this to map how the different approaches to practice theories are used in the articles and identify the many different ways of connecting practice theories to transition approaches. In Sections 5 and 6, I reflect on the implications of the review for transition studies.

## 2. Theoretical contexts

Social Practice Theories (SPT) can deepen our understanding of the key social mechanisms and dynamics underpinning transitions in everyday life and the role of agency and collective action in processes of social change (Köhler et al., 2017). New technologies and evolving concepts of collaborative consumption and circular economy call for new understandings of the role of everyday practices in transitions to sustainability (Welch and Southerton, 2019). For instance, citizens can contribute, beyond their position as consumers, to system change towards sustainability.

SPT are a set of cultural and philosophical accounts that focus on the conditions surrounding the practical conduct of social life. There is no such thing as one unified social practice theory. SPT are cultural theories that treat societal aspects as practices (Reckwitz, 2002). SPT sees the procedures of actions as a practice, understood as a commonly shared routinised way of performing something (Reckwitz, 2002; Shove and Walker, 2010; Watson, 2012). This implies that social structures and technologies are reproduced through routines enacted by ‘carriers’ or ‘practitioners’ of social practices (Reckwitz, 2002; Shove et al., 2012; Strengers and Maller, 2014: 3).

SPT moves away from focusing on individual interests and analyses instead practices by examining performances in the context involved. Systemic change is conceptualised beyond individuals that change and beyond the change in individual attitude, behaviour and choice (Shove, 2010). However, looking beyond the individual does not mean reverting to the systemic, structuralist perspective that often ignores agency and subjectivity (Spaargaren, 2011). Practice theories go beyond individuals but emphasize how human subjectivity is at the heart of processes of structuration, reproduction, and environmental change (Spaargaren and Oosterveer, 2010).

Research on sustainability transitions is motivated by the recognition that environmental problems such as climate change are major societal challenges resulting from unsustainable consumption and production patterns in socio-technical systems such as electricity, heat, buildings, mobility, and agro-food. Technological solutions and incremental improvements alone cannot address these problems: they require radical shifts to new socio-technical systems – ‘sustainability transitions’ (Elzen et al., 2004; Grin et al., 2010; Köhler et al., 2017; Smith et al., 2005).

According to the MLP, transitions occur through dynamic interactions involving three levels: niches, regime, and landscape (Geels,

2011, 2012). Niches are the locus for radical innovations; regimes are the locus of established *practices* and associate rules that stabilise existing systems; the landscape is the wider context influencing niche and regime dynamics (Geels, 2011; Rip and Kemp, 1998). ‘Transition’ is generally understood as a change from one established regime and its practices to a new regime with new rules and practices (Geels et al., 2015).

Regardless of these connections, some scholars are sceptical towards using SPT in transition studies, arguing that the approaches and theories are incompatible due to fundamentally different ontologies (Shove and Walker, 2007, 2010, 2014). SPT adopts a flat ontology where practices are the primary unit of analysis, whereas MLP sees practices as having graded levels of structuration: this has led to discussions of incompatibilities due to alleged hierarchical views (Geels, 2011: 37).

Geels (2011) discusses the flat ontologies in SPT versus hierarchical levels in the MLP, noting that SPT has a relationist ontology that assumes a ‘flat’ world. Thus, the idea of the ‘levels’ in the MLP is to open criticism. Noting how Shove and Walker (2010: 474) have proposed replacing the MLP with SPT, Geels points out that SPT operates with a horizontal circulation of elements, whereas Shove and Walker argue for a flatter model with multiple relations, rather than hierarchical levels, of reproduction across different scales.

There are nuances in this discussion. Geels notes that the niche, regime and landscape levels in the MLP are often incorrectly referred to as micro-, meso-, and macro-levels. Instead, the levels are properly defined as referring to different degrees of structuration of local practices, which relate to differences in scale and the number of actors that reproduce regimes and niches. ‘Levels refer to different degrees of stability, which are not necessarily hierarchical’ (ibid.: 37–38).

Thus, there are synergies in combining concepts from SPT and MLP. Practice theory can explain transitions by distinguishing between new practices, which are more fluid and unstable, and more ‘enduring and relatively stable practices’, which are routinely reproduced and characterised by predictable trajectories (Shove and Walker, 2010: 475). Transitions can be studied by analysing how new practices come into being, how they stabilise, and how established practices disappear. Geels acknowledges that flat ontologies conceptualise transitions differently because the foundational assumptions differ from the MLP. Nevertheless, finding similarities in the types of phenomena of interest, he notes that practice theory could be reformulated in MLP-terms of regimes and niches: stable/routinised practices can be seen as ‘regimes’, whereas emerging fluid practices can be seen as ‘niches’ (Geels, 2011: 37).

### 2.1. Action paradigms in the MLP

The rule-based model of action, on which the MLP is based, incorporates different ways of conceptualizing agency (Geels and Schot, 2007). Rule-based action involves various types of rule-following, -using, -creation and -alteration. Building on Nelson and Winter’s (1982) concept of the technological regime as a domain where the cognitive *routines* of different actors are coordinated, Rip and Kemp (1998) expanded this idea to include not only *routines* but the wider cognitive *rule-set*. These are embedded in engineering practices, production process technologies, product characteristics, skills and procedures, ways of handling relevant artefacts and persons, and ways of defining problems, all embedded in institutions and infrastructures.

Following Giddens (1984), the MLP and transition theory views these *rule-sets* as existing in practices, where actors are *rule-followers and rule-makers* at the same time (Geels, 2011). These regime rules are both the medium and the outcome of actions, the ‘duality of structure’. With *rule structures* seen as gradually rigidifying when moving from individual to community to the wider organizational field, *rule-sets* become constraining institutional habits and routines effectively reproduced in practices by narrowing the search space for new ideas, practices and visions (Geels, 2011; Graugaard, 2014). A transition is a system-wide transformation of the rules encompassing formal regulations, normative assumptions and cognitive heuristics (Scott, 1995). This is why transition theory sees innovation within socio-technical regimes as incremental and looks to niches, conceived as protected spaces where rule structures are less rigid, for path-breaking innovations (Smith and Raven, 2012).

These relate to four foundational paradigms. The first is *rational action*, with conscious attempts to determine the best action among possible choices. This entails rule-using because cost-benefit calculations are only possible when formal, normative and cognitive rules provide a stable frame for calculation (Callon, 1998; Hodgson, 1997). The second is *interpretative action* with interpretations and sensemaking that involve rule-using, such as through cognitive frames and rule-creation and rule-alteration. The third is *power-based action* with formal rule-alterations, for example, through lobbying and institutional entrepreneurship from collective actors, such as professional societies, industry associations, and social movements. The fourth paradigm concerns *routine actions*, where deep structures are usually reproduced through routine action that consists of rule-following.

These forms of agency are simultaneously present, either contributing to change, stability or forming a taken-for-granted backdrop. Their contributions to transitions can vary depending on the unfolding pathway. Transitions can be induced through rational action, as well as through changing interpretations or power struggles. While the multi-level perspective provides an overall ‘global’ framing for all transition pathways, the narrative event-sequences are always enacted and leave space for different ‘local’ subplots (Geels and Schot, 2007).

As Kanger (2021) notes, this ‘global’ model of MLP has been accused of various shortcomings: of lacking agency with an accused structuralist mode of explanation (Berkhout et al., 2004; Shove and Walker, 2010; Smith et al., 2005), relative neglect of power and politics (Kern, 2011; Meadowcroft, 2006, 2009), possible omissions of institutions and ideologies (Meadowcroft, 2011), excluding the spatial dimension (Coenen et al., 2012), conceptual vagueness (Markard and Truffer, 2008), inconsistency in methodologies (Genus and Coles, 2008) and neglecting economic variables (Foxon, 2011). Noteworthy is the lack of policy intervention in practices (Shove and Walker, 2007) and that the MLP fails to provide a conceptualization of practices that go across levels and regimes (Hargreaves et al., 2013).

Seeking to deal with some of these limitations, scholars have extended the MLP in several directions. These include developing local models for niche formation (Geels and Raven, 2006; Raven and Geels, 2010) and regime destabilization (Penna and Geels, 2012;

Turnheim and Geels, 2013), refining the methodology of transitions research (Köhler et al., 2018; Papachristos, 2018), specifying the geography of transitions (Boschma et al., 2017; Hansen and Coenen, 2015), giving different consideration to actors and power (Avelino et al., 2016; Avelino and Rotmans, 2009; De Haan and Rotmans, 2018; Hoffman, 2013; Schot et al., 2016), deliberate development through Strategic Niche Management (Kemp et al., 2000), and multiplicity (Hodson et al., 2017) – and, as I will show in the review, extended with the use of SPT.

## 2.2. Social practice theories

Since 2000, practice-theoretical ways of thinking have been adopted in fields ranging from education, geography, history, art, sociology and political science, to organisational studies and studies of, *inter alia*, consumption, learning, teaching, professions, migration, organisations, international relations, sustainability, and energy use. Although the emerging applications of SPT, some criticism states that corresponding refinements have not matched this in theory applied to inform empirical research (Hui et al., 2016).

In the context of the continuing debate about the structure-agency problematic in social theory and philosophy, scholars have used SPTs to (re)turn to this theoretical complexity (Halkier et al., 2011). However, applying SPT together with other theories has been criticised because of the differences in ontology (Shove and Walker, 2007, 2010, 2014), although proponents hold that combinations with SPT can assist empirical research by directing attention towards *actions* (Frezza et al., 2019; Gram-Hanssen, 2011; Lamers et al., 2017; Perera et al., 2016).

