

Smart sustainable daily life: Insights from across the social sciences

Emilie Vrain
Environmental Change Institute
School of Geography and Environment
University of Oxford
Oxford, UK
emilie.vrain@eci.ox.ac.uk

Charlie Wilson
Environmental Change Institute
School of Geography and Environment
University of Oxford
Oxford, UK
charlie.wilson@eci.ox.ac.uk

Abstract - It is essential that a human-centered smart digital society is a sustainable society. As research is often conducted in disciplinary silos, there is a need for more holistic approaches. This paper is a step towards such advancements, reviewing multiple social science fields which study how ICTs have shaped daily life and why digitalisation has become so integral. Outlining such perspectives, we illustrate the different methods for understanding social aspects of digital daily life and how they can be applied to studying smart sustainable daily life. For example, through ethnography, time diaries and in-depth interviews. We highlight the importance of collecting detailed insights on digital use overtime; the sequences and patterns of activities in daily life; and rich contextual variables to account for the impact of broader social dynamics on human and computer interactions. Our review hopes to inform future research seeking to couple work on the integration of smart technologies and energy systems into society with more foundational social science approaches.

Keywords - Consumer; IoT, Digitalisation; Social practice; Domestication; Innovation adoption; Time use; Digital anthropology

I. INTRODUCTION

Daily life has become digitally connected, shaping how we socialise, plan, learn, work, move around, shop, and play. Digitalisation - the nearly instant, free ability to connect people, devices, and physical objects anywhere - has opened a wealth of new services and possibilities across all domains of daily life [1]. For individuals, digitalisation is inextricably linked to smartphones and other internet-enabled devices which act as interfaces to cloud-based services. These 'disruptive innovations' have far-reaching consequences on "the way we live and work" [2].

Resulting impacts on energy and resource use are highly uncertain. Smart digitalisation of mobility, for example, may reduce fuel use by more than 40% or increase it by more than 100% [3]. Reference [4], a high-profile international report, states digitalisation and the Internet of Things (IoT) can be critical enablers of a global sustainability transformation if they can be 'socially steered' towards decarbonisation. But this promise of utopia sits alongside the risk of dystopia from ever-expanding energy-hungry digital infrastructure and services [5]. For a sustainable human-centred digital society, an integrated body of knowledge on smart sustainable digital daily life is urgently needed, to characterise, analyse and contextualise uncertainties more robustly and advance understanding and action on challenges such as increasing energy efficiency.

Many different research fields explore elements of smart integration and digital society. At the micro-level, user-centred design and ubiquitous computing research is concerned with

usability, functionality, applications, and energy implications of ICTs [6]. A large quantity of literature quantifies or models the direct and indirect energy demand from the use of digital technologies e.g., [7]. Such research commonly use life-cycle assessments, partial footprints and the ICT enablement method and is effective for understanding the consequences and sustainability of digital technology use. It is less common for research to relate to human-centred decision making and more foundational social science research which investigate the deeper reasons of 'why' people use smart technologies and 'how' are they accepted and become integral to daily life. This provides a pre-cursor for studies from across industry, professional and academic realms to build upon.

II. OBJECTIVES AND ORGANISATION

The aim of this paper is to bring together key aspects from different scientific fields to gain holistic insights with wide applicability. Our unique contributions are: 1) a focus on the micro-level of individuals across daily life rather than a specific domain, such as transport; a specific behaviour or practice, such as turning on lights; or a specific mechanism that digitalisation enables, such as greater user control, and 2) the use of a common framework to review diverse fields within the social sciences, commenting on the extent and nature of their methodologies, analyses and findings to provide helpful insights for the smart technology community.

The fields considered in this review are time-use research; domestication theory; innovation adoption models; social practice theory and digital anthropology. This list does not claim to be exhaustive and is not to label different researchers or research traditions but to illustrate the different approaches to studying digital daily life at a micro-level. From theories and models to disciplines. In each section, references to key texts are included and empirical work is drawn upon selectively to illustrate the literature's main points.

The following section outlines the following for each research field: 1) What the body of literature is; 2) How ICT is being investigated, and 3) Empirical findings to the questions how ICT shapes daily life and why digitalisation is so integral to daily life. The discussion section draws together and compares the different fields and concludes with recommendations for further integrated research.

III. RESEARCH APPROACHES

A. Time use research

Time use research spans several disciplines (such as economics, human geography, and sociology) and primarily focusses on individual household members and their allocation of time to everyday activities. A small subset of researchers investigates ICT and time-use [8].

