

Utopian Design Space: Practical Concerns and Transformative Ambitions

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Abstract

Interconnected global crises have emphasized the need for alternative visions of the future, making transformative action urgent. Consequently, Sustainable Human–Computer Interaction (SHCI) has seen growing interest in exploring means to support radical and sustainable change, starting with grassroots, community-driven endeavors. This study explores the concept of Utopian Design Space (UDS) in the context of surplus redistribution in grassroots communities. The objective is to understand how practical concerns and transformative ambitions intersect, creating spaces that foster sharing and caring practices. Through action-oriented research, we examine six local projects, highlighting ICT's role in these initiatives. Our findings highlight the challenges and opportunities in managing values, scalability, sustainability and inclusivity within UDSs. We discuss how aligning ICT with community practices can foster socio-technical innovation and support transformative change, introducing the notion of prefigurative technology. These insights can help us envisage design spaces that foster utopian ideas like equitable resource distribution and generalized reciprocity.

RESEARCH HIGHLIGHTS

- Exploration of Local Contexts: Examines six grassroots community projects focused on surplus redistribution and the role of ICT in these initiatives.
- Introduction of UDS: Presents UDS as a framework where practical concerns and transformational ambitions intersect, promoting sharing and caring practices.
- Challenge to Established Economic Principles: Highlights how UDS promotes inclusivity, equitable resource distribution, community building, and shared responsibility through regular communal events.
- Concept of Prefigurative Technology: Discusses the use of ICT in UDS, emphasizing the alignment of technology with community values to support transformative change.
- Call to Action for Researchers: Encourages action-oriented researchers to integrate practical issues with utopian objectives to foster community-driven sustainability and innovation.

Keywords: *utopian design space; surplus redistribution; transformation; grassroots communities; prefigurative technology*

1. INTRODUCTION

Consumer capitalism, as it is sometimes called (Watkins, 2022), refers to the idea that consumer demand is often divorced from need, largely as a consequence of manipulation in the market. An obvious consequence of this separation is that many things that people own are underused. Further, as Gustave Speth has famously argued (Speth, 2008), human well-being requires us to reconfigure consumption in and through a ‘great transformation’ if the ecological abyss is to be avoided. This, in turn, requires an ideological reboot, as Mackinnon, for instance, has contended (MacKinnon, 2021). Some forms of consumption, notably food consumption, entail vast waste. It is estimated that about one-third of global food production is lost or wasted (FAO, 2011; Mokrane et al., 2023). Meanwhile, many households face food

insecurity (Nord et al., 2005; Birhane et al., 2014). The deep irony lies in the fact that what is so abundant for some that such levels of waste are seen, is scarce for others.

The contradictions of surplus and scarcity lie in complex global contexts that have local impacts. To address this issue, ‘glocal’ investigations into surplus (Ganglbauer et al., 2014) and scarcity (Engelbutzeder et al., 2023b) are, we argue, necessary to understand design opportunities and anti-designs (Rossitto et al., 2021a) for sustainable transformation toward ‘just enough’, a broad philosophy that can be found in local grassroots communities that aim for sustainability based on the sharing of abundant resources and relying on shared skills and mutuality (Engelbutzeder et al., 2023b). Grassroots movements stand as a veritable source of innovation (Seyfang and Smith, 2007), possessing the profound

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capability to mobilize the resources imperative for effecting a paradigm shift toward sustainable practices (Seyfang and Smith, 2007; Ferguson and Lovell, 2015; Tartiu and Morone, 2017; Weber et al., 2020; Ntoulos et al., 2024). This paper explores six local contexts to understand how redistributing surplus through grassroots communities may provide an alternative model, one that has wider aspirations, especially regarding sharing and caring practices.

Our contribution in this paper is the development of the concept, Utopian Design Space (UDS), within the realm of SHCI. UDS offers a socio-technical framework where practical concerns of surplus redistribution and transformative ambitions for sharing and caring practices intersect. As such, UDS is a specific form of 'imaginary' as described by George Marcus (Marcus, 1995). UDS '... illustrate[s] how science and technology (S&T) are imbued with and help to shape political purposes and understandings, ideals of economic growth, notions of credibility and visions of social and technological futures'. (Miller, 2020). Here, we appropriate the idea in support of the quest for 'big ideas' and 'new directions' in order to radicalize SHCI (Knowles et al., 2018) toward 'a holistic composition of philosophy, practice, material living, place and ideology' (Bardzell et al., 2021); we argue that UDS embodies a moral enterprise, engaging in discussions on fairness and communal decision-making, promoting ethical practices, social responsibility and positive community impact. Our study leverages Human-Computer Interaction (HCI) principles to explore how ICT can be aligned with community-driven sustainability initiatives, thus fostering socio-technical innovation. The involvement of ICT in these grassroots initiatives highlights the intersection of technology and community values, demonstrating how HCI can support and amplify sustainable practices. A practical example of this are Communal-Cooking-Events, which invite everyone interested to cook and eat together using rescued food and produce from a community garden. The surplus food is collected through the platform Foodsharing.de, while the coordination of the event and the garden activities takes place in different WhatsApp groups.

Our research aligns with the growing movement within SHCI to address systemic change. By presenting UDS as a framework, we contribute to HCI literature by providing a practical and theoretical basis for designing socio-technical systems that foster community resilience, equity and sustainability. We aim to inspire action-oriented researchers on how to tackle practical issues by linking them to transformative ambitions, focusing on grassroots communities and the ICT challenges they might face in different contexts. For this purpose, we discuss the concept of prefigurative technology within the context of UDS, aligning with SHCI's interest (e.g. (Tomlinson et al., 2013; Silberman et al., 2014; Light et al., 2017; Knowles et al., 2018; Nardi, 2019)) in designing systems that not only meet user needs but also promote broader societal transformations. The prefigurative notion encompasses a design that emphasizes means aligning with ends but acknowledges the complexity of the community artifact ecology (Bødker et al., 2016). UDS's prefigurative aspect involves recognizing the transformative potential in surplus, challenging orthodox norms while simultaneously building alternatives, fostering community and facilitating debates on appropriate technology to align with UDS's future vision.

In this paper we examine six spaces in which the practical concern of surplus redistribution and transformative ambitions for caring and sharing practices intersect. As such, used comparatively, they are a conceptual development from the notion of the socio-technical imaginary (e.g. (Jasanoff, 2015; Lustig, 2019)) in

that they both encompass description of current practice and the envisioning of a possible future through comparison. We focus on what is conducive and what is obstructive, specifically in relation to ICT. Our research highlights the challenges and opportunities in managing values, scalability, sustainability and inclusivity within UDS, thus contributing to HCI's understanding of how technology can support transformative change in real-world settings. The authors were and are founding members of the spaces we examine and have been actively involved as action researchers (Hayes, 2011) throughout the period covered. The presented places have in common that the usual economic rule of acquiring goods and services in a value-equivalent exchange for money is suspended. Our results highlight that exchange value, the foundation of capitalist economy, is replaced by caring and sharing practices concerned with innovative forms of gifting (Berns and Rossitto, 2019) that carry potential for change toward sustainability. The collaborative effort of the grassroots communities brings about tensions, negotiations and the development of rules governing actions. The interpretation of these rules, however, varies and this contributes to the evolution of practices.

In alignment with the special issue on Sociotechnical Design for Citizen Participation and Democracy, this paper contributes by demonstrating how UDS can serve as a model for fostering democratic participation and community engagement through socio-technical systems. By integrating democratic principles into the design and implementation of surplus redistribution initiatives, we highlight a design space in which ICT can be leveraged to support participatory governance, enhance trust and promote inclusivity. Our study provides empirical evidence and theoretical insights into the role of HCI in facilitating citizen participation and democracy within community-driven projects.

The structure of this paper is as follows: first, we review related literature on gifting, sharing and caring practices, as well as relevant research in SHCI. We then outline our research method, including data collection and analysis procedures. Next, we present the context of the six grassroots community projects examined in this study. This is followed by a discussion of the results, focusing on the factors that facilitate or hinder the successful connection of practical surplus redistribution with transformative ambitions. We then delve into the discussion, interpreting the implications of our findings for HCI and proposing design recommendations. Finally, we conclude the paper by summarizing the key insights and suggesting directions for future research.

We use UDS concept, then, in the following way:

- 1) UDS is formed at the intersection of current practical matters, which involve the redistribution of surplus without monetary exchange, and an envisioned future state achieved through self-organization in response to this practical issue, especially emphasizing sharing and caring practices as a means to effect transformative change.
- 2) UDS opposes established economic principles, by promoting inclusivity and equity in resource distribution.
- 3) UDS thrives on regular, communal events, fostering community building and shared responsibility for abundance.
- 4) UDS orients toward an idealized future, creating environments that prioritize diversity and solidarity.
- 5) UDS encourages debate, engagement and collaboration among community members, prioritizing open exchange of ideas and mixed viewpoints.
- 6) UDS recognizes the need for negotiation over fairness in resource allocation, allowing socio-technical innovation to emerge.

- 7) *UDS* is a conceptual realm that encourages designers to envision and explore innovative and transformative possibilities for change, transcending current constraints of surplus and scarcity.
- 8) *UDS* represents a community artifact ecology, which is shaped collaboratively by the community and carries for inspiration toward prefigurative technology (see chapter 6.2).

To ensure clarity throughout this paper, we distinguish between different uses of the *UDS* term. When referring to the overarching conceptual principle, we use *UDS* (italicized). When describing specific, observable instances, we use 'a *UDS*' for singular cases and '*UDSs*' for the plural. This convention allows readers to easily differentiate between the broader design concept and its particular applications across various social settings.

2. RELATED WORK

In the following, we refer to related literature on gifting, sharing and caring practices in order to highlight socio-economical discourses that reflect the tensions and ambitions emerging in *UDS*. Additionally, we connect with prior research in SHCI exploring themes of scarcity, surplus and abundance in the context of redistributive efforts. Furthermore, we incorporate literature from SHCI advocating for transformative approaches, embracing grassroots and community settings and proposing utopian design.

2.1. Gifting, sharing and reciprocity

The concepts of sharing and gift-giving, their linguistic origins and meanings have been shifting and changing over time, especially through the emergence of ICT-supported artifacts. As a consequence, the differentiation between the two concepts has become blurred (Light and Miskelly, 2015; Berns and Rossitto, 2019; Davies, 2019; Spence, 2019; Lampinen, 2021). Past work has highlighted the social importance of gifting in social contexts, describing the practice of gifting and the gift itself as foundational to social life, as something that produces and maintains social bonds (Mauss, 1966). Building on this, in recent years, this insight has been deployed in relation to the use of gifting, especially as an emotional resource, when using digital artifacts. Perhaps most notably, Spence (Spence, 2019) adopts the idea of inalienability from the field of sociology as a way to capture the distinctions between sharing and gifting online. Inalienability describes the social relationship that exists between the digital gift and its giver, which can be more important to the receiver than the gift itself. In the paper, Spence uses the example of creating a curated playlist of songs to illustrate the difference between gifting and sharing. The argument is that the generalization of creating and publishing a playlist for general consumption is what makes it an instance of sharing; while the emotional connection that is cultivated when a playlist is created specifically for another person is what warrants its status as a gift. Expanding this, later work explored the relationships between sharing and gifting in the context of food-sharing communities illustrating how, when gifting practices are expanded beyond traditional configurations (i.e. between friends or family members), the social and material conditions of giving and receiving a gift can become abstracted (Berns and Rossitto, 2019; Berns et al., 2021a). However, gifting can be likened to sharing in its essence, in that, in both instances there is no expectation of an equivalent reward.

The practice of sharing is defined by Belk (Belk, 2007) as an active practice of distribution, which 'can foster community, save

resources and create certain synergies'. The author distinguishes sharing as an alternative to the private ownership that is emphasized in both marketplace exchange and, to a degree, in gift-giving when private property is involved. In sharing, two or more people enjoy the benefits or costs of possessing an object or resource collectively. Yet, similar to gifting, John (John, 2013), Belk (Belk, 2007) and other academic work recognize that sharing is embedded in social and cultural norms, as it can either reduce envy and create feelings of community or create dependency and foster feelings of resentment and inferiority. Belk notes that sharing can manifest as 'sharing in', expressing communal sentiment, or as 'sharing out', dividing resources among relative strangers or if it is intended as a one-time act (Belk, 2017). These distinctions reflect how the degree of intimacy and proximity involved in sharing can vary considerably; e.g. giving resources to family, specifically children, is more akin to sharing than gifting as there is typically no expectation of reciprocation (Belk, 2007).

