Exploring the application of Social Practice Theory in technology-related research: A state of the art literature review

Mena Mesenhöller

Suggested Citation:
Mesenhöller, M. (2025). Exploring the application of Social Practice Theory in technology-related research: A state of the art literature review. Energy Research & Social Science, 126, Article 104145. https://doi.org/10.1016/j.erss.2025.104145

Energy Research & Social Science 126 (2025) 104145

Contents lists available at ScienceDirect

Energy Research & Social Science

journal homepage: www.elsevier.com/locate/erss

Review

Exploring the application of Social Practice Theory in technology-related research: A state of the art literature review

Mena Mesenhöller *

Institute for Modern Japanese Studies, Heinrich-Heine University Düsseldorf, Düsseldorf, Germany

ARTICLE INFO

Keywords:
Social Practice Theory
Technology
Literature review
Sustainability
Energy research

ABSTRACT

While numerous theories and methods aim to analyze the impact of technology on society, they are typically driven by individualist or technologically determinist approaches. Conversely, Social Practice Theory (SPT) highlights the mutual relation between technology and individuals, emphasizing the role of technology in shaping and being shaped by everyday practices to understand technological adoption and change.

This paper systematically reviews 80 studies to investigate how SPT has been applied in technology-related research, identifying key research areas, methodological approaches, and theoretical combinations. Based on our analysis, we develop five propositions how future research should continue to work with SPT in technology-related research: 1.) employing SPT to underrepresented research areas; 2.) applying SPT to new geographical contexts; 3.) maintaining SPT's applicability to a diversity of technology conceptualizations; 4.) enriching the range of methods with large-scale designs; 5.) continuing to connect SPT to other theoretical models.

We conclude that SPT is highly relevant for technology-related research and energy research, as it enables a deeper analysis of how energy-related technologies become embedded in everyday routines. We state that understanding how practices evolve, stabilize, or change is essential for designing policies and interventions that promote sustainable energy transitions. By further integrating SPT into technology research in general, researchers can gain a more nuanced perspective on the socio-technical dynamics of innovation, informing more effective and socially responsive technological transformations.

1. Introduction

In light of the numerous social and global challenges facing contemporary society, there is an increasing reliance on technological solutions. To assess the actual impact of these technologies, and to analyze technology's design, implementation, and evaluation processes, a variety of theories and methods have been developed. While many of these approaches focus primarily on the technology itself or the individuals affected, Social Practice Theory (SPT) shifts the focus onto practices [1]. Highlighting a mutual relation between the individual and technology, SPT views technology as an integral part of practices carried out by individuals in everyday life and declares that all activity is inevitably shaped by the possibilities of the existing technology within a certain historical or cultural context. Taking a sociotechnical perspective, this approach recognizes that technologies do not exist in isolation but are embedded in social, cultural, and material arrangements. SPT therefore assumes a unique position in helping to analyze the impact of technology on society and has increasingly garnered the attention of technology-related research. However, keeping up with the numerous research strands and identifying potential gaps remains challenging. Although several literature reviews have focused on the application of SPT in specific contexts [2–4], they do not address SPT application on technology-related research in general. A systematic review of the literature to provide an overview of the state of the art and to lay the foundations for future research therefore remains a research lacuna, which this paper aims to close.

The central research question of this paper is: *How has SPT been applied in technology-related research and how can it fruitfully be applied in future research?* Through a systematic literature review, we provide insights into contemporary applications of SPT, discussing its strengths and potential weaknesses. Additionally, we map current research gaps and highlight opportunities for future research, offering scholars from various disciplines a foundation to leverage SPT's potential for their respective research. A literature review is necessary to systematically assess how SPT has been applied in technology-related research, as the field is growing rapidly and remains fragmented across different

* Institut für Modernes Japan, Heinrich-Heine-Universität Düsseldorf, Universitätsstr. 1, 40225 Düsseldorf.
E-mail address: mena.mesenhoeller@hhu.de.

https://doi.org/10.1016/j.erss.2025.104145
Received 23 October 2024; Received in revised form 2 April 2025; Accepted 14 May 2025
Available online 27 May 2025

disciplines. By outlining existing studies, this review clarifies the state of the art, uncovers gaps, and provides a structured foundation for future research, pointing out how SPT could be applied more effectively and innovatively in technology-related research.

This paper begins with defining technology through various conceptualizations of the term, followed by a brief introduction into SPT and its approach towards technology. We then continue by explaining the method employed in our literature review. Based on the analysis of 80 research studies, we subsequently explore distinct research areas, geographical areas, conceptualizations of technology, methodical approaches, and combinations of SPT with other theories. In the penultimate discussion chapter, we develop five propositions concerning the possible directions of future research, before we finish with an overall conclusion.

2. Understandings of technology

The relationship between technology and society has long been a subject of scholarly debate across multiple academic disciplines, highlighting the complexity of technological development and its social implications. Theoretical perspectives on this relationship range from deterministic views, which posit technology as an autonomous driver of societal change, to sociotechnical approaches, which emphasize the co-constitutive nature of technology and society.

One of the most enduring perspectives is technological determinism, which views technology as an independent force shaping social structures and human behavior. This perspective, exemplified in Smith and Marx [5], assumes that technological progress follows an internal logic, leading to inevitable societal transformations. Within historical materialism, technological advancements are understood as drivers of social and economic change [6]. Similarly, economic perspectives emphasize technology‘s role as a catalyst for economic transformation. While Schumpeter [7] especially highlighted the disruptive nature of innovation cycles, Romer [8] discussed knowledge spillovers and institutional evolution as mechanisms through which technology fosters societal progress.

In contrast, sociotechnical approaches challenge the notion of technology as an autonomous force, instead emphasizing its entanglement with human actors, institutions, and infrastructures. These perspectives move beyond linear narratives of technological progress, highlighting the dynamic and negotiated processes through which technologies become embedded in everyday life. For instance the Social Construction of Technology (SCOT) framework [9] argues that technological development is shaped by social, political, and cultural contexts rather than unfolding independently. Central to this approach is the idea of interpretative flexibility, meaning that different social groups assign diverse meanings and uses to a technology. Over time, as debates and negotiations settle, technological artifacts become stabilized through closure mechanisms, making their functions appear self-evident. Moreover, scholars such as Winner [10] contend that technologies are not neutral but have inherent political properties, influencing power structures and social organization.

Further expanding on sociotechnical perspectives, Rip and Kemp [11] define technologies as “configurations that work”, emphasizing that technological systems must be stabilized through alignment with social practices, regulations, and institutional frameworks. This once again challenges the deterministic assumption that technologies possess fixed meanings or follow inevitable trajectories, instead foregrounding their contingent nature.

Another key approach is Actor-Network Theory (ANT) [12–14], which conceptualizes technology as part of sociotechnical networks in which both human and non-human actors actively shape technological development. By recognizing the agency of material artifacts, ANT further disrupts deterministic views, demonstrating that technological change emerges from distributed interactions rather than singular causal forces.

Beyond understandings of material technologies, scholars have explored the role of non-material technologies, particularly in governance, institutions, and social organization. The concept of technologies of governance refers to structured techniques and mechanisms that regulate societies and individuals, often in ways not conventionally recognized as technology. Foucault [15] introduced governmentality, where power operates through dispersed techniques such as bureaucratic procedures, surveillance systems, and statistical modeling – forms of technologies of power that shape social order. Similarly, Rose and Miller [16] argue that governance is enacted through technologies of control, including legal frameworks, risk assessments, and policy instruments that structure human behavior and decision-making.

In this paper, we adopt a sociotechnical perspective on technology, emphasizing that technologies are not merely tools or material objects but emerge, evolve, and function within specific social, cultural, economic, and institutional contexts. By engaging with these theoretical traditions, we seek to highlight the interplay between technological artifacts, societal structures, and human agency in shaping contemporary technological change.

3. The relation between SPT and technology

3.1. Introduction to Social Practice Theory

Social Practice Theory has emerged as an important framework within the social sciences, offering nuanced insights into the dynamics of human behavior and social change.

Originating from several contributions of social sciences, SPT primarily draws on the work of Giddens [17], Schatzki [18], Reckwitz [19], and Shove [1]. SPT leans on Giddens' structuration theory, which posits that social structures should be studied by means of social practices, which exist throughout spatial and temporal dimensions [17]. Giddens continued in arguing that human actions and social structures are mutually intertwined and explained how behavioral patterns are linked to beliefs about society [17]. As Schatzki [18] demonstrated about 15 years later, numerous theories of practice had emerged over time, each with distinct areas of focus. In order to unravel the various strings of theories, Reckwitz [19] pointed out the most prominent commonalities among these approaches. In his work, he focused on the relevance of rules and expectations in the analysis of human practices and emphasized the constitutive role of materiality in social life. His definition of practices as routinized behaviors significantly influenced the development of SPT, particularly his decomposition of practices into distinct elements, which served as a foundational aspect of the theory. Building on Reckwitz’ theorization of practices consisting of elements, Shove, Pantzar, and Watson [1] formulated their version of SPT and further advanced the analysis of practices. They stated that in order to fully understand social life and the individuals acting within it, it is necessary to analyze practices, consisting of materials, competence, and knowledge.

At its core, SPT emphasizes the routinized nature of social life, positing that human actions are not merely individualistic or isolated but are deeply embedded within social practices. A social practice is perceived as a nexus of doings and sayings, integrated by understandings, rules, and social structures [20]. These practices encompass a wide range of human activities, from everyday routines to complex professional tasks, and are constituted and interconnected by the following three elements [1]: *materials*, referring to ‘things, technologies, tangible physical entities, and the stuff of which objects are made’ [1,p. 14]; ‘*competence*’ ‘which encompasses skill, know-how and technique’ [1,p. 14]; and *meanings* such as ‘symbolic meanings, ideas and aspirations’ [1,p. 14].

Most importantly, SPT shifts the focus from individual behaviors or macro-level social structures to practices as the primary units of analysis. Rather than focusing on either macro or individual dimensions, SPT creates a duality of entities and instances, allowing for the connection of

societal structures with individual routines.

The analysis of a practice through these three elements also effectively addresses both the routine and dynamic aspects of social life. It acknowledges that practices are often habitual, yet it also provides a framework for understanding how practices shift over time. This dual focus on stability and change enables researchers to investigate how new practices emerge, how existing practices are maintained, and how they transform in response to various pressures, such as technological advancements or policy interventions.

3.2. The role of technology in Social Practice Theory

With uniquely incorporating materiality into the analysis of social practices, SPT recognizes that objects, technologies, and physical environments play a crucial role in shaping human action [1]. In this view, technologies are neither neutral tools nor self-propelling forces [21], but rather, they are integral to the enactment of everyday activities. For instance, SPT enables a precise analysis of technology, such as mobile phones, and differentiates between the three elements of *material* (the phone), *competence* (e.g. how to use the device), and *meaning* (e.g. maintaining social contacts). A smartphone is embedded within social practices of communication, mobility, and work, all of which shape its meaning and functionality. Unlike other theories, technology is not viewed in isolation, but can only be analyzed and understood in the context of a practice that also includes the elements of competence and meaning. Similarly, technological infrastructures, such as energy grids, digital platforms, or transportation systems, do not only serve as passive backdrops but actively configure the possibilities of social action [22], meaning that a certain technology must be studied in relation to the practices it sustains and is sustained by.

Extending the discussion on technology's role in practice theory, Morley's work [21] highlights how technologies operate beyond their immediate presence in a given practice. While SPT has traditionally focused on how materials are actively integrated into practices, Morley [21] argues that technologies also contribute to social change in more indirect ways. For example, automated technologies are not understood as tools used by individuals. Rather, they reshape the very structure of practices by altering human participation, redistributing labor, and influencing the persistence or disappearance of certain routines. This suggests that technology should not be interpreted solely as an element of practice but also as a broader force that modulates the dynamics of practice change [21]. Instead of treating technology as an external object, an autonomous driver of change, or a socially constructed artifact, SPT embeds technology within the ongoing enactment of social life [1]. With this, it reframes technological development as inseparable from the social practices that sustain, transform, and sometimes resist it.