1) *How is ICT being investigated?*

Researchers collect information on digital technology usage (the frequency, duration, sequence, time of day and type of activity). Self-reported time dairies are commonly used to collect detailed data during a 24-hour period. Researchers typically code the diaries to identify the primary and secondary activities and use graphical data analysis to compare time spent on different types of activities. Time-use data is often collected alongside other data depending on the research focus, for example travel surveys to investigate digitalisation's impact on commuting behaviour [9].

2) *How ICT shapes daily life and why digitalisation is so integral to daily life?*

Time-use research identifies the changes to individuals' activities and time-use enabled through digitalisation. Notably, ICTs have shaped activities through replacing, modifying, and avoiding more traditional activities (both the planning and execution of activities), as well as creating entirely new ones [8]. These changes in activity alter time use. Examples include: 1) saving time e.g. through smart automation of tasks; 2) fragmenting time - formerly uninterrupted activities broken into pieces performed at different times - e.g. avoiding an afternoon going to the shops for non-essential items by ordering single items online during spare time [10]; 3) relaxing time constraints of activities by changing the duration and manner of activities, e.g. one does not need to shop during opening hours if they use e-shopping [11]; and 4) increasing the ease of performing multiple activities at once e.g. online applications and working platforms allow people to do several types of tasks on computers or mobile devices simultaneously [12].

Time-use research does not focus on the why so much as the how. However, a small number of researchers consider an important relationship between ICT and daily life - that the use of ICT may lead to a faster pace of life, whilst at the same time, people favouring or performing a faster pace of life may be particularly prone to a high degree of digital usage, a greater number of activities performed and potentially greater energy and resource consumption [13].

B. *Domestication theory*

Domestication theory is an approach in science and technology studies and media studies which focuses on how technologies and their users co-evolve in a process of 'normalisation'. The theory moves beyond linear models of innovation diffusion by demonstrating how users are constantly innovating and adapting to new technologies, enabling new routines, identities, and giving functions and meanings to the technology to fit in daily life [14]. Domestication requires users to undertake: 1) cognitive learning - what the technology can do; 2) practical learning - how to use the technology; and 3) symbolic learning - meaning of the technology and how to incorporate it in identities [15].

1) *How is ICT being investigated?*

Domestication theory has been applied to study a range of ICTs, for example, smart home technologies [16], smart phones and mobile applications [17] and smart electric vehicle (EV) charging [18]. Such studies collect qualitative data from digital technology users; either in-the-wild or as part of a demonstration project, field trial or living lab. Participants are interviewed (often multiple times during a study) or directly observed to gather insights on usage and experiences. Data is

then coded and analysed using the three dimensions of learning as analytical variables.

2) *How ICT shapes daily life and why digitalisation is so integral to daily life?*

Studies concentrate more on the reasons and process of technologies becoming integrated into daily life, with the 'how' suggested implicitly either through 1) the theory's premise that users and the technologies co-evolve, shaping each other in an on-going process; or 2) supplementary data collected through observations and quotes. For example, [16] found living in smart homes can shape daily life by being both time-consuming and demanding and may result in generating energy intensification though new energy demands.

The mechanisms underlying why ICTs become 'domesticated' in daily life differ depending on the context, but an overarching theme often discussed is the role of 'warm' or 'local' experts. Someone who can be called upon for support, knowledge transfer, and examples of use are part of the coping strategies for the different types of learning needed for domesticating ICTs [19]. In a more specific context, [18] results reveal why EV chargers become part of everyday life: through a cognitive dimension of fire safety and optimal charging conditions; a symbolic dimension represented by technological interest and fun; and a practical dimension where economic and comfort concerns were catered for through flexibility-oriented user behaviour. In the context of smart home technologies, [16] found that the disruptive nature and unsettling of existing roles and relationships within a household led to partial domestication, using only some of the potential functionality to make them more familiar.

C. *Innovation adoption*

A variety of adoption theories and models exist to examine the factors that affect the users' acceptance of innovations. For example, Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM) and Diffusion of Innovation theory (DoI). Many more have been developed, often creating an extended version of a previous model, or combining two or more, for example, TAM is an extension of TRA, whilst the Unified Theory of Acceptance and Use of Technology model - UTAUT is TAM combined with seven other innovation acceptance models. This category of theories and models predominantly focuses on why a technology is adopted, and thus lends themselves to the question of 'why is digitalisation so integral to daily life?'. Each has their own focus and a wealth of empirical literature applied in specific contexts. Here we focus on two of the most cited: DoI and TAM.

