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A design interventionist approach to generate anthropological knowledge

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Envisioning ‘anthropology through design’: A design interventionist approach to generate anthropological knowledge



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The literature on Design Anthropology (DA) is skewed towards discussion exploring anthropology’s potential for design. In contrast, discourse on how design can contribute to anthropology is somewhat limited. This article proposes an ‘Anthropology through Design’ (AtD) approach by reflecting on a study on the emergent phenomenon of ‘energy exchange’. The AtD approach aims to generate anthropological knowledge of an emergent sociocultural phenomenon through the use of a design intervention. This article describes four intertwined tracks—Framing, Design Intervening, Ethnographic Particular Understanding, and Anthropological General Understanding—of our AtD process. The proposed AtD approach takes a strategic step in relocating ‘design’ from being an object of anthropology to becoming an instrument for doing anthropology.
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Design Anthropology (DA) is an emerging trans-disciplinary field at the convergence of anthropology and design, two distinct domains of knowledge (Gunn, Otto, & Smith, 2013; Smith et al., 2016). The literature on design anthropology is skewed towards discussion exploring the potential relevance, benefits, and contributions of anthropology for design (Murphy & Marcus, 2013). Traditionally, such discussions have been limited to the methodological use of ethnography in design (Murphy, 2016; Murphy & Marcus, 2013; Otto & Smith, 2013). In contrast, discourse

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on what and how design can contribute to anthropology is limited. Some scholars, such as (Gatt & Ingold, 2013; Kjærsgaard & Otto, 2012; Rabinow et al., 2008; Smith & Otto, 2016), have initiated conversations on the potential of design for anthropology. However, there is a need for further attention on ways design can be utilised for doing anthropology, specifically on how design can facilitate the construction of anthropological knowledge of a sociocultural phenomenon that is ‘emergent’ in the real-world.

We describe an ‘emergent’ sociocultural phenomenon with the following characteristics. It is a sociocultural phenomenon in its nascent form with minimal performances in the real-world or not yet occurring in people’s social life. However, the technological, economic, and sociocultural trends indicate that the real-world occurrences of the emergent phenomenon may become a reality and get established in the near future. In other words, a sociocultural phenomenon that is not out there yet. Nonetheless, it is in the process of becoming. Considering the potential social realities of such a phenomenon, it may be a relevant object for an anthropological inquiry. However, a unique methodological challenge with an emergent phenomenon is that a ‘field-site’ for an anthropological inquiry may not yet exist. This article reflects on a study that aimed to build an anthropological understanding of an emergent phenomenon of ‘energy exchange’ between households. The research is in the context of emerging energy systems where energy will be locally generated through renewable sources, such as solar PV modules, consumed and exchanged within a neighbourhood or a village.

During the research period, the infrastructure for inter-household energy exchanges within neighbourhoods or villages was still not available in a real-world setting¹. Hence, there were hardly any social environments where the phenomenon of energy exchange could be systematically observed and studied. Overall, this situation raised a challenging methodological question, i.e., how to conduct an anthropological and ethnographic study of an emergent sociocultural phenomenon, such as energy exchange, when the field-sites for a systematic and sustained empirical study of the phenomenon are not available in the real-world setting? This article proposes a particular ‘Anthropology through Design’ approach by reflecting on how the reported study addressed this methodological question.

We define ‘Anthropology through Design’ (AtD) in general as *research approaches to generate anthropological knowledge of social and cultural phenomena through design activities*. The primary purpose of an AtD approach is for the sake of generating anthropological knowledge. The object of an AtD inquiry is a sociocultural phenomenon. AtD takes a strategic step in relocating ‘design’ from being an object of anthropology, as in ‘anthropology of design’ (Gatt & Ingold, 2013; Murphy, 2016) or a beneficiary of anthropological

knowledge, as in ‘anthropology for design’ (Gunn & Donovan, 2012; Murphy, 2016)—to become an instrument for doing anthropology.

This article proposes a particular approach for doing ‘Anthropology through Design’. Our AtD approach has four tracks—Framing, Design Intervening, Ethnographic Particular Understanding, and Anthropological General Understanding. These tracks are iterative, entangled, and intertwined with each other. This article describes these tracks and their constituting elements. See Figure 1 for an overview of our AtD approach. The AtD approach is not a prescriptive model. It is better understood as a heuristic framework (Lund, 2014), which suggests a particular process for doing anthropology of an emergent sociocultural phenomenon through design.

We consider this article as a knowledge contribution to the field of design anthropology. Hence, the primary audiences of this article are design researchers

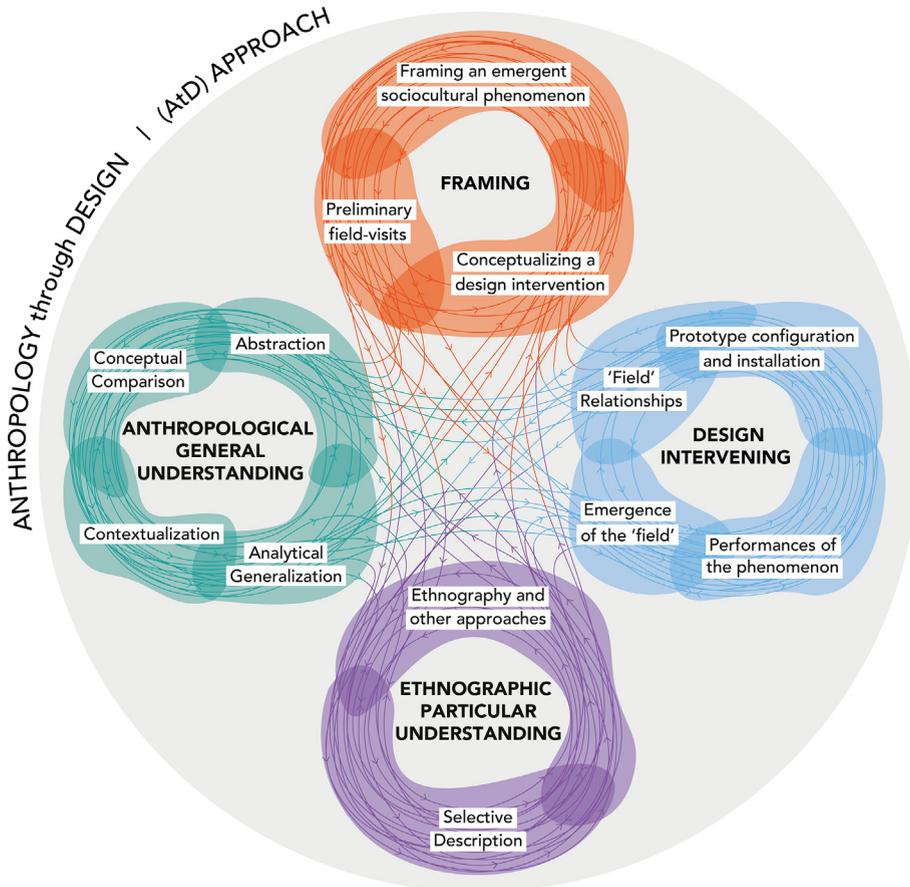


Figure 1 Overview of our ‘Anthropology through Design’ (AtD) approach

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and designers who are interested in design anthropology and design anthropologists. The remainder of this article is organised as follows. Section 1 presents a literature background covering relevant debates in design anthropology. Section 2, 3, 4 and 5 describe the four strategic tracks of the AtD process utilising the case of energy exchange study. Finally, Section 6 presents a general discussion and conclusion.

1 Literature background

1.1 Anthropology, ethnography, and design

In a broad sense, (social and cultural) anthropology is defined as ‘*an intellectually challenging, theoretically ambitious subject which tries to achieve an understanding of culture, society and humanity through detailed studies of local life, supplemented by comparison*’ (Eriksen, 2004, p. 7). Ethnography, which is often stated as the nucleus of anthropology, has two related yet distinct meanings. One of the meanings of the term ‘ethnography’ is a ‘*process of inquiry*’ that includes methods of immersion in a social world, participant observation, and fieldwork (Otto & Smith, 2013; Sanjek, 2010). The other meaning of ‘ethnography’ is a ‘product’ of the ethnographic process that primarily includes ethnographic writings (monographs and articles) produced to describe the observations (Otto & Smith, 2013; Sanjek, 2010). The terms ‘anthropology’ and ‘ethnography’ are often used interchangeably; however, as Ingold (2008) argues, these are distinct and different from each other. Ethnography is a documentary and descriptive exercise. Ethnography’s primary purpose is to retrospectively describe social life for ‘others’ (Gatt & Ingold, 2013; Ingold, 2008; Segelström & Holmlid, 2014). In other words, if ethnography is a methodological approach and its descriptive output, then anthropology is an understanding of being human in a society (Eriksen, 2004, Eriksen, 2010; Van Veggel, 2005). The aim of anthropology is to develop ‘*a generous, comparative but nevertheless critical understanding of human being and knowing in the one world we all inhabit*’ (Ingold, 2008, p. 69).

‘Design’ does not have a single commonly agreed definition amongst design scholars and practitioners. The understanding and the meaning of ‘design’ varies across design disciplines, professions, and fields of design practice, such as visual design, product design, and architectural design (Erlhoff & Marshall, 2008). Often, design is characterised by its orientation towards the future and embracing *change* as a mode of functioning. Similar to the use of the word ‘ethnography,’ design has twin meanings of a *process*, as in ‘designing’ or ‘doing design,’ and as an *outcome*, i.e., designed artefacts that result from design activities. The proposed AtD approach in this article builds upon the notion of ‘designing’ or ‘doing design’. Two particular views on this notion are as follows. Stappers and Giaccardi (2017) describe the process of ‘doing design’ as ‘*work done with the intention to produce a feasible solution to*

improve a given situation'. In contrast, Findeli et al. (2008) describe designing as 'the act of improving or maintaining' the relationships between people and their environments, i.e. "'habitability" of the world, in all its dimensions (physical, psychical, spiritual)'.

While anthropological endeavour is to understand the reproduction of societies, the design aims to transform societies (Otto & Smith, 2013). Within these differences and similarities, a new trans-disciplinary field of design anthropology appears. Some shared features between anthropology and design are their focus on empirical grounding, reliance on methods of observations, and interest in human behaviour and practices for their respective purposes (Murphy, 2016; Otto & Smith, 2013). As it is widely acknowledged, the earliest and still the dominant mode of collaboration between design and anthropology is on a methodological front that focuses on purposing ethnography to benefit design (Murphy, 2016; Murphy & Marcus, 2013; Otto & Smith, 2013). Such an engagement appears in the literature under the label of 'design ethnography' (Dourish, 2006; Murphy & Marcus, 2013; Segelström & Holmlid, 2014). Design ethnography primarily aims for a rich contextual understanding of people's experiences with using a designed artefact and of spaces where the design is or would be situated. Overall, design anthropology is still in its nascent stage, drawing its approaches, perspectives, and debates from both design and anthropology and simultaneously challenging these two disciplines to engage and collaborate (Anastassakis & Szaniecki, 2016; Halse, 2008; Dankl, 2017).

1.2 Configurations of design anthropology

In academic literature, confluences of design and anthropology appear in configurations, such as 'anthropology of design', 'anthropology for design,' 'design for anthropology,' and 'anthropology with design.' Some differences amongst these configurations are more apparent than others. Here, we briefly provide a summary of the key features of these configurations.

Anthropology of Design is a 'cross-cultural study of human design activities' (Hale, 2016, p. 210). This configuration takes design as an object of anthropological analysis (Gatt & Ingold, 2013; Murphy, 2016). The main aim is to develop anthropological theory and understanding of design activities (Gunn & Donovan, 2012). *Anthropology for Design* is an approach of utilising 'anthropological methods and concepts' in a design process (Murphy, 2016). In other words, anthropology for design situates anthropology '*in service of design*' (Gunn & Donovan, 2012). For instance, in a design process where ethnographic studies are utilised for determining design requirements (Gunn & Donovan, 2012). Hence, many design ethnographic studies can be viewed as examples of anthropology for design.