3.3. The value of Social Practice Theory in technology-related research

By embedding technology within social practices, SPT offers distinct advantages for technology-related research. First, it allows scholars to move beyond conventional user-centered approaches that focus primarily on adoption and attitudes towards technology that neglect the broader social and material arrangements that shape technological engagement.

Since such approach can lead to misleading conclusions, such as attributing changes in behavior solely to technological advancements, SPT highlights that such changes result from shifting constellations of social practices that pre-exist, co-evolve with, and even refuse new technologies [18]. Moreover, instead of treating technological uptake as an individual decision-making process, SPT examines how technologies are woven into social routines, professional norms, and institutional structures. This is particularly valuable for studying technologies that reproduce or transform everyday life, such as AI-driven automation, smart home devices, or energy systems. SPT provides a relational understanding of technological stability and change in focusing on how bundles of practices stabilize technological arrangements over time. This allows to examine why certain technologies become integral to daily life, while others fail to take hold. SPT argues that this is not due to inherent technical limitations but because they do not fit within, or successfully reshape, existing practices [1].

SPT in technology-related research opens up new research directions in enabling to study how technological transitions occur through shifts in practice configurations rather than through innovation alone. Recognizing the contingent and recursive nature of technological stabilization within practices, SPT also challenges the classical notion on technological change, which assumes a linear progression from invention to widespread use. For example, research on energy and sustainability transitions have benefited from SPT by revealing that the success of renewable technologies depends not just on their efficiency but on changes in energy-consuming practices [23]. SPT recognizes that technologies do not act alone but within complex networks of human and material arrangements [24]. For instance, Stephenson et al. [25] presented a model for analyzing energy consumption by examining the dynamic interactions between cognitive norms, material culture, and energy practices. Integrating the SPT framework, their research offered a systemic perspective on how energy behaviors are shaped and sustained, emphasizing that energy use is embedded in broader cultural and material contexts, providing a valuable framework for understanding energy transitions. Moreover, research from Klitkou et al. [26] supports these findings in arguing that sustainability cannot be achieved through technological fixes or individual behavioral changes alone but requires interventions that consider the co-evolution of practices, highlighting the need for policy approaches that align changes across multiple practice fields.

To conclude, SPT offers a powerful framework for rethinking technology-related research, also for energy research. By embedding technology within social practices, it moves beyond simplistic models of technological impact and adoption, enabling a deeper analysis of how technologies become part of the fabric of everyday life. This approach not only addresses key limitations in traditional technology studies but also opens new opportunities for understanding technology. Ultimately, SPT does not merely add a social perspective to technology-related research – it reconfigures the very foundations of how technology is conceptualized and studied.

As this overview has shown, SPT holds a significant potential for technology-related research. However, a more detailed examination is needed to understand the specific frames and methodologies in which it has been applied. This systematic literature review aims to refine this understanding by analyzing existing studies and identifying key patterns in how SPT has been utilized. Additionally, we develop propositions that outline promising directions for future research and application. By doing so, we provide a foundation for scholars to further leverage SPT's potential in studying technology and its societal implications.

4. Method and data selection

We adopted a systematic literature review approach based on Galvan and Galvan [27] and along the PRISMA method [28] to ensure the comprehensive capture of all relevant published literature related to the question how SPT has been applied in technology-related research.

Considering the interdisciplinary factors of the research question, we used Scopus and Web of Science (WoS) research databases to identify relevant studies (for a detailed overview on the review process, see Fig. 1). The search terms of the data selection were ‘Social Practice Theor*’ AND ‘technolog*’ in the title-abstract-keywords' fields. This approach allowed for the detection of different disciplinary perspectives on the intersection of SPT and technology-related research, as terminology may vary across disciplines. We included articles published in academic journals as well as conference papers, and book chapters, from all research disciplines. Moreover, the literature had to be published in English and should relevantly engage with SPT in connection with

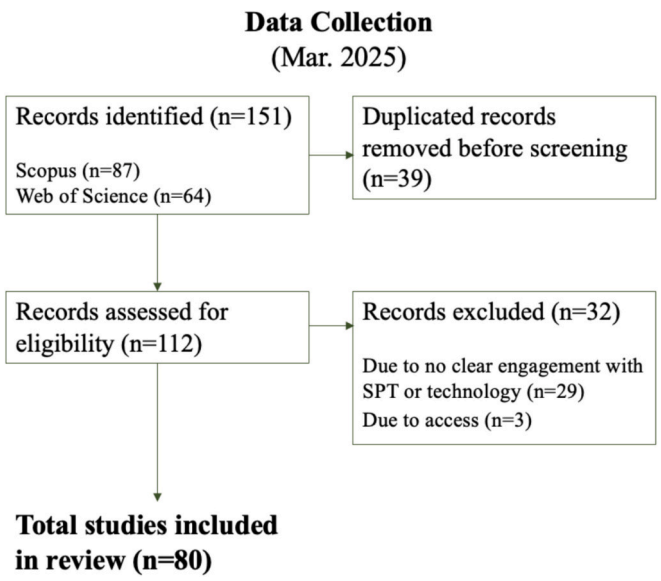

Fig. 1. Overview on the systematic review process (adapted from PRISMA 2020 [28]).

aspects of technology, meaning that SPT had to be applied to the analysis or discussion of a particular technology.

The truncation symbol ensured that grammatical variations were included, thereby capturing an even wider range of studies. The use of both keywords together with the AND operator ensured that the search retrieved papers that explicitly engaged with both SPT and technology, reducing the likelihood of irrelevant results. Given the aim of systematically mapping recent applications of SPT in technology-related research, prioritizing direct mentions of these terms allows for a structured and comparable analysis.

To ensure relevance to current academic discourse, we focused on papers published within a five-year span from 2019 to 2023. In contrast to longitudinal analysis, the aim was to investigate the full breadth of application areas within a relatively short time frame. The decision to focus on these five years was driven by the significant increase in published literature at the intersection of SPT and technology-related research during this period. A preliminary search revealed that between 2014 and 2018, less than half the number of relevant studies were published compared to the more recent timeframe. This sharp rise in academic output suggests a growing recognition of SPT as a valuable framework for analyzing technological change, likely driven by increasing research interest in digitalization, artificial intelligence, digital infrastructures, and sustainability transitions. By selecting 2019 to 2023, this review captures the most active and evolving phase of scholarship in this area, ensuring a comprehensive analysis of current theoretical and empirical developments, as well as offering insights into potential future directions.

The actual search was conducted in March 2025 for both Scopus and WoS, showing 87 results from Scopus and 64 results from WoS. This resulted in 151 papers in total. The preliminary screening procedure involved an initial assessment of titles and abstracts, resulting in the exclusion of 39 papers. Thus, 112 studies were advanced to a full-text scan for evaluation, and the final selection of articles was made based on how much the paper engaged with and referred to the terms 'Social Practice Theor* or 'technolog*'. Using this criterion, an additional 32 articles were excluded. This resulted in a total of 80 papers that were used for the following analysis. Based on the literature, we concluded that the search terms were sufficiently broad to allow us to consolidate them into analytical categories.

To examine commonalities among the articles, we conducted an analysis of the full texts. After reading each article, a summary of the analysis was entered into an Excel file, of which the top rows consisted of categories for coding the articles. These categories were derived both deductively from the research question and inductively from themes that emerged during the review process. The deductive categories included basic information, such as the journal and research question, as well as the broad topic, relevance, goals, method, and geographic area. These categories were then refined by inductive categories, such as application and understanding of SPT, definition of technology, or connections to other theories. The coding in Excel was further filtered through several reiterating phases to ensure a thorough understanding of the material.

The following section presents the literature corpus by highlighting the research areas, geographical areas, definitions of technology, methods used, and application of SPT, before the findings are critically discussed in Section 6 (for a summary, see Fig. 5 Overview on Findings and Propositions').

5. Findings

5.1. Research areas

Analyzing the research areas in which SPT has been applied to technology-related research is essential for understanding the thematic breadth and disciplinary focus of this field. This analysis not only helps to map dominant and emerging trends but also reveals potential gaps where SPT could be further integrated. Moreover, understanding the diversity of application areas allows scholars to position their work within ongoing debates, facilitating cross-disciplinary engagement and enabling the transfer of theoretical and methodological insights across fields.

Since multiple thematic perspectives were often concurrently addressed in one single article, we added several papers to multiple thematic subcategories. Our defined categories were namely 'sustainability', 'food', 'consumption/prosumption', 'energy', 'homes', 'cities', 'mobility/e-mobility', 'health', 'agriculture', 'tourism', 'agriculture', and 'education' (see Fig. 2). Due to space limitations, not all categories will be discussed in our description of the research areas.

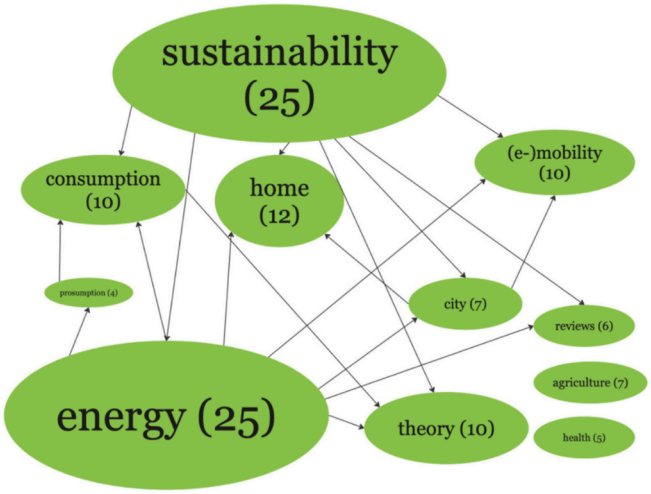

Fig. 2. Overview of research areas and their interconnectedness. Note: The size of the bubbles and the numbers in parentheses indicate the quantity of papers published within each research area. The arrows illustrate the interconnections between research areas as represented in the papers. The arrow directions show which subthemes were combined with which overarching themes. Research areas with fewer than four papers, such as food, education, tourism, and business, are not displayed in this graph. Several papers could align with multiple thematic subcategories, necessitating the use of multi-classification. Thus, the sum of all numbers in parentheses results in a higher number than the total number of papers in the literature corpus.

While analyzing the most common themes, we also identified the most common journals in the interface between SPT and technology (see Fig. 3). This additionally gives deeper insights into the academic landscape and to navigate researchers efficiently to key sources and debates. We hope that this will be especially useful in guiding scholars who seek to publish their own research, so that they can recognize where similar studies have been published, allowing them to adequately position their new contribution within the existing body of knowledge.

We found that a substantial quantity of scholarly articles originated from the field of sustainability studies or analogous disciplines. This was reflected in the considerable volume of literature being disseminated in scholarly journals like 'Sustainability', emphasizing how sustainability studies have extensively adopted the SPT approach. However, looking at the literature more specifically, we noticed an extensive assortment of sub-themes within this overarching subject. A number of authors employed SPT on subjects related to sustainability within the 'home' ecosystem [29–32]. For instance, Breadsell and Morrison [30] used SPT to analyze every-day practices within homes, or Stelmach et al. [32] focused on the flexibility of residential electricity consumption. Another subtopic was 'food', which was picked up by Breadsell and Morrison [30], Keegan and Breadsell [3], and Munir [16]. Moreover, Heidenstrøm and Hebrok [34] analyzed the emergence of new food practices that are incorporated into pre-existing food management routines. An array of research papers specifically investigated questions related to diverse forms of 'consumption'. These papers were published in journals like 'Cleaner and Responsible Consumption' and 'Sustainable Production and Consumption'. While Gao et al. [35] identified several trends and mechanisms of young Chinese travelers and their tourism consumption, Little, Lee, and Nair [36] delved into the factors that perpetuate specific unsustainable production and consumption systems.

The concept of 'consumption' also played a critical role within the sphere of energy studies. Numerous articles explored the interconnection between home and energy [37–41]. In most of these cases this also encompassed the 'consumption' aspect, as exemplified in Hess et al. [42]. Investigating routinized household practices, they disentangled energy demand and interpreted meanings, technology and knowledge of these practices.