Discussions surrounding reciprocity (e.g. (Jaeggi and Gurven, 2013; Kizilcec et al., 2018)) are a common element throughout the literature on both gift-giving and on sharing. While certain norms underpin reciprocity (Gouldner, 1960; Kizilcec et al., 2018), the notion of 'generalized reciprocity' does not necessitate a one-to-one correspondence (Molm, 2010; Sahlins et al., 2017). In generalized reciprocity individuals give without expecting an immediate or specific return, relying on trust for a future reciprocation, especially on mutual support within a community (Graeber and Sahlins, 2017). In contrast, other scholars argue that 'true' gift-giving practices do not entail any compulsory requirement for a transfer in return (Godbout, 1998; Thygesen, 2019; Elder-Vass, 2020). Belk (Belk, 2007) adds that humans tend to share less when they perceive life and consumption as a zero-sum game. More recent work (Ikkala and Lampinen, 2015; Light and Miskelly, 2015; Lampinen, 2021) has highlighted the relationship between sharing, care and reciprocity drawing attention to feelings of unease or indebtedness people can feel when taking something for free or without making a payment or trade of equal value. Relatedly, past research on surplus food sharing illustrates how, within large sharing communities with many participants, multiple different social relationships emerge simultaneously. This means that while some members view sharing as a form of gifting that warrants non-material reciprocity (e.g. showing appreciation), some may simply view the exchange as a non-monetary transaction, while for others the act of sharing items for free is perceived as charity (Berns et al., 2023).

To sum up, in recent years, both gifting and sharing practices have become largely associated with efforts to create more sustainable and just societies (Light and Miskelly, 2015) and as dynamic alternatives to the market economy and the logic of the capitalist system (Engelbutzeder et al., 2023b). Albinsson and Perera (Albinsson and Yasanthi, 2012) explicitly argue that sharing is not exchange and that direct economic-based value is not apparent in sharing events. They explore the concept of collaborative consumption and non-monetary-based sharing events, such as Really Really Free Markets (RRFMs), as a means of promoting sustainability and raising awareness about overconsumption (Albinsson and Yasanthi, 2012). These events not only provide a platform for sharing goods and knowledge, but also foster a sense of community among participants. The difficulties of precise definition, and the fact of considerable overlap, lead us to label the resource redistribution practices observed and documented in this paper as 'sharing', for pragmatic reasons.

2.2. Caring practices

Feminist scholarship offers valuable insight into the complexities of caregiving and its implications for society (Tronto and Fisher, 1990; De La Bellacasa, 2017). From this perspective, care encompasses ‘everything that is done (rather than everything that “we” do) to maintain, continue and repair “the world” so that all (rather than we) can live in it as well as possible. That world includes [...] all that we seek to interweave in a complex, life-sustaining web’ (De La Bellacasa, 2017). Related to this, recent HCI and CSCW scholarship has delved into the concept of care, highlighting, for instance, how relationships of care can be configured between people and Internet of things (IoT) technology in the home (Key et al., 2021) and the ways in which care is enacted by asylum seekers’ case workers while they navigate digitized data-centered bureaucratic systems (Nielsen et al., 2023).

SHCI is evidently closely implicated in such discussions with a focus on developing and using technology in ways that promote environmental sustainability (Rossitto et al., 2022), social equity (Avram et al., 2017) and long-term well-being (Bhat et al., 2023). Specifically, recent work (Rossitto et al., 2022) has unpacked the intricacies of design in such contexts, illustrating how even well-intentioned socio-technical interventions have the potential to disrupt or neglect acts of care. The authors propose ‘digital environmental stewardship’ as a framework for examining and designing interventions concerned with care for the environment from a relational, rather than a transactional, perspective (Rossitto et al., 2022). Similarly, work by Light and Miskelly (Light and Miskelly, 2019) unpacks how the scale and transactional nature of what is widely conceived of as the ‘sharing economy’ does not offer the same care for the planet as more traditional and relational forms of sharing that take place in localized community settings (Rossitto et al., 2022). Connecting to this, Rossitto et al. (Rossitto et al., 2021a) explore the intricate relationship between caring practices and the organization of community-driven initiatives, highlighting how concerns for care and efficiency intersect and influence the design and use of digital technologies in community settings. Nonetheless, the authors highlight how care work is often invisible and typically recognized as ‘work’, and therefore it is typically rendered as irrelevant to technology design.

In the UDSs we examine in this paper, the primary practice is redistributing or sharing of material things such as food or clothes. However, people also help each other with problems and everyday tasks, and provide emotional support. We therefore draw on research that uses the concept of a ‘caring community’ (Wegleitner and Schuchter, 2018) in the sense of a local community in a neighborhood, a municipality or a region in which people mutually care for each other, support each other and jointly manage social tasks (Sempach et al., 2023).

2.3. Surplus, scarcity and abundance

We pointed out above that surplus and scarcity can co-exist. Economic facts, however, disguise the complex moral economy that underpins our behavior and that of others (see (Kessl et al., 2020)). In turn, assumptions about the ‘moral worth’ of beneficiaries in a sharing economy can lead to stigmatization and act as a barrier to participation. As a consequence, participation is hindered as people seek to avoid the stigma associated with being considered in indigence (Offer, 2012; Kessl et al., 2020; Edwards, 2021). Additionally, when beneficiaries view themselves solely as recipients in a one-sided process, it inhibits the development of a shared ideology and cooperative community engagement.

Instead, it leads to dependency, social exclusion and alienation, as highlighted by Kessl (Kessl et al., 2020).

In Engelbutzeder et al. (Engelbutzeder et al., 2023b) the objective was to shift the focus from ideas of scarcity, closely linked to orthodox economic concepts of marginal utility for the consumer and marginal cost for the producer. Instead, we advocated for a cooperative perspective on consumption and production practices, embracing the concept of the ‘prosumer’ (Ritzer et al., 2012). This viewpoint promotes the idea of individuals actively participating in both consuming and producing goods, fostering a more collaborative and mutually beneficial approach. We argued (Engelbutzeder et al., 2023b) that the emphasis on food sharing within SHCI has largely revolved around waste management challenges and their associated solutions, such as addressing ‘food poverty’. However, we propose an alternative perspective that considers food, material possessions and resources as inherently abundant and advocate for investigations into food resource sharing. The perceived scarcity arises from our inadequate distribution practices, which have yet to encompass novel approaches and frameworks. Shifting our focus to innovative distribution models allows us to reframe the issues and unlock the potential for abundance in these domains.

2.4. Sustainable HCI, communities and utopian design

Such arguments are relevant to the community of HCI if they have design or at least intervention consequences. Our interest lies in the design space for the kinds of intervention that may produce the change we advocate for, following a ‘growing movement of SHCI [that] has now congregated around the need for total system change’ as recognized by Bardzell et al. (Bardzell et al., 2021). The attributed (Blevis, 2007; Håkansson and Sengers, 2013; Tomlinson et al., 2013; Silberman et al., 2014; Light et al., 2017; Blevis, 2018; Knowles et al., 2018; Nardi, 2019) and further literature (Hirsch et al., 2010; Liu et al., 2018; Norton et al., 2019; Asgeirsdottir and Comber, 2023) argue to move beyond minor behavioral adjustments for individual consumers and embrace transformative approaches. Bardzell et al. (Bardzell et al., 2021) attest that ‘many of [that movement’s] writings are cautionary rather than offering alternative methodology or process’. The authors advocate for a holistic transition in both our approaches as HCI practitioners and in the systems we design. Lawo et al. (Lawo et al., 2020) contribute to this discourse by illustrating how ICT tools can co-evolve with user practices, fostering long-term transformations in community settings rather than isolated behavior changes.

Following the increasing demand for scaling up actions addressing sustainability, certain contributions within SHCI have aimed to explore how design can effectively support communities (Light and Miskelly, 2015; Biørn-Hansen and Håkansson, 2018; Light and Miskelly, 2019; Lampinen et al., 2022). In investigating an organic food community and its artifact ecology, Bødker et al. recognized three stages: becoming a community, everyday community work and building anew (Bødker et al., 2016). Biørn-Hansen and Håkansson, in a similar fashion, pinpointed three design implications for scaling up change (Biørn-Hansen and Håkansson, 2018): (1) ‘design to tap into existing resources and infrastructures when possible, and try to redefine “original” practices’, (2) design ‘[to foster] the collaboration between similar grassroots initiatives’ and (3) design ‘to empower community organizations and similar groups not only with technical solutions but also with ICT knowledge and skills’. Scaling transformative initiatives is often associated with the capacity of grassroots

movements to foster innovations and mobilize essential resources (Seyfang and Smith, 2007; Ferguson and Lovell, 2015; Tartiu and Morone, 2017; Weber et al., 2020). Ghoshal and Bruckman (Ghoshal and Bruckman, 2019) conduct a thorough analysis of the influence of social computing technologies on grassroots movement building. They identify inclusivity, privacy/security and social translucence as key values for the socio-technical practices of grassroots organizing. A related contribution (Ghoshal et al., 2020) emphasizes the crucial role of cultivating a technology culture characterized by inclusivity, participation and responsiveness to the diverse needs of communities. Their research offers valuable perspectives on the importance of incorporating grassroots viewpoints into technology development and practice, advocating for a more equitable technological landscape. In connection with this, recent research (Berns et al., 2021b) proposes a shift from a design centered on efficient exchange to one that encompasses social factors, including community building, the promotion of activism (Berns et al., 2021b), solidarity (Landwehr et al., 2021) and care (Rossitto et al., 2021a).

In our conceptualization of UDS, we draw upon Harrison and Dourish's (Harrison and Dourish, 1996) distinction between space and place. Within their framework, space represents a realm of potentialities, while place signifies the concrete practices that infuse meaning into this space. According to Shaw (Shaw, 2012), '[t]he design space for a problem is the set of decisions to be made about the designed artifact together with the alternative choices for these decisions'.

The focal point of our interest resides in the degree to which 'utopian design', as it is sometimes termed, can usefully be deployed to understand the role of ICT in the development of alternative choices of the kind we have outlined above. Utopian design as a concept has historically been applied in the main to architectural forms (see e.g. (Myers, 2015)). Having said that, Dorrestijn and Verbeek (Dorrestijn and Verbeek, 2013) use the concept in a way that has much in keeping with our agenda. For them, utopian design equates with design for well-being and involves 'user-influencing' for social engagement. They suggest that both persuasive technology and nudge theory are useful because they 'aim to develop methods to influence human behavior by design, in desirable directions'. According to Koskinen and Hush (Koskinen and Hush, 2016), social design works in three different ways: utopian social design, molecular social design and sociological social design. The concept of utopian social design 'positions design within the utopian principles of politics, counter-movements and design visions' (Koskinen and Hush, 2016). In this context, social design derives its significance from the utopian ideals that imbue the design results with meaning. Soch et al. (Soch et al., 2022) aim to develop a collective intelligence model for human-technology interaction (HTI) design that promotes peace, prosperity and happiness through design intentionality informed by utopian targets. This body of work relates to speculative design, emphasizing the significance of crafting speculative scenarios and narratives that challenge existing paradigms and inspire innovative thinking and encourage creativity in design (Auger, 2013). Chopra et al. (Chopra et al., 2022) discuss aspects of participation in speculative design and highlight its role in addressing tensions within grassroots communities.

Concluding our exploration of related work, we have delved into a rich body of literature that illuminates the intricate dynamics of gifting, sharing and caring practices. This serves as a foundational step in constructing a socio-economic framework in which UDS unfolds. Building upon this, our connection with prior research within SHCI has provided insights into endeavors of

surplus redistribution and their connection to themes of scarcity and abundance. Additionally, our exploration extends to literature within SHCI that advocates for radical transformative approaches. This body of work emphasizes the significance of understanding how design can support grassroots and community settings, aligning with the concept of UDS. In what follows, then, we describe our involvement in grassroots movements which aim at the self-organized redistribution of resources, the spaces for potential utopian design, with a particular emphasis on the use of technological artifacts and ICT.

2.5. Relating UDS to design approaches

All design is about change, but the scale and depth of that change can vary significantly. The concept of UDS stands out by explicitly focusing on radical transformation aimed at addressing systemic issues amidst pressing global crises. While various design methodologies in HCI, such as User-Centered Design, Participatory Design, More-Than-Human Design, Critical Design and Speculative Design, contribute valuable insights and principles that enhance the understanding and application of UDS in grassroots initiatives, UDS goes beyond their scope by envisioning and operationalizing systematic and holistic change. This change is both radical and optimistic, addressing urgent practical issues that threaten planetary disaster. Below, we provide context about each approach based on relevant literature and discuss how UDS relates to them.