Anthropology with Design is a ‘trans-disciplinary gathering or approach that accumulates mutual exchanges [between design and anthropology] among theories, methodologies and tools’ (Anastassakis & Szaniecki, 2016, p. 127). The discourse on ‘anthropology with design’ is about doing anthropology together with designers and people (Gunn & Donovan, 2012). This configuration focuses on disciplinary interaction and collaboration between designers and anthropologists in a research project. *Design for Anthropology* is an approach where ‘anthropologists borrow concepts and methods from design to enhance traditional ethnographic forms’ (Murphy, 2016, p. 434). In other words, here, ‘design’ is utilised for the benefit of ethnography. As the description indicates, the primary practitioners of this configuration are anthropologists, and the focus is on the methodological influence of design on anthropological methodology.

The contemporary discourse in design anthropology argues for moving beyond the configurations of ‘anthropology of design,’ ‘anthropology for design,’ and ‘design ethnography’ as the primary forms of association between design and anthropology (Gunn & Donovan, 2012; Kjærsgaard et al., 2016; Otto & Smith, 2013). Murphy and Marcus (2013, p. 252) state, ‘*Yet as critical as the relationship between anthropology and design has become, we cannot help but notice that this relationship has historically been, by and large, one-sided, with a predominant emphasis on the benefits of anthropology for design without much regard for any potential contributions of design for anthropology ... In other words, in most instances the relationship between anthropology and design is asymmetrical, with anthropology almost exclusively subordinated to the needs of design*’. The AtD approach presented in this article contributes towards making this relationship more symmetrical.

Relatedly, many scholars recommend exploring the potential of design to contribute to a revision and renewal of the process of anthropological knowledge generation for further development of design anthropology (Anastassakis & Szaniecki, 2016; Gatt & Ingold, 2013; Murphy, 2016; Otto & Smith, 2013; Rabinow et al., 2008). Rabinow, Marcus, and colleagues (2008) suggest design and architectural design studio as a relevant metaphor for developing different anthropological research techniques and practices for understanding the contemporary world. Relatedly, Kjærsgaard & Otto (2012) suggest a mutually enriching collaboration between design and anthropology. They state, ‘*design as a way of doing anthropology, and anthropology as a way of doing design. In our view design and anthropology do not simply reflect but actively engage with each other’s practices and perspectives*’ (Kjærsgaard & Otto, 2012, p. 188). Gatt and Ingold (2013) project ‘*anthropology by means of design*’ as distinct from and an alternative to ‘*anthropology by means of ethnography*.’ They view ‘*anthropology by means of ethnography*’ as a descriptive practice, whereas they describe ‘*anthropology by means of design*’ as a practice of correspondence, i.e.,

anthropologists and designers collaboratively responding to the dynamics of the world we all inhabit (Gatt & Ingold, 2013). Overall, these authors delineate design anthropology ‘as a distinct style of doing anthropology’ (Otto & Smith, 2013, p. 10). These views shape the conceptual backdrop of the AtD approach.

2 Framing

This article proposes a particular Anthropology through Design approach by reflecting on the first author’s doctoral research (Singh, 2019). As mentioned earlier, the object of our AtD approach is an emergent sociocultural phenomenon, and the primary purpose of the AtD study is to generate anthropological knowledge of the phenomenon. This section reports on the ‘framing’ track in our AtD process. It is vital to clarify that our description of ‘framing’ differs from the notion of framing in design theory. Design theorists, such as Kees Dorst, Donald A. Schön, and Nigel Cross, describe framing in the problem-solution paradigm, i.e. framing a ‘problem’ to address in order to design a potential ‘solution’ (Cross, 2006; Dorst, 2015; Dorst & Cross, 2001; Schön, 1984). In the context of our AtD approach, we describe ‘framing’ as a process of sustained thinking, reviewing, and revising the articulation of a sociocultural phenomenon. This process is vital for our AtD inquiry and continues throughout the study. The following sub-sections describe the key elements of this track—framing an emergent social phenomenon preliminary field visits, and conceptualising a design intervention. The engagement with these elements is an iterative exercise where findings from one influence the other elements.

2.1 Framing an emergent sociocultural phenomenon

The research started in 2013 with the broad aim to study possibilities for peer-to-peer energy trading within neighbourhoods. The research is connected to the future scenario of energy provisioning systems where renewable energy will be locally generated, consumed and exchanged within a neighbourhood or a village. Many energy scholars envision these energy systems to become more social where householders acquire diverse and active roles not just in energy production and consumption but also in local energy exchange (Saad et al., 2016; Parag & Sovacool, 2016; Bellekom et al., 2016). The research started by reviewing the energy literature on energy exchanges. We soon realised that the phenomenon of ‘energy exchange’ between households is predominantly discussed in the energy literature from a rational techno-economic perspective. This rational choice perspective heavily limits the meaning of energy exchange to the concept of energy trading, i.e. buying and selling of locally generated electricity mediated by neoclassical market mechanisms (see Camarinha-Matos, 2016; Ballo, 2015). As a consequence of this prevailing perspective, the relationships between householders is limited to that a buyer and seller, who are discussed as self-interested individuals, motivated by price incentives, aiming to maximise their monetary profit and minimise household

expenses (Parag & Sovacool, 2016; Strengers, 2013). Furthermore, this rational view locates the value of energy exchange in ideas of efficiency, optimisation of resources, and maximisation of financial benefits (see Saad et al., 2016; Ballo, 2015; Zerriffi, 2011; Lemaire, 2009; Chaurey et al., 2012). We also realised that most literature on energy exchanges is based on simulation studies and lab-based prediction models rather than empirical evidence from people's social world. We started questioning how local social relationships and sociocultural values would shape energy exchanges that emerge in energy systems that are self-governed by the householders and local communities.

Simultaneously, we started engaging with the anthropological literature on 'exchange'. Anthropologists have created a wealth of conceptual and ethnographic texts on various types of exchanges, such as trading, sharing, gifting, allocation, and barter that go beyond the rational choice perspective (see Carrier, 2010; Davis, 1992; Gudeman, 2008; Parry & Bloch, 1989). However, we realised that there was hardly any work about the anthropology of energy exchange. In 2013, when this study had started, a social environment where energy exchanges could be systematically observed was missing as the infrastructure for inter-household energy exchanges was still not available in the real-world setting.

This situation introduced a critical methodological challenge, i.e., how to conduct an anthropological and ethnographic study on the phenomenon of energy exchange when the field-sites for a systematic and sustained observation are not available in the real-world setting. The AtD approach presented in this article is a reflection on how the reported study addressed this challenge. Eventually, the overall aim of the research was re-framed to develop a conceptual understanding of the phenomenon of 'energy exchange' between households from an anthropological perspective. The incredible works of anthropologists, such as (Gudeman, 2008; Hunt, 2012; Mauss, 2002; Polanyi, 2007; Widlok, 2013) started becoming the theoretical backdrop for the research. This sensitisation with the anthropological discourse facilitated framing and re-framing of the phenomenon. Later in the study empowered us to present a critical stance at the rational choice perspective of energy exchange.

A relevant point to mention at this juncture is the backgrounds of the co-authors of this article. The first author has an educational and professional background in design and engineering. The first author has been engaging with design ethnographic methods for many years and has increasingly found anthropological theoretical perspectives to be of significance for design research. As part of the doctoral education, the first author received training in anthropology at a European university. The training included working on the reported study under the supervision of an academic economic anthropologist (the last author of this article). In general, we see a collaboration between

designers and anthropologists as an enriching factor for the design anthropological inquiry into an emergent social phenomenon. The remaining co-authors of this article are from a design research background and were also the supervisors of the first author. The first author played multiple roles in the study, such as designer, design researcher, and ethnographer. Here on, we will refer to the role of the first author as that of a ‘design anthropologist,’ which covers all these multiple tasks.

2.2 Preliminary field-visits

An essential part of the process of framing and reframing in the energy exchange study was making preliminary field-visits to potential research sites. The design anthropologist collaborated with Rural Spark, an energy business startup, which was commercially piloting energy rental services in villages of the Gaya district of India. The energy rental service is a particular type of energy exchange. As part of the Rural Spark’s rental service, someone in a village becomes an ‘energy entrepreneur’ by acquiring an infrastructure, such as solar panels and solar lanterns, from Rural Spark. See Figure 2. The ‘energy entrepreneur’ then provides charged solar lanterns to other villagers (‘customers’) for a monthly rent determined by Rural Spark.

The design anthropologist visited six villages where Rural Spark’s rental services were piloted. These visits included unstructured interviews and participant observations of ‘energy entrepreneurs’ and local ‘customers’ of Rural Spark’s energy service. Although the rental service was functioning on financial payments, the design anthropologist sensed some aspects of local social relations to be playing a role in ongoing energy renting interactions within the village. For instance, a couple of energy entrepreneurs hinted at their reluctance to engage with a specific household belonging to a particular caste group. Similarly, a few energy entrepreneurs spoke of screening customers by considering factors such as their financial ability to pay rent. However, the



Figure 2 Some photographs from preliminary field-visits. Note the labels: ‘1’: a male energy entrepreneur with solar panels; and ‘2’: multiple solar-lanterns getting charged

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design anthropologist realised that the existing pilots in these villages have restricted energy exchanges to the particular frame of renting. The field experience made the design anthropologist imagine possibilities for other types of energy exchanges. However, a social canvas that allowed for different forms of energy exchanges to simultaneously emerge was missing at that moment.

Overall, the preliminary field-visits were helpful for our AtD process for a couple of crucial reasons. First, these field-visits helped to clarify that the perspective of ‘social relations’ could be a relevant frame to investigate energy exchanges. The visits helped to identify possible research directions and questions (details provided in the next section). Second, the visits sensitised us to the potential real-world contexts of the phenomenon. Hence, these visits contributed to various practical aspects, possibilities and constraints for developing a design intervention for research exploration (explained in the next section).

2.3 Conceptualising a design intervention

The ongoing process of framing and re-framing of the phenomenon of energy exchanges and the preliminary field-visits led us to revise our research aim, identify key research questions, and determine the requirements for a design intervention to address the research aim and questions. The revised aim was to develop anthropological knowledge of the emergent phenomenon of energy exchanges between households as part of an off-grid system where householders can decide whom to exchange locally produced energy. Three broad research questions were identified for the study. What energy exchanges between households emerge when households are given control of an off-grid energy installation? How are social relations at work in energy exchanges between households? What values are invoked in the energy exchanges between the households? (The detailed ethnographic findings and anthropological knowledge generated about these questions have been reported in a couple of publications (Singh et al., 2017; Singh et al., 2018). This article presents only a summary of the necessary findings for understanding and communicating our AtD approach.) We realised that a longitudinal ethnographic field study would be needed to address the research aim and answer the identified research questions. However, mentioned in the previous sections, a ‘field’ for doing this anthropological inquiry was not existing in the real-world setting at that time. This critical limitation led us to conceptualise and use a design intervention in our AtD approach.

The conceptualisation of the design intervention in our approach locates on two aspects. Firstly, identifying and designing a prototype that enables the selected phenomenon to emerge in the real-world. A prototype can do this by supporting people to perform the selected phenomenon in their real-world context. By doing so, the prototype can make the phenomenon

observable for a research investigation. See Table 1 for a summary of the key design decisions that shaped the prototype used as part of the design intervention. Secondly, developing a research strategy centred on the use of the prototype in a real-world setting. The research strategy consists of the identification of procedure and use of methods and various tactical dimensions of situating the prototype for generating knowledge of the emergent sociocultural phenomenon. See Table 2 for a summary of the identified research strategy.