Several papers studied energy-associated queries pertaining to 'cities'. For example, Kuusaana, Monstadt, and Smith [43] assessed urban resilience towards electricity blackouts through user practices, whilst Schrage [44] centered on civil servants implementing urban climate plans. Papers in the field of energy studies commonly integrated aspects of 'prosumption' [45,46]. While 'consumption' refers to the use of goods and services typically produced by others, 'prosumption' involves individuals both producing and consuming goods or services themselves. Analyzing the process of prosumers' energy practices, Standal, Talevi, and Westskog [47] argued that different kinds of capitals and internalized habitus enable or restrain individuals from becoming prosumers that interact with technology. Here, they related to Bourdieu's [48] take on practices, who uses the analysis of practices to theorize habitus.

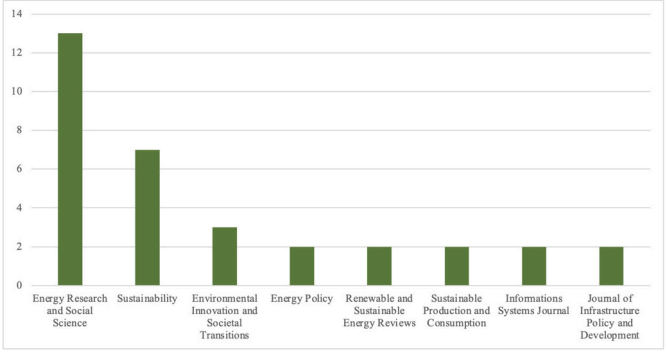

Fig. 3. Overview of the most common journals. Note: The above chart shows the journals that appeared at least twice in the literature corpus. However, most of the journals appeared only once, so the largest category would be 'other' with a total of 35 papers.

The literary corpus included several papers that engaged with aspects of 'mobility'[49,50] and 'e-mobility' [51,52]. For instance, Svennevik, Dijk, and Arnfalk [50] scrutinized how carsharing changes established urban mobility practices, and Sun et al. [53] studied daily mobility practices of e-bikes, while Jensen et al. [54] highlighted the meaningfulness e-driving practices.

Numerous studies originated from other diverse domains such as 'health', 'agriculture', 'tourism', and 'education'. Concerning 'health', a number of papers addressed issues related to digitalization within the health sector [55–57]. Articles from the field of 'agriculture' worked on topics such as smart farming [58], or herd recording systems [59]. Papers dealing with topics of 'tourism' for instance encompassed analyses about the utilization of airport technology among young adults [60]. In the field of education, Cranmer [61], for example, analyzed digital use practices of children with disabilities.

Our analysis of research areas showed a strong presence of sustainability and energy research, indicating that SPT has become a well-established framework for analyzing technological transitions, household consumption, and infrastructure development. However, the application of SPT extends these domains, encompassing a diverse range of fields such as mobility, health, agriculture, education, and tourism, demonstrating its flexibility and interdisciplinary potential. This highlights that SPT is not confined to a single thematic area but is increasingly used as a tool for examining technological change across various socio-material contexts. Recognizing this diversity is crucial for identifying emerging research trends, potential gaps, and new directions for future studies, as well as it broadens the theoretical and methodological conversations around SPT, encouraging cross-disciplinary engagement and the application of its concepts beyond established domains.

5.2. *Geographical areas*

While the above-discussed *research areas* referred to the research discipline and the content background, *geographical area* refers to the geographical background of the studies. Going beyond the thematic focus of studies and examining the geographical distribution of SPT applications in technology-related research provides crucial insights into regional disparities and research priorities. Since social practices are inherently shaped by cultural, political, economic, and infrastructural contexts, understanding which geographical contexts have been studied and which remain underexplored is critical for fostering a more globally representative understanding of SPT's role in analyzing technology. This contributes to discussions on research equity and inclusivity, emphasizing the need for a more diversified and context-sensitive application of SPT.

Naturally, we only specified the geographical area for those studies that were built on field analysis or data collection in a specific location. A predominant share of the papers, namely 53 out of 80, undertook their data collection in regions typically referred to as the Global North. More explicitly, a considerable number of studies originated from the UK and Australia, with each country contributing ten papers. Furthermore, nine studies were derived from Nordic Countries, including Finland, Norway, Denmark, and Sweden. In contrast, only 16 papers centered on regions recognized as the Global South, with nations including Thailand, Pakistan, Iran, India, and Ghana. Lastly, two papers incorporated data from both the Global North and South to facilitate comparisons between the two areas. We are aware of the need to maintain a critical stance in establishing North-South dichotomies, as categorizing studies and nations could inadvertently perpetuate this division. However, by specifically listing the number of publications from the so-called North and South, our intention is to highlight the existing imbalance and advocate for a more equitable distribution in terms of geographical representation

in research.

Geographically, the findings indicate a strong research concentration in the Global North. This imbalance suggests that existing SPT applications in technology research may be shaped by specific socio-economic and infrastructural conditions, potentially limiting its applicability to diverse global contexts. Future research could benefit from expanding the geographical scope to better capture regional variations in technological adoption, practice configurations, and infrastructural constraints

5.3. Technology definitions

Since SPT challenges traditional views of technology as either a neutral tool or an autonomous driver of change, examining how the literature defines 'technology' provides insight into theoretical orientations and analytical frameworks used in this field. The way technology is understood influences how researchers investigate its integration into everyday life, its impact on social practices, and the sociotechnical dynamics that emerge from its use. By inductively categorizing the technology definitions from the reviewed literature, we provide an overview of how technology is understood across different studies, helping to reveal most dominant perspectives, such as: 'technology as tangible element'; 'technology as intangible element'; 'expansive understanding of technology'; 'abstract ideas of technology'. While the definition of the term itself varied widely between the papers, a significant portion of them comprehended technology as a tangible, material element. For instance, Stillman et al. [62] analyzed whether and how smartphones evoked new practices for individuals or communities. Further examples of tangible technologies included a camera [63], household devices [42,64,65], or energy-related technology like solar panels [66].

A subset of the analyzed publications interpreted technology as intangible. For instance, Reid et al. [67] sought to unfold the social practices of online dating through a study of dating platforms, while Gao et al. [35] explored the influence of apps on travel habits. Other scholars explored the implications of artificial intelligence (AI) [68], a video game [69], and healthcare information technology [56,57,70]. Greenhalgh et al. [55] investigated how information infrastructure influences technological innovation.

Some scholars adopted a more expansive understanding of the term and avoided limiting the understanding of technology to a singular mechanism. Instead, they included a conglomeration of diverse technologies, or even encapsulating a complete field of technology. This was largely seen in papers discussing energy technology. Breadsell et al. [71] looked at how various interlocked practices affect the use of energy technologies in the sphere of homes, while Kuusaana, Monstadt, and Smith [43] investigated everyday energy practices of residents and businesses.

Lastly, some papers worked with a notably abstract conceptualization of technology. These papers were predominantly theoretical in nature, exploring technology as a concept itself rather than applying SPT to a specific case study. Giardullo et al. [72] contrasted social and technical disciplines in regard to energy transition, whereas Weidler-Lewis, Wooten, and McDonald [73] focused on the ontological dimension of learning and used SPT as a lens to study the intended and unintended consequences of technology.

Our analysis revealed that the majority of studies framed technology as a material object, aligning with SPT's emphasis on the material element of practice. However, many studies also considered intangible technologies, demonstrating how SPT can be applied beyond purely physical artifacts. Some researchers adopted a broader systems approach, encompassing multiple technologies within an interconnected field, particularly in energy research. Finally, a subset of theoretical contributions focused on abstract, conceptual engagements with technology, demonstrating the potential for SPT to contribute to more general discussions about technology's ontological status. This diversity of definitions highlights the flexibility of SPT as a framework for studying technology while also suggesting that clearer distinctions and more explicit theoretical discussions could enhance coherence across different studies.

5.4. Methods

Examining the methodological approaches used in SPT-related technology research is essential for understanding how empirical studies engage with and operationalize SPT concepts. Since SPT focuses on practices as the unit of analysis, research methods must be capable of capturing the relational and processual nature of technological practices. By analyzing the methodological choices made in the literature, this section aims to identify dominant trends, to assess the diversity of research designs, and to highlight potential methodological gaps.

The methodological approaches of the investigated research papers can be sorted into six distinct categories (also see Fig. 4): literature review (10), qualitative single (16), qualitative mixed (26), quantitative single (5), mixed methods (16), theory (7). While 'qualitative single' included papers applying only one qualitative approach, 'qualitative mixed' included all papers combining various qualitative approaches. In contrast 'mixed methods' included papers combining qualitative and quantitative approaches.

A total of ten articles were classified under the category 'literature review' [2–4,26,29,74–78]. For example, Munir [3] used the SPT lens to systematically analyze literature on sustainable food waste management, and Ojong [4] systematically reviewed papers 'on the topic of solar home system adoption, energy consumption, and social practices in South Asia' (1). The literature review of Malatesta et al. [2] discussed the relation between the technical side of renewable energy systems and consumption practices in the home [2,p. 18]. Moreover, Klitkou et al. examine the interconnectedness of various fields of social practice especially in light of sustainability transformations [26].

We identified 16 papers as solely qualitative, showcasing a singular qualitative approach within their study. 'Qualitative' in this case meant that the studies were 'the outcome of an iterative process in which both deduction and induction were involved' [79,p. 155], and in which categories were created and analyzed. The majority of these studies conducted interviews using SPT to analyze the interaction of certain actors with specific technology [40,45,49,51,53,58,67,80–82]. Moreover, focus groups were used in some studies [60,83]. A purely ethnographic study was seen in Rapp [69], applying SPT to the video game World of Warcraft. Lastly, three articles employed other external resources as basis for their analysis [84–86].

The majority, that is 26 papers, pursued an approach that mixed at least two qualitative approaches. Many combined interviews with ethnographic fieldwork, such as participant observation [54,56,59,61,64,65,68,87–90]. Additionally, some studies linked interviews with data from workshops [8,50,91,92], focus groups [93], or

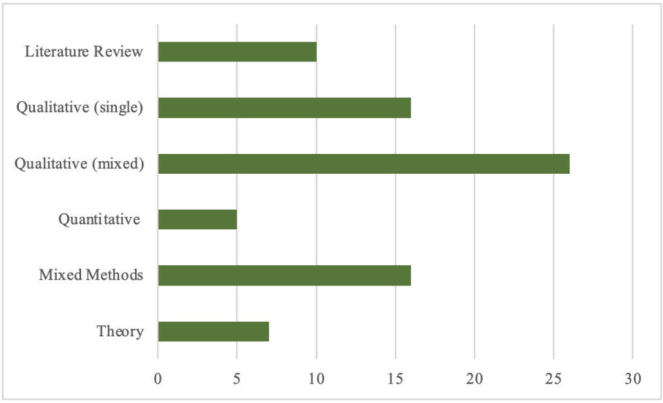

Fig. 4. Overview of methods applied in literature corpus.

data from diary entries [47]. Finally, many of the studies combined even more than two methods, also including supplementary material from travel blogs [35], neighborhood visits, document analysis [43,44,55,94], online reviews [95,96], reflection cycles [97], and digital walk-throughs [98].

We only identified five papers as quantitative studies [32,41,42,99,100]. The term 'quantitative' here related to studies systematically investigating social phenomena through the utilization of statistical or numerical data [101]. Each of the four studies implemented online surveys with a total number of participants ranging from 161 [42] to 804 [41]. Three of the studies focused on the analysis of changes in practices and their elements connected to home energy consumption and home technology [32,42,100].

Our review revealed 16 studies that employed a mixed methods design. Mixed methods designs were understood as 'the third major research approach or research paradigm' [102,p. 112], where quantitative and qualitative data were mixed at 'some stage of the research process within a single study in order to understand a research problem more completely' [103,p. 137]. While interviews remained a foundational element in most of the mixed methods studies, numerous articles fused interview data with surveys or other forms of quantitative data such as census data or data derived from policy reports [29,36,37,39,46,52,62,104,105]. In other cases, interviews were connected to workbooks [30,106] or diaries [31]. Only a limited number of papers refrained from interviews and drew their data from a mix of news articles, reports, or specific statistical figs. [33,38,49,107].