User-Centered Design (UCD) is a design philosophy that prioritizes the needs, preferences and limitations of end users at every stage of the design process. Key principles of UCD include understanding user needs through research, involving users throughout the design process and iterating designs based on user feedback. Influential works in this field include Norman and Draper's work (Norman and Draper, 1986) emphasizing the importance of designing systems that meet the needs and capabilities of users and Gulliksen et al.'s (Gulliksen et al., 2005) framework for user-centered systems design.

UDS aligns with UCD by emphasizing the importance of designing technologies that meet the specific needs of grassroots communities. By focusing on users' practical concerns and transformative ambitions, UDS ensures that the resulting socio-technical systems are tailored to support community-driven surplus redistribution and sustainable practices. This user-centered approach is crucial for creating ICT solutions that are both effective and meaningful for the communities they serve.

Participatory Design (PD) involves all stakeholders, particularly end users, in the design process to ensure the outcomes meet their needs and expectations. Originating in Scandinavia during the 1970s, PD is rooted in democratic ideals and emphasizes collaboration, co-creation and empowerment. Key literature includes Schuler and Namioka's 'Participatory Design: Principles and Practices' (Schuler and Namioka, 2017) and Simonsen and Robertson's 'Routledge International Handbook of Participatory Design' (Simonsen and Robertson, 2012).

The participatory nature of UDS reflects the principles of PD by involving stakeholders in the design process. This approach fosters a sense of ownership and empowerment among community members, enabling them to co-create technologies that align with their values and goals. By actively engaging participants, UDS promotes the development of ICT systems that are deeply embedded in the social and cultural fabric of the community. UDS builds on PD's collaborative ethos but goes further by embedding these participatory practices within a framework that explicitly aims to disrupt existing socio-economic structures, promoting a future

oriented around sharing and caring rather than individualistic consumption.

More-Than-Human Design expands the focus of design to include non-human entities and ecological systems. This approach recognizes the interconnectedness of human and non-human actors and advocates for designing with an awareness of environmental impacts. Key contributors to this field include Giaccardi and Redström (Giaccardi and Redström, 2020), who discuss designing for more-than-human futures, and Coulton and Lindley (Coulton and Lindley, 2019), who explore designing with non-human agents.

UDS expands the scope of design considerations to include non-human entities and ecological systems, resonating with the principles of More-Than-Human Design. By recognizing the interconnectedness of human and non-human actors, UDS promotes sustainability and ethical considerations in the design of technologies for surplus redistribution. However, it also uniquely foregrounds the idea of surplus redistribution as a catalyst for social innovation, pushing the boundaries of traditional ecological considerations. This approach helps ensure that the designed systems contribute positively to the broader ecological context.

Critical Design challenges conventional assumptions and explores alternative futures through provocative and speculative artifacts. Developed by Dunne and Raby (Dunne and Raby, 2024), Critical Design aims to stimulate discussion and reflection on societal issues and the role of technology. It often involves creating conceptual designs that question the status quo and highlight the implications of current technological trajectories.

UDS incorporates elements of Critical Design by challenging traditional economic principles and exploring alternative socio-technical configurations. This approach provokes critical reflection on the role of technology in society and encourages designers to envision and implement systems that disrupt traditional power dynamics and promote social equity. UDS emphasizes practical interventions that challenge and reconfigure orthodox economic practices, advocating for socio-technical systems that support communal decision-making and ethical practices, directly confronting the root causes of social and environmental injustices. By doing so, UDS contributes to a broader discourse on sustainable and just futures.

Speculative Design involves imagining and prototyping possible futures to challenge existing paradigms and inspire innovative thinking. As articulated by Dunne and Raby (Dunne and Raby, 2013), this approach uses design to explore and critique potential future scenarios, encouraging audiences to consider the implications of various technological and social developments.

The speculative aspect of UDS encourages designers to imagine and prototype future scenarios where surplus redistribution leads to more equitable and sustainable communities. By creating speculative artifacts and narratives, UDS helps to envision potential futures that challenge existing paradigms and inspire innovative solutions. This forward-thinking approach is not just about imagining alternatives but about implementing real-world practices that prefigure these utopian ideals, fostering creativity and critical thinking about future possibilities.

These design approaches collectively inform and enhance the concept of UDS, providing a robust framework for HCI researchers and practitioners. UDS advocates for a radical and holistic approach to socio-technical innovation. By focusing on grassroots communities and surplus redistribution, UDS aims to foster environments where meaningful change can take root, challenging the status quo and envisioning a more sustainable and equitable future.

3. METHOD

This study employs a practice-based (Wulf, 2018) and action-oriented research (Hayes, 2011) methodology to explore socio-technical design supporting surplus redistribution within grassroots communities. Everyday practices serve as the unit of analysis (Schatzki, 1996; Reckwitz, 2002; Wulf, 2018). According to Reckwitz, practices represent the emergent level of the social, consisting of routine behaviors made up of various elements, including embodied knowledge and routines, mental activities and meanings and the materials and tools used (Reckwitz, 2002).

In connection with practice-based research (Hayes, 2018), action-oriented research advocates doing research ‘with people experiencing real problems in their everyday lives’ (Hayes, 2011) to foster understanding of a local context while also aiming to facilitate change. Our approach further aligns with the principles of post-normal science, a framework that is used in the case of uncertain facts, controversial values, questions of great importance and an urgent need for action (Funtowicz and Ravetz, 1994). This framework is particularly relevant as it explores alternative approaches to traditional socio-economic paradigms, challenging conventional growth-oriented models and emphasizing the need for sustainable and equitable practices (D’Alisa and Kallis, 2014).

Recognizing the complexity and uncertainty of contemporary life requires approaches that go beyond traditional paradigms. UDS entails negotiations around complex and interdependent ‘wicked problems’ (like answering the questions ‘who gets what, why and when’ as well as ‘are contributions to a project distributed fairly’) that often require prompt and substantial action. As action researchers, we seek to understand what characteristics support grassroots movements in order to envisage transformative potential, focusing on what is conducive and what is obstructive, specifically in relation to ICT, across the projects detailed below. Each project incorporates the qualities of UDS, highlighting factors that facilitate or inhibit change.

AuthorOne served as a co-founding member of all the analyzed projects. Data collection for each project aimed to answer the overarching question: ‘How can socio-technical design support each project?’. Thematic analysis was performed separately for each project, identifying distinct themes such as (Re-)Distributional Justice for the SharingEvent and SharingHut24/7 (Engelbutzeder et al., 2023a) and Food Resource Sharing and Abundance for the Chili-Project (Engelbutzeder et al., 2020; Engelbutzeder et al., 2023b).

After 3 years of investigating the six projects, a common theme emerged: all projects involved surplus redistribution intersecting with transformative ambitions. To explore this observation, two workshops were conducted with six researchers involved in the projects. These workshops utilized brainstorming to better understand and frame the observation as UDS. Subsequently, AuthorOne conducted a second round of thematic analysis on all project data, focusing on identifying the constituting qualities of UDS. The results were shared in two additional workshops with the involved researchers to discuss and refine the concept of UDS, which is presented in this paper. For a flowchart outlining the steps of the methodology see Fig. 1.

The participants were recruited from six community-based grassroots projects. Recruitment leveraged existing community networks and direct involvement in the projects. The study included 74 interviews with 85 participants, some of whom were interviewed multiple times in relation to the different projects. These participants represented a diverse cross-section of the community, varying in age, gender and background.

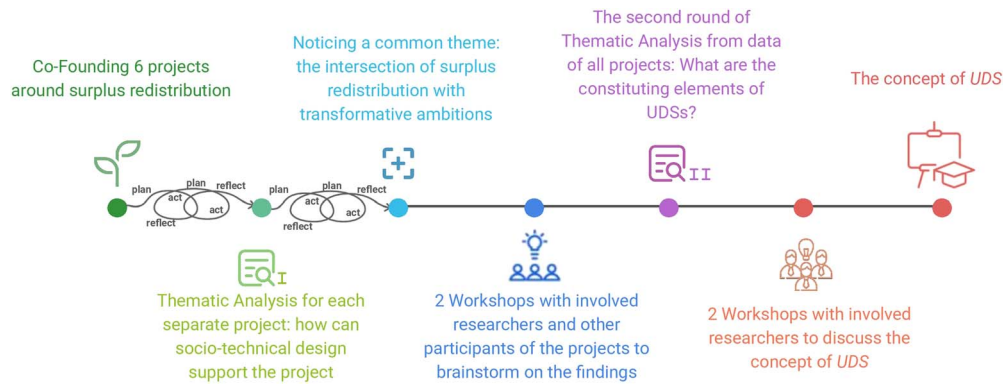


Figure 1. Flowchart outlining the steps of the methodology (inspired by Hayes, 2011).

This diversity ensured a wide range of perspectives on surplus redistribution and transformative practices. The sample size was considered sufficient to obtain a comprehensive understanding of the joint dynamics of the individual projects. Semi-structured interviews were employed as a reliable and purpose-driven method for gathering information and insights. They provided a flexible approach that allowed for both reliability and ease of understanding (Brinkmann and Kvale, 2022). Furthermore, our research design involved the integration of participant observation, enabling the researchers to actively immerse themselves in the practices being studied and to interact with people and objects involved (Bødker et al., 2022).

Our action-oriented research is characterized by cycles of planning, action and reflection (Hayes, 2011). This iterative process was crucial for exploring and supporting the socio-technical design of surplus redistribution projects. Regular meetings were held with volunteers to identify issues and plan interventions. These cycles enabled the continual design and evaluation of actions, with research results emerging iteratively during the process (Hayes, 2011). This iterative approach allowed for the collection of new research data and the refinement of emerging themes. The study has spanned 4 years, providing ample time for in-depth engagement and iterative development of insights.

Data were collected, in addition to interviews, from informal conversations, meetings and workshops (see Fig. 2). Data collection occurred in the natural settings of the projects, such as community gardens, communal kitchens and online platforms used by the participants. Field notes were written during and after the occasions and digital voice recorders were used for interviews. MaxQDA software facilitated the coding and analysis of qualitative data in keeping with Thomas' general inductive approach (Thomas, 2006) for qualitative data analysis. This broadly involves: (a) condensing material into a summary format; (b) establishing clear links between research objectives and the summary findings derived from the raw data (in our case: systematically mapping the identified themes and categories of UDS back to the overarching research question, ensuring that each finding directly related to understanding how socio-technical design can support projects associated with surplus redistribution); and (c) developing a framework for understanding and comparing the experiences or processes that are evident in the raw data.

Our research adhered to the ethical guidelines set by the authors' university, ensuring participant anonymity, and obtaining necessary permissions for data usage. All participants provided informed consent, being fully briefed on the research objectives, their role and their right to withdraw at any time. Confidentiality was maintained by anonymizing participant data

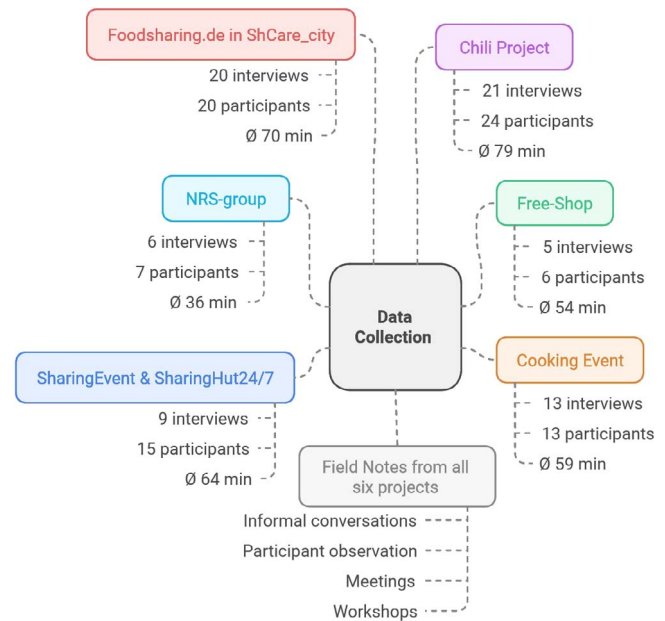


Figure 2. Data collection.

and securely storing all research materials. Notably, all the project names, figures and quotes presented below have been translated from German to English. Pseudonyms were used for participants and the city context.

Internal validity was ensured through the iterative cycles of action research, with continuous reflection and feedback refining the interventions and understanding. The findings may be transferable to similar community-based surplus redistribution initiatives, although they are context-specific. Reliability was ensured through consistent data collection methods and cross-validation of findings via multiple data sources and participant feedback.