Four phases tell the story of SPT development relevant for this study. First, SPT has social scientific roots in the work of early Bourdieu, early Giddens, late Foucault – and, with this background, is rooted in the philosophy of early Heidegger and late Wittgenstein. Second, their insights were used together in a philosophical ontology of practices (Knorr-Cetina et al., 2001; Schatzki, 1996, 2002). Third, these were further developed into newer interpretations and analytical frameworks applicable for empirical studies (Reckwitz, 2002; Røpke, 2009; Shove, 2003; Spaargaren, 2011; Warde, 2005). Fourth, these insights have been further developed in several research fields.

The further development of SPT in this fourth phase is diverse. As related by Warde (2014), scholars from different disciplines and sub-disciplines discovered, identified, and pursued the use of practice-theoretic tools. The approach has become well-known in several ways – in terms of a ‘new paradigm’ for media studies (Couldry, 2004), ‘Practice Lens’ or ‘Practice-Based Studies’ in management learning and organizational behaviour (Gherardi, 2009; Nicolini et al., 2003), a ‘practice-oriented shift’ in economic geography (Jones and Murphy, 2011), practice-oriented design (Scott et al., 2012), and ‘practice theory’ in consumption studies (Warde, 2005) and ecological economics (Røpke, 2009). Of particular interest for this study is how themes of environmental degradation, climate change, and sustainability have led to the steadily increased use of SPT in empirical studies of consumption.

The research field of sustainable consumption has fruitfully used SPT in ways relevant for transition studies (Spaargaren, 2003; Spaargaren et al., 2006; Warde, 2005). Practice-based approaches can reveal processes of reproduction and change in forms of consumption, bringing new conceptual insights on sustainability transitions (McMeekin and Southerton, 2012). More empirical studies are needed to develop a practice-theoretical understanding of sustainability transitions that can address consumption patterns, with the recurrent relationship between collective agency and the everyday performances of practices (Welch and Yates, 2018). Relevant here are discussions on the usefulness of applying SPT in connection with sustainability transition studies (Kennedy et al., 2015; Welch and Southerton, 2019).

One recognised application of SPT is the three-elemental approach. Shove et al. (2012: 22) present a scheme of a co-evolution of three elements: competence, meaning and material, and hold that change and stability can be described and analysed by focusing on the trajectories of these elements and the making and breaking of links between them. ‘Practices’ are established if elements are connected and co-evolving when links are made. The elements may also exist separately, as ‘proto-practices’ before being linked and as ‘ex-practices’ after links are broken (Schatzki, 2011; Shove et al., 2012).

These three elements are based on earlier concepts (Gram-Hanssen, 2010; Reckwitz, 2002; Schatzki, 1996; Warde, 2005). ‘Competence’ concerns skills, techniques, and know-how (Shove et al., 2012). ‘Meaning’ concerns ideas, aspirations and symbolic meanings (Shove et al., 2012) – with, for example, Reckwitz (2002) holding that it is about emotions, motivational knowledge and mental activities. However, it may also concern the history and setting of what people do, enabling this element to handle past, present and future aspects (Schatzki, 1996, 2002). ‘Material’ is about things, tangible physical entities, and technologies (Røpke, 2009; Shove et al., 2012). Earlier considerations of how things are involved in practices range from disregarding them (Bourdieu, 1984; Giddens, 1984) to counting them in various ways (Reckwitz, 2002; Schatzki, 2002, 2010).

Schatzki (1996) presented a division between practice-as-performance and practice-as-entity. Although the two are intertwined, the practice-as-entity sees practices as distinguishable concepts (e.g. eating, driving, reading), and practice-as-performance describes the conduct or performance of practice in a precise moment in time (Shove and Pantzar, 2007; Shove et al., 2012; Warde, 2005). Practice-as-entity can identify elements that configure recognisable patterns of action that can be understood without performing it (Higginson et al., 2015; McMeekin and Southerton, 2012; Spurling et al., 2013; Strengers and Maller, 2014). Practice-as-performance concerns how these actions are observable, making it possible to identify the space- and time-specific aspects involved in the production and reproduction of practices in daily life (Maller, 2015).

## 2.3. Innovation system approaches

The emerging field of sustainability transition research, or transition studies, addresses fundamental changes in existing socio-technical systems. Sustainability transitions concern changes where established socio-technical systems shift to more sustainable

modes of production and consumption through systemic changes that are long-term, multi-dimensional, and fundamental transformational (Markard et al., 2012). Many early transition studies were based on systems approaches to innovation, highlighting the interrelatedness of technological, organisational, institutional, and socio-political change. System change, with discussions of stability and instability and the role of innovations, has been a key research objective in such studies.

Socio-technical systems concern the realisation of societal functions that cover basic needs such as energy, food, mobility, and housing, and therefore, innovation systems (IS) approaches go beyond studying independent products, processes, or technologies (Smith et al., 2010). Transition studies initially looked back, studying long-term, fundamental shifts. The focus has now shifted towards examining what steers, governs, or accelerates these changes, to understand these complex processes.

Variants of IS approaches have been formulated and applied empirically (Binz and Truffer, 2017), using national (Freeman, 1987; Lundvall, 1992, 2016), regional (Cooke et al., 1997), sectoral (Malerba, 2002), and technological (Bergek et al., 2008; Carlsson and Stankiewicz, 1991) approaches. These innovation system approaches have focused on the national level and boundaries in the national innovation system (NIS), regions in the regional innovation system (RIS), sectors in the sectorial innovation system (SIS), and technologies in the technological innovation system (TIS).

Basically, these approaches concern system boundaries, identifying which elements contribute to the generation of innovation-related positive externalities and which ones do not (Bergek et al., 2015). These approaches have many shared features, as innovation and diffusion processes involve collective and individual acts (Jacobsson and Bergek, 2011). However, there are also significant differences in each tradition's epistemology, research objectives, and methodological approach (Coenen and López, 2010). Because of the focus on national, regional, or sectoral and technological capabilities, approaches have typically been concerned more with the supply side (Nelson and Rosenberg, 1993; Wieczorek and Hekkert, 2012).

In addition to NIS, RIS, SIS and TIS, a Global Innovation Systems (GIS) framework has been proposed. This framework examines innovation dynamics in transnational contexts, conceptualised around knowledge creation, market formation, resource mobilisation, and technology legitimation (Binz and Truffer, 2017). Recently, given the focus on transformative innovation policy and challenge-based innovation missions, a Mission Innovation System (MIS) approach has been proposed (Hekkert et al., 2020), where innovation policy is shifting towards addressing societal challenges by transforming socio-economic systems.

Unlike other IS approaches, a PIS approach can foreground the practices, acknowledging that practices are shaped by the supply side (Dijk et al., 2019). A PIS approach can offer an innovation system perspective where practices form the innovation and diffusion process as both a collective and an individual act, contributing to the generation of innovation-related externalities. I elaborate on this in Section 5.

### 3. Methodological approach

In this study, I apply a seven-step process of literature review to identify and synthesise the research findings (Petticrew and Roberts, 2008: (1) define the questions that the review sets out to answer; (2) determine the types of studies that need to be located in order to answer the questions; (3) conduct a comprehensive literature search to locate those studies; (4) screening the results of that search; (5) critically appraise the studies to be included; (6) synthesising the studies and assess heterogeneity in the findings; (7) disseminate the findings of the review.

This review covers articles indexed in the Scopus database.<sup>1</sup> A preliminary study started with a search on 8 April 2020, where a total of 70 articles were found. After reviewing the items in this selection, I selected 59 articles for closer examination; and then Steps 1 and 2 were conducted again in iterations, reframing the research question and adjusting the search string. This eventually led to the research question guiding the study 'How are social practice theories applied to study system change in sustainability transition research, and how could this be further developed in future research?'. The search string was adjusted accordingly to ensure the inclusion of studies applying SPT in sustainability transitions studies and innovation system research.

The study presented here is based on a new search conducted on 8 February 2021, where 121 articles were found. These were found through this search string, identifying articles where the title, abstract, or keywords contained: ("social practice theor\*" OR "social practice" OR "practice theory") AND ("innovation system" OR "multi level perspective" OR "energy transition" OR "sustainability transition\*" OR "socio-technical transition\*" OR "socio-technical transition\*" OR "socio-technical innovation" OR "socio-technical system" OR "socio-technical change")) limited to journal articles in English.

As part of step 4, I sorted through the studies retrieved, screening the results of that search. In step 5, I decided which appeared to meet the inclusion criteria and merited a more detailed examination. I followed a broad inclusion principle and included all articles that used SPT for studies within transitions research. I excluded articles that did not include SPT. Content analysis of the abstracts, headings, and introductions revealed, unsurprisingly, that some items concerned *practice* in other senses, e.g. 'research practice'. Such articles were omitted, leaving out 38 articles, so that the analysis was based on the sample of the remaining 83 articles, as shown in Fig. 1.

As part of steps 5 to 7, I coded the articles in two steps. First, I undertook a broader content review of the items, to clarify their input with theoretical and empirical positioning, the research processes in the studies, and the output of specific contributions. I wanted to map the relations between these studies and emerging tendencies, such as how certain articles built on each other, or discussion of specific research traditions within, for example, consumption research. Here I noted several ways in which SPT was used in studies of

<sup>1</sup> Scopus is the largest abstract and citation database of peer-reviewed literature. It lists publications issued by Elsevier, Springer, Wiley-Blackwell, Taylor & Francis, Sage, Oxford University Press, Emerald, among others.