DoI is a theory describing the process by which information on an innovation's attributes are communicated across society, reducing uncertainty and perceived risks of adoption [20]. DoI literature mainly focuses on the reasons for, and likelihood of adoption, and states five key elements influence the adoption decision process: characteristics of adopters, the innovation's attributes, communication channels, time, and social system. TAM is a model of user acceptance and usage of technology, with perceived usefulness and ease of use being key [21].

1) *How is ICT being investigated?*

Research applying DoI and/or TAM either focus on one element, for example, the innovation attributes or focus on multiple elements. Online surveys are the most common method used to investigate adoption intentions of non-adopters, or experiences and decision-making processes of

adopters. Established Likert scale multi-item questions are typically used to capture specific variables such as, opinion leadership [22], or perceived usefulness and ease of use [21]. Statistical methods are then used to test hypotheses and develop models, for example, structural equation models to examine factors that drive adoption propensity [23] or logit models to predict adoption [24]. Other methods in the adoption literature include: interviews, focus groups or participant observations using an analytical framework [25].

2) How ICT shapes daily life and why digitalisation is so integral to daily life?

Results from statistical models help identify the most significant factors of ‘why’ adoption intentions, decision-making processes and digital innovation diffusion is occurring. In a study ten years ago, US undergraduates were found to perceive smartphones as worthwhile devices and a symbolic device to signal affiliation and timely technology adoption. Perceived popularity, price, and ethnicity were strong predictors of adoption [26]. Smartphone functionality has advanced, and determinants of adoption will have altered.

Since smartphone adoption reached mass markets, academic attention has focused more on the adoption of specific apps. For example, [23] studied smartphone chat bots for online shopping and found usage intention was directly influenced by trust, personal innovativeness and attitude. Reference [27] studied the adoption of mobile banking apps and found the most significant influential factor of usage intention was perceived usefulness, followed by perceived credibility and perceived costs. In a different study, compatibility, perceived technology security, performance expectations, and social influence were significant in the adoption of mobile payment options [28]. These examples highlight the range of factors contributing to why such innovations are integrating into daily life. As methods and sample characteristics differ between studies, direct comparisons are not suitable. However, a recent study using the same method to study a wide range of sustainable digital innovations across consumer domains (food, transport, energy and homes) found that early adopters perceive innovations to offer higher relative advantage, are easy to use, and are compatible both with their values and lifestyles [24].

A wealth of DoI literature aims to uncover why innovations have not diffused and contributed to daily life. Smart home technology studies like [25], identify a plethora of barriers e.g., security concerns, effort required, lack of knowledge, connectivity problems or insufficient customer support.

D. Social practice

Social practice theory (SPT) shifts the analytical lens from a focus on the individual (or agent) towards more collective approaches and practices. Prominent research in the field describe social practices as actions comprising of three interconnected elements, making them a conceivable single entity: 1) materials: things, technologies, tangible physical entities, and other material objects; 2) competences: skills, habits, knowledge, tacit knowledge, and technique; and 3) meanings: ideas, symbolism, aspirations, and other cognitive dimensions [29]. As connections between the three elements alter, e.g., through the introduction of digital technologies (material), practices emerge, persist, shift, or disappear [30].

1) How is ICT being investigated?

Researchers applying SPT to the realm of ICTs study either a specific online practice, such as, online grocery shopping [31], or a specific digital technology (material) to investigate bundles of practices, such as, mobile phone use in nature [32] or ICT use in the home [33]. In-depth interviews are commonly used to explore experiences and usage of technology, as well as the associated rationales, attitudes, meanings and expectations. However, [34] argues that SPT is well suited to methods capable of observing what happens in the performance of a practice and so utilises an ethnographic case study approach. Transcripts or field diaries are then analysed using a priori coding themes based on the three elements of SPT (materials, competences, meanings).

2) How ICT shapes daily life and why digitalisation is so integral to daily life?

Taking each of the three elements in turn, studies using SPT provide a descriptive account of how ICTs shape daily life. Often the technology itself (hardware or software) is framed as being a new ‘material’ replacing the old. For example, screens and keyboards replacing pen and paper [35] or navigational apps replacing map and compass [32]. Use of these new materials then impact upon the competencies and meanings of a given practice, thus altering it. For example, [32] discuss how the affordances of outdoor activity apps (material) enable increased accessibility and peer learning of a practice like hiking - the ability to gather information on where to go, how to prepare, and find others to share their experiences with. Desire for optimising experiences (meaning) is influenced by the norms and skills of the outdoor community, shared through information such as route reviews (competence). In another example, [36] show how online dating apps (material) enable efficient searching, screening, and blocking of potential partners. Skills are developed by the user (competence) to seek a partner, and the practice’s enmeshment within broader online cultures of image presentation, balances possibility and risks (meaning).