3 Design Intervening

This section describes the ‘design intervening’ track, of our AtD approach. The essential engine of our AtD approach is a design intervention. We describe a design intervention in the context of the AtD approach as *an intervention comprising of prototypes and other artefacts configured based on strategic design choices and activities to enable the emergence of a sociocultural phenomenon in the real-world*. This description builds upon the notion of ‘intervention’ in

Table 1 Key design decisions for identification of the prototype

<i>S. No.</i>	<i>Dimension</i>	<i>Description</i>	<i>Consequences</i>
D1	Cost	The prototype should be cheap (cost < 2000 Euros) to fit within the limited project budget.	Various ideas to enable inter-household energy exchanges that required expensive material components such as connecting households with electrical cables were abandoned. A prototype that enabled a manual exchange of energy by use of storage devices was selected.
D2	Role of prototype coupled with a reason for energy exchange	The prototype should have some utility for people, i.e., it addresses some of their needs, which they fulfil by exchange of energy.	In the un-electrified villages in Gaya, people valued solar lighting and mobile phone charging. Hence, the prototype was directed towards these needs.
D3	Portability	The prototype should be portable to enhance a manual exchange of energy	Portable power banks, solar lanterns and LED lamps were selected.
D4	Robustness	The prototype should be robust to sustain rugged use by the villagers in harsh physical conditions for a long duration.	The design anthropologist decided to use an assemblage of off-the-shelf products that were made for the environment. Various ideas for including lab-made electronics, such as using Arduino boards, were abandoned not to compromise robustness.
D5	Ease of Use	Local villagers should be familiar with the use of the components of the prototype. Using the prototype should have a minimal learning curve.	The design anthropologists selected various items that had simple on-off buttons and charging options.

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Table 2 Key decisions for research strategy of the prototype

<i>S.No.</i>	<i>Theme</i>	<i>Decision</i>
R1	Research Location	Gaya district was a relevant site for the research as it had many un-electrified villages.
R2	Duration of the study	The initial aim was to have the prototype function for at least three months.
R3	Criteria for selecting a field-site	Some of the critical criteria identified were: (a) un-electrified village, (b) heterogeneous population belonging to different castes, (c) need for solar lights, (d) people’s familiarity with solar technology, (e) ease in physically accessing the villages, (f) feasibility of conducting field research, and (g) interest of the villagers to participate in the research.
R4	Mode of energy exchange	An energy kiosk model, where a volunteering household in a village would become an ‘energy-giver’ for the village, was selected—various other structural alternatives, such as making multiple households as energy-givers were considered.
R5	Criteria for selecting an energy-giver	Some of the key critical identified were: (a) degree of interaction and communication a potential energy-giver has with other caste groups in the village, (b) their literacy levels, (c) proficiency and comfort in using the prototype, and (d) their interest and desire to be energy-giver.
R6	Ownership of the prototype	We decided to make the volunteering households (‘energy-givers’) owners of the prototype without asking for any financial investment to acquire the prototypes. The energy-givers will get to keep all the components of infrastructure provided even after completion of the study. (See Singh et al., (2018) for discussion and consequences of this choice).
R7	Number of exchangeable items	The number of exchangeable items should be large enough to allow for inter-household energy exchanges to happen. The design anthropologist assumed that if the number of such items is small (<5), then a household may prefer to use these for their household’s needs rather than exchanging these with others.
R8	Demand > Supply	We selected villages where the demand for the solar lighting will be higher than the supply. Such a situation will require an energy-giver to select and make choices about whom to provide energy. Hence, it makes the research inquiry on their choices discernible. Moreover, this situation is a better representation of off-grid villages in rural India.
R9	Methods	We decided to use traditional ethnographic methods, with various other techniques such as ethnographic network mapping, self-reporting diary, and hand-drawn mapping exercises.

Design Anthropology ([Halse & Boffi, 2016](#)) and Research through Design ([Stappers & Giaccardi, 2017](#); [Stappers, Sleeswijk Visser, & Keller, 2015](#)). The design intervention provides material, social, and conceptual space for the sociocultural phenomenon to appear in situ and to become observable for an anthropological inquiry, i.e. making emergence possible. It is worth noting that the notion of ‘emergence’ is also discussed in the design literature. However, such discussions revolve around unexpected and creative surfacing of ‘solutions’ to design ‘problems’ ([Alexiou, 2010](#); [Dorst, 2019](#)). The following sub-sections describe the four constituting elements of this *track—prototype configuration and installation, performances of the phenomenon, emergence of the ‘field’, and ‘field’ relationships*.

3.1 Prototype configuration and installation

A vital component of this design intervening track is introduction of a prototype at an identified research location. In our AtD process, a prototype serves the primary role of being a research instrument for generating anthropological knowledge. The ability of the prototype to be a useful research instrument is conjoined with its success in enabling the sociocultural phenomenon to emerge in the real-world. The social phenomenon, the prototype becomes a means for the performance of the phenomenon (section 3.2) and the construction of a 'field' (section 3.3).

In the reported study, the design anthropologist selected Rampur and Manpur as research sites as these two villages fulfilled the pre-identified criteria (R3) specified in Table 2. See Figure 3. Both villages are located in the Gaya district of Bihar state in India and were off-grid as these villages did not receive any electricity supply from the electricity grid. Rampur and Manpur respectively comprise of 200 and 350 households. Both the villages had households belonging to different caste groups. Caste is an aspect of social structure and stratification that is prevalent in Bihar. In the two villages, most of the population belonged to Manjhi and Ravidas caste groups who are economically poorer than the rest and fall lowest in the caste hierarchy.

The prototype used in the study is a small-scale off-grid energy distribution infrastructure for solar lighting. The prototype consisted of an assemblage

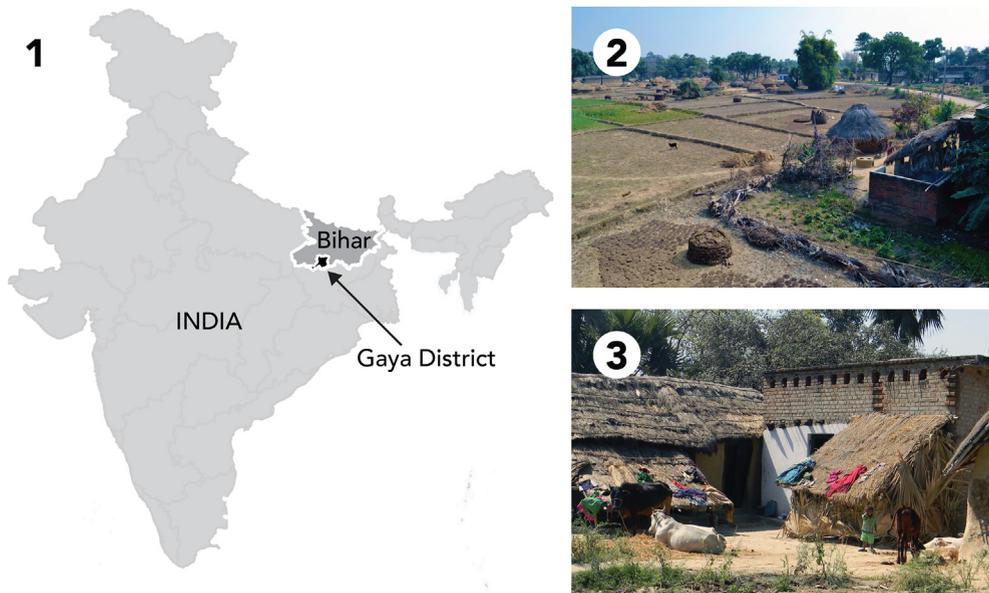


Figure 3 Research sites. Note the following labels. '1': a map of India with the location of Gaya district and Bihar state indicated; '2': Rampur; and '3': Manpur

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of existing commercially available products such as solar panels, energy routers, LED bulbs, power banks, and various cables. See [Table 3](#) and [Figure 4](#). The design anthropologist configured the prototype utilising the design decisions ([Table 1](#)) and identified the research strategy ([Table 2](#)). The design engineers of Rural Spark also contributed to the design and arrangement of the prototypes. For instance, a RuralSpark’s designer designed a 3D-printed case and secured the power banks using the case’s design. In total, thirty-three ‘solar-items’, i.e., fourteen sets of LED bulbs with power banks and nineteen solar lanterns, were available for use and exchange in both the villages. The total cost of the prototype was 40000 Indian Rupees (INR) (around 523€).

The process of introduction and installation of a prototype in itself has the potential to bring valuable insights into the phenomenon. Nita and Aarti, two females at Rampur and Manpur respectively, became the energy-givers for their corresponding village². They had volunteered and were selected as energy-givers as they fulfilled the pre-identified criteria (R5) specified in [Table 2](#). The prototype was installed at each of the houses of Nita and Aarti on 1 February 2016. The installation of the prototype happened in the presence of villagers. Soon the news of the installation spread through the village. The prototype installation caught the villager’s attention, and many came to converse with the design anthropologist. The presence of the prototype became a key trigger for various interactions and conversations between the design anthropologist and the villagers.

Table 3 Key components of the prototype

<i>Item</i>	<i>Quantity</i>	<i>Comments</i>
Solar Panel (75 W)	1	Solar panel was needed to charge the solar lanterns and the power banks. See Figure 4.2
Solar Lanterns	19	These are rechargeable LED lights. The difference between a LED bulb (below) and a solar lantern is that a solar lantern is fitted with a battery and does not require a connection with a power bank to function. See Figure 4.3
Energy Routers	2	An Energy Router is interfacing equipment to let the solar panel charge the solar lanterns and power banks. See Figure 4.4
Power Banks	14	These portable power banks provide 5 V Direct Current (DC) current output to two Universal Serial Bus (USB) ports, which can be used to power a LED bulb (below) and charge a mobile phone. See Figure 4.7
LED Bulbs	14	These are bulb-shaped 3W LED lights that work when connected to the power banks as these do not have an embedded battery. See Figure 4.8
Cables	50	There were two types of USB cables. First, the cables to connect the energy router with solar lanterns and power banks. Second, the cables to connect a power bank to charge a mobile phone. See Figure 4.5



Figure 4 Off-Grid Energy Distribution Infrastructure. Note the labels: '1': charging station; '2': solar panel; '3': solar lantern; '4': energy router; '5': cables; '6': 3D printed casing of the power banks; '7': a power bank in use; '8': a LED bulb connected with a power bank

Before making the installation, the design anthropologist had conversed with the energy-givers, their family members, and other villagers to understand their initial thoughts on what they foresee emerging through the use of the prototype in their village. Both the energy-givers confidently stated that they would offer the solar-items to the villagers who need those the most. In this regard, they anticipated a large number of Manjhi and Ravidas households to become energy-givers. They stated that caste differences would not have a role in the energy exchanges. Overall, the villagers gave an amicable and harmonious description of their social life. This description was contrary to the social realities that emerged through the prototype (described in subsequent sections of this article).

Envisioning 'anthropology through design'

3.2 Performances of the phenomenon

The prototype introduced at Rampur and Manpur enabled the phenomenon of inter-household energy exchanges through manual transactions of ‘solar-items,’ i.e., solar lanterns, LED bulbs and power banks, between households in the villages. Nita and Aarti, the energy-givers, determined every aspect of the energy exchanges in consultation with their family members. The design anthropologist refrained from any involvement in structuring the energy exchanges. Right from the start of the study, the design anthropologist communicated to the energy-givers and established that they could decide to use the prototype in whichever way they feel appropriate. Nita and Aarti can decide whom to provide a solar-item, give an item for free or for rent, or in whichever way they prefer. The design anthropologist clarified that there is no right or wrong way to exchange the solar-items. Nita and Aarti took pride in being energy-giver and appreciated that they had complete control of the prototype.