We categorized a total of seven articles as theoretical papers as they did not partake in collecting either qualitative or quantitative data but focused solely on constructing theoretical arguments [63,66,72,73,108–110].

Overall, the analysis of the methodological landscape underscores the clear dominance of qualitative methods, reflecting the emphasis in SPT on understanding practices in their social and material contexts. Mixed-methods approaches were also frequently used, suggesting a growing interest in triangulating findings to capture both practice dynamics and broader statistical patterns. However, purely quantitative studies remained rare, reflecting ongoing challenges in quantifying social practices without reducing their complexity. Literature reviews and theoretical contributions also played a role in shaping the field, providing conceptual clarity and integrating findings across different empirical studies. This underscores the importance of qualitative and mixed-method approaches in SPT research on technology, while also pointing to the need for further methodological innovation, particularly in developing robust quantitative and computational techniques to analyze social practices at scale.

5.5. The potential of applying SPT as sole theoretical concept

Investigating how SPT functions as an independent analytical framework helps clarifying its strengths, limitations, and theoretical contributions to technology research. Examining studies that use SPT in isolation shows how SPT can be used effectively to explain technological change and highlights SPT's conceptual depth. Understanding the potential of SPT as a stand-alone framework is crucial for assessing its explanatory power and identifying areas for further theoretical development.

We identified a high number of papers focusing exclusively on SPT, without combining it with other theoretical approaches. For instance, Walton and Ford [46] applied SPT to the case of transition from kerosene to solar lighting practices in Vanuatu, a small island developing state in Oceania. Analyzing the aspects of material, meanings, and competences, each in relation to practices associated with solar lighting, they comprehensively substantiated the interconnected nature of the elements, as theorized by Shove, Pantzar, and Watson [1]. Jensen et al. [54] employed SPT to determine the relevance of technology and infrastructure, highlighting the importance of the element 'meaning' as it challenges traditional definitions of car driving [54,p. 42]. Sun et al. [53] employed SPT to compare e-bike practices in China and the Netherlands [53,p. 3].

While the aforementioned studies applied SPT in a systematic manner, considering all three elements, namely material, competence, and knowledge, a considerable number of papers focused only on specific aspects of SPT. For instance, Rapp [69] examined primarily the aspect of temporalities within video games and, drawing on Schatzki's [18,p. 2] conceptualization of SPT, effectively illustrated how players of video games engaged in recurrent practices that generate circular temporalities. Lo Piano and Smith [76] too examined the temporality aspect of SPT. Their study investigated the temporalities of energy demand to explore the potential for controlling energy demand and enhancing temporal flexibility. In line with one of SPT's main claims they successfully showed that the introduction of new elements, particularly material artifacts, can impact 'the sequences and synchronicity of the socio-temporal organization of practices' [76,p. 10].

Our findings indicate that a substantial number of studies applied SPT as a sole theoretical framework, demonstrating its robustness and versatility in explaining technological practices. These studies effectively unpacked the elements of practice without relying on additional theoretical frameworks, particularly in research on energy transitions, mobility, and digitalization. While this suggests that SPT is sufficiently comprehensive for many research contexts, it also raises questions about whether additional theories might enhance its explanatory potential in certain cases, particularly in studies dealing with power structures, institutional change, or macro-level dynamics. Ultimately, this review highlights the strength of SPT as a self-sufficient analytical tool, while also pointing to the need for further reflection on when and how additional theoretical perspectives may be beneficial.

5.6. The potential of applying SPT in combination with other theoretical concepts

While SPT is a powerful framework for analyzing the relationship between technology and everyday life, it has been often applied in combination with other theoretical approaches to address specific research questions and to overcome certain conceptual limitations. Since SPT primarily focuses on practices as the unit of analysis, it sometimes lacks an explicit framework for macro-level systemic change, individual agency, or institutional structures. To bridge these gaps, scholars have increasingly integrated SPT with other frameworks that provide complementary perspectives. Investigating how and why scholars combine SPT with other theories is crucial for understanding its methodological flexibility, explanatory reach, and limitations. By mapping these interdisciplinary connections, this section explores how SPT interacts with other theoretical concepts, what analytical advantages these combinations offer, and where further integration could be beneficial.

5.6.1. SPT linked to the multilevel perspective (MLP)

Various papers applied SPT in combination with the Multilevel Perspective (MLP). According to Giardullo et al. [72], MLP distinguishes between three analytical levels – micro, meso, and macro – to analyze socio-technical transitions. In contrast to this vertical perspective, SPT examines the horizontal circulation of human agency [72,p. 124]. Furthermore, the two theories approach technology differently. While MLP often centers its analysis on technology itself, technology in SPT is 'only a piece of a bigger story' [81,p. 2804]. In SPT, the analysis does not focus on the technology but on a practice, which may subsequently integrate a certain type of technology. We see potential in integrating the two theories because SPT allows to investigate a certain practice in detail, whereas MLP allows to interpret this practice on three analytical levels.

For instance, Little, Lee, and Nair [36] employed both MLP and SPT to explore the forces that shape unsustainable production and

consumption systems. They asserted that MLP 'offers a hierarchical framework for unpacking complex, system-based problems' [36,p. 167] by focusing on the dynamics between macro, meso and micro-level phenomena, with technology playing a central role. Although MLP enables to understand the relation between the three levels, Little, Lee, and Nair [36] argued that it lacks to focus on social aspects. To address this need, they incorporated SPT to examine the nature of system change and highlighted the social structures underlying individual actions. Their approach revealed that disrupting unsustainable systems requires reordering materials, competences, and meanings across all three analytical levels [36,p. 183]. We agree that there is a need for a more social perspective to grasp the subtle aspects of social systems' change and evaluate their paper as successfully doing so.

In a study on the social implications of smart-farming technology, Jakku et al. [58] similarly argued that MLP inadequately addresses the social dimensions of system change due to its focus on technology rather than on practices. To address these shortcomings, Jakku et al. [58] effectively applied SPT, emphasizing the relevance of human agency. In their work, they firstly applied MLP to demonstrate the need to pursue socio-technical transitions at all three levels, whereas a SPT analysis secondly highlighted the importance of images and meanings during these transitions. We agree that MLP could overlook the actions of people and the analysis of meaning-making and thus see their paper as a positive example of how SPT can complement MLP.

Carvalhais and Pinto [81] also supported the integration of MLP and SPT, contending that such fusion enables a comprehensive investigation of the emergence, change, and sustainment of practices related to technological devices. This perspective was echoed by Giardullo et al. [72], who argued that 'materiality' serves as the interface between MLP and SPT, allowing for an adequate conceptualization of the role of technologies [72,p. 146].

An illustration of how SPT has been used alongside transition studies was a study by Koretsky and van Lente [84] in which they looked at technological phase-outs as an 'unravelling' of the three elements, namely material, competence, and meaning [84,p. 304]. Instead of focusing on practices itself, they were more interested in changes of socio-technical configurations and therefore included the analysis of temporal and spatial dimensions to their analysis. With this, they precisely avoided two critiques of SPT, namely the simplification of reducing socio-technical circumstances to only three elements, and the neglection of systemic phenomena [84,p. 304]. We consider this paper as fruitful, since it successfully applied SPT onto the temporal and spatial dimensions.

5.6.2. SPT linked to the technology acceptance model (TAM)

The Technology Acceptance Model (TAM) is a theoretical framework that seeks to explain how users come to accept the use of a certain technology. According to TAM, if users find a technology useful and easy to use, they are more likely to develop a positive attitude towards it. This in turn leads to a higher intention to use it, and ultimately results in actual use [111].

Uhde and Hassenzahl [110] highlighted the limitations of TAM, advocating for an increased use of SPT for analyses of human-technology interaction, particularly concerning acceptance in public spheres. They convincingly argued that TAM are 'too rigid to account for the nuanced variations of social situations' [110,p. 1]. They noted that TAM lacks focus on the relationships between individuals, suggesting that SPT is better suited for analyzing the social and material dimensions of human-technology interaction. Therefore, they introduced a context-based approach using hypothetical examples of phone calls in different social settings, based on SPT. We especially agree with their position, arguing that constellations of situated practices, including material, competence, and meaning, fundamentally determine whether a human-technology interaction enhances a social experience or is deemed unacceptable.

Similarly, Mooses et al. [40] argued that TAM was only partially useful for their analysis of the perception of smart technology in Estonia. We agree that in their case TAM was useful for understanding technology acceptance on an individual level, but to accurately cover the analysis of social systems, SPT was needed [40,p. 21]. Additionally, Shah et al. [100] used TAM as a theoretical basis for their work on behavioral intentions to adopt 5G, but also incorporated SPT and analyzed each element (material, competence, and meaning).

5.6.3. SPT linked to other theoretical concepts

While the preceding sections highlighted the most common combinations of SPT and other theoretical concepts, single studies have used SPT also together with further approaches. For instance, Labanca [66] argued that integrating 'complex systems approaches' with SPT would give 'urgently needed insights into innovation for decarbonisation' [66, p. 1]. Complex system approaches suggest that global networks are highly interdependent systems, difficult to understand or control [112]. In this view, any system with social actors can be considered complex, making this approach suitable for analyzing global issues and large-scale dynamics [66,p. 3]. We agree with Labanca et al. [66] that complex systems must be situated within history and culture, because complex systems approaches alone are too abstract. To avoid this difficulty, Labanca et al. [66] successfully highlighted how SPT's emphasis on more specific dimensions helps to understand how units of practices travel and mobilize.

Standal, Talevi, and Westskog [47] explored the potential of combining SPT with Domestication Theory and acknowledged the benefits of SPT in exploring socio-technical change. In a compelling way, they applied ideas from Domestication Studies to highlight how technology, such as photovoltaic (PV) systems, become integrated into family's everyday routines. By convincingly drawing on both SPT and theories of domestication, their article showed how the particular phases of domestication are gendered and how different cultural capital influences individuals' interaction with technology [47,p. 1].

In a further example, Hess et al. [42] combined aspects from social psychology research to SPT. In their paper about changing household practices, they applied an adjusted version of SPT to disentangle routinized energy consumption and investigated how home energy advice can change the elements of a practice. Although SPT rejects the individual as the center of analysis and advocates to focus on practices as units of analysis [1], Hess et al. [42] proposed the inclusion of individual behaviors too. We agree that expanding the scope of analysis and including behaviors can help to explore how individuals influence routine behaviors, materials, knowledge, and meaning.

Other scholars focused on the specific practices at home and analyzed them as interlocking practices based on the concept of the home system of practices [38,106]. In this context, Breadsell et al. [71] stated that the adoption of a particular technology depends on the understanding of connected practices, suggesting that practices should be already considered during the building phase. We agree and see the need to apply a practice-perspective during the design process, employment stage, and evaluation phase of a new technology.

5.6.4. Interim conclusion

Our analysis revealed that combining SPT with other theoretical approaches is a common strategy in technology-related research, allowing scholars to address specific analytical gaps and weaknesses of SPT. While one critique towards SPT is its limited ability to analyze macro-level systemic transitions, as it focuses on everyday practices rather than structural changes, research combining SPT with MLP addressed this critique in examining how technological innovations emerge, stabilize, and disrupt socio-technical regimes. Another limitation of SPT is that it downplays individual decision-making and user perceptions, making it less suitable for studying technology adoption. Thus, the integration with TAM showed how perceived usefulness and ease of use influence the uptake of new technologies. Additionally, SPT interprets technology as embedded within practices but does not fully

explore how people adapt to and incorporate new technologies over time. Domestication Studies bridge these gaps in analyzing how users negotiate, appropriate, and normalize technologies in everyday life. Moreover, since SPT does focus on cognitive and psychological processes, integrating insights from psychology enables a deeper understanding of how personal dispositions shape engagement with technology-related practices.

These findings suggest that while SPT is a strong and independent theoretical framework, its explanatory power can be enhanced when combined with complementary approaches that offer macro-level perspectives, institutional analyses, or psychological dimensions. This underscores the importance of interdisciplinary engagement and suggests that future research could further explore how SPT can be refined, expanded, or hybridized to capture the evolving relationship between technology and social life.