SPT research focusing on the dynamics and reconfiguration of practices reveal the reasons and rationale behind digitalisation spreading across daily life through analysing the element of ‘meaning’. Reference [31] found being accustomed to smartphones (competence) was a precondition for online grocery shopping (material). The practice is enabled by multiple resources and generated by various household needs and ideologies (meanings), for example, it’s difficult to shop with children; shopping is time consuming; difficult to carry heavy shopping bags; online enables organisation and healthier eating habits – all rationale for adopting the practice. Another example is the desire for self-monitoring, self-enhancement, and competition (meaning) being fulfilled through the “metrification” and “gamification” of various practices such as outdoor activities - all made possible through the “network society” providing abundant data [32]. From these examples, the competitive self-improvement meanings and the convenience, time-efficiency, and versatility are very different underlying rationales.

E. Digital anthropology

Digital anthropology (DA) is a growing subfield of anthropological thinking which sheds light on people’s use of ICTs in everyday life and practice. The question - what digital technologies do to the concept and experience of human being - lies in most DA studies e.g. [37], in addition to the consideration of how people shape and are shaped by digital artefacts and their infrastructural systems [38].

1) *How is ICT being investigated?*

Anthropology is best known for its ethnographic approach - long-term, participatory, and experiential observation and documentation - providing a distinct descriptive contribution to interdisciplinary discussions. Anthropologists link both theoretical and ethnographic discussions to ‘tack between the most local of local detail and the most global of global structure in such a way as to bring them into simultaneous view’ [39]. For DA, two primary methods have emerged: researchers who conduct projects wholly in cyber- space; and those who study the use of ICTs by their informants, contextualised in the offline world. Reference [40] proposes a third, blending both online and offline field sites through immersive cohabitation (being an observing participant in both worlds).

2) *How ICT shapes daily life and why digitalisation is so integral to daily life?*

DA explores how ICT shapes daily life through either a broad viewpoint or through a narrower lens, with mobile phones being a key subject of many studies from as far back as the 1990’s (see [41] for a review). Examples from the broader end of the spectrum include [42] who describes the mobile phone to be an extension of self, whilst [43] explains how phones have enabled personalisation and provides a full-time intimate community. ICTs are shown to provide teenagers autonomy from their parents [41], and shift power dynamics through altering relationships between consumers and companies, giving rise to prosumers [44]. Examples from a narrower focus include studies on specific capabilities that digitalisation have enabled: ease of photography [45]; a virtual ‘third’ place through gaming and social media [46], peer-to-peer services connecting supply with demand [47]. Prior to social media the way people communicated was dualist – either private conversations or public broadcasting. Whereas now, social media has been defined as ‘scalable sociality’, occupying a space of group sociability that wasn’t possible before. One that allows the user to determine the group size and privacy level [48]. All these examples are presented as positive changes to society. However, ample DA studies also explore the negative consequences associated to digital life, such as overuse, reliance and addiction [49].

Discussions amongst anthropologists about ‘why’ certain phenomenon occur are, again, deliberated in either a general or specific manner. For example, [46] discusses the broad flow of culture, animated through online content feeds which results in a copious mix of interpersonal and mass media information accelerating diffusion. In more specific reflections, [45]’s study on smartphone photography highlights the rapidity of new social norms around beauty which have been facilitated by selfie apps. Finally, another example is [50] who investigated the use and consequences of social media in nine countries. Results emphasise the great variability across cultures, such as the meanings attached to social media. In South Italy it’s seen as detracting from education but in Brazil it constitutes education.