Soon after the installation of the prototype, a large number of villagers started enquiring and requesting the solar-items from the energy-givers. Within a couple of days, the energy-givers started assigning the solar-items to households, referred to as ‘energy-receivers’ in this research. The demand for solar-items was more than the possible supply, i.e. thirty-three solar-items provided at each of village. Hence, Nita and Aarti had to strategise and choose receivers amongst the households asking for the solar-items. The energy-givers and energy-receivers initiated, arbitrated, and reconfigured structures of energy exchanges. Eventually, 27 households at Rampur and 36 households at Manpur became energy-receivers at their respective villages. The villagers desired the solar-items because of the portability, quality and aesthetics of the light emitted from these items. Villagers started using the solar-items for mobility and work in their agricultural field after sunset, illuminating cooking places and other interiors of their houses, for studying to replace the oil-based lamps. See [Figure 5](#).

A typical performance of the energy exchange was: an energy-receiver visits the energy-giver’s house, obtains the assigned and charged solar-item, judiciously uses the solar-item for a few days, once the solar-item was drained of the charge, the receiver brought it back to the giver’s place for charging. In this way, the phenomenon of energy exchange emerged with the use of the ‘prototype’. As the prototype started becoming an infrastructure for the phenomenon, the performances of the phenomenon started emanating in the real-world.

3.3 Emergence of the ‘field’

The emergence of the phenomenon in the real-world also constructed the ‘field’ for investigating the phenomenon. The AtD approach views a ‘field’ as *a collection of performances in the social world capacitated by a prototype*



Figure 5 Various use of solar-items. Note the following labels. '1': home-lighting; '2': studying; '3': cooking after sunset; and '4': mobility in agricultural field

introduced. The field provides a window to observe and study an emergent sociocultural phenomenon. For instance, the emanating performances of energy exchanges at Rampur and Manpur became the relevant object for the design anthropologist's observation, probing and analysis. These performances enabled the design anthropologist to conduct a 'fieldwork' (explained in section 4.1)—a primary data collection activity—on germinating energy exchanges. The fieldwork would have failed or considerably diminished if the villagers had refused to use the prototype.

Here, our emphasis on the idiom of 'performance' is about the *performative* nature of the field, i.e., an entity that results from social actions (Coleman & Collins, 2006). This performativity of the field is also illustrated by the coupling of the time span of the field with the functioning of the prototype. For instance, various elements of the prototype introduced at the villages broke down during the study. Some of the solar-items were restored, reconfigured, and put back into circulation after the villagers found creative solutions to mend the prototype's broken elements using locally available materials. See Figure 6. However, many of the items were damaged beyond use. Of the total of 66 solar-items available for energy exchange in both the villages combined at the start of the study, only 36 solar-items (54%) were functional after the eleven months, i.e., at the end of the study. The decrease in the number of solar-items also reduced the number of energy exchanges happening in the field. Such a reduction in the energy exchanges lowered the empirical opportunities of the phenomenon. See Figure 7 for an illustration of the temporal span of the field. Hence, the field is dynamic, and emergent that sustains through various re-configurations. Overall, we consider the design intervention not merely an event of prototype introduction but as a 'process of becoming' (Coleman & Collins, 2006) that remains in constant flux.

Envisioning 'anthropology through design'



Figure 6 Re-configuration of various elements of the prototype. Please note the labels. '1': soldering of a broken energy-router; '2': energy-giver repairing a solar-lantern at Manpur; '3': a family member of energy-giver at Rampur redesigning the casing of power banks using locally available materials; and '4': redesigned cases of power banks Rampur

3.4 'Field' relationships

The emerging 'field' took shape within the web of relationships amongst design anthropologist ('outsider'), local people ('insiders'), and the design intervention. See Figure 8. A crucial aspect of the field relationships is the rapport between the design intervention and the villagers. The energy-givers formed a strong bond with the prototype that reflected in their care and repair of the equipment and enhanced the fieldworks's time span. The design anthropologist had initially planned the study for three months. However, strong bonding between the prototype and the energy-givers allowed the design anthropologist to continue the study for 11 months.

Often engagement in activities unrelated to the research helps in forming a trusting relationship with the research participants. For instance, during a visit to Manpur, Aarti and her husband mentioned their interest in buying a small digital video camera to start a rental service for their village. The design

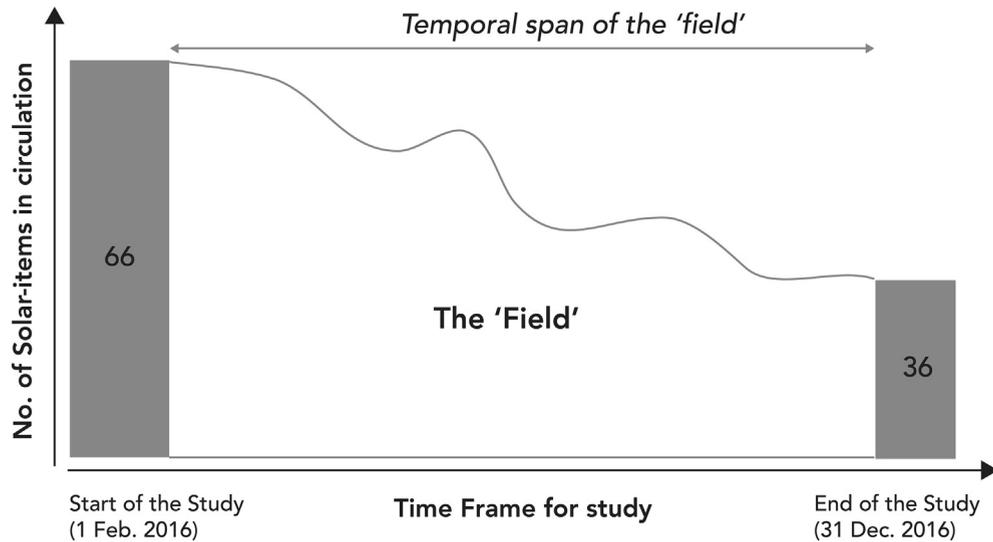


Figure 7 A temporal span of the 'field' (Note that the bars in the figure are based on the exact numbers of the solar-items. However, the meandering line joining the two bars is not based on exact numbers but illustrates a variation in solar-items in circulation due to re-configuration)

anthropologist started sharing his views and knowledge about digital photography and videography during the field-visits. Eventually, the energy-giver's family bought a digital video camera and started a rental service to document weddings and other social functions. As the information about this spread within the village, the design anthropologist was invited by the villagers to take their photographs during various local social functions. An unplanned

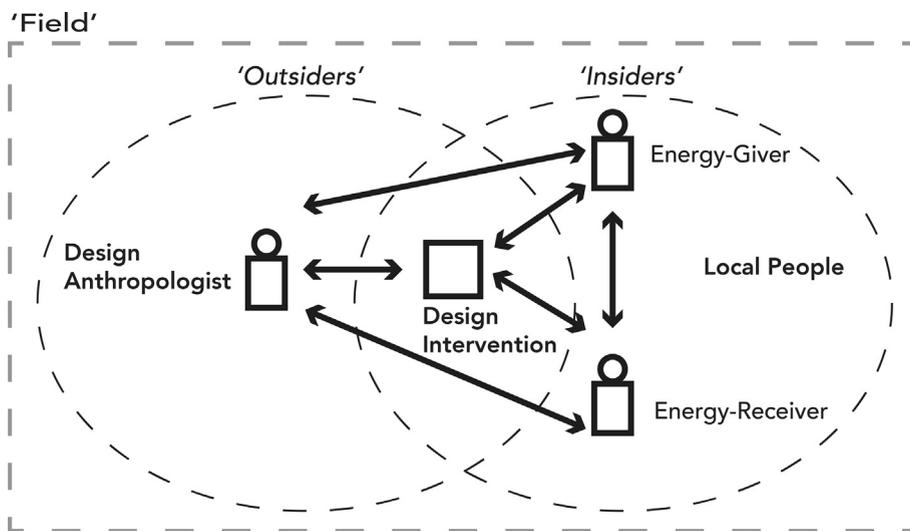


Figure 8 Some types of 'field' relationships

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yet beneficial outcome of this situation was increasing trust between the design anthropologists and the villagers. The villagers started openly sharing their views on social relations with each other, and in general, speaking of various intricacies of their lives. For instance, some villagers informed the design anthropologist about their preferences to socially engage with households belonging to a particular caste group but not with Ravidas and Manjhi households because of their lower caste status. Ravidas and Manjhi households narrated past events and described various ongoing practices that illustrated how caste-based inclusion and exclusion is still prevalent in the villages. Many of these details would have remained inaccessible to the design anthropologist without the trusting relationships with the villagers. Hence, we see the fieldwork in our AtD process as a matter of ‘correspondence’ (Gatt & Ingold, 2013), i.e., a dialogic process that grows with strong engagement amongst ‘insiders,’ ‘outsiders,’ and the design intervention.

4 *Ethnographic particular understanding*

This track of our AtD process aims to discern the emergent phenomenon from the performers’ viewpoints, i.e. develop an ‘ethnographic particular’ understanding’ of the emergent phenomenon. This track caters to comprehension and description of *specific* and *concrete* observations of the emergent phenomenon in the field³. This track focuses on research participants’ conceptions, vocabulary, categories, and local models concerning the emergent phenomenon. This track is a step to uncover how people in a field connect with the phenomenon in diverse ways, meanings they associate with it, and why they behave in the way they do. In total, the AtD approach acknowledges the co-existence of people’s multiple realities, perceptions, and logics. We describe the two key elements of this track as ‘*ethnography and other approaches*’ and ‘*selective description*’. In the following sub-sections, we provide descriptions of these two elements, including three vignettes highlighting the ethnographic particularities about energy exchanges that emerged at Rampur and Manpur.

4.1 *Ethnography and other approaches*

As the selected phenomenon emerges in the field, the investigation to develop an ethnographic particular understanding of the phenomenon can begin. This process is iterative and explorative, where empirical observations from the field shape the research direction. In the reported study, as the villagers started becoming participants in the energy exchanges, the design anthropologist set forth to investigate the selected research questions (stated in section 2.3). The design anthropologist paid attention to what the villagers are *saying and doing* about these energy exchanges and how their social relations appear and work in these exchanges.

We consider a combination of ethnographic methods along with other research methods based on the context of a field to be beneficial for building an understanding of an emergent phenomenon. For instance, in the reported study, traditional methods of ethnography (O'Reilly, 2005)—participant observation, interviews, and field-notes—were combined with specific techniques of ethnographic network mapping (Schensul et al., 1999), self-reporting diary (Alaszewski, 2006), and hand-drawn mapping (Kumar, 2002). See Figure 9 for a visual impression of the field study. Adopting the ethnographic network mapping approach, we took the energy-givers as the 'focal' persons and investigated energy exchanges between them and each energy-receiver through ethnographic methods. The energy-givers were provided with a self-reporting diary for documenting various aspects of energy exchanges for their respective villages. See Figure 10 for the various attributes that were documented in the diary. Through the hand-drawn mapping exercises, the energy-givers created a spatial map of the energy exchanges in their villages. See Figure 11 for the information documented on the hand-drawn maps. Utilising multiple methods was useful for triangulating the emerging ethnographic particular understanding.