Based on our overall analysis of the existing literature, we will now proceed to discuss our findings and formulate five propositions about the potential of SPT in future research.

6. Discussion

6.1. Proposition 1: Expanding SPT to underrepresented research areas and new societal issues

Our evaluation of recent studies applying SPT showed that most of the literature focused primarily on sustainability, energy, and consumption technology (for an overview on findings and propositions, please see Fig. 5). Topics such as food or home technology were also extensively discussed with reference to the SPT framework. Given that SPT in its evolving phase has been predominantly applied to issues of climate change and sustainability, the ongoing focus, even in connection to technology, is understandable. However, we also identified instances where SPT has been applied to new fields such as health, agriculture, tourism, and education in combination with technology. These examples highlight the potential of SPT to explore topics beyond sustainability, showcasing its versatility in addressing various technological questions.

Since the number of SPT applications in these additional fields remains relatively small, we advocate for further expansion of SPT in these underrepresented areas. Moreover, because SPT is relevant to any research area that involves the design, implementation, or evaluation of

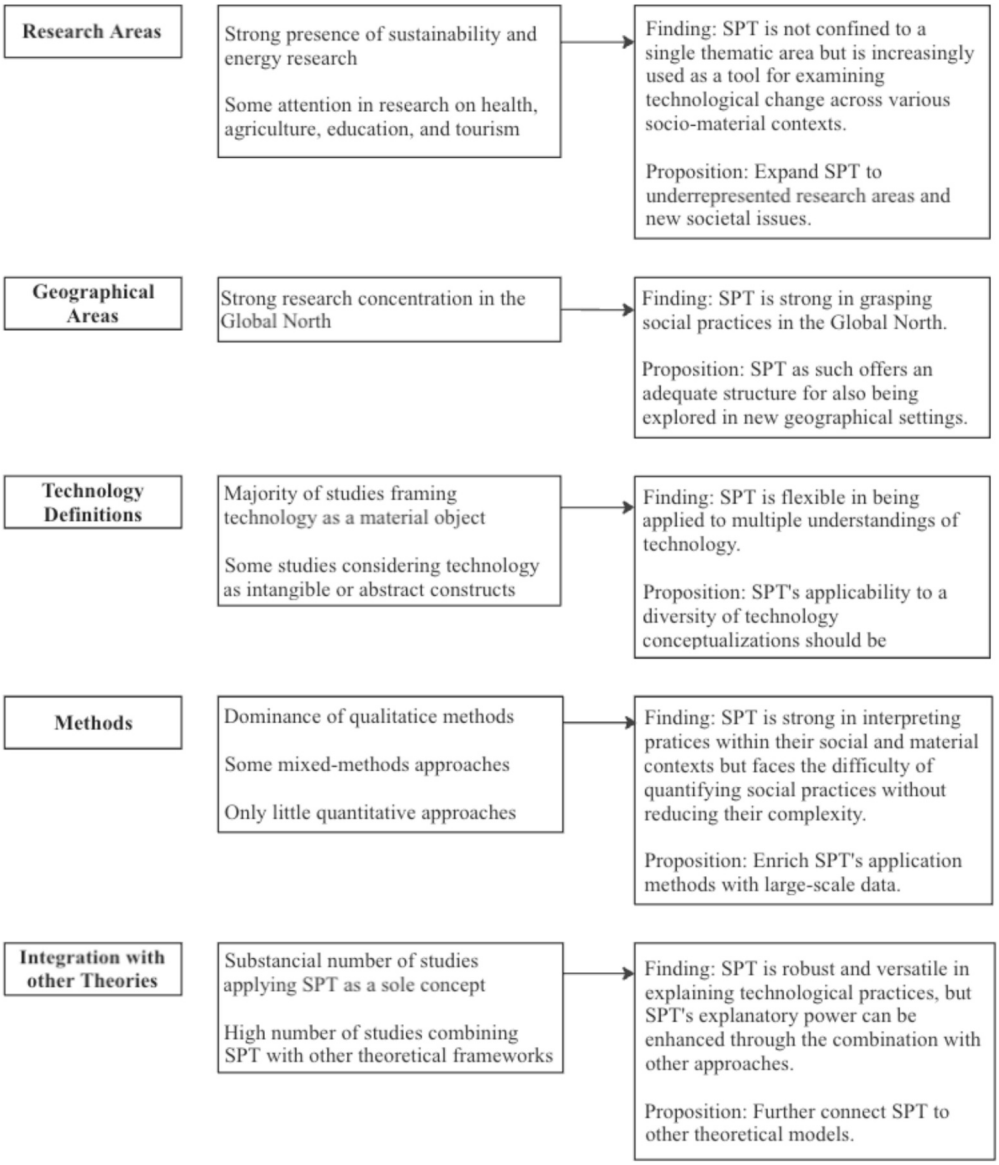

Fig. 5. Overview on findings and propositions.

technology, we see significant potential for applying SPT to even entirely new technology-related domains apart from the mentioned ones. For example, a substantial body of research on technology in elderly care underscores the importance of addressing demographic change through technological innovations [113,114]. Given that many societies are currently experiencing demographic shifts, we suggest utilizing SPT to analyze technologies aimed at tackling these demographic challenges. This allows to examine how access to and engagement with emerging technologies differ across demographic groups and socio-economic contexts. SPT especially adds to the research on technological transformations, because it inherently considers the interdependencies between different practices, allowing to trace how technologies become embedded in or disrupt established routines over time and thus offers a holistic perspective on technological change in multiple research areas.

6.2. Proposition 2: Applying SPT to new geographical contexts transcending cultural categorizations

Concerning the geographical focus, we found that the majority of research covered the so-called Global North. This trend can once again be attributed to the historical development of SPT, which emerged in the Global North and naturally progressed to address issues pertinent to these contexts. Consequently, subsequent studies have typically been conducted under similar conditions to build on existing findings. However, this geographic concentration has resulted in a notable gap of research connecting SPT with technology studies from the so-called Global South, which has also been highlighted by other authors [3,64]. While we acknowledge the danger of reinforcing the dichotomy between the Global North and South by categorizing studies accordingly, our intent is to draw attention to this imbalance and advocate for more research on the Global South.

In our understanding, a more equitable geographical distribution in energy research and beyond is essential to capture the diversity of energy practices across different socio-cultural, economic, and infrastructural contexts. Comparative analyses between North and South and the integration of findings from diverse contexts offer significant research potential. Since SPT emphasizes how energy use is embedded in everyday routines, materials, and social meanings, studies that focus predominantly on the Global North risk producing context-specific insights that may not apply to other regions with different energy infrastructures and socio-political conditions. In our view, especially questions of emerging technologies can be relevant for the Global South, examining how newly arriving technologies influence societies and social practices. The work of Walton and Ford [46], who found how portable lightning is deeply embedded in practices in Vanuatu, is a good example for such an approach. However, the overarching question whether SPT can simply be applied to new contexts with distinct social structures will inevitably arise. Sun et al. [53] argue that much SPT literature has focused on how to pursue a change towards sustainable practices. However, in their view, this approach is only plausible 'given that the way of living in most parts of the Global North is substantially based on a high consumption and high emissions model' [53,p. 8]. Therefore, prerequisites for applying SPT may differ significantly between the Global North and South. One could argue for the development of an adapted version of SPT tailored to issues pertinent to the Global South, without relying on conceptions derived from Global North studies, as Sun et al. [53] also argue. However, we do not see this need because in our understanding SPT is precisely concerned with the concrete situatedness of practices in local and material contexts. We would instead argue that exactly because SPT focuses on the unit of practices by the means of the three elements (material, competence, and meaning), it provides the flexibility that is required to adapt these elements sensitively to various contexts. By *sensitively* we mean that while the material element may remain consistent, its introduction into a new context needs a redefinition and adaptation of the elements of competence and meaning. For example, while the material of a washing machine may have a meaning of cleanliness in certain contexts, this meaning may be quite different (e.g., dependence on machines) in contexts where washing machines have not been established. According to SPT, the introduction of new material could lead to the modification or disappearance of old practices (e.g., washing by hand). Consequently, even with the same material element, the other two elements (competence and meaning) would have to be continuously re-evaluated and adjusted according to specific contexts. With SPT showing such high degrees of adaptability for each element, we see significant potential for examining research subjects globally and in new geographical areas, transcending cultural or national categorizations.

Therefore, SPT allows to expand the research to underrepresented regions, and provides a more comprehensive understanding of how energy transitions unfold in diverse settings, including informal economies, decentralized grids, and community-driven energy initiatives. A broader geographical scope ensures that sustainability policies and interventions based on SPT research are more inclusive, adaptable, and effective in addressing global energy challenges rather than reinforcing regionally biased solutions.

6.3. Proposition 3: Maintaining SPT's applicability to a diversity of technology conceptualizations

Our analysis of the technology definitions showed that there was no consistent definition of the term across papers, ranging from technology as a material element to abstract and complex conceptualizations. While this could be perceived as a problem, we see no need to strive for a singular definition. We advocate for maintaining this diversity in definitions and continuing to incorporate even new understandings of technology into SPT-based research. In our view, this diversity exemplifies the theory's adaptability and its capacity to investigate technology from multiple perspectives. For example, considering the issue of demographic change, numerous emerging technologies aim to mitigate this problem's impact or assist societies in adapting to inevitable social shifts. On the one hand, there are directly linked tangible technologies, such as robots in elderly care. On the other hand, complex networks comprising various technologies exist at different levels, such as the internet of things. These technological networks are highly entangled but still deal with demographic change and its effects on society.

SPT can specifically contribute to maintaining a diversity of technology conceptualizations by focusing on how technologies are embedded within and shaped by social practices, rather than treating technology as a fixed or isolated entity. This flexibility allows researchers to analyze both tangible artifacts, and broader sociotechnical systems, without imposing a rigid definition of technology. Encompassing these diverse conceptualizations of technology will enrich the theoretical framework and enhance its applicability across different technological domains. Technology-related research can thus benefit from SPT since the theory explores how different conceptualizations of technology interact with everyday life, how technologies are stabilized or resisted within practices, and how emergent technological systems co-evolve with societal transformations.

6.4. Proposition 4: Enriching SPT's application methods with large-scale data

Our examination of methods revealed a predominant reliance on qualitative and rather small-scale approaches in the existing literature. While some studies utilized a single qualitative method, the majority integrated at least two qualitative approaches. Additionally, several studies employed a mixed-methods approach, combining both qualitative and quantitative techniques. Notably, interviews were a common methodical choice across nearly all studies, underscoring their significance in SPT-based technology research. However, the frequent combination of interviews with other methods raised the question of

whether interviews alone yield sufficiently nuanced results. It appeared that additional approaches were often necessary to comprehensively understand the research subject. Furthermore, our analysis identified a lack of large-scale research within the literature corpus, a gap highlighted also by other researchers [26,42,109]. Although there are indisputable benefits of qualitative and individualistic approaches to situate practices in their social, historical and cultural contexts, we suggest that large-scale research can serve as a complementary approach, providing information on numbers and patterns. For instance, we consider them especially useful for simultaneously examining multiple practices, allowing for a comparison and analysis of interrelations between practices. A particularly useful example for this is Hess et al. [42] who have conducted a randomized field experiment on changing routinized household energy consumption. Such designs also simplify the data collection from multiple points in time and enable longitudinal analysis. Moreover, large-scale approaches allow to assess the interpretations of the elements competence and meaning of a high number of individuals in relation to a certain practice. For instance, Zanocco et al. [41] explored a total of 804 consumers' household energy activities and their perspective on smart energy technologies.

Such study designs are particularly effective in moving beyond the micro perspective of individual practices, emphasizing more general trends of a distinct population and addressing potential critique asserting that SPT is excessively detail-oriented. Thus, using the existing large-scale studies as benchmarks and further applying new methods could enhance SPT's applicability to new research subjects and open up SPT's scope to researchers in novel disciplines.