IV. DISCUSSION

A. *Comparison of research fields*

It is worth re-emphasising that this paper is far from an exhaustive review of all approaches applied to the subject of ICTs in daily life. Nor is it systematic in nature. The intent is to represent a range of approaches from the social sciences, broadening understanding and highlighting what can be learnt

and built upon within the smart sustainable technology community. Table 1 synthesises the literature reviewed, and Fig. 1 provides typologies of: methods; units of analysis; and insights, to visualise approaches along spectrums and guide comparisons. From both Table 1 and Fig. 1 it is clear each approach provides a different perspective into understanding digital daily life. The mapping of each on to the various spectrums in Fig. 1a shows that there is a good coverage of quantitative and qualitative methodologies but a shortfall in longitudinal studies. There is a wide range of analytical lens used along the human/non-human spectrum (Fig. 1b), from practices and time to competences and attributes (Table 1). As we focus on research studying the micro-scale of the individual, it is unsurprising that the five approaches are generally to the left of Fig. 1b. We chose to display an individual/society scale as it helps identify which of the approaches also include wider societal variables in their analyses. DA is a good example which studies an individual or group and reflects on their surroundings/context in society.

The framework used to review the literatures included whether results provide insights on the process of digitalisation (the rationale, the ‘why’) and/or the outcome of digitalisation (the changes enabled by digitalisation). It became clear that each approach leans more towards one or the other. Adoption models provide more insights on the process whilst time-use research focus more on the outcome. Fig. 1c highlights that even across only five approaches there is a wide range of insights provided, driven either by data or theory and covering both outcome and process. Each approach occupies a different space in the three Fig(s), showing that no one approach provides an all-encompassing perspective on digital daily life. One notable similarity across the pistes - something that is learnt despite the analytical lens digital daily life is studied through - is that digital devices and associated infrastructure have had wide implications on the different elements within each model, theory or framework. In time-use research, the key variables of activity type and time allocation have altered with digitalisation enabling new uses of time such as multitasking and doing activities quicker. From SPT we learn that digitalisation has changed the materials, meanings and competences of different practices. The adoption process of innovations have also transformed with new attributes being offered and new ways of communicating information about an innovation thus altering diffusion. In domestication theory, the pathways to learning different competences are impacted by digital technology use and experiences. Within DA, insights reveal digitalisation has shifted and is continuously shifting the functions and processes within and around an individual’s context. All these examples allude to the fact that digitalisation has had far reaching and complex impacts.

B. *Advancing research*

For industry, researchers, and professionals looking to couple their work on the integration of smart technologies and IoT into daily life and the network, with more foundational social science approaches and advance understanding on their impacts, the proceeding section outlines useful insights regarding methodologies and analyses.

1) *Methodology*

The methodologies presented throughout Section III are wide ranging and provide a toolbox of approaches. Studies concerned with how different sustainable ICTs are interlinked with each other across daily rhythms and what the potential displacement effects are, could draw inspiration from time-use

research. For example, [8] developed a conceptual framework for systematically assessing the impact of ICT on time and energy use. SPT also considers sequencing and patterning of human and computer interactions but through the lens of practices. Reference [51] combined both time-use and social practice approaches using interviews and electricity metering data to investigate 1) time as a resource; 2) practices as configuring temporalities; 3) collective and personal temporal rhythms - how shared and individual temporalities influence the performance of practices. Lessons can also be learnt from digital anthropology on methods for gathering detailed insights and learn about digitalisation over time. As the world of ICT advances rapidly, longitudinal ethnographic studies capturing usage and user experiences would help better understand what the successful learning processes are for integrating various sustainable technologies (such as smart transport or energy systems) into daily life.

2) Analysis

The various theories and units of analysis touched upon within this paper have identified the importance of including a rich set of contextual variables within research. Adoption models emphasising the role of social influence and SPT highlighting that the way technologies are used are shaped by broader social patterns, are relevant for the consequences of digitalisation and how much energy they use. Domestication theory also offers an interesting analytical lens to pay more attention to the longer-term domestication biographies of different users. As [16] suggests, this would enable analysis to encompass the wider influences on everyday lives and

practices that ultimately shape the impacts that technologies come to have.

V. CONCLUSION

Digital technologies have rapidly become intertwined into daily life. To study society, human behaviour, or our impact on the environment and to overlook digitalisation would be folly. Research is needed which will unearth common processes and mechanisms which are robust to variations in context, ensuring insights are generalisable, scalable, and not constrained by research norms and practices in specific domains. The unique contribution of this paper is a synthesis of disciplines, approaches and theories all studying the ICTs in daily life from across the social sciences, bringing together key aspects to provide holistic insights with wide applicability. We hope that this review encourages the discussion and development of integrated research with the ultimate goal of informing the common social need of ensuring a smart digital daily life helps and not hinders efforts for sustainability.

ACKNOWLEDGMENT

This research was supported by ERC Consolidator Grant #101003083 for the iDODDLE project (The Impacts of Digitalised Daily Life on Climate Change).