4.2 Selective description

The 'selective description' consists of identifying and describing key events, observations, and findings from the field. This step bridges the empirical insights and anthropological understanding from the insights (next section). This element entails selecting, compressing, and simplifying the ethnographic data (DeWalt & DeWalt, 2011). Here, we provide three abridged ethnographic vignettes to illustrate the kind of ethnographic particulars documented in the study. These three vignettes are ethnographic particular instances that are *specific* and *concrete* (Lund, 2014). These are *specific* as these are observations of a particular space (Rampur and Manpur) and time (during the time-span of the field). These are *concrete* as these are descriptions of actual observations and events in real-world. These vignettes are abridged due to the scope of this



Figure 9 Visual impressions of the field study. Note the labels. '1': discussion with an energy-giver and '2': conversations with an energy-receiver.

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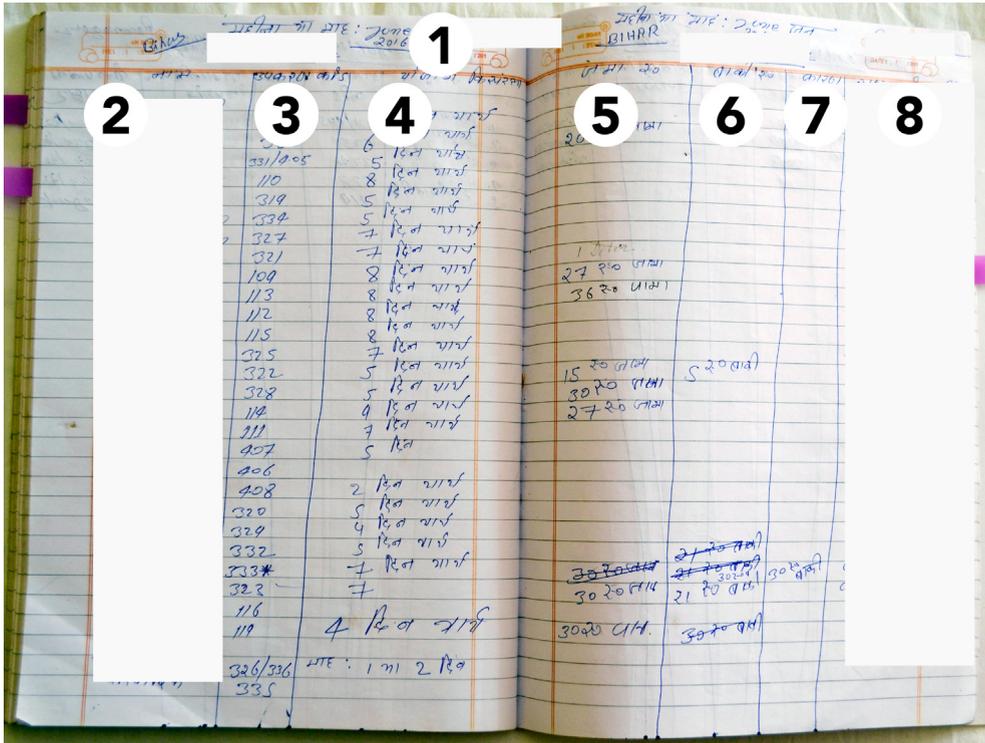


Figure 10 A sample of a diary entry that documents energy exchanges for June 2016. Note the labels: '1': month; '2': receiver name; '3': solar-item code; '4': number of charging; '5': return provided; '6': return due (if any); '7': any reason/comment; '8': head of the receiver's household. (We have concealed the names mentioned in the figure to anonymise research participants.)

article. In the next section, we will utilise these vignettes to discuss the components of 'anthropological general understanding'.

4.2.1 Vignette-1: energy exchanges with Kunti Devi at Manpur

Kunti Devi is a neighbour of Aarti, the energy-giver at Manpur. Both are of the same age, and they frequently meet for a short chit-chat. Aarti describes their relationship as that of friendly neighbours who are closely connected and of a close confidante. Hours after the installation, Aarti visited Kunti to inform her about the installation and invited her to take a solar-item. Kunti willingly became an energy-receiver on that day and continued to be so until the study's end. While Aarti was structuring energy exchanges at Manpur, she decided to avoid cash-based rent from Kunti. She feared that use of money might spoil their friendly relations. Both of them discussed and eventually decided to structure energy exchanges where payment for the solar-item would be preferably made in kinds. Kunti's household has cattle, and for the first few months of the energy exchanges she periodically provided batches of 250 mL of cow-milk as payment for energy. Later, Kunti

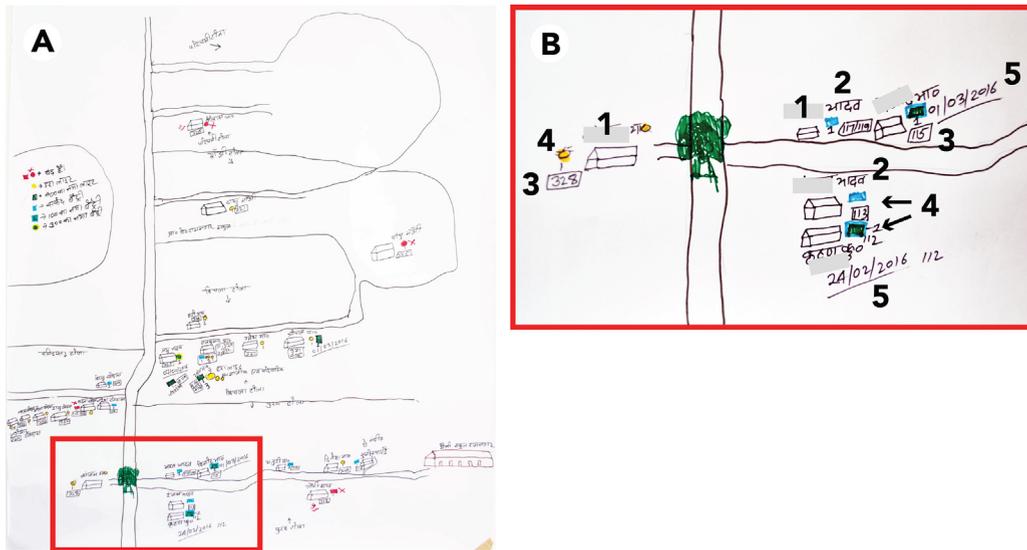


Figure 11 'A' is a hand-drawn map of Rampur. 'B' is an enlarged version of the red-lined rectangle in 'A'. 'B' highlights sample of information documented on the hand-drawn maps. Note the following labels in 'B'. '1': Name of the energy-giver or energy-receiver; '2': Caste of the energy-giver or energy-receiver; '3': Item code of the solar-item assigned to a particular energy-receiver; '4': Icon indicating the type of solar-item; '5': Starting date of energy exchanges with an energy-receiver. The names of the energy-giver and energy-receivers mentioned on the map have been concealed for anonymisation. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

provided small amounts of rice and wheat grains and 100 Indian rupees in cash as payment.

4.2.2 Vignette-2: energy exchanges with Pavan Manjhi at Rampur

Pavan, an aged villager, belongs to the Manjhi caste group. Manjhis are the lowest caste group at Rampur, and they report suffering from acute poverty. Manjhi men and women often work as agricultural labourers for local farmers. Nita, the energy-giver at Rampur, is a higher caste (Yadav) landowner. She describes her relationship with Pavan's family as that of a village acquaintance. This association periodically also takes the shape of a cultivator-labour relationship as Pavan, and his family members on occasions work in Nita's agricultural field in return for a wage. Pavan's household became an energy-receiver right at the start of the study. Pavan spoke of numerous benefits of the solar lantern. He specifically mentioned the benefit of the solar lantern for his grandchildren who used it to study as a replacement for oil-based lamps, which are considered unsafe and precarious to health. Nita decided a rent of three rupees for each charging of a solar lantern. She reasoned that asking for a small rent from Pavan and other acquaintances are essential for her household's economic needs. Pavan's family

obliged and made payments on a few occasions. Nita was pleased with ongoing energy exchanges with Pavan's household. However, surprisingly, Pavan's family terminated the energy exchanges within a month from the start. They started fearing the accumulation of financial debt. Historically, the perpetual debt has been used by land-owners and higher caste groups to socially and economically control Manjhis. Before the prototype installation, Nita had estimated that many Manjhi households would become energy-receivers due to their acute need for the solar-items and her willingness to provide them. However, this estimate was far removed from what emerged after the prototype introduction. Many Manjhi households at Rampur, even when they needed the solar-items, refused to engage in a monetary energy exchange with the Nita as they started viewing these energy exchanges in connection with the history of their inter-caste relations with Yadavs.

4.2.3 Vignette-3: energy exchanges with Mahesh Yadav at Rampur

Nita lives in a joint family group along with the nuclear family of Mahesh Yadav, her elderly father-in-law. Nita offered Mahesh a solar lantern for his personal use. Mahesh willingly accepted the offer and reported the solar lantern, to be of immense use for his mobility after sunset. For the entire duration of the study, Mahesh would use the solar lantern, and once discharged, would give it to Nita for recharging it. Nita did not ask or even mention any rent to Mahesh. Similarly, Mahesh did not provide any tangible (cash or in-kind) return, yet Nita was satisfied with these exchanges. Her behaviour was in contrast with energy exchanges with other energy-receivers with whom Nita assertively demanded monetary returns for providing energy. Nita explained that as a daughter-in-law, she must share things and resources needed by members of her joint family group. Nita added, 'this is how we live', an aspect of local social life that other villagers confirmed. She further clarified that if she had not offered the lantern to Mahesh, her relation with Mahesh would have been jeopardised. She was satisfied that these energy exchanges allow her to maintain healthy social relations with her joint family group.

5 Anthropological general understanding

In the reported study, the ethnographic particulars indicated how energy exchanges that emerged at Rampur and Manpur are connected to dimensions of social relations such as friendship (Vignette-1), caste (Vignette-2), and kinship (Vignette-3). These insights are attractive but are *particular* and *specific* to Rampur and Manpur. These ethnographic particulars may not be directly helpful for researchers and practitioners in other parts of the world. For instance, how the structure of caste shaped energy exchanges at Rampur is intriguing but may not be helpful for contexts where caste dynamics are not present. These ethnographic particulars insights become more useful for

researchers and practitioners working beyond the specific field when the particulars are made connectable and relatable for them.

In this section, we describe the ‘anthropological general understanding’ track of our AtD approach. This track aims at moving from ethnographic particular understanding to anthropological general understanding of an emergent phenomenon⁴. The anthropological knowledge is generated in the vacillating journey involving switching between empirical observations and theoretical perspectives (Lund, 2014; Shore & Trnka, 2013). The *ethnographic particulars* are analysed, compared and translated into more abstract concepts, categories and frameworks, i.e. *anthropological general* understanding. Hence, the anthropological knowledge is composed of both *ethnographic particular* and *anthropological general* understandings. This section describes four intertwined and concurrent elements—*abstraction*, *conceptual comparison*, *contextualisation*, and *analytical generalisation*—for developing anthropological general understanding from the ethnographic particulars. Although these four elements are simultaneously enmeshed, we still describe these separately in the following sub-sections for the sake of clarity and communication. Here, our AtD approach builds upon the approaches by which sociocultural anthropology explains and interprets social and cultural life (See, Descola, 2005; Ingold, 2008; Shore & Trnka, 2013; Lund, 2014).

It is relevant to mention that both the tracks of anthropological general understanding and ethnographic particular understanding of the AtD process are closely connected and sometimes overlapping. For instance, when a researcher returns from a field-visit and writes an analytical reflection on an observation, he or she is already starting to connect the *specific* and *particular* from the field to a more *general* understanding. The four elements of this track are operationalised in the writing of the field-notes and are foregrounded in the analysis of ethnographic data. In the reported study, the design anthropologist conducted an in-depth data analysis of the field-notes, diary entries, hand-drawn maps, photographs, and interview transcripts. NVivo, a qualitative data analysis software, was used for the cycles of coding and memoing (Bazerley & Jackson, 2013). Coding is relevant for summarising, reducing and condensing the data (Saldaña, 2016). Memoing captures the analytical reflection, emergent categories, and themes from the data analysis (Emerson et al., 2011; Saldaña, 2016). The design anthropologist cross-checked the key emergent findings with the energy-givers and other villagers through telephonic and face-to-face conversations.