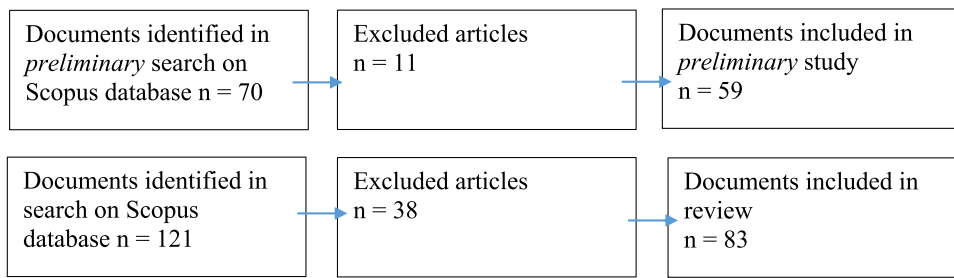


Fig. 1. Flow chart showing the process and steps of the review and preliminary study.

system change. Second, I started categorising the types of applications, which revealed five central tendencies. I also noted bibliographical data – research disciplines, research institutes, location, year, and publication journal. Having considered how this relates to action paradigms in the MLP, I synthesised this to clarify the premises for further research.

This approach is not unproblematic. There is a risk of not including articles that used other words in titles, keywords and abstracts than those in my search string. Also, the search involved journal articles only – not doctoral theses, books or book chapters. As part of steps 6 and 7, I sought to clarify how SPT is used in studies of system change. Presenting the studies in five distinct ways involves simplifications, leaving out explanations of complementary contributions of the articles. Further, as I was the sole investigator, the research depended heavily on my individual skills; the possibility of personal biases influencing the results should also be noted.

#### 4. Results: review

Guided by the first part of the research question, ‘How are social practice theories applied to study system change in sustainability transition research, and how could this be further developed in future research?’ this section presents my findings. I begin with a short bibliographical overview of the articles. Then I explain how they in five key ways use SPT in studies of system change. With these five sub-sections, I map how the different approaches to practice theories are used in the articles and identify the many different ways of connecting practice theories to transition approaches. In the following Sections of 5 and 6, I use the synthesized results drawn from the review to discuss how these studies, in sum, contribute to overcoming controversies and dichotomies associated with transition studies research and SPT. The dichotomies emerge from the five main ways of using SPT in transition studies, for example, through how the studies connect stability/instability and normality/novelty with a daily life focus and in studies connecting production/consumption, social/technical and micro/macro with a community focus and looking beyond user practices. I then relate this to the broader innovation system approaches and suggest future research directions by presenting the PIS approach framework.

The articles covered empirical topics within housing, transport/mobility, energy, food, water systems, and related (sub-) topics, such as heating, agriculture, fertilisation, sanitation, and building. Some articles overlap several topics. 39 articles were about energy,

#### Documents by year

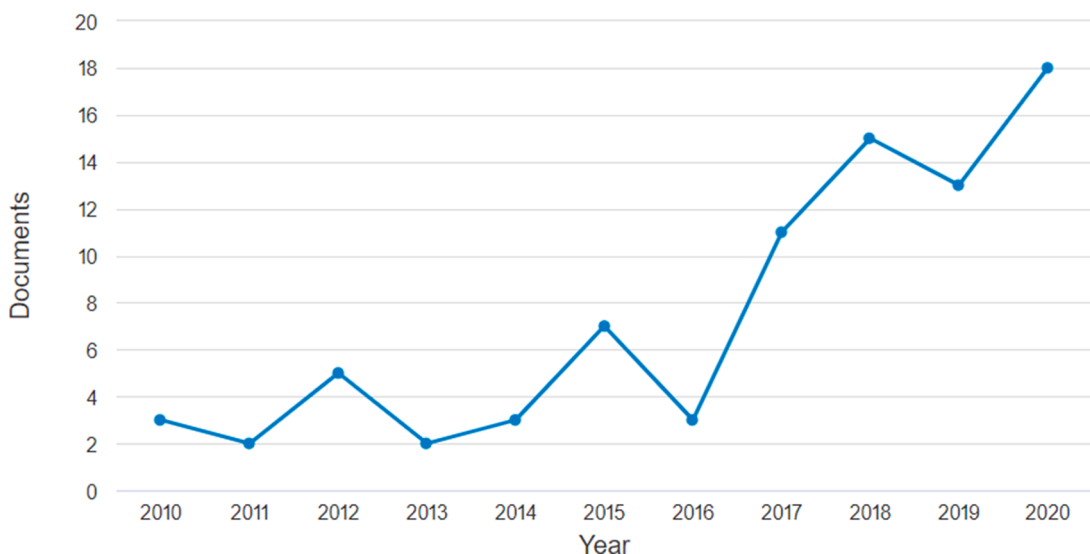


Fig. 2. . Documents in the sample 2010–2020.

including a sub-topic of housing energy (15 articles). 18 articles were about food, with a sub-topic of agri-food (9). 14 articles were about mobility, 4 about water, and 2 about sanitation. 11 included studies in the Global South. The articles are mainly published from 2010 and onwards, with increased publications in the following years, as shown in Fig. 2. They appeared in various relevant journals, including *ERSS Energy Research and Social Science*, *Journal of Cleaner Production*, and *Technological Forecasting and Social Change*, and were published in Australia, Austria, Belgium, Denmark, Finland, Germany, Italy, Netherlands, UK, and the USA. The studies covered cases in those countries as well as others, like China and Kenya.

My review of the articles in the sample shows in what ways SPT are used in transition research to study system change. In the following sections, I explain how the articles in five main ways use SPT, and transition studies approach for studies of system change by (i) considering change and continuity in practice elements, niches and regimes, (ii) connecting consumption and production, (iii) going beyond user practices, (iv) mapping diffusions of innovations in daily life and (v) discussing policy implications and interventions. I present the articles in the sample under these five tendencies and elaborate on how the articles apply SPT in transition studies. This presentation highlights some of the particular theoretical and empirical contributions of studying *system change* in the articles, implying that some articles fall within several tendencies.

#### 4.1. Change and continuity in practice elements, niches, and regimes

In this section, I present the studies that stand out in studying system change by investigating the tension between stability and instability by exploring dynamics between practice elements, niches and regimes. A main discovery in these studies is that they emphasise that aspects of stability and normality are necessary to understand instability and novelty. The studies in Table 1 show the articles in the first set of key contributions of applying practice theories in transition studies to study system change: change and continuity in practice elements, niches, and regimes.

Wells and Nieuwenhuis (2012) hold that theoretical expectations of systemic change need a greater emphasis on how technological transition as a process may mean that many *existing* practices and structures are retained more or less intact rather than entirely replaced by new practices and structures.

Hargreaves et al. (2013) and Seyfang and Gilbert-Squires (2019) use SPT and MLP to reveal critical points or constraints blocking transitions in regimes and practices. Hargreaves and colleagues argue that both the MLP and SPT are ‘middle-range’ approaches that refuse to give predominance to either structure or agency in socio-technical change processes and instead focus on the dynamics of ‘structuration’ that drive both system *stability* and *change* (Hargreaves et al., 2013: 407). Also applying SPT and MLP, Seyfang and Gilbert-Squires (2019) acknowledge differences between MLP and SPT but propose that parallels exist in particular between the stability of regimes and practices and possible disruption by niches and proto-practices. These parallels concern how regimes and practices are seen as stable, supported by existing rules, regulations, institutions, and innovation, and that change need to deal with such stable elements. Fig. 3 shows a continuation of this argument. Based on Gazull et al. (2019) study of household energy transition policies in Mali, the underlying assumption of this figure is that transitions in regimes (vertical circle) and transitions in everyday practices (horizontal circle) follow different dynamics that interplay (points of convergence or divergence) and then either reinforce or hinder each other.

Watson (2012) explores the relations between micro- and macro-change through a systemic approach, examining the potentials of a practice theory approach to shed light on systemic change in transport. He confronts two key criticisms of practice theories: first, concerning their apparent difficulty in accounting for *change*; second, concerning their limited ability to move beyond a micro-level focus on doing. In his ‘systems-of-practice approach’, he identifies three mechanisms involved when practice change: how elements change, how people change, and how this relates to changes in other practices. Watson’s study indicates that system change in transitions could be explained from a practice-based perspective. He proposes conceptualising the regime as a system of interrelated social practices, as ‘[...] practices (and therefore what people do) are partly constituted by the socio-technical systems of which they

**Table 1**  
Articles studying system change by considering change and continuity in practice elements, niches, and regimes.