REFERENCES

- [1] WBGU, Towards Our Common Digital Future. Berlin: German Advisory Council on Global Change (WBGU), 2019.
- [2] McKinsey, 'Disruptive technologies: Advances that will transform life, business, and the global economy.', San Francisco, CA., 2013.

TABLE I. MAIN FEATURES OF SOCIAL SCIENCE APPROACHES STUDYING DIGITAL DAILY LIFE

	Time-use	Social practice	Innovation adoption	Domestication theory	Digital anthropology
Key research question	How do individuals spend their time?	What meanings do people ascribe to their practices?	What are the reasons for adoption?	How do technologies and users co-evolve?	What do devices do to human experience?
Methods: Main research methods	Self-reported time diaries	Interviews	Online surveys	Field trials, interviews, observations	Ethnography (online and offline)
Analysis: Main variable(s) and units of analysis	Time allocation of activities, activity type	Practice(s), materials, competences, meanings	Adoption propensity, attributes, personal characteristics, social system	Cognitive, practical, symbolic learning, technology usage and experiences	Individual's context
Insights: How ICT shapes daily life?	Saves and fragments time, relaxes time constraints, increases multitasking	Practices emerge, persist, shift or disappear	Dependent upon the adoption of digital devices	Users and the technologies co-evolve, shaping each other in an on-going process	Provide autonomy, shift gender roles/ power dynamics, enable capabilities
Insights: Why digitalisation is integral to daily life?	Increased pace of life	Changes in competences and meanings	Perceived positive innovation attributes	Familiarisation of functionality	New norm formation, cultural contexts

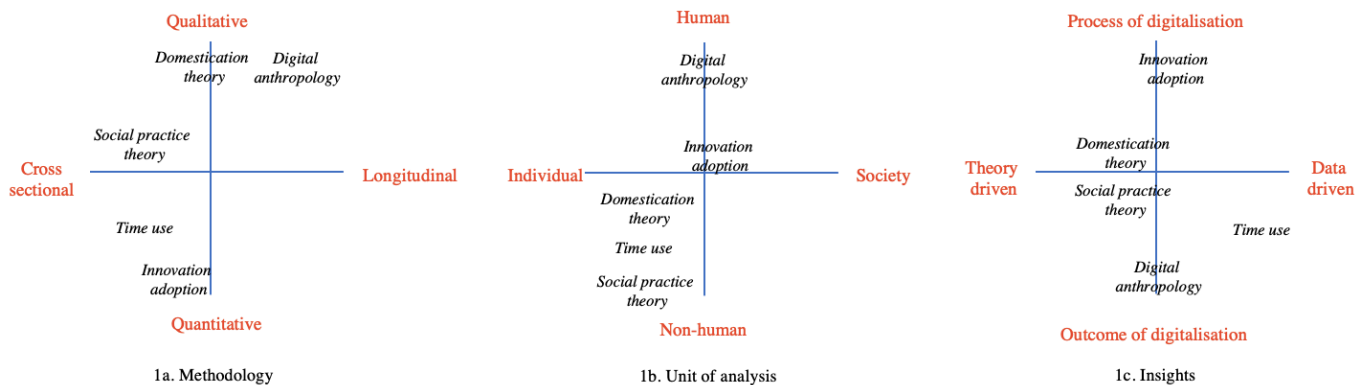


Fig. 1. Main features of social science approaches studying digital daily life.