5.1 *Abstraction*

In the AtD approach, ‘abstraction’ is an incremental process of moving from ethnographic particulars towards conceptual ideas about an emergent phenomenon. The process of abstraction in anthropology is generally described

as ‘an attempt to identify inherent decontextualised qualities or properties in the studied events’ (Lund, 2014, p. 229). This process of abstraction encompasses examining the empirical findings in the light of concepts. The use of concepts is central to the selecting, describing, analysing, and abstracting of empirical data (Lund, 2014). See Table 4 for some of the abstract ideas that emerged while analysing the three vignettes utilising the concepts of ‘exchange’, ‘social relations’, ‘caste’, and ‘payment’. Ethnographic particulars become examinable, comparable, and discussable through concepts in this process of abstraction. The choice of the concepts emanates from the framing and other tracks of the AtD process and a researcher’s interests. For instance, frames of ‘exchange’ and ‘social relations’ were identified during the start of the study. However, the concepts of ‘payment’ and ‘caste’, a more specific aspect of ‘exchange’ and ‘social relation’ respectively, came to the fore due to the energy exchanges that emerged in the field.

Table 4 Anthropological generalised understanding in context of three vignettes

	<i>Definition</i>	<i>Vignette-1</i>	<i>Vignette-2</i>	<i>Vignette-3</i>
Abstraction	It is an incremental process of moving from <i>ethnographic particulars</i> towards conceptual insights about an emergent phenomenon.	Energy exchanges with ‘friends’; Cash and In-kind payment; For maintaining friendship	Energy exchanges with ‘other’ caste group; Monetary payments; For material gain	Energy exchanges within joint family group; Non-monetary exchanges; For moral obligations
Conceptual Comparison	It is a process of comparing <i>ethnographic particulars</i> with the views and knowledge from outside.	Comparison with concepts of sharing and bartering; Exchanges amongst social relations in other societies	Comparison with concept of energy-trading; Exchanges between distinct social groups in other societies	Comparison with concept of sharing; Exchanges amongst kinship relations in other societies
Contextualisation	It is a process of locating the materialising understanding of an emergent phenomenon within the local and global contexts, discourses, and meanings.	Local values about asking money from friends; Energy poverty	Caste-based setup; Economic poverty; Energy poverty	Patrilineal and patrilocal setup; Joint-family living; Energy poverty
Analytical Generalisation	It is a process of constructing a conceptual and theoretical understanding of an emergent phenomenon.	Mutual Energy Sharing; In-kinds and In-cash returns; For the sake of social relations	Mutual Energy Trading; In-cash returns; For the sake of material gains	Mutual Energy Sharing; Intangible returns; For the sake of social relations

5.2 Conceptual comparison

In the AtD approach, ‘conceptual comparison’ is a process of comparing the ethnographic particulars with the views and knowledge from outside. Comparison is an innate part of an anthropological knowledge construction process (Descola, 2005; Ingold, 2008; Sanjek, 2010). Comparison is often described as a ‘*means to clarify the significance of the anthropologist’s findings, through creating contrasts, revealing similarities with other societies, and to develop (or criticise) theoretical generalisations*’ (Eriksen, 2004, p. 34). For comparison, anthropology utilises concepts to organise and interpret empirical observations and events from the field (Schneegg, 2014). The process of conceptual comparison is filled with juggling between specific findings on the selected concepts from the perspective of research participants and the current external understanding of these concepts. For instance, in the reported study, we compared the energy exchanges that emerged at Rampur and Manpur with the concepts of ‘energy trading’ and ‘energy sharing’ in the energy literature. We contrasted energy exchanges that emerged in the field with anthropological texts on different exchanges, such as sharing, trading, and barter. Furthermore, we searched and examined the reports for any description of social relations and different types of payments in energy systems located in the global South and the global North. See Table 4 for comparisons specific to the three vignettes. This process helped us recognise conceptual similarities and differences between the energy exchanges at the field-sites and existing knowledge about the energy exchange in general. Overall, this process of conceptual comparison contributed to ‘*making the exotic familiar and the familiar exotic*’ in the construction of anthropological knowledge (Eriksen, 2004, p. 34).

5.3 Contextualisation

‘Contextualisation’ is a process of locating the materialising understanding of an emergent phenomenon within the local and global contexts, discourses, and meanings. Elucidating the context of empirical findings is critical for anthropological knowledge (Descola, 2005; Shore & Trnka, 2013). In the reported study, some contexts such as economic and energy poverty were the relevant backdrop for understanding the energy exchanges. Some other contexts, such as the inter-caste relationship (Vignette-2) and the patrilineal and patrilocal setup of the villages (Vignette-3), were crucial to understanding the specific energy exchanges. See Table 4 for examples of some relevant contexts for the three vignettes. The attention to these diverse contexts helped us comprehend the reasons for variations in the energy-givers’ preferences when exchanging energy with different social relations. For instance, Nita shunned monetary payments from her father-in-law (Vignette-3) but desired those with her acquaintances (Vignette-2).

5.4 Analytical generalisation

In the AtD approach, ‘analytical generalisation’ is a process of constructing a conceptual and theoretical understanding of an emergent phenomenon. An analytical generalisation is distinct from empirical generalisation (Lund, 2014). An empirical generalisation is an approach to extrapolate findings from the field as a valid representation for other settings or groups of people (Lund, 2014). In contrast, analytical generalisation is the process of identifying and bringing forth ‘*fundamental or constituent properties in an event or phenomenon*’ (Lund, 2014, p. 226). An analytical generalisation is central to an anthropological knowledge generation endeavour and works with the critical use of concepts (Moore & Sanders, 2014). This process comprises of back and forth movement analysing and comparing the *specific, concrete, and local* with the *general, conceptual, and global* understanding. The AtD approach does not intend to develop general laws of society or empirical generalisation; instead, it aims to improve the conceptualisation of an emergent phenomenon.

As indicated by the three vignettes, the ethnographic particulars were about specific social relations such as friendship, caste, and kinship. However, in light of our research questions (section 2.3), we moved towards a more generalised understanding by connecting these particular findings with the anthropological discourse of *mutuality* or social relations. Mutuality refers to people’s ability to socially associate with others, form relationships and live life through these social ties (Gudeman, 2016). See Table 4 for some of the results of analytical generalisations specific to the three vignettes. In this process of creating an anthropological general understanding, the study resulted in two key conceptual outputs—a taxonomy of *mutual energy exchanges* (Singh et al., 2017) and a classification of energy returns (Singh et al., 2018).

We defined a *mutual energy exchange* as a social and personal transaction of energy between an energy-giver and energy-receiver, which is mutually structured and negotiated. Further, we described two distinct types of mutual energy exchanges—*mutual energy sharing* and *mutual energy trading*. *Mutual energy trading* is a mutual energy exchange performed for the sake of material or monetary gain. In contrast, *mutual energy trading* is a mutual energy exchange performed for the sake of the social relationship between exchangers. Sociability and sociality are foregrounded in the cases of mutual energy sharing. On the other hand, rational thinking, economic calculations, and strategising for material benefits are at the fore in mutual energy trading. Utilising the ethnographic particulars, we demonstrated how these two types of energy exchanges are conceptually distinct, dialectically conjoined, and invoked diverse values embedded in different notions of moralities.

We defined three types of energy returns—*in-cash*, *in-kinds*, and *intangible*. An *in-cash return* is ‘a payment made by an energy-receiver to an energy-giver for

the energy provided in the form of currency notes and coins. An *in-kind return* is *'a payment made by an energy-receiver to energy-giver for the energy provided in the form of a thing or work of economic value'*. An *intangible return* is *'a return in the form of unmeasured and unquantified social gestures and actions, such as goodwill or social support, made by an energy-receiver in favour of energy-giver for the energy provided'*. Utilising the ethnographic particulars, we presented how people's preference for a type of energy return could vary with the dynamics of their social relationships. The research showcased that when people get to structure energy exchanges, they employ a range of social, cultural, moral and economic notions that transcended the dominant notions of economic rationality as suggested by the rational choice approach. The study demonstrated that structuring energy exchange is a complex sociocultural process.

As the above summaries of the conceptual outputs indicate, the anthropological knowledge produced is more general as it analytically speaks of mutuality, values, moralities, and forms of exchange. A benefit of such analytical general outputs is that researchers and practitioners can utilise the concepts to investigate the emergent phenomenon in other sociocultural settings. For instance, in 2021, we are participating in a recently granted project, Local Inclusive Future Energy City Platform (LIFE), which will explore the concepts of mutual energy exchanges, in-kinds and intangible returns in the Netherlands. The anthropological knowledge produced in the reported study is providing inspiration and directions for design activities in the LIFE project. The concepts, such as in-kinds and intangibles returns, enable the researchers, designers, and energy practitioners involved in the LIFE project to develop specific research questions and design goals.

Overall, the research contributed to energy anthropology scholarship. The anthropological knowledge generated was communicated in scientific articles that included an article in a special issue on 'anthropology of energy' (Singh et al., 2017, 2018). The findings from the study were also presented and discussed at the Energy Anthropology Network panel, *'at the grid edge: homes, neighbourhoods and energy markets'*, at the European Association of Social Anthropologists Biennial Conference (EASA2020)⁵. These knowledge outputs are being discussed in various anthropological publications see (High & Smith, 2019; Johnson, 2019; Smith, 2019; Smith & High, 2017).

6 Discussion and conclusion

This article proposed an 'Anthropology through Design' (AtD) approach by reflecting on a longitudinal study on the emergent phenomenon of energy exchange between households. The article proposes AtD as research approaches to generate anthropological knowledge of emergent sociocultural phenomena through design activities. This article proposes a particular approach for doing

‘Anthropology through Design’. We view our AtD approach as a heuristic framework (Lund, 2014). It suggests, rather than prescribes a particular approach for doing anthropology through design. Further, the four tracks of the AtD approach—*Framing*, *Design Intervening*, *Ethnographic Particular Understanding*, and *Anthropological General Understanding*—are iterative and intertwined with each other. The proposed approach considers an *ethnographic particular* and *anthropological general* understanding of an emergent phenomenon to be ensuing from the dynamics of dialogues, performances, and relationships amongst design anthropologists, design intervention, and research participants. Further, the approach presents a way to generate anthropological knowledge of an emergent phenomenon by critically working with *concepts*. In this regard, the approach suggests four intertwined and concurrent processes of *abstraction*, *conceptual comparison*, *contextualisation*, and *analytical generalisation*. Overall, the proposed AtD approach implies the collaborative, emergent, generative, relational, performative, and dialogic nature of anthropological knowledge generated.

The AtD approach proposed in this article agrees with the scholars on endorsing the potential of design for anthropology (Gatt & Ingold, 2013; Smith & Otto, 2016). The proposed AtD approach is a way to conduct an anthropological study of an emergent sociocultural phenomenon, such as energy exchange, when a field for systematic and sustained ethnographic inquiry does not yet exist. In other words, the approach proposes a way for doing anthropology of an emergent phenomenon before it appears or has become dominant and widespread in the real-world. Design, through its intervention with a prototype, creates social situations for conducting field research, which still is the core feature of constructing anthropological knowledge. Design provides a creative and open arena for conducting an anthropological inquiry by generating possibilities for investigating an emergent phenomenon’s multiple social realities and people’s manifold beings shaping those realities.