Change and continuity in practice elements, niches, and regimes	
Existing practices and structures remain intact	Wells and Nieuwenhuis (2012)
Parallels exist between the stability of regimes and practices, possible disruption by niches and proto-practices	Hargreaves et al. (2013) Seyfang and Gilbert-Squires (2019)
Interplay (points of convergence or divergence) between transitions in regimes and transitions in everyday practices	Gazull et al. (2019)
‘Systems-of-practice approach’	Watson (2012)
Five mechanisms influencing changes in practices	Huttunen and Oosterveer (2017)
Practices are stabilised through reproduction	Svennevik et al. (2020)
<i>Dynamics of early change:</i>	
- ‘Proto-practices’	Julsrud and Farstad (2020)
- ‘Niches-in-the-making’	Paschen et al. (2017)
- Practice evolutions: ‘niche ripening’ and ‘regime resistance’	Huber (2017)
<i>Literature reviews:</i>	
- conceptually on reconfiguration research	Laakso et al. (2021)
- empirically on agro-food research	El Bilali (2018)
- theoretically on socio-technical change research	Sovacool and Hess (2017)

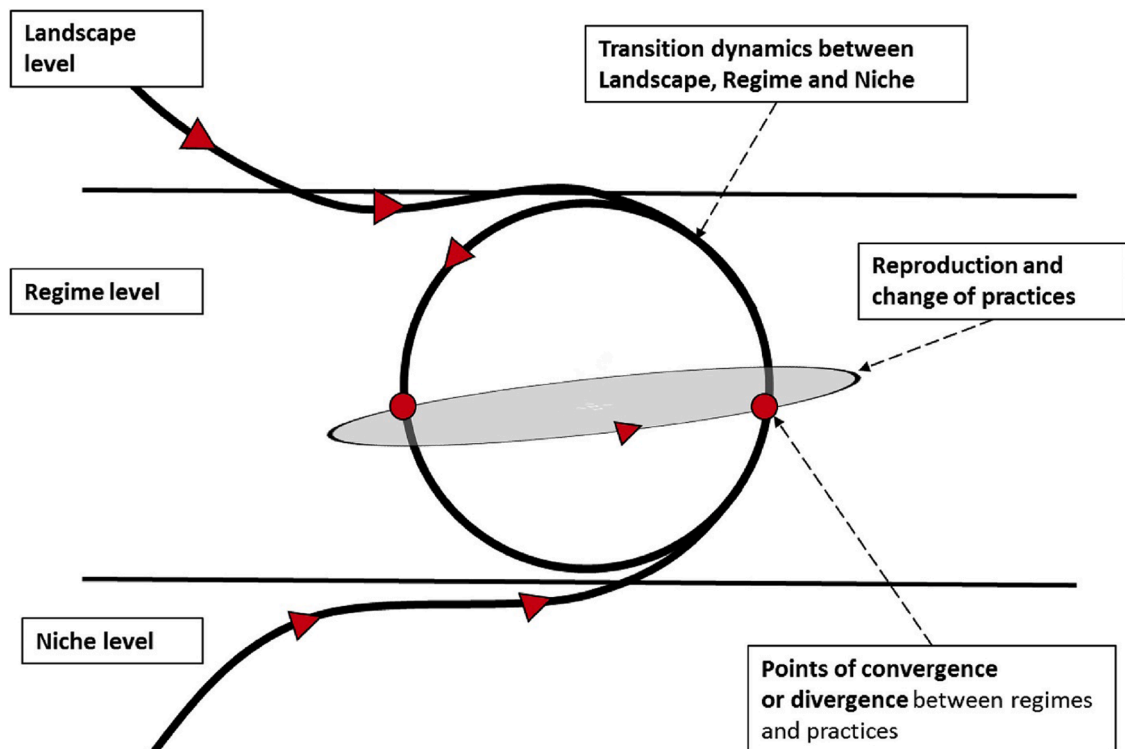


Fig. 3. . Combining MLP and SPT (Gazull et al., 2019).

are a part; and those socio-technical systems are constituted and sustained by the continued performance of the practices which comprise them. Changes in socio-technical systems therefore only happen if the practices which embed those systems in the routines and rhythms of life change; and if those practices change, then so will the socio-technical system...[As such] any socio-technical transition has to be a transition in practices' (Watson, 2012: 488–489).

Also Huttunen and Oosterveer (2017) study how practices change, and how this is linked to the socio-technical system surrounding the practices. They identify five ‘fertilisation practices’ consisting of links between the elements of meaning, materials, and competencies. In turn, they identify five mechanisms influencing changes in practices (1) the core purpose of the practice; (2) the nature of connections between elements and practices; (3) multiplication and diversification as dynamics of a practice, (4) the power of performance; and (5) the practitioners (Huttunen and Oosterveer, 2017). These issues relate to three distinct circuits of reproduction through which practices are maintained and stabilised (Hargreaves et al., 2013, p. 406; Pantzar and Shove, 2010: 458). Here, the focus is on the stabilization of practices. Similarly, in their study on the reproduction of car-sharing practices, Svennevik et al. (2020) find three specific ways in which practices are performed when certain elements are linked. They further suggest that practices are

Table 2

Articles studying system change by connecting consumption and production.

Connecting consumption and production	
Social Practices Approach (SPA): Combines human agency and social structures to understand sustainable consumption	Liu et al. (2016)
Consumption practices as basic units of analysis: the connection between the personal and the planetary	Spaargaren and Oosterveer (2010)
Recursive relationship between collective agency and the everyday performances of practices that produce consumption patterns	Welch and Yates (2018)
Interplay of technological innovation and consumer practices	Evans et al. (2020)
Energy-access: instead of distinction between producers and consumers	Ockwell et al. (2018)
Household to account for intermediary interactions between the individual and the collective:	
- as agents of change	Naus et al. (2015)
- in retrofitting	Rodriguez and Calderon (2014) Willand et al. (2019)
- in laundering	Pettersen et al. (2013)
- connecting energy and water provision to laundering, eating and heating practices	Strengers (2011)
Sustainable Product-Service Systems (S.PSS):	
- consumer practices in S.PSS configurations	Vezzoli et al. (2015)
- experimentation in designing S.PSS in collaboration with stakeholders and users.	Liedtke et al. (2015)



stabilized through combinations of complementary practices, certain connections between particular elements, and content in current practices coming from previous practices and later serving as a foundation for future practices.

Other empirical studies map different dynamics of early change, including studies of ‘proto-practices’ (Julsrud and Farstad, 2020) and ‘niches-in-the-making’ (Paschen et al., 2017). In an empirical study of collaborative consumption for housing, Huber (2017) indicate two areas where MLP insights might complement SPT in understanding practice evolutions – through ‘niche ripening’ and ‘regime resistance’, shedding light on the systemic processes that affect practice configurations.

In addition to empirical studies, three review articles map dynamics of change and continuity in practice elements, niches, and regimes, focusing conceptually on reconfiguration research (Laakso et al., 2021a), empirically on agro-food research (El Bilali, 2018) and theoretically on socio-technical change research (Sovacool and Hess, 2017).

#### 4.2. Connecting consumption and production

In this section, I present the studies that stand out in studying system change by investigating the connections between consumption and production. A main discovery in these studies is that they emphasise that both the production and consumption side matters, especially the connections between them. The studies in Table 2 show the articles in the second set of key contributions of applying practice theories in transition studies to study system change: connecting consumption and production.

Sustainability transitions concern how socio-technical systems shift to more sustainable modes of production and consumption (Markard et al., 2012). Changes in consumption and production are central in sustainability transition studies and in SPT research alike. A general misunderstanding and mistaken simplification are that transition studies focus on production and practice theory on consumption (Köhler et al., 2017). My literature review shows that accusations of the narrow focus on consumption (in practice theory), and production (in transition studies) are incorrect as these approaches take in both aspects. Scholars applying SPT to transition studies go beyond the simplification of the focus on consumption-for-practice theory and production-for-transition studies, elaborating instead on the interaction between providers and users to explain the role of practices in system change.

Some studies investigate how consumption connects to social structures. For example, Liu et al. (2016) discuss various theoretical perspectives on sustainable consumption and argue that neither an ‘individualist’ nor a ‘system- or structural’ perspective alone is sufficient to understand and analyse the transition towards sustainable consumption. They propose applying a Social Practices Approach (SPA) that combines human agency and social structures to understand sustainable consumption issues. Earlier, Spaargaren and Oosterveer (2010) had proposed using consumption practices as basic units of analysis, to avoid individualist and privatised accounts of the role of citizen-consumers in environmental change while making possible a comprehensive analysis of the relationship between the personal and the planetary in the process of ‘greening’ everyday life consumption.

Welch and Yates (2018) argue that a practice-theoretical understanding of sustainability transitions can reveal the recursive relationship between collective agency and the everyday performances of practices that produce consumption patterns. Similarly, an

**Table 3**

Articles studying system change by going beyond user practices.

Beyond user practices	
<i>Farming, beyond user practices:</i>	
- fertilisation practices	Huttunen and Oosterveer (2017)
- smart farming	Jakku et al. (2019)
<i>‘Provider practices’:</i>	
- Food consumer practices, food retail practices and food production practices	Hinrichs (2014)
- Firm’s sustainable innovation journey: Flow of practices	Langendahl et al. (2016)
- Food production: permaculture community influence the agro-food regime, Strategic Niche Management and Communities of Practice.	Maye (2018)
- Collective Energy Practices	Verkade and Höffken (2019)
Practices established in ‘systems of provision’: Technologies reconfigure relations between users, providers, and infrastructure networks.	Judson et al. (2015)
<i>Collective practices, beyond the consumer and user discourse:</i>	
- Studies of networks of food-purchasing groups	Zwart and Mathijs (2020)
<i>Collective energy practices:</i>	
- Energy participation	Chilvers et al. (2018)
- Prosumers	Standal et al. (2020)
- Practices of energy infrastructure provision	Edomah et al. (2017)
- Local actors (re)producing contexts	Faller (2016)
- Repair infrastructure reshaping systems of provision	Ariztia et al. (2019)
<i>Other ‘scales’ of collective practices:</i>	
- Urban neighbourhoods in grassroots initiatives	Slater and Robinson (2020)
- Grassroots and community-based initiatives	Seyfang and Haxeltine (2012)
- Grassroots innovators in ecovillages	Roysen and Mertens (2019)
- Transition movement	Poland et al. (2019)
- Energy- and sustainability cultures	Stephenson (2018)
- Broader understandings of energy cultures	Ford et al. (2017)
- Actions embedded in institutions	Novalia et al. (2018)
- Global agri-food systems: ‘Strategic regime mapping’	Morrissey et al. (2014)

empirical study of plastic packaging has explored the interplay of technological innovation and consumer practices to better account for processes of change (Evans et al., 2020). Further, in an introductory article to a special issue of *Energy Research & Social Science*, Ockwell et al. (2018) argue that applying social practice perspectives to the energy-access challenge offers a perspective where energy access drops the distinction between producers and consumers.