Nevertheless, we acknowledge that SPT has traditionally tended to focus on micro-scale studies because it emphasizes the situated nature of practices, analyzing how materials, competences, and meanings interact in specific social, historical, and cultural contexts. Additionally, its commitment to understanding the everyday enactment of practices has led researchers to prioritize qualitative, in-depth methods such as ethnography and interviews. Thus, scaling up SPT research poses challenges, as it requires understanding how practices spread, evolve, and interconnect across broader systems without reducing them to aggregated individual behaviors or abstract societal trends. However, these hurdles can be overcome when scholars develop methods through SPT that capture the dynamics of practice circulation, institutional influences, and large-scale socio-technical transitions. Since SPT redefines the concept of scale by shifting attention away from conventional hierarchical models, such as individual, community, national, towards the interconnectedness of practices across different sites and levels, we see its potential in also being applied to large-scale studies. In doing so, SPT highlights how macro-level changes are emergent from shifting practice configurations rather than external structural forces.

6.5. *Proposition 5: Continuing to connect SPT to other theoretical models*

Our analysis revealed that a high number of studies exclusively utilized SPT for the analysis of technology-related topics. These studies frequently applied each element of SPT to their subjects, often identifying a specific technology as the material element. Additionally, some papers focused on single aspects of SPT, such as the element of 'meaning' or aspects of temporality. These studies demonstrated that SPT alone can be a robust analytical framework. Nevertheless, most studies combined SPT with other theories, such as the MLP, the TAM, or complex systems approaches. A common theme of the critiques towards SPT has been the contrast between abstract and detailed analyses [72,81,110]. While the aforementioned theories often provided broad and abstract frameworks, SPT brought in a more detailed perspective by focusing on the individual level and its associated practices. We argue that this juxtaposition revealed SPT's ability to enrich analyses that might otherwise be too general. One could argue that this frequent combination with other theories indicates that SPT alone is insufficient to address research problems comprehensively. Giardullo et al. [72,p. 136] thus suggested the development of a more generalized and unspecific version of SPT to enhance its applicability. In this regard, Shove [115] formulated an initial approach to how SPT can be applied to large social phenomena. She argued that in order to understand large-scale issues, it is necessary to zoom in and out and to further interpret the horizontal connections of bundles of practices. We agree with this suggestion and see the potential for SPT to also being applied to broader issues. However, we argue that the ultimate goal should not be to reconstruct SPT or create a new version of SPT to make it applicable to global issues and questions. Rather, we state that the strength of SPT lies precisely in its flexibility to be combined with a variety of other theories, thus allowing for both micro- and macro-level analyses. As the literature has shown, SPT's strength has been in adding a more concrete perspective to questions that would otherwise be answered too generally with reference to other theories.

Connecting SPT to other theoretical models is especially beneficial in technology-related research, because it enables researchers to overcome a specific theory's limitations and gain a more complex understanding of technological and social transformations. While SPT provides a detailed, practice-centered approach, both micro and macro-level phenomena can be effectively addressed in combination broader frameworks, be it either established or novel ones. This allows to examine merging technological systems, interdependencies between practices, and how practices evolve across multiple contexts. Furthermore, theory combinations will also expand the range of research areas that can benefit from SPT, enabling researchers from diverse disciplines to incorporate SPT into their work and sets of theory. Recognizing that SPT is not limited to sustainability-related questions or solitary applications, we see vast potential for its use in exploring new research domains.

7. Limitations

Our research question was intentionally broad and did not specify a particular type of technology or research area. Thus, this study did not analyze the detailed application of SPT in any one particular field or technology. Nevertheless, the categories we created still show the prevalent research areas, technology understandings, methods, and application combinations of SPT.

We acknowledge that the chosen keywords for the query had certain limitations, such as potentially overlooking studies that discuss technology under related terms like 'digitalization', 'infrastructure', or 'innovation', or those engaging with SPT without explicitly using the explicit name of the theory. However, our search query was intentionally designed to ensure conceptual clarity and methodological rigor. Using the keywords 'technolog*' and 'Social Practice Theor* helped broadening up the range of material, while maintaining a focused and replicable approach. This prevented an overly broad or unfocused dataset that might dilute the core research question. Future research could expand upon this approach by incorporating alternative terminology or citation tracking methods to identify indirectly related studies, but for this initial review, the selected keywords provide a clear, replicable, and theoretically consistent foundation for analysis.

While focusing on the last five years provided a comprehensive and up-to-date overview of recent developments, this approach may have excluded studies that shaped the application of SPT in technology-related research, potentially overlooking key theoretical contributions from earlier years. Since technological change often builds on long-term trends, limiting the scope to a short timeframe might have obscured continuities and historical developments in how SPT has been applied. Additionally, academic publishing cycles can result in delays between research conduction and publication, meaning that some recent innovations in the field might not yet be fully represented in the literature. Despite these limitations, the five-year scope ensured a focused and methodologically consistent analysis while still capturing the latest theoretical and empirical advancements.

We pointed out the low number of papers from the so-called Global

South. However, this could also be due to the fact that we only included English-language papers in our literature corpus, potentially leading to a bias towards literature from North America or Europe. To avoid this potential bias, relevant literature from the Global South could be translated into English, or publications written in languages such as Spanish, Chinese, or French could be included in future research.

8. Conclusion

In this paper, we conducted a systematic literature review to explore the application of SPT in current technology-related research and found that the application is diverse on several dimensions. Based on our analysis, we formulated five propositions for future research applying SPT to technology-related topics.

First, we identified a high potential for employing SPT to under-represented research areas and to societal issues other than sustainability. For example, we proposed to apply SPT to technology-related questions on the topic of demographic change. Expanding SPT to more research fields would provide a deeper understanding of how social practices shape and are shaped by technological, institutional, and environmental changes, allowing for more comprehensive analyses beyond its current focus on sustainability and consumption. Second, we found a need to apply SPT to new geographical contexts that transcend cultural categorizations. Since SPT offers the possibility to adapt each of the three elements to a specific cultural and historical context, we see much opportunity in exploring processes of technological emergence and change in geographical areas different from those of the dominant Global North. Third, we argued for maintaining the diversity of technology conceptualizations. Since our literature corpus revealed how SPT can be applied to a multidimensional understanding of technology, we argued for linking SPT new conceptualizations of technology. This especially applies since SPT changes the way that technology is taken to be. Fourth, we uncovered a significant majority of studies using qualitative or small-scale research designs and proposed to enrich these methods with large-scale perspectives in order to fully exploit the potential of SPT and to open its scope to new disciplines. Fifth and finally, we encouraged combining SPT with other theories, as our research corpus showed how a high degree of papers that benefited from linking SPT with other theoretical models to gain a broader understanding of the research subject.

For researchers in energy studies, particularly those engaged with energy transitions, demand-side management, and socio-technical change, our findings emphasize the value of SPT in moving beyond individualistic and behavioral approaches towards understanding how energy-related practices are shaped by infrastructures, policies, and socio-material configurations. Rather than assuming that energy consumption is the outcome of rational choices or economic incentives alone, SPT highlights the embedded, routinized, and interdependent nature of energy practices. This perspective is particularly useful for readers of Energy Research & Social Science, as it allows for the exploration of how policy interventions, new technologies, and changing infrastructures interact with established social practices to either enable or hinder sustainable transformations.

By applying SPT to technology-related research, scholars can unpack the social dynamics of technological adoption, resistance, and stabilization, revealing why certain technologies become normalized while others fail to integrate into everyday life. The benefit of such an approach lies in its ability to capture interconnections between different practices, showing how changes in one domain – such as home energy use – can have ripple effects on mobility, food consumption, or work-related practices. Given the urgency of climate change and the growing need for sustainable energy transitions, we strongly recommend that future research continues leveraging SPT in novel ways, particularly in comparative, interdisciplinary, and policy-oriented studies. By doing so, researchers can further expand SPT's scope and potential, strengthening its role in explaining not just how technologies are used, but how they actively shape and are shaped by social life.

CRediT authorship contribution statement

Mena Mesenhöller: Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The author declares no competing interests.

Data availability

No data was used for the research described in the article.

References

[1] E. Shove, M. Pantzar, M. Watson, The Dynamics of Social Practice: Everyday Life and How it Changes, Sage, Los Angeles, 2012.
[2] T. Malatesta, G.M. Morrison, J.K. Breadsell, C. Eon, A systematic literature review of the interplay between renewable energy systems and occupant practices, Sustainability 15 (12) (Jun. 2023) 9172, https://doi.org/10.3390/su15129172.
[3] K. Munir, Sustainable food waste management strategies by applying practice theory in hospitality and food services- a systematic literature review, J. Clean. Prod. 331 (2022), https://doi.org/10.1016/j.jclepro.2021.129991.
[4] N. Ojong, Solar home systems in south Asia: examining adoption, energy consumption, and social practices, Sustainability 13 (14) (Jul. 2021) 7754, https://doi.org/10.3390/su13147754.
[5] M.R. Smith, L. Marx, Does Technology Drive History?: the Dilemma of Technological Determinism, MIT Press, 1994.
[6] K. Marx, F. Engels, Das Kapital. Kritik der Politischen Ökonomie, Ottto Meisner, Hamburg, 1867.
[7] J.A. Schumpeter, The Theory of Economic Development, Harvard University Press, 1934.
[8] P.M. Romer, Endogenous technological change, J. Polit. Econ. 98 (5) (1990) S71–S102.
[9] T.J. Pinch, W.E. Bijker, The social construction of facts and artefacts: or how the sociology of science and the sociology of technology might benefit each other, Soc. Stud. Sci. 14 (3) (Aug. 1984) 399–441, https://doi.org/10.1177/030631284014003004.
[10] L. Winner, The Whale and the Reactor: a Search for Limits in an Age of High Technology, Univ. of Chicago Press, Chicago, 1994, 6. Print.
[11] A. Rip, R. Kemp, Technological Change, in: S. Rayner, E.L. Malone (Eds.), Human Choice and Climate Change: Resources and Technology, Battelle Press, 1998, pp. 327–399.
[12] M. Callon, Some elements of a sociology of translation: domestication of the scallops and the fishermen of St Brieuc Bay, Sociol. Rev. 32 (1_suppl) (May 1984) 196–233, https://doi.org/10.1111/j.1467-954X.1984.tb00113.x.
[13] B. Latour, Where are the missing masses, sociology of a few mundane artefacts, in: W.E. Bijker, J. Law (Eds.), Shaping Technology-Building Society. Studies in Sociotechnical Change, MIT Press, Cambridge, 1992, pp. 225–259.
[14] J. Law, Notes on the theory of the actor-network: ordering, strategy, and heterogeneity, Syst. Pract. 5 (4) (Aug. 1992) 379–393, https://doi.org/10.1007/BF01059830.
[15] M. Foucault, Discipline and Punish: the Birth of the Prison, Pantheon Books, New York, 1977.
[16] N. Rose, P. Miller, Political power beyond the state: problematics of government, Br. J. Sociol. 43 (2) (1992) 173–205.
[17] A. Giddens, Structuration theory: past, present and future, in: Giddens' Theory of Structuration, Routledge, 1991.
[18] T.R. Schatzki, Introduction: Practice theory, in: T.R. Schatzki, K. Knorr Cetina, E. von Savigny (Eds.), The practice turn in contemporary theory, Routledge, London, 2001, pp. 1–14. Transferred to digital print.
[19] A. Reckwitz, Toward a theory of social practices: a development in culturalist theorizing, Eur. J. Soc. Theory 5 (2) (May 2002) 243–263, https://doi.org/10.1177/13684310222225432.
[20] T.R. Schatzki, Social practices: a Wittgensteinian approach to human activity and the social, 1st ed., Cambridge University Press, 1996 https://doi.org/10.1017/CBO9780511527470.
[21] J. Morley, Technologies within and beyond practices, in: A. Hui, T. Schatzki, E. Shove (Eds.), The Nexus of Practices: Connections, Constellations, Practitioners, Routledge, London, 2016, https://doi.org/10.4324/9781315560816.
[22] E. Shove, Matters of Practice, in: A. Hui, T. Schatzki, E. Shove (Eds.), The Nexus of Practices: Connections, Constellations, Practitioners, Routledge, London, 2016, pp. 155–168, https://doi.org/10.4324/9781315560816.
[23] E. Shove, G. Walker, What is energy for? Social practice and energy demand, Theory Cult. Soc. 31 (5) (Sep. 2014) 41–58, https://doi.org/10.1177/0263276414536746.