4. CONTEXT: PROJECTS OF GRASSROOTS COMMUNITIES

Six design cases that arose in the context of a ShCare_city and whose joint analysis subsequently provided the conceptualization of UDS are described below, particularly with regard to the inclusion of ICT.

4.1. Free-shop

In the 'Free-Shop', people give away items they no longer need. Every Wednesday, between 10 a.m. and 6 p.m., visitors can

discover various items that volunteers have sorted, cleaned up and placed in a schoolyard of ShCare_city for people to take home. Customers frequently offer monetary donations, which are politely declined.

The Free-Shop is a creative-activist art project inspired by 'social sculpture' in honor of Joseph Beuys' 100th birthday. For Beuys it was especially important that every human being is an artist. For Beuys it was especially important that people become aware of this, that people recognize their co-creative nature and then also participate in shaping society according to needs and abilities.

To facilitate communication among helpers, a WhatsApp group was established. AuthorOne opted for WhatsApp instead of Telegram, which was the primary platform for coordinating local projects, because most Free-Shop volunteers were using WhatsApp at that time. Later, they also joined Telegram to participate in other projects. Within the WhatsApp group, however, work coordination was minimal. Instead, a few regular helpers would simply confirm their attendance the day before. A PAD (a web-based collaborative real-time editor) was thus created to coordinate fixed tasks but proved difficult to use for some helpers and was dropped by the community. The coordination occurred on-site with little reliance on formal meetings; instead, it unfolded in a somewhat chaotic manner. Some of the helpers held certain roles over a period of time and were also unwilling to hand them over to others or let them participate. Certain roles were popular because they conferred an advantage when it came to collecting material. The lack of effective coordination contributed to conflicts between volunteers with differing views on their rights over items and between volunteers and guests when guests were aggressive about their rights to donations. Other problems indicated a general tension between, on the one hand, the sharing philosophy and, on the other, some individualistic behavior. To a limited degree, these problems were mitigated by the regular posting of images, videos and information via a Telegram info channel, Facebook group and Instagram.

The dedicated WhatsApp group for the Free-Shop is frequently used for sharing photos, internal updates, personal greetings and task assignments. P1 wrote there that she would bring sausage salad and another person wrote that she would bring suitable bread. P1 reports, though, that while she finds digital media good for communication and networking and would welcome an app for these functions, she would not trade things online. She says that she would not buy anything on Ebay either, as she would rather see an item live and test it. P2 says that 'digital should not replace analog here because it is about creating community'. However, he believes that more digital offerings would be useful, e.g. to be able to organize car sharing. In no instance things have been offered in the WhatsApp group. Yet often members tried to reserve certain things in the Free-Shop and communicated their frustration in the WhatsApp group if the things were not there anymore.

4.2. Communal-cooking-events

Once a month, the Communal-Cooking-Event invites all interested people to cook and eat together. Rescued food from Foodsharing and produce from the community garden are used. Some evenings are designed to be country-specific and offer those who have moved to the local region a platform to present their culinary culture in order to engage in intercultural exchange through eating together.

In >4 years the coordination of the Communal-Cooking-Event has developed from individuals doing the main work to a well-

distributed set of tasks. The community places special emphasis on announcing before each event that 'we prepare, cook, eat and clean together'. To facilitate communication and coordinate tasks, a Telegram group was created that has been moved to WhatsApp, because more participants used it. There, a message that lists the persons responsible for the next Communal-Cooking-Event dates is continuously shared. Members copy the message, add their name to a date they choose to take over some kind of responsibility and repost it. Those members who did not know how to copy, alter and paste a message just wrote a message, asking if somebody could set their name to a specific date. Later, in addition to regular messages, a PAD was utilized to coordinate specific tasks required before or during the event, with a link to the PAD provided in the group description. Each task lists existing experts, along with a field for trainees to enter their names as they are being trained by the expert. The PAD also includes the task of ensuring that all roles are filled and communicating the status of the PAD to the WhatsApp group. In the following time, further functionalities of WhatsApp and the PAD were explained in personal meetings. Besides the WhatsApp group, where photos and videos from the events are shared, the organizers also use Facebook, Instagram and a Telegram channel to spread their message of community-oriented action.

The members who sign in to be responsible are the ones who coordinate food procurement through Foodsharing, urban gardens and shopping. On Foodsharing.de the team functionality of a store is converted to direct pick-ups from different 'lucrative' stores to the Communal-Cooking-Events. To this point food procurement through Foodsharing works, because for every event so far, an experienced Foodsaver has signed up. Another core responsibility is to stay until everything is cleaned and tied up. Between procuring food and the cleanup, there is an element of serendipity, described as 'creative chaos'. Those in charge contribute according to their skills, such as engaging with people about the event's purpose or coordinating the cooking teams.

A development that grew out of the Communal-Cooking-Event is an urban community garden. Organizers chose not to dispose of leftover cuttings through the regular city garbage. Instead, they built a compost area behind the building, which was later expanded with several raised beds. In more loose or close connections to the other UDSs presented here, four more communal gardens emerged in the local city. Similarly noteworthy, the organizers are noticing a steady dwindling of pots and pans from the kitchen, which is used by several dozen groups. Previously, the Free-Shop, which until a few months ago was still in the same building, had provided a steady surplus of kitchen equipment.

4.3. SharingEvent and SharingHut24/7

The weekly SharingEvent and the permanently open SharingHut24/7 are detailed in (Engelbutzeder et al., 2023a) focusing on the role of ICT. In response to the temporary closure of local food banks during the Covid-19 pandemic volunteers established a publicly accessible SharingHut24/7 to bring and take food. They also organized regular SharingEvents for (re-)distributing rescued and donated food. The project showcased the negotiation process of (re)distributional justice and emphasized community building to align technology's varied purposes and support the community in shaping artifact ecologies (Bødker et al., 2016). In our research (Engelbutzeder et al., 2023a), we focused on the conflicting use of Foodsharing.de, Telegram groups and Facebook, discovering that:

- Regarding ICT, minimal overhead was very important.

- Volunteers and helpers do not see computer literacy as high on their agenda.
- Tools were quickly dropped when some members had difficulties using them.
- The community coordinated its work through an artifact ecology.
- Telegram groups were also used to strengthen community building, which the Foodsharing platform was seen as too static for.

Subsequent developments have severely problematized the cohesion of the community. The Homeland-Association manager's passing was accompanied by accusations of social fraud against the organization. The two main authors of (Engelbutzeder et al., 2023a) had previously worked closely with the main manager and both SharingEvent and SharingHut24/7 were placed at the Homeland-Association. After his death, it became impossible for the two researchers to continue the jointly founded living-lab due to a lack of communication with the new executives. The community encountered numerous challenges during this period. The SharingHut24/7 had to close due to fire safety concerns. The weekly SharingEvent faced challenges in sourcing sufficient amounts of surplus. The community especially struggled to establish effective communication with Foodsharing ShCare_city to address the lack of surplus goods at the SharingEvent. Difficulties arose in formulating a comprehensive hygiene plan for a new SharingHut24/7 and in reaching an agreement among the involved associations regarding (legal) responsibility for it. Yet, the SharingEvent has not paused but rather has become a happening for a community of people that cares for each other also in other contexts.

4.4. Foodsharing.de and Foodsharing ShCare_city

Established in Germany in 2012, the Foodsharing initiative and its platform facilitate saving and sharing surplus food. Registered Foodsavers collect discarded food from businesses, keep it themselves or redistribute it for free to individuals or through SharingHut24/7s, as shown in Fig. 3. This principle ensures cost-free redistribution. Currently, ~158 000 Foodsavers and 14 800 food businesses participate, with >7200 pick-ups every day. Moreover, 572 000 Foodsharers can share through the platform's food basket feature, allowing users to offer food by uploading images and providing further details. This feature has seen >315 000 uses. The initiative operates in a decentralized manner, with (usually) elected ambassadors leading districts and overseeing coordination, public relations, event planning, business collaboration and rule enforcement. Store coordinators (FS-Store-Coordinator) are responsible for overseeing a Foodsaver team for a certain store.

In 2016, AuthorOne, closely tied to the German Foodsharing Network, played a key role in initiating ShCare_city's first Foodsharing Community. However, after relocating to ShCare_city in 2018, AuthorOne noticed a lack of community building in Foodsharing ShCare_city. Initially, members formed pick-up teams, treating the platform as 'micro-cosmoses' for coordinating food collection. In 2019, AuthorOne invited individuals through the NRS-group (see chapter 5.6) and Foodsharing.de for communal meals and discussions. This led to informal talks evolving into planned meetings, driving community growth and organization. Today, the community has expanded significantly. Four hundred Foodsavers manage 62 cooperations where surplus food is picked up and support the SharingEvent, three SharingHut24/7s and the Communal-Cooking-Events in ShCare_city. Monthly gatherings,

including virtual ones, aid coordination. Specialized groups emerged, addressing new member support, conflict mediation, public relations, sustainability and redistributional justice. The initiative evolved from fragmented pick-up teams to a well-organized, collaborative Foodsharing Community in ShCare_city. Foodsharing ShCare_city is using a private Facebook group to share information, events and food as well as a public Instagram account to share photos, videos, events and information.

The Foodsharing movement operates through distinct districts, overseen by appointed ambassadors who typically hold elected positions. These ambassadors assume the role of orchestrating the comprehensive administration within their respective districts. They therefore have a higher level of authority and decision-making power on the platform. Similarly, FS-Store-Coordination have certain rights on the platform. The hierarchies within the platform have sparked controversies and development of new hierarchical structures:

'[...] in my store I would like to do as I see fit. I am the [FS-Store-Coordinator]. If someone I know well wants to come in, then I put a check mark on it. And if I do not want someone in, then I exclude them. There is also a lot of injustice, a lot of abuse of power. Especially not only among those responsible for operations, but also among the ambassadors, who simply have the possibility of unverified people, kicking people out of operations, kicking [FS-Store-Coordination] out or putting them in. So, there is a lot of arbitrariness and there are still few recognized arbitration boards or there are not arbitration boards in every district that might be able to bring peace into it.' (Foodsharing-participant17)

4.5. Chili-Project

The Chili-Project and its context are described in (Engelbutzeder et al., 2020; Engelbutzeder et al., 2023b), focusing on the role of ICT in promoting communal food resource sharing. As part of our action-oriented research, we were an active part of the Foodroots Community, an offshoot of Foodsharing ShCare_city. Within this context, the Chili-Project emerged, involving the distribution of chili plants to adoptive parents. Participants were invited to join a Telegram group to foster a community of shared interest. In the paper we argued for a paradigm shift from surplus to abundance and emphasized the need for 'glocal' endeavors that foster deep change in food systems. The data presented was from the project's first year, now in its fourth. In contrast, attempts to replicate the project in another city ultimately foundered after a year. It is not entirely clear why, but a clue lies in the near-absence of message traffic that we interpret as a lack of collective narrative and community-building efforts that had been present in ShCare_city. Just sharing the seeds, project idea and educational material was maybe not enough.