Households are of particular interest here. They can act as agents of change (Naus et al., 2015); and, by being the analytical foci, households can account for intermediary interactions between the individual and the collective – in studies of retrofitting (Rodriguez and Calderon, 2014; Willand et al., 2019), laundering (Pettersen et al., 2013) and connecting energy and water provision to laundering, eating and heating practices (Strengers, 2011).

The Sustainable Product-Service Systems (S.PSS) approach also links consumption and production, and questions if models can create equitable and sustainable economic and social values decoupled from material and energy consumption. The introductory article in *Journal of Cleaner Production* by Vezzoli et al. (2015) reviewed the current state of such research and summarised articles that offer insights into the potentials of the S.PSS concept for understanding and accelerating sustainability. Research applying SPT here sheds new light on consumer practices in S.PSS configurations, and strategic niche management to foster a suitable design and experimentation milieu. Liedtke et al. (2015) further emphasise experimentation, arguing that real-life socio-technical experiments are essential infrastructure for designing S.PSS in collaboration with stakeholders and users.

### 4.3. Beyond user practices

In this section, I present the studies that stand out in studying system change by investigating practices in transitions beyond only user practices. A main discovery in these studies is that they emphasise that practices are not limited to users in system change. The studies in Table 3 show the articles in the third set of main contributions of applying practice theories in transition studies to study system change: beyond user practices.

In addition to connecting production and consumption, SPT is used beyond a user or consumer perspective. For example, the study by Huttunen and Oosterveer (2017) explores the prospects of applying practice theory for analysing changes in agricultural fertilisation practices. They note how a sustainability transition in agriculture requires a shift from a regime oriented towards increasing productivity to one where the environmental and social effects of production are central. Focusing on the three practice elements – materials, meanings, and competencies – they explore the prospects of applying practice theory for analysing the change in agricultural fertilisation practices. Similarly, Jakku et al. (2019) use the MLP combined with SPTs. Their empirical analysis of advances in Smart Farming and Big Data applications, shows the divergence of expectations and norms between actors and institutions at the niche and regime levels. They argue that bridging this divide will require niche-level interventions to enhance farmers' agency and their local networks, and the design of new institutions at the regime level to facilitate a fair and transparent allocation of risk and benefits in farming-data information chains.

Other studies tackle practices beyond a user focus or perspective, indicating the possibilities of using SPT to study variants of 'provider practices' in firms, organizations or networks. For example, Hinrichs (2014) finds SPT with MLP useful for studying the dynamics, durability and significance of innovations in food and agriculture, noting that a broad application of SPA includes examining transitions in food consumer practices, food retail practices and also food production practice. Another study drawing on practice theory develops a conceptual framework to explore the firm's sustainable innovation journey, conceptualised as practices (Langendahl et al., 2016). Their findings show that a firm can usefully be treated as a flow of practices that either resist or accommodate new practices deemed more sustainable. Another example is a study that applies the transition approach to a novel food production context by examining the food production side of permaculture (Maye, 2018). Here, Strategic Niche Management and Communities of Practice theory are combined to examine how the permaculture community has evolved and has sought to influence the agro-food regime. Further, Verkade and Höffken (2019) develop the concept of Collective Energy Practice building on earlier practice-based thinking for a new understanding of a 'system of energy practices'. This expands the practice-based understanding of energy, which, they hold, has focused on energy practices of the home.

Another study investigates how new technology uptake is shaped by energy services provision and everyday practices, and how such technologies mediate and reconfigure relations between users, providers, and infrastructure networks (Judson et al., 2015). The authors find that, although new technologies do lead to the rearrangement of practices, this is often disrupted by obduracy in conventions and habits around domestic heating and hot-water practices that have been established in relation to existing systems of provision. Their study demonstrates how, rather than simply increasing levels of knowledge to ensure that such technologies are adopted efficiently and effectively, systemic arrangements of energy provision and everyday practice are co-implicated in socio-technical innovation.

SPT has been used to address variants of collective practices and aspects beyond the consumer or user discourse, as in studies of networks of food-purchasing groups in Belgium (Zwart and Mathijs, 2020). Further, attention is paid to collective energy practices – as in studies of energy participation (Chilvers et al., 2018), prosumers (Standal et al., 2020), practices of energy infrastructure provision (Edomah et al., 2017), local actors (re)producing contexts (Faller, 2016), and repair infrastructure reshaping systems of provision (Ariztia et al., 2019).

Also other 'scales' of collective practices have been studied – urban neighbourhoods in grassroots initiatives (Slater and Robinson, 2020), grassroots and community-based initiatives (Seyfang and Haxeltine, 2012), grassroots innovators in ecovillages (Roysen and Mertens, 2019), the transition movement in Canada (Poland et al., 2019) energy- and sustainability cultures (Stephenson, 2018), broader understandings of energy cultures (Ford et al., 2017) and actions embedded in institutions (Novalia et al., 2018).

With yet another different theoretical positioning, Morrissey et al. (2014) discuss global agri-food systems. In the context of

globalized supply chains, they focus on energy, materials and practice elements that promote sustainable outcomes across the system and aim to develop an integrated approach for regime analysis. Their study seeks to elaborate the MLP by proposing ‘strategic regime mapping’ (SRM) – an integrated means through which complex transition dynamics can be mapped across (a) energy and material flows and (b) social practices which shape, direct, and determine these energy and material flows.

#### 4.4. Diffusions of innovations in daily life

In this section, I present the studies that stand out in studying system change by investigating diffusions of innovations in daily life. A main discovery in these studies is that they emphasise how daily life in different ways matters for diffusions of innovations. The studies in Table 4 show the articles in the fourth set of main contributions of applying practice theories in transition studies to study system change: diffusions of innovations in daily life.

The issues of connecting consumption and production and going beyond the user relate to the role of everyday life for transitions. Hargreaves et al. (2013) argue for integrating MLP and SPT because of how innovations connect with everyday life. Although the MLP offers a valuable framework for understanding sustainability transitions in particular systems and regimes, it needs to be extended to account for activities that cut across existing regimes and systems to account for multiplicity, such as in transport, food, and ICT. For example, Jones (2012), using a multi-sector approach, finds that the non-transport sector influences travel behaviour; Mu et al. (2019) show how mobile apps can be developed for linking everyday food practices with sustainability transitions; Røpke et al. (2010) show how ICT-related transformations of everyday practices have implications for residential electricity consumption; and Lane et al. (2018) focus on life course and find that the use of domestic information technology (IT) such as live-streaming of video can lead to unsustainable trajectories of IT use.

**Table 4**

Articles studying system change by mapping diffusions of innovations in daily life.

Diffusions of innovations in daily life	
Role of everyday life for transitions	Hargreaves et al. (2013)
<i>Account for multiplicity: activities that cut across existing regimes and systems:</i>	
- Transport: multi-sector approach, non-transport sector influences travel behaviour	Jones (2012)
- ICT and food	Mu et al. (2019)
- ICT and residential electricity consumption-	Røpke et al. (2010)
- Domestic information technology	Lane et al. (2018)
Everyday practices to account for normality, snacking	Twine (2015)
<i>Space-specific aspects for understanding daily life:</i>	
- Oscillating domestic spaces: context and daily lives matter for the implementation and diffusion of innovations	Cherunya et al. (2020)
- Social niches and niche development to describe spatial differentiation	Pilloni et al. (2020)
<i>Experimentation as earlier stages of innovation diffusion processes:</i>	
- Practice-orientated approach to experimentation to map out interventions in integrated elements of practice stemming from path-dependencies in recurring everyday practices	Kaljonen et al. (2019)
- Experimentation as novelties, involve citizens as active participants in new practices	Jalas et al. (2017)
- How experiments are sustained and whether they can generate more systemic changes in carbon-related consumption	Horne and Moloney (2019)
- Experiment to explore cultural complexities	Järvensivu (2017)
<i>Following stages after experimentation:</i>	
- ‘Practice-consensus’ on local practices in early processes of ‘niche’ innovations can be drivers of transitions	Birchnell et al. (2018)
- Change practices of more resourceful actors, especially as regards policy, to move beyond experimental stages of innovation	Kokko and Fischer (2021)
<i>Actors in various ways/ how roles in everyday life matter:</i>	
- Elites and events: assemble new practices from often-disparate elements and influence others through events where they attempt to establish a new consensus	- Human-centred, contextual approaches Birchnell (2012)
	Greene (2018)
	- Daily lives of poor and marginalised women and men, lived realities of the people - Energy impacts, women’s empowerment
	Ockwell et al. (2019) Winther et al. (2018)
- ‘Energy justice’, shows why energy use matters in everyday life	Groves et al. (2017)
<i>Daily household routines and economic activities for energy consumption patterns:</i>	
- Energy consumption patterns, solar home system adopters	Bisaga and Parikh (2018)
- Decentralised solar PV electrification	Boamah and Rothfuß (2018)
- Solar energy in the context of daily life	Boamah (2020)
<i>Learning in daily life:</i>	
- ‘Educative practices’ learning at the niche level to interrupt the reproduction of norms and attitudes	Plummer and Van Poeck (2020)
- Ecovillages as transdisciplinary sustainability ‘classrooms’	Roysen and Cruz (2020)
Social innovation, practices in socio-technical regime: practices of management, design and producing, consumption practices, governance practices, epistemic practices, inscribed practices, and cultural practices	Hölsgens et al. (2018)

Activities that engage more directly with people's everyday practices can facilitate accounts of normality as much as novelty. For example, Twine's (2015) study of understanding 'snacking' through a practice-theory lens argue that applications of practice theory in the field of sustainability transitions aim to move beyond individualistic assumptions of behaviour change and instead situate snacking as an eating practice that has emerged within the social, temporal, economic and cultural organisation of everyday life today.