[24] T.R. Schatzki (Ed.), The Site of the Social: a Philosophical Account of the Constitution of Social Life and Change, Pennsylvania State University Press, University Park, 2002.
[25] J. Stephenson, B. Barton, G. Carrington, D. Gnoth, R. Lawson, P. Thorsnes, Energy cultures: a framework for understanding energy behaviours, Energy Policy 38 (10) (Oct. 2010) 6120–6129, https://doi.org/10.1016/j.enpol.2010.05.069.
[26] A. Klitkou, et al., The interconnected dynamics of social practices and their implications for transformative change: a review, Sustain. Prod. Consum. 31 (2022) 603–614, https://doi.org/10.1016/j.spc.2022.03.027.
[27] J.L. Galvan, M. Galvan, Writing Literature Reviews: a Guide for Students of the Social and Behavioral Sciences, Seventh edition, Routledge, New York London, 2017.
[28] M.J. Page, et al., The PRISMA 2020 statement: an updated guideline for reporting systematic reviews, BMJ (Mar. 2021) n71, https://doi.org/10.1136/bmj.n71.
[29] J.K. Breadsell, C. Eon, G.M. Morrison, Understanding resource consumption in the home, community and society through behaviour and social practice theories, Sustainability 11 (22) (Nov. 2019) 6513, https://doi.org/10.3390/su11226513.
[30] J.K. Breadsell, G.M. Morrison, Changes to household practices pre- and post-occupancy in an Australian low-carbon development, Sustain. Prod. Consum. 22 (2020) 147–161, https://doi.org/10.1016/j.spc.2020.03.001.
[31] M. Sahakian, et al., Challenging social norms to recraft practices: a living lab approach to reducing household energy use in eight European countries, Energy Res. Soc. Sci. 72 (2021), https://doi.org/10.1016/j.erss.2020.101881.
[32] G. Stelmach, C. Zanocco, J. Flora, R. Rajagopal, H.S. Boudet, Exploring household energy rules and activities during peak demand to better determine potential responsiveness to time-of-use pricing, Energy Policy 144 (Sep. 2020) 111608, https://doi.org/10.1016/j.enpol.2020.111608.
[33] E. Keegan, J.K. Breadsell, Food waste and social practices in australian households, Sustain. Switz. 13 (6) (2021) 3377, https://doi.org/10.3390/su13063377.
[34] N. Heidenstrom, Informal household preparedness: methodological approaches to everyday practices, J. Risk Res. 23 (3) (Mar. 2020) 379–397, https://doi.org/10.1080/13669877.2019.1569106.
[35] J. Gao, X. Zeng, C. Zhang, P. Porananond, Understanding the young middle-class Chinese outbound tourism consumption: a social practice perspective, Tour. Manag. 92 (Oct. 2022) 104555, https://doi.org/10.1016/j.tourman.2022.104555.
[36] V.J. Little, C.K.C. Lee, S. Nair, Macro-demarketing: the key to unlocking unsustainable production and consumption systems? J. Macromark. 39 (2) (2019) 166–187, https://doi.org/10.1177/0276146718823885.
[37] S. Hagejärd, G. Dokter, U. Rahe, P. Femenías, 'It's never telling me that I'm good!' Household experiences of testing a smart home energy management system with a personal threshold on energy use in Sweden, Energy Res. Soc. Sci. 98 (2023), https://doi.org/10.1016/j.erss.2023.103004.
[38] T. Malatesta, C. Eon, J.K. Breadsell, A. Law, J. Byrne, G.M. Morrison, Systems of social practice and automation in an energy efficient home, Build. Environ. 224 (2022), https://doi.org/10.1016/j.buildenv.2022.109543.
[39] S. Moeller, A. Bauer, Energy (in)efficient comfort practices: how building retrofits influence energy behaviours in multi-apartment buildings, Energy Policy 168 (2022), https://doi.org/10.1016/j.enpol.2022.113123.
[40] V. Mooses, I. Pastak, P. Kamenjuk, A. Poom, Residents' perceptions of a smart technology retrofit towards nearly zero-energy performance, Urban Plan. 7 (2) (2022) 20–32, https://doi.org/10.17645/up.v7i2.5020.
[41] C. Zanocco, J. Flora, R. Rajagopal, H. Boudet, Exploring the effects of California's COVID-19 shelter-in-place order on household energy practices and intention to adopt smart home technologies, Renew. Sustain. Energy Rev. 139 (2021), https://doi.org/10.1016/j.rser.2020.110578.
[42] A.-K. Hess, I. Schubert, R. Samuel, P. Burger, Changing routinized household energy consumption using the example of washing, cooking, and standby: a randomized controlled field experiment of home energy advice, Clean. Responsible Consum. 4 (2022) 100052, https://doi.org/10.1016/j.clrc.2022.100052.
[43] J.A. Eledi Kuusaana, J. Monstadt, S. Smith, Practicing urban resilience to electricity service disruption in Accra, Ghana, Energy Res. Soc. Sci. 95 (2023) 102885, https://doi.org/10.1016/j.erss.2022.102885.
[44] J. Schrage, Three tensions in governing energy demand: a social practice perspective on Nordic urban interventions, Cities 141 (2023), https://doi.org/10.1016/j.cities.2023.104497.
[45] K. Pumphrey, S.L. Walker, M. Andoni, V. Robu, Green hope or red herring? Examining consumer perceptions of peer-to-peer energy trading in the United Kingdom, Energy Res. Soc. Sci. 68 (Oct. 2020) 101603, https://doi.org/10.1016/j.erss.2020.101603.
[46] S. Walton, R. Ford, Easy or arduous? Practices, perceptions and networks driving lighting transitions from kerosene to solar in Vanuatu, Energy Res. Soc. Sci. 65 (2020), https://doi.org/10.1016/j.erss.2020.101449.
[47] K. Standal, M. Talevi, H. Westskog, Engaging men and women in energy production in Norway and the United Kingdom: the significance of social practices and gender relations, Energy Res. Soc. Sci. 60 (Feb. 2020) 101338, https://doi.org/10.1016/j.erss.2019.101338.
[48] P. Bourdieu, The Logic of Practice, Stanford University Press, Stanford, Calif, 1990.
[49] S. Palliyani, D.-H. Lee, Benchmarking ride-hailing regulation in global cities using mixed-method approach and social practice theory, J. Infrastruct. Policy Dev. 5 (2) (2021), https://doi.org/10.24294/jipd.v5i2.1338.
[50] E.M.C. Svennevik, Providers and practices: how suppliers shape car-sharing practices, Sustain. Switz. 13 (4) (2021) 1–14, https://doi.org/10.3390/su13041764.
[51] T.E. Julsrud, J.M. Denstadli, Moving small crafts and services enterprises towards green mobility practices: the role of change agents, Environ. Innov. Soc. Transit. 37 (2020) 254–266, https://doi.org/10.1016/j.eist.2020.09.003.
[52] T. Meelen, T. Schwanen, Organizations as users in sustainability transitions: embedding vehicle-to-grid technology in the United Kingdom, Energy Res. Soc. Sci. 106 (2023), https://doi.org/10.1016/j.erss.2023.103303.
[53] Q. Sun, J. Zhao, A. Spahn, G. Verbong, Pathway towards sustainability or motorization? A comparative study of e-bikes in China and the Netherlands, Glob. Environ. Change-Hum. Policy Dimens. 82 (Sep. 2023) 102735, https://doi.org/10.1016/j.gloenvcha.2023.102735.
[54] R.H. Jensen, M.K. Svangren, M.B. Skov, J. Kjeldskov, Investigating EV Driving as Meaningful Practice, in: Presented at the ACM International Conference Proceeding Series, 2019, pp. 42–52, https://doi.org/10.1145/3369457.3369461.
[55] T. Greenhalgh, J. Wherton, S. Shaw, C. Papoutsi, S. Vijayaraghavan, R. Stones, Infrastructure revisited: an ethnographic case study of how health information infrastructure shapes and constrains technological innovation, J. Med. Internet Res. 21 (12) (2019), https://doi.org/10.2196/16093.
[56] M. Kumar, J.B. Singh, R. Chandwani, A. Gupta, Locating resistance to healthcare information technology: a Bourdieusian analysis of doctors' symbolic capital conservation, Inf. Syst. J. 32 (2) (2022) 377–413, https://doi.org/10.1111/isj.12357.
[57] R. Niemelä, M. Pikkarainen, M. Ervasti, J. Reponen, The change of pediatric surgery practice due to the emergence of connected health technologies, Technol. Forecast. Soc. Change 146 (2019) 352–365, https://doi.org/10.1016/j.techfore.2019.06.001.
[58] E. Jakku, Bruce Taylor, Aysha Fleming, Claire Mason, Simon Fielke, Chris Sounness, Peter Thorburn, "If they don't tell us what they do with it, why would we trust them?" Trust, transparency and benefit-sharing in smart farming, NJAS - Wagening. J. Life Sci. 90–91 (1) (2019) 1–13, https://doi.org/10.1016/j.njas.2018.11.002.
[59] N. Phisanbut, K. Songsupakit, P. Nuchsiri, P. Piamsa-Nga, Using social practice theory to increase herd recording system engagement, Agric. Nat. Resour. 55 (4) (2021) 674–683, https://doi.org/10.34044/J.ANRES.2021.55.4.18.
[60] P. Pant, Technology social practices by Millennials and Gen Z at airport departure terminals, Tour. Manag. Perspect. 43 (Jul. 2022) 100978, https://doi.org/10.1016/j.tmp.2022.100978.
[61] S. Cranmer, Disabled children's evolving digital use practices to support formal learning. A missed opportunity for inclusion, Br. J. Educ. Technol. 51 (2) (Mar. 2020) 315–330, https://doi.org/10.1111/bjet.12827.
[62] L. Stillman, M. Sarrica, T. Denison, A. Sarker, After the smartphone has arrived in the village. How practices and proto-practices emerged in an ICT4D project, Commun. Comput. Inf. Sci. 1236 (2020) 81–94, https://doi.org/10.1007/978-3-030-52014-4_6.
[63] I.P. Junge, Single use goes circular–an ICT proto-practice for a sustainable circular economy future, J. Sustain. Res. 3 (2) (2021), https://doi.org/10.20900/jsr20210009.
[64] T. Ariztia, F. Fonseca, O. Bernasconi, Heating ecologies: resituating stocking and maintenance in domestic heating, Energy Res. Soc. Sci. 47 (2019) 128–136, https://doi.org/10.1016/j.erss.2018.08.023.
[65] R. Martin, Making sense of renewable energy: practical knowledge, sensory feedback and household understandings in a Scottish island microgrid, Energy Res. Soc. Sci. 66 (Aug. 2020) 101501, https://doi.org/10.1016/j.erss.2020.101501.
[66] N. Labanca, et al., Transforming innovation for decarbonisation? Insights from combining complex systems and social practice perspectives, Energy Res. Soc. Sci. 65 (2020), https://doi.org/10.1016/j.erss.2020.101452.
[67] D.S. Reid, et al., Online sexual partner seeking as a social practice: qualitative evidence from the 4th British national survey of sexual attitudes and lifestyles (Natsal-4), J. Sex Res. 59 (8) (Oct. 2022) 1034–1044, https://doi.org/10.1080/00224499.2021.1994516.
[68] F. Bonetti, M. Montecchi, K. Plangger, H.J. Schau, Practice co-evolution: collaboratively embedding artificial intelligence in retail practices, J. Acad. Mark. Sci. 51 (4) (Jul. 2023) 867–888, https://doi.org/10.1007/s11747-022-00896-1.
[69] A. Rapp, Time, engagement and video games: how game design elements shape the temporalities of play in massively multiplayer online role-playing games, Inf. Syst. J. 32 (1) (Jan. 2022) 5–32, https://doi.org/10.1111/isj.12328.
[70] J.C. Rangel, S. Humphrey-Murto, Social studies of science and technology: new ways to illuminate challenges in training for health information technologies utilisation, Med. Educ. 58 (1) (2023) 27–35, https://doi.org/10.1111/medu.15179.
[71] J. Breadsell, C. Eon, G. Morrison, Y. Kashima, Interlocking practices and their influence in the home, Environ. Plan. B Urban Anal. City Sci. 46 (8) (2019) 1405–1421, https://doi.org/10.1177/2399808318824114.
[72] P. Giardullo, et al., Connecting dots: multiple perspectives on socio-technical transition and social practices, Tecnoscienza-Ital. J. Sci. Technol. Stud. 10 (2) (Dec. 2019) 121–152.
[73] J. Weidler-Lewis, M. Wooten, S.P. McDonald, The ontological construction of technology and behavior through practice, Hum. Behav. Emerg. Technol. 2 (4) (2020) 377–386, https://doi.org/10.1002/hbe2.213.
[74] D.M. Evans, A.L. Browne, I.A. Gortemaker, Environmental leapfrogging and everyday climate cultures: sustainable water consumption in the global south, Clim. Change 163 (1) (2020) 83–97, https://doi.org/10.1007/s10584-018-2331-y.