Despite the enthusiastic start of the project, it also threatens to come to an end in ShCare_city. The initiator and main organizer states:

'I have the feeling that the project is running slowly. [...] It is reduced to distributing plants in spring. In the group there are hardly any questions asked or successes shared. It may be that this could be communicated better. I find that the project is already dead. As there is hardly any participation. Of course, parts of Chili-Project will be continued (the seed-box, tomato tasting, taking seeds at the seeds ferry) but I would not bother to grow plants for adoption and advertise again under the name Chili-Project. It was a great project in the first Covid year. The

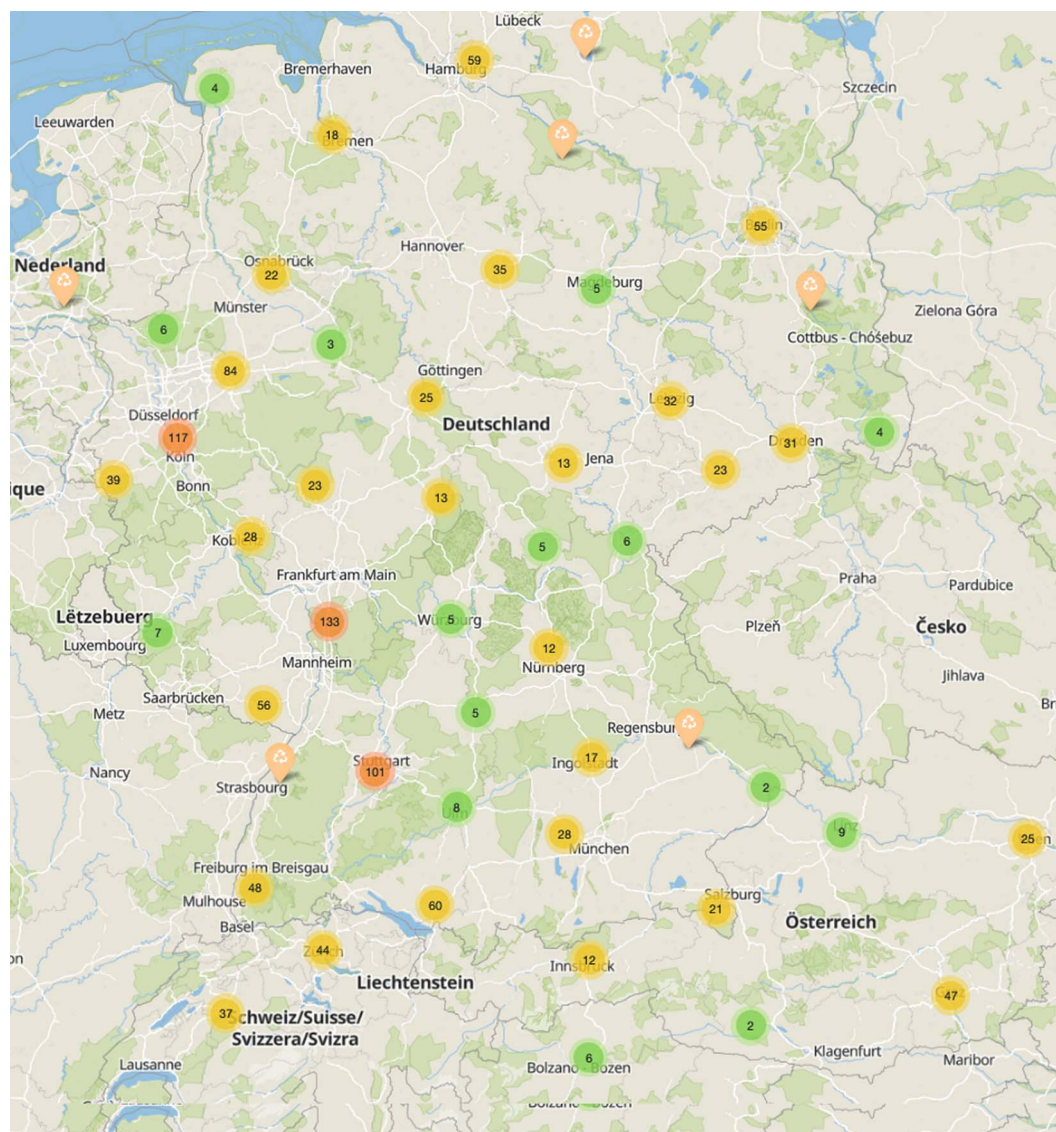


Figure 3. Publicly accessible map on Foodsharing.de displaying available SharingHut24/7 s.

year was also exciting when we started with tomatoes. Now it has fallen asleep. There is also no effort from the group or participants to creatively redesign the project.' (Telegram-message from Chili_participant10 to AuthorOne)

These outcomes raised questions about the project's future trajectory and the scalability. Since the project succeeds or fails on the level of community engagement, we seek to understand how we can foster that engagement better. Current attempts to revitalize it include the establishing of a new website that serves as a platform for the project. Notably, it incorporates educational modules, as depicted in Fig. 4. In addition, a proposed chatbot would fulfill various functions, including supporting the onboarding process by clarifying the purpose of the group and facilitating community engagement. It would assist participants in making informed decisions, such as selecting the appropriate tomato variety for their specific needs (e.g. suitable for balcony cultivation). Furthermore, the chatbot would disseminate recurring information and prompt participants to share the seeds and knowledge they acquired during the season, fostering the creation of an inventory. Another crucial aspect would be facilitating

connections between newcomers and experts by matching their respective needs and inventory. A further trial will take place as the project is initiated in city_B, where individuals and seeds from ShCare_city and city_B will converge.

4.6. NRS-group

The 'Natural Resources ShCare_city' Telegram chat group (NRS-group) is a public platform with ~2000 members, utilizing the Telegram messenger application. Telegram enables various forms of communication, including one-on-one and group messaging, channel-based information dissemination and integration with third-party applications. This cloud-based app supports voice and video calls and is accessible on multiple platforms. Initial registration requires a phone number verification via SMS or call. Inside a group, members can share messages, media files and use Telegram's features like stickers and surveys. Admins can pin essential messages atop the chat for visibility.

Interactions within the NRS-group are limited to Telegram's chat features. Therefore, organization and management of the sharing and gift-giving practices are primarily conducted via messages sent to and received from the NRS-group. User interactions



Figure 4. Educational material for growing tomatoes.

are structured around keywords like ‘Offering’ or ‘Searching’, indicating resources being shared or sought. Messages include details about the resource, its type, size, condition and location. Images are often attached for offered resources. The NRS-group promotes resource exchange via digital communication, which leads to physical resource exchange through personal meetings or designated pick-up points. This intertwining of digital and real-world interaction fosters social connections. Reciprocity and follow-up interactions also contribute to a sense of community building.

However, conflicts emerged, leading to the creation of a discussion group that established principles for conflict mediation. These guidelines clarified appropriate behavior, discouraging barter and emphasizing community-oriented sharing. Administrators managed this through explicit messaging in a pinned message and the implementation of a Bot (<https://missrose.org/>) to ensure smooth operation, reducing their workload. The group facilitates ~30–40 daily offers and searches. Some interviews revealed that individuals also engage with the group for entertainment or unexpected discoveries.

The NRS-group needs to clarify contact guidelines due to the excess private messages users receive when inquiring about offered resources, aiming to prevent confusion and message overload. Users also face challenges related to inaccurate resource descriptions, size/weight discrepancies and appointment no-shows. However, the impact of surplus redistribution on community building appears limited according to wider aspiration, primarily serving as a redistribution medium. Interviews suggest the NRS-group effectively coordinates resource sharing among members. Its success is attributed to established, intuitively learned rules that enhance the platform’s functionality:

‘Well, that is well regulated because there is also an extra discussion [chat]group, and I do not know now whether I read any rules or something at the beginning but that was then somehow clear, [...] at the beginning I observed a bit it was then clear that one writes at the beginning search or offer. And for me it is also clear that I do not start to discuss in the [chat] group but if I want something that I write to the people directly.

And that was somehow so natural for me. And then at some point later I also read from someone: Yes, please answer people privately.’ (NRS_Participant5)

4.7. Overview

The following table (Table 1) presents an overview of the projects presented in this chapter.

5. RESULTS

Our comparison of six projects is intended to highlight the factors that facilitate or mitigate against the successful connection of the practical issue of surplus and its redistribution with transformative ambitions, including the development of sharing and caring communities. We should note that one difficulty here, and hence a relevant factor, is that there is sometimes no agreement as to what success would look like.

The results provide insights into the design space that, we consider, needs to be addressed when practical issues and transformative ambitions intersect in grassroots communities. This understanding reveals the challenges that emerge in UDSs and helps derive design implications. HCI professionals can, in this way, link practical issues with utopian objectives.

After describing the emergence and manifestation of UDSs, our findings highlight that UDSs face challenges in managing values due to differing conceptions of fairness, scaling up effectively, ensuring sustainability and longevity through ongoing support and community engagement and overcoming barriers related to inclusivity and accessibility. These insights inform HCI researchers and practitioners about the nuances of the design space that can be directed at a utopian perspective on transformative community practices in the context of surplus redistribution.

Emergence and Manifestation: The redistributive practices we have highlighted are practices that occur through the coordination of redistributors and include picking up or delivering, sorting, positioning and distributing material and food that are surplus for various reasons and making them available for free to be taken and used by others. UDSs are created, in principle, by gathering surplus resources in one place and performing redistribution with the rule of ‘no exchange of things or food for money’. In this space, social innovations can emerge that support social cohesion, especially sharing and caring practices. Surplus then acts optimally as a catalyst for transformative ambitions. Our own aspirations as participants have always been to do with fostering a shift toward sharing and caring practices within the grassroots communities. This transformation is, or should be, multi-faceted and involves two essential aspects: the conversion of surplus into a gift and the subsequent metamorphosis of that gift into abundance. Acts of gifting at this level create opportunities for a culture of generalized reciprocity and solidarity to emerge that can nurture a sense of togetherness and mutual support. In the abundant environment that we advocate, the shared gift becomes a seed that germinates, producing a bountiful harvest of goodwill and resources, as the following quote illustrates:

‘There were some unknown foods at the SharingEvent. Among them was a product called “WaterDrops”. One guest said, “Come on, want to try this? I will make you one too?”. A conversation ensued about foods that are now available at SharingEvent that people do not know about. Among them were lychees, which were then tasted together with three other guests. The guest cut another apple and gave each of the other three guests a

Table 1. Overview of projects.

Project	Description	Appearance	Current ICT usage
Free-Shop	People can bring and take as many things as they want to a regular offline event.	physical UDS	WhatsApp group for sharing photos, internal updates, personal greetings and minimal task assignments
Communal- Cooking-Event	Surplus food and produce from the community garden are collected in a kitchen and cooked together.	physical UDS	WhatsApp group for sharing photos, internal updates and task assignments Foodsharing.de to coordinate pick-ups of surplus food
Sharing Event & SharingHut 24/7	Surplus food and produce of the community garden are collected in a kitchen and cooked together.	hybrid UDS	Telegram group to coordinate attendance of volunteers Another Telegram group for sharing information and photos regarding SharingEvent and SharingHut24/7 Foodsharing.de to coordinate pick-ups of surplus food
Foodsharing	Foodsharing supports saving and sharing of surplus food.	hybrid UDS	Foodsharing.de to coordinate pick-ups of surplus food and enable peer-to-peer food sharing Facebook private group to share events, information and food Instagram public page to share photos, videos, events and information
Chili-Project	Pre-grown chili plants are distributed to adoptive parents to form a community of interest.	hybrid UDS	Telegram group to share experiences, ask for advice and get expert information
NRS Telegram group	People can offer and search for resources online.	digital UDS	Telegram group to offer and request goods and services/Another Telegram group to negotiate rules

piece. There was then talk about what some of the foods were called in Arabic.' (Fieldnotes_03.09.2020)

Surplus resources can enable communities to collectively address issues and collectively develop future visions. In the context of the Free-Shop, e.g. some helpers offered additional support in filling out welfare applications and dreamed together of a world in which people share according to their needs and abilities. Where surplus redistribution exists, community members are encouraged to pool further resources and talents to tackle challenges that affect the entire community, such as education, healthcare or infrastructure. This collaborative problem-solving approach promotes a sense of collective responsibility and empowers individuals to work together for the betterment of the community.

In this way, redistributing surplus might produce a profound cultural transformation, dismantling the scarcity mindset, replacing it with an ethos of abundance. It reinforces the idea that the more individuals share with one another, the greater the abundance for the whole community (Engelbutzeder et al., 2023b). Ultimately, this shift cultivates a culture of sharing, caring and collective prosperity. Of course, what matters is whether such ambitions are realized within a UDS and, if not, why not. It must be emphasized that not all emerging practices can be considered as transformative, but the shared experience of co-creation constitutes a process wherein the reconstruction of an order occurs collectively and creates occasions that introduce cracks and ruptures into the hegemonic order (Waldenfels et al., 2011). Having said that, communities do not exist *sui generis*. They are built. There are processes of learning that are also essential to progress. Comparison of the six projects provide us with pointers.

In the context of ICT, we discern three manifestations: Physical, Hybrid and Digital UDS.

Physical UDS: The Free-Shop and Communal-Cooking-Event exemplify physical UDS, where surplus redistribution, sharing

and caring predominantly unfold in physical spaces, with ICT primarily serving for task coordination.

Hybrid UDS, as illustrated by endeavors such as the Chili-Project, Foodsharing.de, SharingEvent and SharingHut24/7, exhibit a fusion of practices spanning both physical and digital realms. Although SharingEvent could still be classified as a physical UDS on its own, the closely related SharingHut24/7 and Foodsharing.de spaces lean toward the hybrid category. For instance, the Telegram groups of Sharing Event and SharingHut24/7 facilitate the sharing of current food availability through photos, along with private food offers and requests. Foodsharing.de provides a public map displaying all SharingHut24/7 locations, coupled with additional peer-to-peer sharing functionalities. Crucial negotiation and decision-making processes within the Foodsharing ShCare_city community unfold through a combination of physical and hybrid meetings.

The digital UDS variant finds its expression in the NRS-group. While transactions occur physically, and personal relations form between members, the community and its rule-making practices, along with those that involve coordination and communication, predominantly unfold in the digital realm.