In agreement with Halse and Boffi (2016), we view a design intervention as a form and means of anthropological inquiry. A design intervention is a vital engine of the proposed AtD approach. It constructs a material, social, and conceptual space for a sociocultural phenomenon to emerge and become observable for an anthropological inquiry. A crucial benefit of utilising an intervention is that it helps in generating knowledge that is grounded in performances and practices of an emergent phenomenon and not merely relying on what people *say* and *speculate* about what will happen when the emergent phenomenon becomes a social reality for them. For instance, the reported study indicated significant gaps between what the energy-givers and the villagers had speculated about the energy exchanges before the design intervention and what actually happened. In the context of an emergent phenomenon, the design intervention provides a handle to explore the gap between *what*

people say they will do and what they actually do, which is a relevant epistemological orientation in anthropology (see Beattie, 2014; Holy & Stuchlik, 2014).

In the AtD process, a prototype is a research instrument and is a crucial component of a design intervention. This view of a prototype is consistent with the discussion in design literature on prototypes as vehicles for research (Stappers, Sleswijk Visser, & Keller, 2015; Tironi, 2018; Wensveen & Matthews, 2015). In the AtD approach, a prototype acts as an infrastructure for the phenomenon to germinate, acquire performers, enable social situations for performances to emerge. The prototype acquires its meaning through its engagement and embedding in the social lives of the research participants (Lauff et al., 2020). In our AtD approach, the object of analysis is not the prototype itself but the performances and practices of a sociocultural phenomenon that emanates through the use of the prototype. An area for further research is identifying how the AtD approach can be utilised to study emergent sociocultural phenomena, such as racial discrimination in Artificial Intelligence based digital platforms, associated with grave ethical and moral issues. Any deliberate attempt to facilitate the emergence of such phenomena through a design intervention will be ethically and morally problematic.

The AtD approach aligns with the view that design anthropology is developing its own ‘*distinct way of knowing*’ that extends both the dominant approaches in design and anthropology (Kilbourn, 2013; Otto & Smith, 2013). The AtD approach works within a dialectic of intervening and observing. It takes into account both knowing by observing, as in traditional ethnography, and imbibes knowing by intervening or causing ‘change’ as in design. Hence, the AtD process answers invitations from many scholars to develop design anthropological approaches that simultaneously work with intervention and emergence (Hale, 2016; Smith & Otto, 2016). While Marcus, Rabinow, and colleagues discuss a ‘design studio’ as a ‘site’ for doing anthropology (Rabinow et al., 2008), our AtD approach views the ‘design-enabled field’ as the site.

In contrast to the innovative suggestion by Gatt and Ingold (2013) to view design as an alternative to ethnography in the process of anthropological knowledge production, the AtD approach suggests a closer and concurrent manifestation of both. A crucial difference between *design ethnography* and the AtD approach is that even though both engage with ethnography, they have very different purposes. *Design ethnography* utilises ethnography for the benefit of design (see Ball & Ormerod, 2000; Cranz, 2016). The AtD approach uses ethnography capacitated by design for the sake of anthropological knowledge. However, it is worth noting that the anthropological knowledge generated may inspire further design activities and actions, as reported in section 5.4. It hints at the potential of anthropological knowledge produced

in the AtD process to become material and ingredient for design activities and actions.

In the existing orientations in design anthropology, such as about *Anthropology with Design* and *Design for Anthropology*, designers and anthropologists are two distinct experts who hold onto their differentiated disciplinary identities and bring their distinct training and focus into a research inquiry. In contrast, we point to the possibilities of a unique profile of a ‘designer-anthropologist’—an expert practitioner who could simultaneously be a designer and an anthropologist and has the capability and skills to produce both design knowledge and anthropological knowledge. We invite scholars to pursue the development of the profile of ‘designer anthropologist’.

Even though a comparison of Research through Design (RtD) and AtD requires a more extensive discussion, we briefly mention a few points here. RtD is defined as a ‘*way of doing research in which design activities play an essential role in the generation of knowledge*’ (Boon et al., 2020). Both RtD and AtD aim to generate new knowledge. Moreover, our AtD approach is in line with the discourses of RtD in assigning design activities, design artefacts, and prototypes a central role in a knowledge generation process. However, the knowledge generated in RtD projects is often implicitly or explicitly intended for design (see Jonas, 2007; Koskinen & Krogh, 2015; Stappers & Giaccardi, 2017). In contrast, the primary goal of the AtD approach is to generate anthropological knowledge. Similar to diversity in RtD (Boon et al., 2020), it is not difficult to imagine possible diversity in the ways of doing AtD. It will be fruitful to identify and explore different approaches to AtD, for instance, through visualisation (Singh & Romero Herrera, 2019), serious games (Singh et al., 2015), living labs (Keyson, Guerra-Santin, & Lockton, 2017) and many more. We invite designers and anthropologists to explore such possibilities collaboratively and dialogically. Finally, in conclusion, ‘Anthropology through Design’ takes a strategic step in relocating ‘design’ from being an object of anthropology to becoming an instrument for doing anthropology. Consequently, AtD extends the conception of ‘design’ towards understanding and investigating the materialising social worlds—the emerging social realities and possibilities of lives people can make and inhabit in them.

Endnotes

1. In this article, we use the word ‘real-world’ to contrast with the ‘lab settings’. Here, ‘real-world’ refers to research ‘in the wild’, i.e. participants social life world. This distinction is important to emphasise as many design projects are also conducted through ‘lab settings’, where participants are brought into a lab environment and are removed from their everyday social life world.

2. Please note that the real names of villages and all the villagers have been changed in this article for the purpose of anonymity.
3. See (Lund, 2014) for more on *specific* and *concrete* aspects of qualitative analysis.
4. We understand that even anthropological general understanding is embedded in a particular time, space, and historical condition, hence is also ‘particular’.
5. 16th European Association of Social Anthropologists (EASA) Biennial Conference. New anthropological horizons in and beyond Europe. <https://easaonline.org/conferences/easa2020/>

Declaration of competing interest

None.

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References

- Alaszewski, A. (2006). *Using diaries for social research*. London: Sage.
- Alexiou, K. (2010). Coordination and emergence in design. *CoDesign*, 6(2), 75–97. <https://doi.org/10.1080/15710882.2010.493942>.
- Anastassakis, Z., & Szaniecki, B. (2016). Conversation dispositifs: Towards a transdisciplinary design anthropological approach. In R. C. Smith, K. T. Vangkilde, M. G. Kjærsgaard, T. Otto, J. Halse, & T. Binder (Eds.), *Design Anthropological Futures* (pp. 121–138). London: Bloomsbury Academic.
- Ballo, I. F. (2015). Imagining energy futures: Sociotechnical imaginaries of the future smart grid in Norway. *Energy Research & Social Science*, 9, 9–20. <https://doi.org/10.1016/j.erss.2015.08.015>.
- Ball, L. J., & Ormerod, T. C. (2000). Applying ethnography in the analysis and support of expertise in engineering design. *Design Studies*, 21, 403–421.
- Bazerley, P., & Jackson, K. (2013). *Qualitative data analysis with NVivo*. London: SAGE.

- Beattie, J. H. M. (2014). Understanding and explanation in social anthropology. In H. L. Moore, & T. Sanders (Eds.), *Anthropology in theory: Issues in epistemology* (pp. 130–140). Chichester, West Sussex, UK: Wiley Blackwell.
- Bellekom, S., Arentsen, M., & van Gorkum, K. (2016). Prosumption and the distribution and supply of electricity. *Energy, Sustainability and Society*, 6(1), 22. <https://doi.org/10.1186/s13705-016-0087-7>.
- Boon, B., Baha, E., Singh, A., Wegener, F. E., Rozendaal, M. C., & Stappers, P. J. (2020). Grappling with diversity in research through design. In S. Boess, M. Cheung, & R. Cain (Eds.), *Synergy - DRS international conference 2020* (pp. 139–151). <https://doi.org/10.21606/drs.2020.362>.
- Camarinha-Matos, L. M. (2016). Collaborative smart grids – a survey on trends. *Renewable and Sustainable Energy Reviews*, 65, 283–294. <https://doi.org/10.1016/j.rser.2016.06.093>.
- Carrier, J. G. (2010). Exchange. In A. Barnard, & J. Spencer (Eds.), *The Routledge Encyclopedia of Social and Cultural Anthropology* (2nd ed.). (pp. 271–275) New York: Routledge.
- Chaurey, A., Krithika, P. R., Palit, D., Rakesh, S., & Sovacool, B. K. (2012). New partnerships and business models for facilitating energy access. *Energy Policy*, 47, 48–55. <https://doi.org/10.1016/j.enpol.2012.03.031>.
- Coleman, S., & Collins, P. (2006). ‘Being ... where?’ performing fields on shifting grounds. In S. Coleman, & P. Collins (Eds.), *Locating the field space, place and context in anthropology*. Oxford: Berg Publishers.
- Cranz, G. (2016). *Ethnography for designers*. New York: Routledge.
- Cross, N. (2006). *Designerly ways of knowing*. London: Springer-Verlag.
- Dankl, K. (2017). Design age: Towards a participatory transformation of images of ageing. *Design Studies*, 48, 30–42. <https://doi.org/10.1016/j.destud.2016.10.004>.
- Davis, J. (1992). *Exchange*. Buckingham: Open University Press.
- Descola, P. (2005). On anthropological knowledge. *Social Anthropology*, 13, 65–73. <https://doi.org/10.1017/CCOL9780521846301.007>.
- DeWalt, K. M., & DeWalt, B. R. (2011). *Participant observation: A guide for fieldworkers*. Plymouth, United Kingdom: AltaMira Press.
- Dorst, K. (2015). *Frame Innovation: Create new thinking by design*. The MIT Press.
- Dorst, K. (2019). Co-evolution and emergence in design. *Design Studies*, 65, 60–77. <https://doi.org/10.1016/j.destud.2019.10.005>.
- Dorst, K., & Cross, N. (2001). Creativity in the design process: Co-evolution of problem-solution. *Design Studies*, 22(5), 425–437. [https://doi.org/10.1016/S0142-694X\(01\)00009-6](https://doi.org/10.1016/S0142-694X(01)00009-6).
- Dourish, P. (2006). Implications for design. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems - CHI '06*, 541. <https://doi.org/10.1145/1124772.1124855>.
- Emerson, R. M., Fretz, R. I., & Shaw, L. L. (2011). *Writing ethnographic fieldnotes*. Chicago: The University of Chicago Press.
- Eriksen, T. H. (2004). *What is anthropology?* London: Pluto Press.
- Eriksen, T. H. (2010). *Small places, large issues. An introduction to social and cultural anthropology*. London: Pluto Press.
- Erlhoff, M., & Marshall, T. (2008). *Design Dictionary: Perspectives on design terminology*. Birkhäuser: Basel.
- Findeli, A., Brouillet, D., Martin, S., Moineau, C., & Tarrago, R. (2008). *Research through design and transdisciplinarity: A tentative contribution to the methodology of design research*. Berne, Switzerland: Swiss Design Network Symposium 2008 67–91.