- [3] Z. Wadud, D. MacKenzie, and P. Leiby, 'Help or hindrance? The travel, energy and carbon impacts of highly automated vehicles.', *Transp Res Part A Policy Pract*, vol. 86, pp. 1–18, 2016.
- [4] IEA, 'Digitalization and Energy', Paris, France, 2017.
- [5] S. Zuboff, 'Big other: surveillance capitalism and the prospects of an information civilization.', *J. Inf. Technol.*, vol. 30, no. 1, pp. 75–89, 2015.
- [6] J. Morley, K. Widdicks, and M. Hazas, 'Digitalisation, energy and data demand: The impact of Internet traffic on overall and peak electricity consumption', *Energy Res Soc Sci*, vol. 38, no. August 2017, pp. 128–137, 2018.
- [7] J. Bieser and L. Hilty, 'Assessing indirect environmental effects of information and communication technology (ICT): A systematic literature review', *Sustainability (Switzerland)*, vol. 10, no. 8, 2018.
- [8] J. Bieser and L. Hilty, 'Conceptualizing the impact of information and communication technology on individual time and energy use', *Telemat. Inform.*, vol. 49, no. February, p. 101375, 2020.
- [9] A. S. Morris, A. Humphrey, P. C. Alvarez, and O. D. Lima, 'The UK Time Diary Study 2014 - 2015 Technical Report', 2016.
- [10] B. Lenz and C. Nobis, 'The changing allocation of activities in space and time by the use of ICT —“ Fragmentation ” as a new concept and empirical results', *Transp Res Part A Policy Pract*, vol. 41, pp. 190–204, 2007.
- [11] T. Schwanen, M. Dijst, and M. P. Kwan, 'ICTS and the decoupling of everyday activities, space and time: Introduction', *Tijdschrift voor Economische en Sociale Geografie*, vol. 99, no. 5, pp. 519–527, 2008.
- [12] T. Zhang, X. Sun, Y. Chai, and H. Aghajan, 'A look at task-switching and multi-tasking behaviors: From the perspective of the computer usage among a large number of people', *Comput. Hum. Behav.*, vol. 49, pp. 237–244, 2015.
- [13] T. Santarius and J. Bergener, 'Does the Use of ICT speed up the Pace of Life?', in 7th International Conference on ICT for Sustainability (ICT4S2020), Bristol, UK, 2020, pp. 107–115.
- [14] L. Haddon, 'The contribution of domestication research to in-home computing and media consumption', *Inform. Soc.*, vol. 22, no. 4, pp. 195–203, 2006.
- [15] K. Sørensen, 'Learning Technology, Constructing Culture - Socio-technical change as Social Learning', Trondheim: Norwegian Universitu of Science and Technology, June, p. 22, 1996.
- [16] T. Hargreaves, C. Wilson, and R. Hauxwell-baldwin, 'Learning to live in a smart home', *Build. Res. Inf.*, vol. 46, no. 1, pp. 127–139, 2018.
- [17] M. de Reuver, S. Nikou, and H. Bouwman, 'Domestication of smartphones and mobile applications: A quantitative Mixed-Method study', *Mob Media Commun*, vol. 4, no. 3, pp. 347–370, 2016.
- [18] I. M. Henriksen, W. Thronsen, M. Ryghaug, and T. M. Skjølsvold, 'Electric vehicle charging and end user motivation for flexibility: a case study from Norway', *Energ. Sustain. Soc.*, vol 11, no. 44, 2021.
- [19] J. Stewart, 'Local experts in the domestication of information and communication technologies', *Inf Commun Soc*, vol. 10, no. 4, pp. 547–569, 2007.
- [20] E. M. Rogers, *Diffusion of Innovations*, 5th ed. Free Press, 2003.
- [21] F. D. Davis, 'Perceived usefulness, perceived ease of use, and user acceptance of information technology', *MIS Q*, vol. 13, no. 3, pp. 319–339, 1989.
- [22] R. E. Goldsmith and T. S. De Witt, 'The Predictive Validity of an Opinion Leadership Scale', *J. Mark. Theory Pract.*, vol. 11, no. 1, pp. 28–35, 2003.
- [23] D. Kasilingham, 'Understanding the attitude and intention to use smartphone chatbots for shopping', *Technol Soc*, vol. 62, no. 101280, 2020.
- [24] C. Wilson, E. Vrain, and B. Andrews, 'Consumer Uptake of Digital Low-Carbon Innovations', in ICT4S, 2022.
- [25] A. Sanguinetti, B. Karlin, and R. Ford, 'Understanding the path to smart home adoption: Segmenting and describing consumers across the innovation-decision process', *Energy Res Soc Sci*, vol. 46, pp. 274–283, 2018.
- [26] D. Kim, H. Chun, and H. Lee, 'Determining the factors that influence college students' adoption of smartphones', *J Assoc Inf Sci Technol*, vol. 65, no. 3, pp. 578–588, 2014.