Managing values: The overarching sharing and caring is sometimes problematized by different conceptions of what is 'fair' or even what objectives should be prioritized (Engelbutzeder et al., 2023a). The following quote highlights Foodsharing participant13 reflection on sustainability goals in Foodsharing.de, wherein he discerns a clear contradiction when food is exclusively collected by car:

'But I notice in the community that this sustainability aspect is unfortunately often no longer lived, but that there are more or less only "car drivers stores", which people who actually live closer to the store can no longer join. [...] Those who have been with the "club" for a long time often have the feeling that

they have more rights and are already involved in stores that function like that. [...] They have integrated this into their everyday lives and are not prepared to give up their privileges. So, I think that's a general problem in our society, that at some point people take the privileges they have for granted and then do not want to give them back.' (Foodsharing_participant13)

Within UDSs, conflicts, power dynamics and orthodox economic practices can emerge, potentially undermining the cooperative and egalitarian principles. Differences in opinions, resource distribution, decision-making processes or leadership issues can weaken the cohesion and resilience of a UDS. Even though the anti-equivalent exchange philosophy contrasts with orthodox economic practices, they sometimes reinsert themselves. There is a view on the part of some members that merit should be rewarded, and that reward should be distributed according to individual performance and productivity. This was visible in discussions about who should be allowed to lunch at the Free-Shop, whether volunteers had 'first pick' at the SharingEvent, whether ambassadors for Foodsharing.de should have more extensive rights on the platform because of their responsibilities and so on. This tendency is also evident in the recent implementation of a tool on Foodsharing.de called 'commitment statistic', which displays how many pick-ups and other tasks a Foodsaver has done and can be accessed only by ambassadors and FS-Store-Coordiators.

Mismatched beliefs are also to be seen in attitudes on the part of some who see the investigated UDSs as charitable. Fairness was a particularly significant ideological issue in the SharingEvent (Engelbutzeder et al., 2023a) and Foodsharing ShCare_city. The voluntary developers of the Foodsharing.de platform introduced a novel feature called 'cherry-picking rule'. The rule empowers ambassadors to selectively limit the number of pick-ups for each Foodsaver from particularly 'lucrative' supermarkets within a specified timeframe. As one interviewee put it:

'And that is why I think there is an unspoken OK from both sides, so that for example Manuel, I, Alina and many others who are ideally behind it, say it is OK for us that we do the work and you somehow "only save food". We also get into a bit of a tangle in between because these interests also oppose each other. For example, the cherry-picking rule has been introduced and we are placing more and more value on it, so sustainability and redistributive justice, where locally and preferably by foot pick-ups are made, which of course also excludes people again.' (Foodsharing_participant1)

A developer reveals that the Foodsharing.de development is thinking about linking the functionalities of 'commitment-statistic' and 'cherry-picking rule':

'I think the cherry-picking rule is great. So, creating dependencies like that. We have this idea of coupling: you can pick up here, but in return you have to clean the SharingHut24/7 once a month. At the moment, this is done in such a way that someone really sits down in both teams [one for coordinating pick-ups and another for coordinating cleaning] and says: "ah, he has [cleaned] then and then, then he can pick up here, then I can confirm it". So, each slot confirmation sometimes takes five minutes. That is so much work to do. The cherry-picking rule takes a little bit of that off your hands.' (Foodsharing_participant17)

Scale and Scope: UDSs may struggle to scale up to larger communities or societal levels. UDSs require appropriate infrastructure, facilitation and support mechanisms to function effectively. Insufficient resources, limited access to technologies or a lack of organizational structures can hinder the development and sustainability of UDSs. The effectiveness and impact of these spaces might be limited to smaller, localized contexts, making it challenging to achieve widespread systemic change without careful consideration of the way in which the current infrastructure operates and how it might be successfully built on. We have noted, for instance, that although Foodsharing.de is widely and successfully used for certain purposes, other technologies are sometimes preferred, partly to avoid some of the hierarchical elements imposed by Foodsharing.de. Security and privacy concerns, particularly in Telegram and Facebook usage, may intensify with increased scale.

Scale-related issues also disclose the way in which information is shared. At a local level, ICT facilitates the documentation and sharing of grassroots experiences, best practices and lessons learned. This is almost entirely done in and through the use of existing facilities such as Telegram, Facebook and so on. Chili-Project participants created additional Telegram groups for sharing gardening knowledge and resources, expanding beyond chili plants. Involvement extended offline through friends, relatives and community interactions, fostering personal connections and initiating related activities beyond the original project. The important element of this is that of cross-fertilization. Simply put, ICT plays an important role in linking the different UDSs—it is important to sow seeds (projects) and nurture them (workshops, decision making processes, conflict management) in order to build a framework for the individual projects to grow into a common ecosystem that is interconnected and interdependent. In a socio-technical ecosystem that supports, e.g. the connection of NRS-group and Free-Shop, or of the public SharingEvent/SharingHut24/7 Telegram group to the functionalities regarding SharingHut24/7 at Foodsharing.de, or the possibilities of bringing ambitions such as seed-sharing in via Foodsharing.de. Public displays with sharing-and-caring-contents could be brought to the socio-technical ecosystem and we are currently engaged with that process.

Sustainability and Longevity: Maintaining the sustainability and longevity of a UDS can be a challenge. Without proper governance, ongoing support and community engagement, these spaces may struggle to sustain the desired sharing and caring practices over time. UDSs thrive on active engagement and participation from individuals and communities. If there is a lack of involvement and commitment from participants, it can weaken the collaborative and cooperative dynamics essential for a UDS to flourish. The problems that SharingHut24/7, for instance, experienced are evidenced in online communications. Thus, a message in the Telegram group 'SharingHut24/7 Achenbach' asked, '[h]as anyone been to the SharingHut24/7? Is there anything left there or has it already been looted?'. A respondent in an interview highlighted the majority's lack of engagement:

'I am a bit bitter at how selfish people are in relation to SharingHut24/7 and that they just rather look at what advantage they themselves have from it and not what advantage Foodsharing has from it. Tasks are not distributed fairly. The people who take care that SharingHut24/7 is built and organized, are then even the idiots who have to take care that it stays running.' (Foodsharing_participant2)

While conflicts arose steadily about the rapid disappearance of food in SharingHut24/7, about people who take the food others want to bring there directly from their car, about hygiene and the contribution that everyone could make to it and much more, a community emerged around the regular SharingEvent, establishing common practices for more equitable distribution (Engelbutzeder et al., 2023a). Similar observations were made for both the seeds-box and seeds-ferries in the Chili-Project. While the seeds-box placed in a library frequently remained devoid of seeds, the coordinators of the seed-ferries enthusiastically reported that the community consistently possessed a greater variety of seeds than previously.

A significant challenge for grassroots communities is external dependency, for such communities seldom exist isolated from wider society. External factors, such as government policies or market forces, can significantly impact the functioning and success of these spaces, making them vulnerable to external constraints. In our instances, the passing of the central coordinator of the Homeland Association, who consistently supported SharingEvent and SharingHut24/7, had an impact on both projects. Following this, SharingHut24/7 ceased to exist, and the adjacent garden, once tended to by the community, is no longer maintained. AuthorOne's confrontation with city officials over Free-Shop community needs led to its eviction from city-managed premises.

It is crucial to address these fragilities and develop strategies to mitigate risks and strengthen a UDS to ensure its long-term viability and impact. UDSs may face resistance or challenges from existing socio-economic systems and power structures. The influence of orthodox economic practices and social norms can impede the transformational potential of these spaces, hindering their ability to achieve widespread adoption. While by no means the only relevant factor, ICTs play a clear educational role.

Inclusivity and Accessibility: Ensuring inclusivity and accessibility within a UDS is crucial but can be difficult to achieve. Overcoming barriers such as language, cultural differences or unequal resource distribution requires careful consideration and design. In all UDSs, we noticed a tendency toward assistance with ICT evolving into a communal practice, such as aiding others in navigating Telegram and joining relevant groups. Analyzing issues within the Free-Shop revealed differing opinions on community membership rights and responsibilities, largely due to distinctions between insiders and others. Those who only take or bring things but do not also collaborate were referred to by Free-Shop_participant2 (P2) as 'visitors' who are not part of the 'core team'. P2 believes that most people share an overall vision that is broadly anti-capitalist, nevertheless the 'core team' has advantages in the distribution of items. For example, it is not uncommon for particularly good items to first be offered within the core team if anyone wants them before they 'go out to the masses'. Within the core team, the sense of community and cohesion, as well as helping each other, is particularly pronounced. Competition, envy and conflicts would hardly exist. For example, Free-Shop_participant5 (P5) says, 'It is like a flea market, except this flea market is like a family and there is hardly any competition here'. When asked, however, he explains that conflicts do occur, but mostly 'outside' with 'visitors' who do not help out.

P5 explicitly formulated a hierarchy: in first place for him is the 'community feeling', in second place the 'activities' and only in third place the things. This hierarchy implicitly divides members into (1) committed contributors who are primarily interested in community and meaningful activity, (2) visitors who simply want to take advantage of what is offered; donors, who shed their

surplus rather idealistically. The 'core team' exemplifies their commitments to a negotiative order rather than one where rules and procedures are imposed. The insider group subscribes to a strong ideology that has elements of environmentalism, alternative economics and a sharing and caring ethos. P2 explains that there is no exchange of equivalents here: 'I can give a pair of pants here and take a book, although the pants were more expensive, but that does not matter because I could not use the pants anymore, but I could use the book.' (P2). He finds a 'world without money' an interesting thought. He thinks someone could also trade a Ferrari for a pair of pants if they no longer needed the Ferrari but did need the pants.

When we contrast the Free-Shop (a physical UDS) with the NRS-group (a digital UDS), the most notable distinction lies in the varying degrees of community building. The NRS-group prioritizes surplus redistribution efficiency, whereas the Free-Shop rather follows the ethical principle of 'need before interest'. However, time also plays a role, i.e. P2 does not wait for the person with the highest need: 'The most important thing is to give things a new purpose. After all, we do not want to store things here forever. That would be a lengthy process, trying to figure out who is most in need, like an auction'. P2 further explains that not only does the exchange not have to be equivalent, it does not have to be between A and B, but can involve C: 'I might not return the favor now to the one who gave me something, but to another who needs help' (P2). This is generalized reciprocity in action. From an insider perspective, no distinction is made between sharing and caring. P2 says 'sharing is caring', emphasizing that sharing things automatically results in caring for each other. As a sense of belonging and community develops, the community becomes not only a sharing, but also a caring community. He speaks of mutual 'services'. Some would bring their children to the Free-Shop and one would take care of them together, e.g. go to the art room with them.

'From our perspective as people who are partially or fully involved, it is more of a caring community here, because we are not just taking care of ourselves, we are also taking care of each other. And the people who show up here as clientele form a sharing community.' (P5)

Attempts to regulate these visions through identifying levels of commitment were undertaken via Foodsharing.de's commitment statistic. Such regulative strategies seem to work, at least for insiders:

'I like the commitment statistics, but it always makes me angry, because I see from one specific person [...] how much is saved. Then I ask myself, where do all the things go? So, it is such a personal thing though and I get annoyed that so many slots are booked (by that person) then. So that is 7,8,9,10 pick-ups in a week.' (FS_participant10)

'[Through the commitment statistic] you can see how much others pick up. Some people have said that "I do not pick up very often", and then they pick up three times a week, but that is why I think you can use it to control things a bit. Definitely.' (FS_participant11)

These and many other observations by interviewees testify to the strong normative elements entailed in Foodsharing and the other projects. It does seem that there is a need for some monitoring of

processes such that people are seen to be making a commitment. 'Are people doing their share of the work? Are they being deceitful in their picking up of food? Is the wider agenda of sustainability being met?', are regularly raised questions.

6. DISCUSSION

Below, we discuss the implications of our findings for the field of HCI, particularly focusing on the emerging concept of a UDS that can support sustainable community practices, bridging the practical issue of surplus redistribution with the transformative ambitions inherent in the concept of UDS. By examining the challenges and opportunities identified in our study, we aim to provide actionable insights for designing socio-technical ICT systems that engage with surplus as a catalyst for supporting the emergence of sharing and caring practices, encouraging community engagement and supporting the long-term sustainability of grassroots initiatives.

In this chapter, we will:

- Discuss how UDS represents a unique concept linking of grassroots work with desired future states, creating environments that prioritize diversity, solidarity and ethical considerations. This includes examining how UDS challenges established economic principles by promoting inclusivity and equity in resource distribution.
- Explore the concept of prefigurative technology, a particular imaginary, which refers to technologies that embody the values and practices of a desired future state within UDS. This section will highlight how socio-technical innovations emerge through negotiation processes and the development of rules within grassroots communities.
- Provide actionable insights for HCI professionals that engage in similar issues.