Some studies find space-specific aspects helpful for understanding daily life. Cherunya et al. (2020) study on sanitation access in informal settlements of Nairobi draw on insights from 'socio-technical transitions' and 'practice theory' in developing the concept of oscillating domestic spaces. Noting how context and daily lives matter for the implementation and diffusion of innovations, they argue that an insufficient understanding of the context in which users must manage their daily lives is a major reason why newly provided and improved basic services are not maintained despite their seemingly superior functionality and user convenience. They propose an approach to analysing the embedding of basic services that focuses on the users' daily practices, explaining how users take part in sustainability transitions, and noting the added value of the time-space dimension in analysing practices in highly complex contexts. Their study also highlights the lack of research on issues concerning the global South, such as informal settlements.

Pilloni et al. (2020) propose another way of including space. They apply SPT with concepts of social niches and niche development to describe spatial differentiation in their study of the success and failure of biogas units. They find that knowledge and financial and policymaker support were critical drivers, and that the involvement of women and young people was crucial for the adoption – whereas patriarchy and financial capability represented barriers.

Relating to earlier stages of innovation diffusion processes, several articles focus on experimentation, such as the study by Kaljonen et al. (2019) on the value of practice theories through studies of sustainable eating in the Finnish and Nordic context. They argue for a practice-oriented approach to experimentation to map out interventions in integrated elements of practice stemming from path-dependencies in recurring everyday practices. For example, cultural differences in meanings attached to meat can create resistance to vegetarian food.

Other contributions on experimentations, like Jalas et al. (2017), focus on tensions between novelty and normality by viewing experimentation as novelties that involve citizens as active participants in new practices in sustainability transitions. Similarly, Horne and Moloney (2019) examine how low-carbon experiments are sustained and whether they can generate more systemic changes in carbon-related consumption.

Järvensivu (2017) examines a socio-technical experiment to explore the cultural complexities that arise when typical fossil-fuelled practices are changed. He shows that shifts in the material arrangements for energy, food and transportation reconfigure meanings and competencies. Transitioning to a post-fossil fuel society emerges as not only a technical matter, but has deep cultural implications.

As to the steps after experimentation, Birtchnell et al. (2018) find that 'practice-consensus' on local practices in early processes of 'niche' innovations can be drivers of transitions. Further, in their study of the failure of innovation in the sanitation sector, Kokko and Fischer (2021) propose dividing practice into elements of material, activity, competence and meaning, to facilitate detailed analysis of how an innovation interacts with existing practices, and how understanding the various elements of practice can help to identify lock-ins that prevent niche innovations from succeeding. They conclude that it is necessary to change the practices of more resourceful actors, especially as regards policy, in order to move beyond experimental stages of innovation.

In line with this study arguing for a focus on resourceful actors, other articles further investigate actors in various ways and show how the roles played by humans and everyday life matter. For example, Greene (2018) argues the need for human-centred, contextual approaches to sustainability transitions that consider social differentiation in complex lived experiences, to design more integrated and resilient energy futures. Other studies include more broadly those involved in the social when aspects of daily life are taken into account. On the one hand, Birtchnell (2012) finds that elites and events play a role in shaping practices for transitions, as elites assemble new practices from often-disparate elements and influence others through events where they attempt to establish a new consensus. On the other hand, Ockwell et al. (2019) include the daily lives of poor and marginalised women and men, and argue that SPT is more explicit than socio-technical transitions theory in emphasising the lived realities of the people who are supposed to benefit

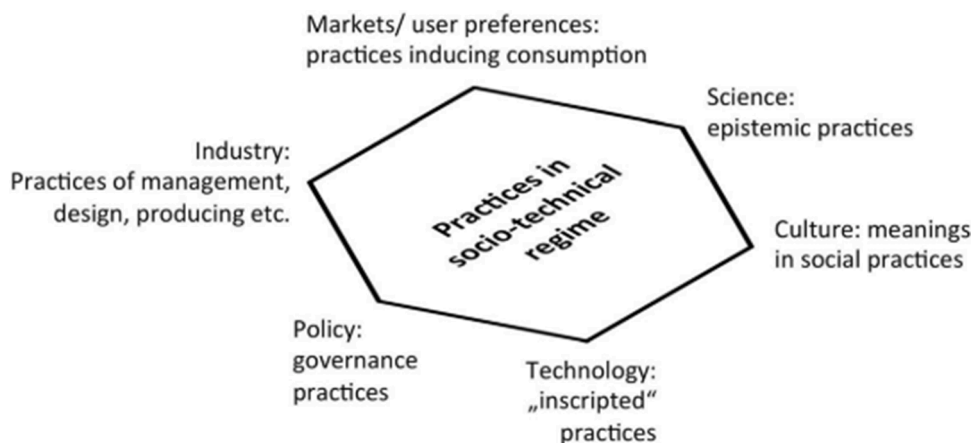


Fig. 4. . Elements of socio-technical systems from a practice perspective (from Hölsgens et al. 2018).

from access to new, sustainable technologies. Further, [Winther et al. \(2018\)](#) study of solar-powered electricity access shows how energy impacts women's empowerment in rural Kenya; and the study by [Groves et al. \(2017\)](#) on 'energy justice' shows why energy use matters in everyday life.

Other studies focus on daily household routines and economic activities. [Bisaga and Parikh \(2018\)](#) examine energy consumption patterns and shifts in practices due to access to improved energy services amongst solar home system adopters in Rwanda; [Boamah and Rothfuß \(2018\)](#) look at decentralised solar PV electrification in Ghana; and [Boamah \(2020\)](#) investigates solar energy in the context of daily life in the Kenyan periphery.

Some studies emphasize the role of learning in daily life. [Plummer and Van Poeck \(2020\)](#) introduce the concept of 'educative practices', arguing that one role of learning at the niche level within sustainability transitions is to interrupt the reproduction of norms and attitudes within socio-technical systems. Further, [Roysen and Cruz \(2020\)](#) examine educating for transitions with ecovillages as transdisciplinary sustainability 'classrooms'.

[Hölsgens et al. \(2018\)](#) take an SPT perspective to investigate whether the MLP approach is suited for analysing and understanding the diffusion trajectories of social rather than technological innovations. A significant challenge for social innovation research is translating *social innovation* from a high-potential novelty into actual mainstream practice. They argue that elements of socio-technical systems can be portrayed as social practices, which are shown in [Fig. 4](#). Here, practices are at the levels of regimes and niches with practices of management, design and producing, consumption practices, governance practices, epistemic practices, inscribed practices, and cultural practices are illustrated as part of the socio-technical regime.

#### 4.5. Policy implications and interventions

In this section, I present the studies that stand out in studying system change by investigating policy implications and interventions. A main discovery in these studies is that they emphasise how SPT can reveal and inform policies. The studies in [Table 5](#) show the articles in the fifth set of main contributions of applying practice theories in transition studies to study system change: Policy implications and interventions.

The other four key topics of contributions relate to policy because these studies offer implications for systemic interventions that go beyond behavioural change. Nevertheless, certain articles stand out as studies of policies or as contributions on how to steer policy interventions.

In their seminal paper, [Shove and Walker \(2010\)](#) use practice theory to conceptualise the dynamics of demand. Using two cases – daily showering, and the congestion-charging scheme in London – they consider the challenges of understanding transitions in practice and governing these. They argue that practices of daily life interrelate, erode and reinforce each other, so various types of interventions may be involved in the dynamics. Instead of intervening in, for instance, driving, one needs to understand and intervene in the nexus of practices where driving is situated. Following this line of reasoning, [Labanca et al. \(2020\)](#) argue that policies should go beyond techno-centric views; they advocate for research and policy agendas that are firmly grounded in social practices and that take complex and dynamic energy supply and demand as the point of departure.

Some studies are specific contributions on how to use policy interventions to steer for future change. For example, [Rohracher \(2008\)](#) argues that energy policies could use a range of strategies inspired by a socio-technical understanding of transition processes, such as visions, expectations, and scenario-building. [Schwanen et al. \(2011\)](#) find SPT helpful for challenging established views, because, given existing economic, social, and political systems and ideals, transport research on climate-change mitigation tends to revolve around reducing carbon use. They want to challenge the focus on merely optimizing the status quo, and ask 'What is the kind of world that we would like to live in and find desirable, and how should mobility be configured in that world?'

SPT is also used to emphasize particular types of actors when the analytical focus is on policies. For example, [Smith's \(2019\)](#) study

**Table 5**  
Articles studying system change by discussing policy implications and interventions.

Policy implications and interventions	
- Interventions should follow dynamics of demand, intervene in the nexus of practices	<a href="#">Shove and Walker (2010)</a>
- Policies should go beyond techno-centric views	<a href="#">Labanca et al. (2020)</a>
<i>How to use policy interventions to steer for future change:</i>	
- Visions, expectations, and scenario-building	<a href="#">Rohracher (2008)</a>
- Challenge the focus on merely optimising the status quo	<a href="#">Schwanen et al. (2011)</a>
<i>Emphasise particular types of actors when the analytical focus is on policies:</i>	
- Governance imaginaries, figure of the policymaker in order to reveal 'governance on the inside'	<a href="#">Smith (2019)</a>
- Individual agency by complementing transition management approaches with practice theory	<a href="#">Rauschmayer et al. (2015)</a>
- Community in focus	<a href="#">Scotti and Minervini (2017)</a>
- Cities engage in 'strategic practice management'	<a href="#">Cohen and Ilieva (2015)</a>
<i>Studies of policy:</i>	
- Regulating loops that lock-in system behaviours	<a href="#">Little et al. (2019)</a>
- Deliberate technology phase-out as the policy to weaken incumbents	<a href="#">Koretsky and van Lente (2020)</a>
- Interventions concern upscaling alternative practices	<a href="#">Laakso et al. (2021)</a>
- Regulatory environmental taxation as part of a 'smart policy' mix	<a href="#">Bachus and Vanswijgenhoven (2018)</a>
- Energy policy	<a href="#">Sovacool et al. (2020)</a>
- Innovation policy	<a href="#">Smits and Kuhlmann (2004)</a>

of governance imaginaries uses SPT to centre the *figure* of the policymaker in order to reveal ‘governance on the inside’. Rauschmayer et al. (2015) propose a heuristic combination that returns individual agency into the study of sustainability transitions by complementing transition management approaches with practice theory. They argue that research for sustainability transitions as policy-oriented transdisciplinary research calls for a well-grounded comprehension of the societal problem involved. Scotti and Minervini (2017) propose putting the community in focus in considering environmental governance and regulations; and Cohen and Ilieva (2015) examine how cities engage in ‘strategic practice management’ to support shifts toward sustainable practices, and thus sustainable socio-technical systems.