[75] P. Kivimaa, S. Laakso, A. Lonkila, M. Kaljonen, Moving beyond disruptive innovation: a review of disruption in sustainability transitions, Environ. Innov. Soc. Transit. 38 (2021) 110–126, https://doi.org/10.1016/j.eist.2020.12.001.
[76] S. Lo Piano, S.T. Smith, Energy demand and its temporal flexibility: approaches, criticalities and ways forward, Renew. Sustain. Energy Rev. 160 (May 2022) 112249, https://doi.org/10.1016/j.rser.2022.112249.
[77] H. El Bilali, Transition heuristic frameworks in research on agro-food sustainability transitions, Environ. Dev. Sustain. 22 (3) (2020) 1693–1728, https://doi.org/10.1007/s10668-018-0290-0.
[78] B. Anthony, Developing a decentralized community of practice-based model for on-demand electric car-pooling towards sustainable shared mobility, Case Stud. Transp. Policy 15 (Mar. 2024) 101136, https://doi.org/10.1016/j.cstp.2023.101136.
[79] P. Aspers, U. Corte, What is qualitative in qualitative research, Qual. Sociol. 42 (2) (Jun. 2019) 139–160, https://doi.org/10.1007/s11133-019-9413-7.
[80] Y. Malakar, A. Fleming, S. Fielke, S. Snow, E. Jakku, Comparing established practice for short-term forecasts and emerging use of climate projections to identify opportunities for climate services in Australian agriculture, Clim. Serv. 33 (Jan. 2024) 100442, https://doi.org/10.1016/j.cliser.2023.100442.
[81] R.L. Carvalhais, M. de R. Pinto, The consumption of photovoltaic energy based on the theory of practice and sociotechnical transitions, Qual. Rep. 27 (12) (Dec. 2022), https://doi.org/10.46743/2160-3715/2022.5516.
[82] M. Sloane, J. Zakrzewski, German AI Start-Ups and 'AI Ethics': Using A Social Practice Lens for Assessing and Implementing Socio-Technical Innovation, in: Presented at the ACM International Conference Proceeding Series, 2022, pp. 935–947, https://doi.org/10.1145/3531146.3533156.
[83] C. Doidge, L. Palczynski, X. Zhou, A. Bearth, G. van Schaik, J. Kaler, Exploring the data divide through a social practice lens: a qualitative study of UK cattle farmers, Prev. Vet. Med. 220 (2023), https://doi.org/10.1016/j.prevetmed.2023.106030.
[84] Z. Koretsky, H. van Lente, Technology phase-out as unravelling of socio-technical configurations: cloud seeding case, Environ. Innov. Soc. Transit. 37 (2020) 302–317, https://doi.org/10.1016/j.eist.2020.10.002.
[85] K. Mitchell, C. Simpson, C. Adachi, What's in a name: The ambiguity and complexity of technology enhanced learning roles, in: Presented at the ASCILITE 2017 - Conference Proceedings - 34th International Conference of Innovation, Practice and Research in the Use of Educational Technologies in Tertiary Education, 2019, pp. 147–151.
[86] B.K. Sovacool, D.J. Hess, R. Cantoni, Energy transitions from the cradle to the grave: a meta-theoretical framework integrating responsible innovation, social practices, and energy justice, Energy Res. Soc. Sci. 75 (2021), https://doi.org/10.1016/j.erss.2021.102027.
[87] K. Reindl, J. Palm, Energy efficiency in the building sector: a combined middle-out and practice theory approach, Int. J. Sustain. Energy Plan. Manag. 28 (2020) 3–16, https://doi.org/10.5278/ijsepm.3426.
[88] H. Kang, A.C. Barton, E. Tan, S.D. Simpkins, H. Rhee, C. Turner, How do middle school girls of color develop STEM identities? Middle school girls' participation in science activities and identification with STEM careers, Sci. Educ. 103 (2) (Mar. 2019) 418–439, https://doi.org/10.1002/sce.21492.
[89] R.C.M. Kakeu–tardy, H. Howarth, M. Sahakian, R. Véron, On the (in)visibility of practices: opportunities for the promotion of household waste-segregation in western Switzerland, Worldw. Waste 6 (1) (2023) 5, https://doi.org/10.5334/wwwj.95.
[90] I. Arts, A. Fischer, D. Duckett, R. van der Wal, Information technology and the optimisation of experience – the role of mobile devices and social media in human-nature interactions, Geoforum 122 (2021) 55–62, https://doi.org/10.1016/j.geoforum.2021.03.009.
[91] R. Camilleri, M. Attard, R. Hickman, Future low-carbon transport scenarios: practice theory-based visioning for backcasting studies, Sustain. Switz. 14 (1) (2022) 74, https://doi.org/10.3390/su14010074.
[92] E.M.C. Svennevik, M. Dijk, P. Arnfalk, How do new mobility practices emerge? A comparative analysis of car-sharing in cities in Norway, Sweden and the Netherlands, Energy Res. Soc. Sci. 82 (2021), https://doi.org/10.1016/j.erss.2021.102305.
[93] T. Harries, R. Rettie, J. Gabe, Shedding new light on the (in)compatibility of chronic disease management with everyday life – social practice theory, mobile technologies and the interwoven time-spaces of teenage life, Sociol. Health Illn. 41 (7) (2019) 1396–1409, https://doi.org/10.1111/1467-9566.12952.
[94] L. Beyeler, M. Jaeger-Erben, How to make more of less: characteristics of sufficiency in business practices, Front. Sustain. 3 (2022), https://doi.org/10.3389/frsus.2022.949710.
[95] M. Naeem, W. Ozuem, P. Ward, Understanding the accessibility of retail mobile banking during the COVID-19 pandemic, Int. J. Retail Distrib. Manag. 50 (7) (Jun. 2022) 860–879, https://doi.org/10.1108/IJRDM-02-2021-0064.
[96] M. Naeem, W. Ozuem, K. Howell, S. Ranfagni, Understanding the process of meanings, materials, and competencies in adoption of mobile banking, Electron. Mark. 32 (4) (Dec. 2022) 2445–2469, https://doi.org/10.1007/s12525-022-00610-7.
[97] M. Naeem, W. Ozuem, The role of social media in internet banking transition during COVID-19 pandemic: using multiple methods and sources in qualitative research, J. Retail. Consum. Serv. 60 (2021), https://doi.org/10.1016/j.jretconser.2021.102483.
[98] N. Heidenstrøm, M. Hebrok, Towards realizing the sustainability potential within digital food provisioning platforms: the case of meal box schemes and online grocery shopping in Norway, Sustain. Prod. Consum. 29 (2021) 831–850, https://doi.org/10.1016/j.spc.2021.06.030.
[99] B. Vamsi Krishna, K. Suresh Kumar, S. Gildhiyal, M. Srinivas, W.K. Ibrahim, M. Bader Alazzam, An empirical study on application of 5G smart system in education, in: Presented at the 2023 3rd International Conference on Advance Computing and Innovative Technologies in Engineering, ICACITE 2023, 2023, pp. 637–642, https://doi.org/10.1109/ICACITE57410.2023.10182680.
[100] S.K. Shah, Z. Tang, S.M.F. Sharif, A. Tanveer, An empirical study of Chinese students' behavioral intentions to adopt 5G for smart-learning in COVID-19, Smart Learn. Environ. 8 (1) (Oct. 2021) 25, https://doi.org/10.1186/s40561-021-00172-9.
[101] R. Watson, Quantitative research, Nurs. Stand. 29 (31) (Apr. 2015) 44–48, https://doi.org/10.7748/ns.29.31.44.e8681.
[102] R.B. Johnson, A.J. Onwuegbuzie, L.A. Turner, Toward a definition of mixed methods research, J. Mix. Methods Res. 1 (2) (Apr. 2007) 112–133, https://doi.org/10.1177/1558689806298224.
[103] N.V. Ivankova, J.W. Cresswell, Mixed Methods, in: J. Heigham, R.A. Croker (Eds.), Qualitative Research in Applied Linguistics: a Practical Introduction, Palgrave Macmillan, Houndmills, Basingstoke, Hampshire [England]; New York, 2009.
[104] A. Martin-Vilaseca, J. Crawley, M. Shipworth, C. Elwell, Living with demand response: Insights from a field study of DSR using heat pumps, in: Presented at the Eceee Summer Study Proceedings, 2022, pp. 1209–1218.
[105] M.S. Sharifzadeh, G. Abdollahzadeh, C.A. Damalas, Farmers' behaviour in the use of integrated pest management (IPM) practices: perspectives through the social practice theory, Int. J. Pest Manag. (2023) 1–14, https://doi.org/10.1080/09670874.2023.2227607.
[106] J.K. Breadsell, J.J. Byrne, G.M. Morrison, Household energy and water practices change post-occupancy in an Australian low-carbon development, Sustainability 11 (20) (Oct. 2019) 5559, https://doi.org/10.3390/su11205559.
[107] F. Kaviani, Y. Strengers, K. Dahlgren, H. Korsmeyer, S. Pink, Building plausible scenarios for future living: intervening in energy forecasting using household ethnography and foresight, Energy Res. Soc. Sci. 106 (2023), https://doi.org/10.1016/j.erss.2023.103315.
[108] M. Seguin, Strong Structuration Theory (SST) and Global Public Health, in: P. Liamputtong (Ed.), Handbook of Social Sciences and Global Public Health, 2023, pp. 257–271, https://doi.org/10.1007/978-3-031-25110-8_19.
[109] S. Karimzadeh, M. Boström, Ethical consumption: why should we understand it as a social practice within a multilevel framework? Open Res. Eur. 2 (2022) https://doi.org/10.12688/openreseurope.15069.2.
[110] A. Uhde, M. Hassenzahl, Towards a Better Understanding of Social Acceptability, in: Presented at the Conference on Human Factors in Computing Systems - Proceedings, 2021, pp. 1–6, https://doi.org/10.1145/3411763.3451649.
[111] F.D. Davis, Perceived usefulness, perceived ease of use, and user acceptance of information technology, MIS Q. 13 (3) (Sep. 1989) 319, https://doi.org/10.2307/249008.
[112] D. Helbing, Globally networked risks and how to respond, Nature 497 (7447) (May 2013) 51–59, https://doi.org/10.1038/nature12047.
[113] J. Reis, M. Amorim, N. Melão, Y. Cohen, M. Rodrigues, Digitalization: A Literature Review and Research Agenda, in: Z. Anisic, B. Lalic, D. Gracanin (Eds.), Proceedings on 25th International Joint Conference on Industrial Engineering and Operations Management – IJCIEOM, Lecture Notes on Multidisciplinary Industrial Engineering, Springer International Publishing, Cham, 2020, pp. 443–456, https://doi.org/10.1007/978-3-030-43616-2_47.
[114] C. Wagner, 'Silver robots' and 'robotic nurses'? Japans robot culture and elderly care, in: A. Schad-Seifert, S. Shimada (Eds.), Demographic Change in Japan and the EU: Comparative Perspectives, Düsseldorf University Press, 2010, pp. 131–154, https://doi.org/10.1515/9783110720044.
[115] E. Shove, Connecting Practices: Large Topics in Society and Social Theory, Taylor & Francis, 2022.