By addressing these points, we aim to demonstrate how HCI research can guide the design and development of socio-technical artifact ecologies that empower communities and promote social, sustainable or utopian innovations.

6.1. UDSs as moral enterprises?

A UDS is constituted where there is both a current practical issue (redistribution of surplus and its redistribution) and a desired future state that is anticipated by grassroots communities self-organizing around the practical issues. The UDS concept refers to physical, hybrid or virtual spaces in which conventional social rules of action are suspended, and new rules and practices can be experienced and developed. We consider this to be an unusual feature of grassroots work, not seen in many other contexts, and hence one which requires a particular conceptual lens. UDS serves as an imaginary space for envisioning radical ideas and alternative designs that can be enacted by collectively working on a practical issue like surplus and its redistribution. As such, used comparatively, they are a conceptual development from the notion of the socio-technical imaginary (e.g.) in that they both encompass description of current practice and the envisioning of a possible future through comparison.

Both current practice and ideological visions are accompanied by tensions, negotiation processes and rules, a common theme within grassroots communities (Davies, 2019; Rossitto et al., 2021a; Berns et al., 2023). For UDS this does not mean surplus is a necessary or sufficient condition. It is an enabling factor. Redistribution introduces rules that determine 'who gets what, when and why'. The dynamic nature of UDS emerges, in the

instances we describe, when the redistribution of surplus is not limited to a singular event, but takes place regularly, both in a physical or digital place. Only in this regularity does the possibility for community building and development of sharing and caring practices toward abundance arise. In the process between surplus and abundance lies transformative power. At the same time, helpers engage in coordination and organization, deriving different benefits (SharingEvent: guests and helpers have equal chance of food; Free-Shop: helpers make first pick).

The redistribution of surplus sees the emergence of rules, procedures and practices that have a moral force, albeit a sometimes contradictory one. The point is that these emerge in and through performance, as Butler (Butler, 2015) terms it. This kind of negotiation process can also be envisioned in other contexts besides surplus redistribution. We argue that the six contexts we have described represent spaces within which the process of transformational education (Bildung) (Koller, 2011) can be involved. UDS thus potentially represent 'a process of the transformation of world- and self-relations that may develop when humans are confronted with certain problems without being provided with the means necessary for solving them' (Koller, 2011). Specific practices of sharing and togetherness, which have developed, e.g. within the SharingEvent or the Free-Shop, can be seen as a counter-design to prevailing practices of mutual exchange logic (with or without money). Within the projects described, developments took place that impacted on these logics.

Generalized reciprocity (Molm, 2010; Graeber and Sahlins, 2017; Sahlins et al., 2017) plays a crucial role within UDS, emphasizing giving without expecting an immediate or direct return. This practice fosters a culture of trust and mutual support, which is foundational to the sharing and caring practices within these spaces. The act of giving and sharing resources, without the expectation of direct reciprocation, cultivates a sense of community and collective well-being. By engaging in generalized reciprocity, community members contribute to an environment where surplus resources are transformed into communal abundance, reinforcing the ethical dimensions of resource redistribution and enhancing social bonds.

UDSs are constituted in their emergent opposition to dominant economic and social forces. They introduce participants to the striking challenge of surplus in a context in which they come into relationship with both the surplus and with others via its redistribution. Sharing things increases the likelihood that people care for each other (Light and Miskelly, 2015). As participants evoke and collectively experience further sharing and caring practices in UDSs they design notions of abundance (Engelbutzeder et al., 2023b). The success of a UDS, as we have seen, requires more than just surplus; coordination, organization and resource-pooling collectively contribute to the evolution of a UDS and the aspiration toward community building. Yet, UDS can be understood as spaces in which not only care for one another but also ecological care for the planet is practiced (Rossitto et al., 2022). In the use of surplus, the transformative power lies in the design space between surplus and abundance.

The steady flow of 'money-free' surplus leads to a progressive decline in orthodox economic practices in a UDS and promotes sharing, caring, resource-sharing and prosumption (Ritzer et al., 2012) practices. Even so, established economic practices like the merit principle (only those that contribute properly receive benefits), efficiency orientation (efficient resource allocation vs leisure and caring) and rational choice theory (e.g. presumption that those who pick up free stuff sell it elsewhere) can also be observed in UDSs. It is in the relationship or nexus of innovative and

orthodox economic practices that socio-ecological transformation can be experienced, researched and designed.

UDS refers to an idealized conceptual realm where designers can envision and explore innovative and transformative possibilities for 'holistic' change toward sustainability and the potential of technologies within them (Blevis, 2007; Hirsch et al., 2010; Håkansson and Sengers, 2013; Tomlinson et al., 2013; Silberman et al., 2014; Light et al., 2017; Blevis, 2018; Knowles et al., 2018; Liu et al., 2018; Nardi, 2019; Norton et al., 2019; Bardzell et al., 2021; Asgeirsdottir and Comber, 2023). Thus, there is some overlap in design approaches such as speculative design (Auger, 2013) and design fiction (Grand and Wiedmer, 2010), which also center around exploring alternative futures and challenging existing conventional assumptions around technology, ethics and society. However, UDS is not a design approach that also envisions undesirable scenarios. It is an inherently optimistic theoretical construct that encourages designers to think in between the current constraints of surplus and scarcity and imagine a future that is significantly better than the present (Engelbutzeder et al., 2023b). Knowledge about practices within UDS is critical because, as Rossitto et al. point out, '[a]nti-designs, i.e. technological explorations that can hinder care and caring as they meddle with, or disrupt, important relationships of volunteering and organizing', can exist, where rather than facilitating or enhancing care, these technological interventions may create barriers or challenges that impede the nurturing of supportive relationships and community engagement (Rossitto et al., 2021a).

The UDS concept acknowledges technology's potential to profoundly shape and influence society. It encourages HCI researchers and practitioners to tackle issues of surplus and scarcity through their reflexive involvement to consider the social, ethical and cultural implications of technology design and to envision alternative futures that promote human well-being, equity and sustainability (Fry, 2009). UDSs create a microcosm of the desired future society within the present, demonstrating the feasibility and desirability of alternative ways of organizing and relating to one another.

Knowles et al. suggest that SHCI should unite behind the belief 'that in order to sustain the quality of life for humans on this planet into the very far future, significant changes are needed to our current way of life', and thus aim to radicalize SHCI (Knowles et al., 2018). Within UDS, designers can imagine and explore radical ideas, disruptive innovations and alternative design approaches that may challenge existing norms and assumptions. It is a creative and visionary space where conventional boundaries and limitations can be temporarily suspended. Therefore, UDS serves as an imaginative starting point from which practical innovations can be derived and sustainability in daily practices can be supported. The concept of UDS is a call for HCI practitioners to engage in critical reflection and ethical consideration of the technologies they create. It encourages designers to question existing power structures, anticipate potential risks and unintended consequences and strive for designs that align with alternative values and aspirations.

Within a UDS, projects or initiatives that emerge can embody the principles of a moral enterprise by promoting ethical practices, social responsibility and positive impact on individuals and communities. The negotiation processes within a UDS, specifically around the question of 'who gets what, why and when', contribute to UDS being considered a moral enterprise that provides surplus goods and resources free of charge while it engages people into moral discussions around it. These negotiations foster a sense of fairness, justice and communal decision-making, where

considerations of need, equity and inclusivity are taken into account. By engaging in these discussions, UDSs create an environment that goes beyond conventional economic principles, highlighting the ethical dimensions of resource redistribution, encouraging further sharing and caring practices and promoting a shared responsibility for the well-being of the community.

6.2. Prefigurative technology

The concept of prefigurative technology is rooted in the idea of prefigurative politics, a principle fundamental to anarchist philosophy. Prefigurative politics involves practicing the values and practices of an ideal future society in current actions and structures (Yates, 2021), rather than deferring these ideals until after a future revolution or transformation (Jeffrey and Dyson, 2021). As such, it constitutes a specific and directed imaginary that stresses the importance of consistency between means and ends (Graeber, 2002; Maeckelbergh, 2011), advocating for practical, immediate and direct action (Franks, 2003). It encompasses building alternatives to existing institutions while simultaneously challenging them (Breines, 1989; Epstein, 1993).

Prefigurative technology involves the deliberate design and use of technology to create and maintain alternative forms of organization, decision-making and participation that align with prefigurative political principles. This includes using digital platforms and social media for decentralized and participatory decision-making processes and developing free/libre open-source software (FLOSS) and hardware that encourage collaboration (Ahmed et al., 2014; Jahn et al., 2024), transparency (Lakhani and Wolf, 2003) and collective ownership (Michael and Bradford, 1999). According to Asad (Asad, 2019), 'prefigurative design' similarly draws on prefigurative politics but applies it within research justice, fostering equitable and collaborative research practices that prioritize community autonomy. While both prefigurative design and prefigurative technology focus on creating alternatives aligned with future societal values, prefigurative design specifically addresses justice within research relationships, establishing partnerships that allow communities to shape the research autonomously. This emphasis on justice in research relationships is also crucial to the success of a UDS, as it ensures that community-driven values and goals remain central throughout the design and implementation processes.

Mechanisms to Afford Prefiguration: Technology can support prefiguration by enabling the enactment of desired future societal values and practices in the present. This can be achieved through several mechanisms: firstly, technology can facilitate decentralized and participatory decision-making processes, allowing for more inclusive and democratic engagement within communities. Open-source platforms and collaborative tools enhance transparency and collective ownership, which are essential prefigurative principles. Secondly, technology can improve connectivity and coordination, helping communities organize and mobilize around shared utopian goals. Lastly, adaptive and flexible technological approaches can be tailored to meet evolving community needs, ensuring that the tools used remain aligned with the community's transformative ambitions.

Challenges to Prefiguration: Conversely, technology can obstruct prefiguration when it reinforces existing power structures, limits inclusivity or fails to align with the community's values and goals. Proprietary platforms that lack transparency or promote hierarchical control can undermine efforts to establish egalitarian and participatory decision-making processes. Technologies that are not adaptable to the evolving needs of a community can stifle innovation and responsiveness. Additionally,

platforms that prioritize profit over privacy and user autonomy can alienate community members and hinder the development of trust and collaboration. When technology imposes rigid structures or is inaccessible to all community members, it can create barriers to participation and perpetuate social inequalities, thus frustrating the transformative ambitions of prefigurative practices.

Practical Example: An illustrative example is the evolution of Communal-Cooking-Events, where surplus food is used to cook meals collectively. This initiative led to the establishment of composts for food waste and eventually to communal gardens. To coordinate the events and the adjacent urban garden (see chapter 4.2) we are seeing a progressive expansion of community artifact ecology that is oriented toward the needs of the community and at the same time opens up a space that goes beyond the redistribution of surplus, using it as a means to be productive together, negotiate common rules and build community. Such practices embody prefigurative principles by integrating practical approaches with broader transformative goals. This development resonates with Yates (Yates, 2015), who identifies five key components of prefigurative politics: collective experimentation, creation and sharing of political meanings, establishing future-oriented social norms, consolidating these norms within movement infrastructure and spreading ideas and goals.

Balancing Practical Concerns and Transformative Ambitions: As communities become more aware of the desirability of prefigurative technology, they must balance practical concerns with transformative ambitions within their socio-technical artifact ecology. Community artifact ecology refers to the constellation of artifacts utilized by a community, emerging from key members' contributions (Bødker et al., 2016). It evolves with community needs through negotiation and adoption. This dynamic and stable ecology co-evolves with community practices, stemming from various influences and tied to culture and place. The arrangement is underpinned by a shared understanding of essential activities and artifact roles. Rather than just technology use, focus lays on observing the community shaping collaborative environments. Communities with limited resources creatively shape their artifact ecology, using mundane tools and creating software specifications for their needs while finding ways to fund development. This shifts from mere use to active shaping (Bødker et al., 2016).

For instance, while platforms like Diaspora, Mastodon or Matrix inherently reflect values such as transparency and open collaboration, more widely used platforms like Facebook or Telegram, despite potential value misalignments, can also serve as effective starting points due to their accessibility and reach. This nuanced balancing of values and needs related to practical concerns alongside transformative ambitions takes place within the intricate framework of the community's artifact ecology and can be called prefigurative technology. In the sense of Michel de Certeau (de Certeau, 1988), prefigurative technology can be understood as a tactic rather than a strategy. According to de Certeau, strategies are employed by entities that control a defined space, allowing them to assert intentions with stability. In contrast, tactics are employed by actors who lack such control, maneuvering creatively within established structures to achieve situational gains. Prefigurative technology, seen as a tactic, allows community actors to navigate spaces not fully within their control, adapting existing technologies and resources to realize incremental social change. This tactic operates within current power dynamics, yet it uses everyday practices to anticipate and enact aspects of a future society in the present.