Some articles are more explicitly studies of policy. Drawing on MLP and SPT, Little et al. (2019) present an ethnographic case study of a failed tax on plastic bags, identifying the mechanisms that reinforce unsustainable marketing systems. Mapping these system mechanisms highlighted regulating loops that lock-in system behaviours at the macro- (landscape), meso- (regimes of technology and practice), and micro- (individual consumer and firm) levels. Further examples are a study that finds that deliberate technology phase-out is recognised as a viable policy option to weaken incumbent socio-technical configurations (Koretsky and van Lente, 2020); and another arguing that interventions may concern upscaling alternative practices (Laakso et al., 2021b). Other policy-focused articles include studies of regulatory environmental taxation as part of a ‘smart policy’ mix (Bachus and Vanswijgenhoven, 2018), energy policy (Sovacool et al., 2020) and innovation policy (Smits and Kuhlmann, 2004).

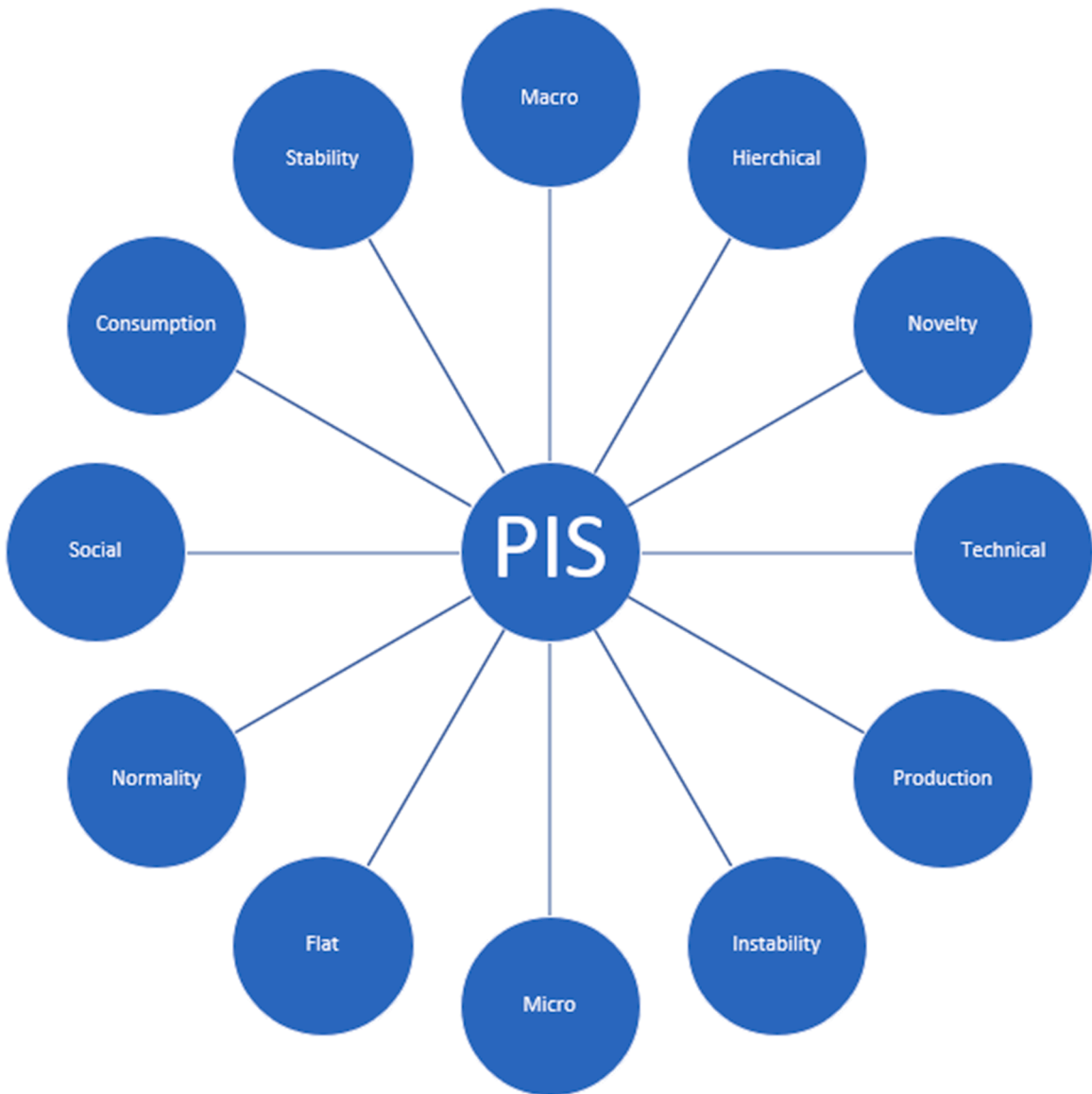


Fig. 5. . PIS overcoming six dichotomies.

## 5. Discussion: reflections

I first reflect on the results of the review by explaining how these five ways of studying system change by using SPT in transition research correspondingly concern overcoming six associated dichotomies. I then justify why the PIS approach is needed regarding this and the need for a practice paradigm for the MLP and innovation system approaches. I then elaborate on the core concepts in the suggested PIS framework. With this, I address the second part of the research question; How are social practice theories applied to study system change in sustainability transition research, and how could this be further developed in future research?

Based on the review and the discussion of the need for a practice paradigm of local actions in the MLP, I propose concretising the connections between SPTs, MLP and innovation systems approaches to form a Practice Innovation System framework for future research. Despite the many fruitful studies that apply SPT in transition studies, concretization is still lacking, and the review also revealed that there is not one dominant or leading way of using SPT in transition studies. I, therefore, suggest that the distinct, self-developed framework of the PIS approach can contribute here.

### 5.1. Practice Innovation System (PIS) approach

This review reveals that SPT in transition studies are used to study local time- and space-specific changes beyond individuals' behavioural change, connecting practices to societies by studying different 'scales' of collective practices, such as grassroots and community-based initiatives. This correspondingly concerns overcoming six associated dichotomies: consumption and production, normality and novelty, stability and instability, micro and macro change, social and technical change, and flat and hierarchal levels (see Fig. 5).

A general (mis)understanding and mistaken simplification is that transition studies merely focus on production and SPTs on consumption (Svennevik, 2021). The studies in the review show many different ways in which SPT are used in transition studies to overcome the alleged divisions that transition studies mainly focus on production, novelty, instability, hierarchical levels and macro and technical change and SPT focus on consumption, normality, stability, flat levels and micro and social change. Connecting production and consumption and the other five opposites, the studies overcome these dichotomies and unravel these misunderstandings.

My review of the articles in the sample shows how SPT is used in transition research to study system change and, through this, overcoming the six dichotomies and structure–agency division. My review shows how SPTs are applied in sustainability transition research for more purposes than studying users and that applying SPT contribute to additional extensions of the MLP.

However, the review also reveals that there is not one dominant or leading way of using SPT for this. I, therefore, suggest a concrete conceptualisation that can help in doing that. The closest to this is Watson (2012) outlining a 'systems of practice' approach, where he identifies three mechanisms involved when practice change: how elements change, how people change, and how this relates to changes in other practices. Nevertheless, this article still lacks a heuristic, conceptual connection linking theories of practice with socio-technical systems approaches. I, therefore, suggest that the distinct, self-developed framework of the PIS approach can contribute here.

The PIS approach can provide a concrete conceptualization of the practice paradigm in transition studies. I suggest the practice-paradigm as an action paradigm, as an alternative to the other four foundational paradigms of rational, interpretative, power-based and routine types of rule-based actions conceptualizing agency in the MLP. As the MLP with the other four rule-based action paradigms provides an overall 'global' framing, I hold SPT can help account for past, present and future *local actions*. The PIS approach follows Giddens (1984) in understanding rules as structures that are recursively reproduced because they are used and changed by actors. With the practice paradigm, I hold that the PIS approach makes it possible to study actors and actions differently from, e.g. markets and institutions, when innovations occur in the social realm – for example, concerning the citizen instead of the user, and going beyond market logic. The PIS approach goes beyond the boundaries and perspectives of the other IS approaches, making it possible to study cross-national, -regional, -sectoral and -technological practices. A PIS approach can thus offer an innovation system perspective where practices form the innovation process.

I propose the Practice Innovation System approach to conceptualise the practice paradigm for innovation studies and sustainability transition research. This approach can account for the role of social systems within innovation development, with a different (and reduced) focus on organizations than is the case with other innovation systems approaches. The approach is aimed at not only studying practices but studying innovations through a practice theoretical perspective.