- Gatt, C., & Ingold, T. (2013). From description to correspondence: Anthropology in real time. In W. Gunn, T. Otto, & R. C. Smith (Eds.), *Design Anthropology: Theory and Practice* (pp. 139–158). London: Bloomsbury Academic.
- Gudeman, S. (2008). *Economy's tension - the dialectics of community and market*. New York: Berghahn Books.
- Gudeman, S. (2016). *Anthropology and economy*. Cambridge, U.K.: Cambridge University Press.
- Gunn, W., & Donovan, J. (2012). Design anthropology: An introduction. In W. Gunn, & J. Donovan (Eds.), *Design and Anthropology* (pp. 1–16). Farnham, England: Ashgate.
- Gunn, W., Otto, T., & Smith, R. C. (Eds.). (2013). *Design Anthropology - Theory and Practice*. London: Bloomsbury Academic.
- Hale, T. (2016). Meeting the Yeti: Learning about design ethnography and teaching anthropological habitus in a student-led project on “disconnection”. *Annals of Anthropological Practice*, 40(2), 207–218. <https://doi.org/10.1111/napa.12102>.
- Halse, J. (2008). *Design anthropology: Borderland experiments with participation, performance and situated intervention*. IT University of Copenhagen.
- Halse, J., & Boffi, L. (2016). Design interventions as a form of inquiry. In R. C. Smith, K. T. Vangkilde, M. G. Kjærsgaard, O. Ton, J. Halse, & T. Binder (Eds.), *Design Anthropological Futures* (pp. 89–103). London: Bloomsbury.
- High, M. M., & Smith, J. M. (2019). Introduction: The ethical constitution of energy dilemmas. *The Journal of the Royal Anthropological Institute*, 25(S1), 9–28. <https://doi.org/10.1111/1467-9655.13012>.
- Holy, L., & Stuchlik, M. (2014). Anthropological data and social reality. In H. L. Moore, & T. Sanders (Eds.), *Anthropology in theory: Issues in epistemology second* (pp. 141–150). Chichester, West Sussex, UK: Wiley Blackwell.
- Hunt, R. C. (2012). One-way economic transfers. In J. G. Carrier (Ed.), *A Handbook of Economic Anthropology*. Massachusetts, USA: Edward Elgar.
- Ingold, T. (2008). Anthropology is not ethnography. *British Academy*, 154, 69–92. <https://doi.org/10.5871/bacad/9780197264355.001.0001>.
- Johnson, C. (2019). Anthropology and energy policy. In M. Ozawa, J. Chaplin, M. Pollitt, D. Reiner, & P. Warde (Eds.), *In search of good energy policy* (pp. 69–75). Cambridge, U.K.: Cambridge University Press.
- Jonas, W. (2007). Design research and its meaning to the methodological development of the discipline. In R. Michel (Ed.), *Design Research Now* (pp. 187–206). Berlin: BirkhäuserVerlag AG.
- Keyson, D. V., Guerra-Santin, O., & Lockton, D. (Eds.), (2017). *Living labs: Design and assesment of sustainable living*. Springer International Publishing. <https://doi.org/10.1007/978-3-319-33527-8>.
- Kilbourn, K. (2013). Tools and movements of engagement: Design anthropology as a particular style of knowing. In W. Gunn, T. Otto, & R. C. Smith (Eds.), *Design Anthropology: Theory and Practice* (pp. 68–82). London: Bloomsbury Academic.
- Kjærsgaard, G., Halse, J., Smith, R. C., Vangkilde, K. T., Binder, T., & Otto, T. (2016). Introduction: Design anthropological futures. In R. C. Smith, V. K. Tang, M. G. Kjærsgaard, T. Otto, J. Halse, & T. Binder (Eds.), *Design Anthropological Futures* (pp. 1–16). London: Bloomsbury Academic.
- Kjærsgaard, M. G., & Otto, T. (2012). Anthropological fieldwork and designing potential. In W. Gunn, & J. Donovan (Eds.), *Design and Anthropology* (pp. 177–191). Farnham, England: Ashgate.

- Koskinen, I., & Krogh, P. G. (2015). Design accountability: When design research entangles theory and practice. *International Journal of Design*, 9(1), 121–127.
- Kumar, S. (2002). *Methods for community participation: A complete Guide for practitioners*. New Delhi, India: Vistaar Publications.
- Lauff, C. A., Knight, D., Kotys-Schwartz, D., & Rentschler, M. E. (2020). The role of prototypes in communication between stakeholders. *Design Studies*, 66, 1–34. <https://doi.org/10.1016/j.destud.2019.11.007>.
- Lemaire, X. (2009). Fee-for-service companies for rural electrification with photovoltaic systems: The case of Zambia. *Energy for Sustainable Development*, 13(1), 18–23. <https://doi.org/10.1016/j.esd.2009.01.001>.
- Lund, C. (2014). Of what is this a case?: Analytical movements in qualitative social science research. *Human Organization*, 73(3), 224–234.
- Mauss, M. (2002). *The gift: the form and reason for exchange in archaic societies*. London: Routledge.
- Moore, H. L., & Sanders, T. (2014). Anthropology and epistemology. In H. L. Moore, & T. Sanders (Eds.), *Anthropology in theory: Issues in epistemology second* (pp. 1–18). Chichester, West Sussex, UK: Wiley Blackwell.
- Murphy, K. M. (2016). Design and anthropology. *Annual Review of Anthropology*, 45, 433–449. <https://doi.org/10.1111/gena.12013>.
- Murphy, K. M., & Marcus, G. E. (2013). Epilogue: Ethnography and design, ethnography in design. .ethnography by design. In W. Gunn, T. Otto, & R. C. Smith (Eds.), *Design Anthropology: Theory and Practice* (pp. 251–268). London: Bloomsbury Academic.
- Otto, T., & Smith, R. C. (2013). Design anthropology: A distinct style of knowing. In W. Gunn, T. Otto, & R. C. Smith (Eds.), *Design Anthropology: Theory and Practice* (pp. 1–29). London: Bloomsbury Academic.
- O'Reilly, K. (2005). *Ethnographic methods*. London: Routledge.
- Parag, Y., & Sovacool, B. K. (2016). Electricity market design for the prosumer era. *Nature Energy*, 1, 1–6. <https://doi.org/10.1038/nenergy.2016.32>.
- Parry, J., & Bloch, M. (1989). Introduction: Money and the morality of exchange. In *Money and the Morality of Exchange* (pp. 1–32). Cambridge: Cambridge University Press.
- Polanyi, K. (2007). *The great transformation: the political and economic origins of our time*. Boston: Beacon Press.
- Rabinow, P., Marcus, G. E., Faubion, J. D., & Rees, T. (2008). *Designs for an anthropology of the contemporary*. London: Duke University Press.
- Saad, W., Glass, A. L., Mandayam, N. B., & Poor, H. V. (2016). Toward a consumer-centric grid: A behavioral perspective. *Proceedings of the IEEE*, 104(4), 865–882. <https://doi.org/10.1109/JPROC.2016.2520760>.
- Saldaña, J. (2016). *The coding manual for qualitative researchers*. London: Sage.
- Sanjek, R. (2010). Ethnography. In A. Barnard, & J. Spencer (Eds.), *The routledge encyclopedia of social and cultural anthropology* (2nd ed., pp. 243–249). New York: Routledge.
- Schensul, J. J., LeCompte, M. D., Trotter, R. T. I., Cromley, E. K., & Singer, M. (1999). *Mapping social networks, spatial data, & hidden populations*. Plymouth, United Kingdom: AltaMira Press.
- Schnegg, M. (2014). Anthropology and comparison: methodological challenges and tentative solutions. *Zeitschrift für Ethnologie*, 139, 55–72.
- Schön, D. A. (1984). Problems, frames and perspectives on designing. *Design Studies*, 5(3), 132–136. [https://doi.org/10.1016/0142-694X\(84\)90002-4](https://doi.org/10.1016/0142-694X(84)90002-4).
- Segelström, F., & Holmlid, S. (2014). Ethnography by design: On goals and mediating artefacts. *Arts and Humanities in Higher Education*, 1–16. <https://doi.org/10.1177/1474022214560159>.

- Shore, C., & Trnka, S. (2013). Introduction. Observing anthropologists: professional knowledge, practice and lives. In C. Shore, & S. Trnka (Eds.), *Up close and personal: on peripheral perspectives and the production of anthropological knowledge* (pp. 1–33). Oxford: Berghahn.
- Singh, A., & Romero Herrera, N. (2019). EthnoVis : Developing an Interactive Visualization as a Designerly Tool and Process of Longitudinal Data Analysis and Communication. In *Proceedings of the 4th Biennial Research Through Design Conference*. <https://doi.org/10.6084/m9.figshare.7855895.v1>.
- Singh, A., van Dijk, H. W., Wartena, B. O., Romero Herrera, N., & Keyson, D. V. (2015). “Electric city”: Uncovering social dimensions and values of sharing renewable energy through gaming. In *Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems (CHI EA’15)* (pp. 1519–1524). <https://doi.org/10.1145/2702613.2732929>.
- Singh, A., Strating, A. T., Romero Herrera, N. A., van Dijk, H. W., & Keyson, D. V. (2017). Towards an ethnography of electrification in rural India: social relations and values in household energy. *Energy Research & Social Science*, 30, 103–115. <https://doi.org/10.1016/j.erss.2017.06.031>.
- Singh, A., Strating, A. T., Romero Herrera, N. A., Mahato, D., Keyson, D. V., & van Dijk, H. W. (2018). Exploring peer-to-peer returns in off-grid renewable energy systems in rural India: An anthropological perspective on local energy sharing and trading. *Energy Research & Social Science*, 46, 194–213. <https://doi.org/10.1016/j.erss.2018.07.021>.
- Singh, A. (2019). *Conceptualizing inter-household energy exchanges: An anthropology-through-design approach*. Doctoral dissertation. The Netherlands: Delft University of Technology. <https://doi.org/10.4233/uuid:57be7165-2726-4a1a-b076-c5ed3988e00b>.
- Smith, J. M. (2019). Boom to bust, ashes to (coal) dust: The contested ethics of energy exchanges in a declining US coal market. *The Journal of the Royal Anthropological Institute*, 25(S1), 91–107. <https://doi.org/10.1111/1467-9655.13016>.
- Smith, J., & High, M. M. (2017). Exploring the anthropology of energy: Ethnography, energy and ethics. *Energy Research and Social Science*, 30(April), 1–6. <https://doi.org/10.1016/j.erss.2017.06.027>.
- Smith, R. C., & Otto, T. (2016). Cultures of the future: emergence and intervention in design anthropology. In R. C. Smith, K. T. Vangkilde, M. G. Kjærsgaard, T. Otto, J. Halse, & T. Binder (Eds.), *Design Anthropological Futures*. London: Bloomsbury Academic.
- Smith, R. C., Vangkilde, K. T., Kjærsgaard, M. G., Otto, T., Halse, J., & Binder, T. (Eds.). (2016). *Design Anthropological Futures*. London: Bloomsbury Academic.
- Stappers, P. J., & Giaccardi, E. (2017). Research through design. In *The Encyclopedia of Human-Computer Interaction* (2nd ed.). Interaction Design Foundation.
- Stappers, P. J., Sleeswijk Visser, F., Keller, A. I. I., Visser, F. S., & Keller, A. I. I. (2015). The role of prototypes and frameworks for structuring explorations by research through design. In P. A. Rodgers, & J. Yee (Eds.), *The Routledge Companion to Design Research* (pp. 163–174). New York: Routledge.
- Strengers, Y. (2013). *Smart energy technologies in everyday life: Smart utopia?* New York: Palgrave Macmillan.
- Tironi, M. (2018). Speculative prototyping, frictions and counter-participation: A civic intervention with homeless individuals. *Design Studies*, 59, 117–138. <https://doi.org/10.1016/j.destud.2018.05.003>.

- Van Veggel, R. (2005). Where the two sides of ethnography collide. *Design Issues*, 21(3), 3–16. <https://doi.org/10.1162/0747936054406708>.
- Wensveen, S., & Matthews, B. (2015). Prototypes and prototyping in design research. In P. A. Rodgers, & J. Yee (Eds.), *The Routledge Companion to Design Research* (pp. 262–276). New York: Routledge.
- Widlok, T. (2013). Sharing - allowing others to take what is valued. *Journal of Ethnographic Theory*, 3(2), 11–31.
- Zerriffi, H. (2011). Innovative business models for the scale-up of energy access efforts for the poorest. *Current Opinion in Environmental Sustainability*, 3(4), 272–278. <https://doi.org/10.1016/j.cosust.2011.05.002>.