Technologies on their own, of course, cannot be prefigurative in the sense we mean. They become so in and through their deployment in a socio-technical ecology specifically geared to grassroots communities' needs, visions and objectives. For us as action-oriented researchers it is important to understand that technology can only aid activist movements when it garners sufficient user adoption and furthermore, that grassroots movements have limited resources for the design of their technology. Many grassroots movements are effectively forced to use platforms that are accessible to a lot of people, such as Facebook (as seen in (Belk, 2017; Edwards, 2021)).

Dynamic Nature of Artifact Ecologies: Prefigurative technology is characterized by its use within dynamic community artifact ecologies, rather than by its physical attributes. This perspective shifts the emphasis from the tangible aspects of technology to its role in fostering community engagement, challenging existing norms and developing transformative practices. Research on artifact ecologies delves into the study and design of technological systems, emphasizing their relation to sociocultural contexts (Jung et al., 2008; Bødker and Klokmoose, 2011; Bødker and Klokmoose, 2012; Bødker et al., 2016). It examines how artifacts are used in specific contexts and how their combined usage can lead to new properties or functionalities (Vasiliou et al., 2015; Bødker et al., 2017). Building on this foundational understanding, subsequent studies, such as those by Korsgaard et al. (Korsgaard et al., 2022), introduce the concept of collective artifact ecologies. These studies highlight that the formation of artifact ecologies within communities is often an organic process, driven by the diverse contributions and knowledge of community members. These ecologies can feature interactions between artifacts that are complementary or sometimes even conflicting, showcasing the dynamic nature of these systems (Bødker et al., 2017). This research underscores the significance of context in designing and understanding artifact ecologies, arguing that effective creation and management of these systems depend heavily on the deep, local knowledge and expertise of community members (Vasiliou et al., 2015). Moreover, artifacts within these ecologies are frequently chosen and adapted by the collective members, indicating that the design of artifact ecologies is a collaborative and adaptive process (Korsgaard et al., 2022).

Selecting Appropriate Platforms: When selecting a platform in the early stages of community formation, platforms that inherently reflect values such as transparency and open collaboration in their design, like Diaspora, Mastodon or Matrix, could be appropriate choices. However, platforms that might initially seem at odds with the fundamental values of grassroots initiatives, such as Facebook or Telegram, can serve as effective starting points to build the community artifact ecology that resonates with community needs and values in a prefigurative sense. Platforms that seem to be well suited for grassroots communities' values can contradict the prefigurative notion, for instance, by being too highly structured and thus not responsive to changing needs, such as inclusivity. The critical factor in prefigurative technology is not the intrinsic assessment of a technology but the evaluation of a complex ecosystem comprising various actors, artifacts and their interrelations, addressing both the now and the future. The future may require scaling and flexibility in as-yet-not-wholly-understood ways. For a design to effectively address the socio-technical artifact ecology of a community with a focus on prefigurative technology, it must be applicable not only during the initial stages of grassroots communities and movements but also relevant and adaptable for their daily operations and scaling phases. This ensures that the technology remains functional,

supportive and aligned with the evolving needs and dynamics of the community at every stage of its development.

Navigating Contradictions: Despite potential contradictions to the values of grassroots initiatives, WhatsApp might still play a role in their prefigurative artifact ecology due to its inclusivity and widespread reach. This approach requires a nuanced understanding of how different technologies can be leveraged to support the overarching goals of a community, even if they do not perfectly align with all its ideals. While platforms like Facebook offer valuable support for community-led sharing initiatives, facilitating organizational tasks such as event advertising (Berns and Rossitto, 2019) and enabling broader audience reach (Davies and Legg, 2018), research has also highlighted critical concerns (Landwehr et al., 2019; Rossitto et al., 2021b). These tools, despite their utility, can sometimes clash with the foundational values of the communities they serve. This discrepancy raises important questions about the alignment between digital platforms and the ethos of community members, underscoring the need for careful consideration of the tools we adopt in pursuit of community engagement and support (Ganglbauer et al., 2014; Rossitto et al., 2021b).

Role in UDS Framework: Within the UDS framework, prefigurative technology acts as a bridge between the present state of surplus resources and a utopian vision. It enables communities to actively experiment with, embody and enact alternative forms of social, political and organizational structures through ICT aligned with their utopian future vision. Prefigurative technology in UDS encourages HCI researchers to gear design toward community building: technology becomes a powerful enabler of social change when it shifts the focus from the material nature of technology to its role in facilitating radical purpose, pushing boundaries and enabling the emergence of transformative practices.

In our case, prefigurative technology serves as a bridge linking the current availability of surplus and its redistribution to a future vision of sustainable practices within the community. Tools like Telegram exemplify this concept through their inclusive nature and simplicity, supporting activities such as community gardening and collective cooking events, despite potential contradictions with some community values. By adopting and adapting technologies with a prefigurative claim, communities can navigate their current realities while progressively shaping and realizing their aspirations for a more sustainable and collaborative future. This approach underscores the pragmatic use of available technologies to foster community building, aligning with the broader objectives of prefigurative technology, which is about using technology not just as a tool for practical purposes but as an integral part of a broader strategy to realize visionary societal changes within current community operations and structures.

6.3. Actionable points for HCI professionals

The findings from this study provide several actionable insights for HCI researchers and practitioners aiming to design and implement socio-technical systems that support grassroots community initiatives and foster transformative practices. These insights are drawn from the challenges and opportunities identified within the UDS framework.

1. Facilitate Active Community Engagement, Inclusivity and Accessibility: Design socio-technical systems that encourage active participation and inclusivity within the community. Ensure these systems are user- and community-friendly and accessible to all community members, regardless of their technical literacy levels, to promote widespread adoption and effective use.

2. Incorporate Prefigurative Technology: Choose, design and develop technologies that align with the community's future societal values and practices. Prioritize tools that support decentralized decision-making, transparency and collective ownership, such as FLOSS.

3. Balance Immediate Needs with Long-term Ambitions: Create socio-technical systems that balance immediate practical needs with the community's broader transformative ambitions. Ensure flexibility in technology to adapt to evolving community needs.

4. Foster a Holistic Community Artifact Ecology: Understand and support the ecosystem of artifacts used by the community. Integrate technologies with care, considering the complexity of artifact ecologies, promoting engagement, resource sharing and the development of new social norms.

5. Enhance Generalized Reciprocity: Encourage practices of generalized reciprocity by designing systems that facilitate giving without expecting immediate returns. This fosters trust and mutual support, essential for community resilience. Incorporate features that promote the sharing of surplus in a manner that reinforces social bonds.

6. Ensure Sustainability in Scaling: Develop socio-technical systems with sustainability in mind when scaling. Support ongoing community engagement and growth by adapting to changing dynamics and increasing participation. Ensure that scaling efforts do not compromise the community's values and long-term goals.

7. Promote Ethical Considerations in Design: Integrate ethical considerations into the design process, ensuring that technologies and their integration into the artifact ecology reflect the community's values and promote social justice. Address potential conflicts between technology and community values and enhance fairness, transparency and equity.

8. Encourage Experimentation and Innovation: Foster an environment that supports collective experimentation with new technologies and practices. Promote a culture of continuous improvement and adaptation, allowing the community to evolve and innovate over time.

9. Provide Training and Support: Offer training and support to community members to ensure effective use of technology. Facilitate workshops, tutorials and ongoing assistance to build technological proficiency and confidence within the community. Support education and skill-building within the community to develop the competencies needed to engage effectively with the technology.

10. Facilitate Conflict Resolution: Develop socio-technical systems that support managing and resolving conflicts, as differing conceptions of fairness and resource distribution can lead to tensions within a UDS.

11. Foster Inter-Community Collaboration: Create ICT systems that facilitate collaboration and knowledge sharing between different grassroots communities, enabling them to learn from each other and scale successful practices.

12. Promote Environmental Sustainability: Ensure ICT systems are designed with environmental sustainability in mind, aligning with the broader goals of reducing waste and promoting sustainable practices.

By implementing these actionable points, HCI researchers and practitioners can contribute to the development of socio-technical systems that not only address immediate practical issues but also support the long-term transformative ambitions of grassroots communities. This approach aligns with the broader objectives of UDS, promoting sustainable, inclusive and equitable community practices.

7. LIMITATIONS

This study is largely conceptual, bringing together existing projects to provide a framework that enables designers to see beyond the local context and imagine a very different possible world. UDS aims to address systemic issues through radical and optimistic transformation, but it is important to acknowledge that this framework needs further empirical validation in future studies. Our research integrates insights from various grassroots initiatives and existing design methodologies to outline the potential of UDS. However, the implementation and long-term effectiveness of UDS in fostering sustainable and equitable communities remain to be fully tested in diverse real-world scenarios. The ambitious nature of UDS, while inspiring, requires further empirical evaluation to establish its practical viability and scalability.

Furthermore, the reliance on qualitative methods may introduce researcher bias. However, the action research approach (Hayes, 2011; Hayes, 2018) mitigated this through iterative cycles of reflection and participant involvement. AuthorOne's deep involvement in the projects could introduce bias, but this was counterbalanced by involving multiple researchers and incorporating participant feedback in the reflection and analysis stages.

Lastly, prefigurative politics, and by extension prefigurative technology, face criticism for being potentially restrictive and exclusionary, demanding high commitment and adherence to specific practices and values (Hines, 2023). Critics argue that this rigidity can alienate those unable or unwilling to meet these requirements and may cause the community or movement to become detached from broader social and economic justice struggles (Cooper, 2020). Additionally, there is a concern that prefigurative politics, and consequently prefigurative technology, may become detached from larger contexts of social and economic justice struggles, focusing too narrowly on specific community practices and ideals.

8. CONCLUSION

In this paper, we outlined our involvement as action-oriented researchers in six local contexts addressing surplus redistribution. These insights have played a crucial role in formulating the concept of UDS, placing specific emphasis on related ICT aspects. UDSs bring together current practical issues, like redistributing surplus without monetary exchange, and future visions achieved through community-driven self-organization. These transformative ambitions stand against traditional economic principles, promoting inclusivity and fairness in resource distribution.

UDS thrives on regular communal events, building a sense of community and shared responsibility, emphasizing diversity and solidarity. By encouraging open dialog and collaboration, UDS recognizes the importance of negotiation for fair resource allocation, fostering socio-technical innovation. Representing a collaborative community artifact ecology, UDS guides design toward prefigurative technology, shaped by and inspiring the community.

Through introducing the UDS concept to the HCI community, our aim is to showcase how surplus redistribution can be a viable foundation for grassroots initiatives fostering sustainability. This paper places particular emphasis on tensions and negotiation processes within grassroots community settings and the varied ICT challenges designers may encounter in different contexts of UDSs. We draw on prefigurative politics to introduce the concept of prefigurative technology. While many technologies used by grassroots movements are not prefigurative on their own, they can become so through their deployment in socio-technical

ecologies aligning with grassroots communities' needs, visions and objectives. Prefigurative technology emphasizes meshing present issues and utopian visions within a community artifact ecology, fostering community building.

The research highlights that while UDSs can catalyze social innovation and promote sharing and caring practices, they face significant challenges related to scalability, sustainability and inclusivity. The dynamic nature of community artifact ecologies (Bødker and Klokmoose, 2012; Bødker et al., 2016), characterized by the interplay between physical, hybrid and digital UDS, underscores the importance of contextualized and adaptable ICT solutions. Prefigurative technology plays a crucial role in this ecosystem, aiding grassroots movements in navigating the complexities of socio-technical integration.

Our findings suggest that the transformation from surplus to abundance, facilitated by generalized reciprocity and solidarity, can foster a cultural shift toward an ethos of collective prosperity. By emphasizing the role of ICT in supporting these processes, this study contributes to the broader discourse on sustainable human-computer interaction and its potential to drive radical, community-driven change.

Our specific intention with this paper is to inspire action-oriented researchers to engage in practical issues by connecting them to transformative goals. UDSs ultimately create opportunities for engagement and support a conducive environment for sharing and caring practices. Future research should focus on empirical validation of the UDS framework in diverse real-world scenarios, addressing the limitations identified in this study. By doing so, we can better understand the mechanisms through which UDSs can achieve their utopian ambitions and contribute to building resilient, sustainable and equitable communities.

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Data availability

The data underlying this article cannot be shared publicly due to guarantees provided to participants that their data would remain confidential and not be shared with third parties.

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