This would involve a '3 × 3' conceptual framework consisting of three elements, three levels, and three layers: elements of meaning, material, and competence, levels of niche, regime, and landscape, and layers of practice-as-performance, practice-as-connections, and practice-as-entity. This framework integrates these perspectives, showing how the concepts complement one another and providing a more comprehensive picture of how the various dynamics of change and continuity. I suggest placing the PIS in the "innovation system" approach "family" because it can be used to consider how social practices structure the development, diffusion, and use of new technologies, products, and processes (Edquist, 2005). The PIS is helpful because, instead of studying institutions and organizations directly, the approach makes the practices the unit of analysis (which indirectly takes institutions into account) but focuses on how these are recursively shaped.

I hold that concepts from SPT can contribute to a Practice Innovation System (PIS) approach. *The three elements* come from the elemental approach in SPT. I propose highlighting the co-evolution of elements by elaborating on Shove et al. (2012) three colours – yellow 'meaning', red 'competence', and blue 'material' – by adding the connections between the elements shown as orange, green and violet blend in between the elements (see Fig. 6).

*The three levels* come from the MLP. I propose highlighting regime and niche practices and including other regime practices, as

presented earlier in Fig. 4.

The three layers come mainly from Schatzki's (1996) original distinctions between practice-as-entity and practice-as performance (see Higginson et al. 2015; McMeekin and Southerton 2012; Shove and Pantzar 2007; Shove et al. 2012; Spurling et al. 2013; Strengers and Maller 2014). I propose conceptualizing these as *layers* and introducing a new layer, 'practice-as-connection', inspired by the concept of the nexus of practices (Hui et al., 2016). Practice-as-performance refers to the actual doings, the repeated performances seen as observable action. Practice-as-entity concerns the general understandings and sayings that make practices distinguishable concepts, as recognizable patterns of action. Practice-as-connection, then, is the context surrounding the performances, e.g. neighbouring practices and the setting for the practices performed or understood. I distinguish the 'practice-as-connections' to amplify the space- and temporal-specific aspects involved in the production and reproduction of practices in daily life and to emphasise new possibilities for analytical foci of investigating what practices are *for*. The connections between the layers are crucial here. Such a distinction deviates from other SPTs that sees practices as flat and not disconnected from their surroundings. This layer acknowledges that practices are interconnected, and this distinction is suggested as a way of studying the nexus of practices. The layers also make it possible to identify shifts in the development of new practices when the understandings of practices are different or more developed than is the doing of the practice, say when the *understandings* of a vegan diet or solar energy are present, but the actual execution of it is not yet present.

Fig. 7 show the '3 × 3' conceptual framework consisting of three elements, three levels, and three layers. The y-axis shows increased structuration for the practices and the x-axis show time development. The arrows suggest some dynamics in the model, for example, as just mentioned on how the entity can develop before the performance. Also, a two-sided arrow illustrates the dynamics between the *layers* going both ways and in iterations.

## 6. Conclusion: research direction

This review showed five ways SPT are used in transition research to study system change. I explained how the articles, in five main ways, use SPT and transition studies approach for studies of system change by (i) considering change and continuity in practice elements, niches and regimes, (ii) connecting consumption and production, (iii) going beyond user practices, (iv) mapping diffusions of innovations in daily life and (v) discussing policy implications and interventions. I presented the articles in the sample under these five tendencies and elaborated on how the articles apply SPT in transition studies. The review revealed that SPT in transition studies are used to study local time- and space-specific changes beyond individuals' behavioural change, connecting practices to societies by studying different 'scales' of collective practices, such as grassroots and community-based initiatives. Reflecting on this, I argue that the studies in the review show promises of using SPT for transition studies to study system change by linking consumption and production, normality and novelty, stability and instability, micro and macro change, social and technical change, and flat and hierarchical levels. Based on the review and the discussion of the need for a practice paradigm of local actions in the MLP, I propose concretising the connections between SPTs, MLP and innovation systems approaches to form a Practice Innovation System framework.

The PIS approach is suitable for a range of empirical studies that seek to investigate innovations and the role of policy incentives to



Fig. 6. . Co-evolution of elements.



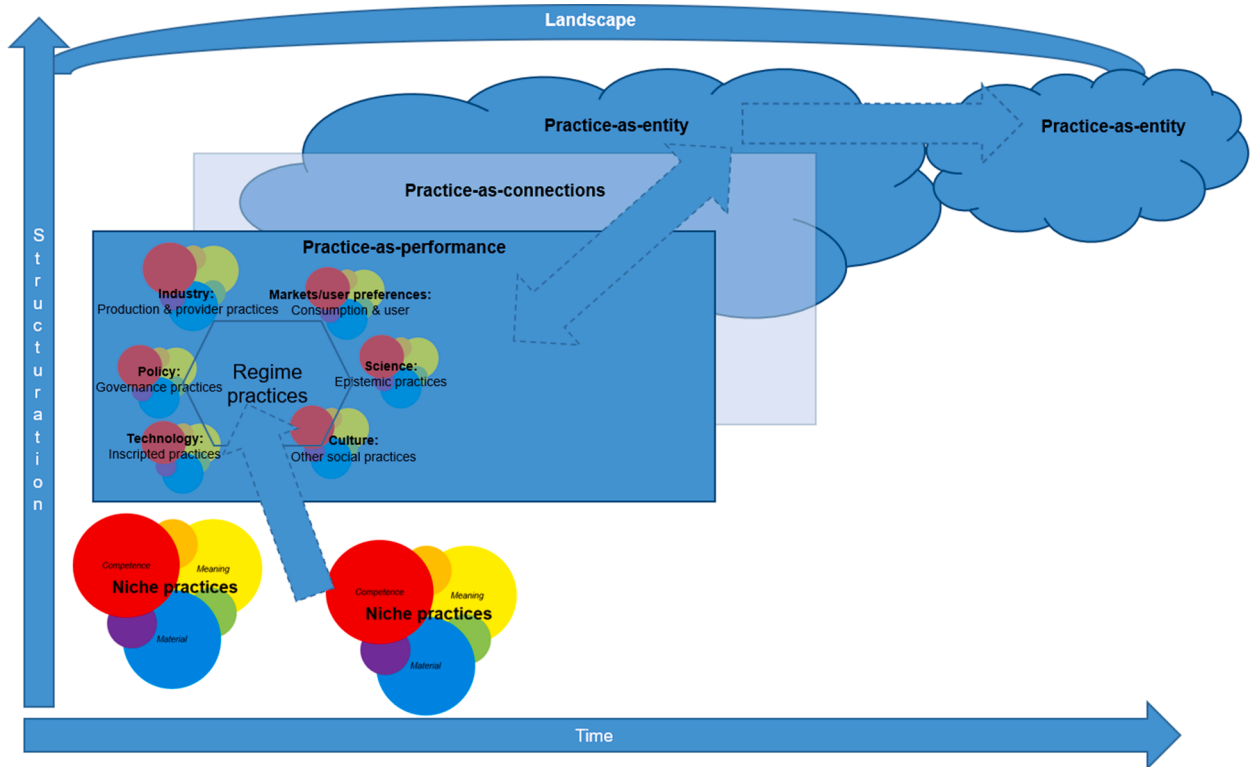


Fig. 7. . Conceptual framework PIS.

reveal change and continuation in sustainability transitions. The PIS approach is well-suited for accounting for system change, particularly suitable for emerging concepts such as prosumers and intermediaries, as well as in studies of informal practices, power distribution, and social justice.

In particular, I suggest eight avenues for applying the PIS approach in transition studies: (1) disruption, (2) experimentation, (3) destabilization, (4) failures, (5) unsustainability, (6) social sustainability, (7) informal practices and (8) interventions. (1) The PIS approach can be suitable for analysing the disruptiveness of disruptions. Alongside technological disruption, disruption in transitions focuses on policies and institutions, actors and ownership models, markets and business models, and behaviour and practices. While markets, regulations, and actors are the most commonly identified non-technological issues connected to disruption, an important neglected dimension is disruption in the context of behaviour, practices, and culture (Kivimaa et al., 2021). (2) Experimentation concerns, for example, living-labs and pilot projects and the PIS approach can be used to study practices in experimentations revealing how new everyday practices relate to existing everyday practices. (3) These issues also relate to phase-out and decline in sustainability transitions. While much attention has been on technology phase-out in conjunction with industrial diversification (Andersen and Gulbrandsen, 2020), destabilization can be studied by revealing declining practices and how to phase out existing practices, also in terms of de-learning. (4) The PIS approach can also be applied to investigate innovation failures, and this can be useful because understanding the different elements of practice helps identify lock-ins that hinder niche innovations from succeeding (Kokko and Fischer, 2021). (5) Also, knowing more about unsustainability is relevant for knowing more about sustainability, and the PIS approach can be used to study unsustainable practices (Antal et al., 2020). (6) Social justice and social sustainability also need more attention. Sustainability transitions research is criticized for focusing too heavily on environmental issues at the expense of equality problems, which could result from a Global North bias. I suggest that future research can apply the PIS approach for research beyond environmental sustainability, focusing in particular on social justice and power relations beyond Global North cases. (7) Studies of informal practices found both in the Global South and Global North need further attention (Cherunya et al., 2020), and a PIS approach can be used for such a purpose. (8) Lastly, the PIS approach is suitable for studies directing attention to innovations and interventions.

#### Data availability

Data will be made available on request.

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## Disclosure statement

The author reports no potential conflict of interest.

## Declaration of Competing Interest

The author declares that she has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data Availability

Data will be made available on request.

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