- [27] H. T. T. Tran and J. Corner, 'The impact of communication channels on mobile banking adoption', *Int. J. Bank Mark.*, vol. 34, no. 1, pp. 78–109, Feb. 2016.
- [28] T. Oliveira, M. Thomas, G. Baptista, and F. Campos, 'Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology', *Comput Human Behav*, vol. 61, pp. 404–414, Aug. 2016.
- [29] A. Reckwitz, 'Toward a theory of social practices a development in culturalist theorizing.', *J. Soc Theory*, vol. 5, no. 2, pp. 243–263, 2002.
- [30] E. Shove, M. Pantzar, and M. Watson, *The Dynamics of Social Practice. Everyday Life and How it Changes*. London: SAGE, 2012.
- [31] J. Berg and M. Henriksson, 'In search of the “good life”: Understanding online grocery shopping and everyday mobility as social practices', *J Transp Geogr*, vol. 83, no. December 2017, p. 102633, 2020.
- [32] I. Arts, A. Fischer, D. Duckett, and R. van der Wal, 'Information technology and the optimisation of experience – The role of mobile devices and social media in human-nature interactions', *Geoforum*, vol. 122, pp. 55–62, 2021.
- [33] I. Røpke and T. H. Christensen, 'Energy impacts of ICT - Insights from an everyday life perspective', *Telemat. Inform.*, vol. 29, no. 4, pp. 348–361, 2012.
- [34] T. Hargreaves, 'Practice-ing behaviour change: Applying social practice theory to pro-environmental behaviour change', *Journal of Consumer Culture*, vol. 11, no. 1, pp. 79–99, 2011.
- [35] S. Taipale, 'Bodily dimensions of reading and writing practices on paper and digitally', *Telemat. Inform.*, vol. 32, no. 4, pp.766–775, 2015.
- [36] D. S. Reid et al., 'Online Sexual Partner Seeking as a Social Practice', *The Journal of Sex Research*, 2021.
- [37] H. Horst and D. Miller, 'Normativity and materiality: A view from digital anthropology', *Media Int. Aust.*, no. 145, pp. 103–111, 2012.
- [38] H. Geismar and H. Know, *Digital Anthropology*, 2nd ed. London, UK.: Taylor & Francis, 2021.
- [39] C. Geertz, 'From the Native's Point of View: On the Nature of Anthropological Understanding', in *Local Knowledge: Further Essays in Interpretive Anthropology*, New York: Basic Book, 1983, pp. 55–72.
- [40] J. M. Bluteau, 'Legitimising digital anthropology through immersive cohabitation: Becoming an observing participant in a blended digital landscape', *Ethnography*, vol. 22, no. 2, pp. 267–285, 2021.
- [41] H. A. Horst, 'The anthropology of mobile phones', in *Digital Anthropology*, H. Geismar and H. Know, Eds., 2nd ed. London, UK: Taylor & Francis, 2021.
- [42] R. Pertierra, 'Mobile Phones, Identity and Discursive Intimacy', *Human Technology: An Interdisciplinary Journal on Humans in ICT Environments*, vol. 1, no. 1, pp. 23–44, Apr. 2005.
- [43] M. Ito, D. Okabe, and M. Matsuda., *Personal, Portable, Pedestrian: The Mobile Phone in Japanese Life*. Cambridge: MIT Press, 2005.
- [44] A. Singh, A. T. Strating, N. A. Romero Herrera, D. Mahato, D. V. Keyson, and H. W. van Dijk, 'Exploring peer-to-peer returns in off-grid renewable energy systems in rural India: An anthropological perspective on local energy sharing and trading', *Energy Res Soc Sci*, vol. 46, no. July, pp. 194–213, 2018.
- [45] Y. Yang, 'Smartphone photography and its socio-economic life in China: An ethnographic analysis', *Global Media and China*, vol. 6, no. 3, pp. 259–280, 2021.
- [46] B. Burroughs, 'Facebook and FarmVille: A digital ritual analysis of social gaming', *Games Cult*, vol. 9, no. 3, pp. 151–166, 2014.
- [47] B. Borm, 'Welcome Home An Ethnography on the Experiences of Airbnb Hosts', in *Digital Environments Book Subtitle: Ethnographic Perspectives Across Global Online and Offline Spaces*, Transcript Verlag, 2017.
- [48] J. Borgerson and D. Miller, 'Scalable sociality and “How the world changed social media”: conversation with Daniel Miller', *Consumption Markets and Culture*, vol. 19, no. 6, pp. 520–533, 2016.
- [49] T. Sutton, 'Digital harm and addiction: An anthropological view', *Anthropol Today*, vol. 36, no. 1, pp. 17–22, 2020.
- [50] D. et al. Miller, 'Contemporary Comparative Anthropology – The Why We Post Project.', *J. Anthropol.*, vol. 84, no. 2, pp. 283–300, 2019.
- [51] F. Friis and T. Haunstrup Christensen, 'The challenge of time shifting energy demand practices: Insights from Denmark', *Energy Res Soc Sci*, vol. 19, pp. 124–133, 2016.