TATuP Zeitschrift für Technikfolgenabschätzung in Theorie und Praxis
Journal for Technology Assessment in Theory and Practice

oekom science

RESEARCH ARTICLE

From an ethics of deficiency to an ethics of abundance: Convivial technologies in care

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Abstract · The paradigm of humans as 'deficient beings' legitimizes technological innovations aimed at compensating for presumed human deficits. In care technologies, this becomes manifest in prioritizing automation and efficiency, while relational and participatory aspects are neglected. This article argues for a shift from deficit-oriented framings to an ethics of abundance and conviviality. Drawing on empirical examples such as humanoid care robots and DIY assistive tools, we illustrate how convivial approaches can support relational care practices. Concludingly, we discuss concrete options for the design of care technologies at the micro level (e.g., co-design) and at the macro level (cultural shift toward conviviality) to create infrastructures that focus on relationality, collective well-being, and resource efficiency.

Von einer Ethik des Mangels zu einer Ethik der Fülle: Konviviale Technologien in der Pflege

Zusammenfassung · *Das Paradigma vom Menschen als 'Mängelwesen' legitimiert technische Innovationen, die auf die Kompensation vermeintlicher Defizite abzielen. In der Pflege zeigt sich dies in der Fokussierung auf Effizienz und Automatisierung, während relationale und partizipative Aspekte vernachlässigt werden. In diesem Artikel plädieren wir für eine Abkehr von defizitorientierten Ansätzen hin zu einer Ethik der Fülle und Konvivialität. Anhand empirischer Beispiele (wie humanoide Pflegeroboter, DIY-Hilfsmittel) zeigen wir, wie konviviale Technologien relationale Pflegepraktiken fördern können. Wir geben Empfehlungen zur Gestaltung von Pflegetechnologien auf Mikroebene (z. B. Co-Design) sowie auf Makroebene (kultureller Wandel hin zur Konvivialität), um Infrastrukturen zu schaffen, die Relationalität, gemeinschaftliches Wohlergehen und Ressourceneffizienz in den Mittelpunkt stellen.*

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https://doi.org/10.14512/tatup.7183
Received: 02. 04. 2025; revised version accepted: 27. 07. 2025; published online: 15. 12. 2025 (peer review)

Keywords · *convivial technology, care ethics, assistive technologies, DIY technology, humanoid robots*

This article is part of the Special topic "Deeply sustainable technologies: Beyond extractivism, exploitation, and exclusion," *edited by K. Kastenhofer, A. Schwarz, K. R. Srinivas, A. Vetter. https://doi.org/10.14512/tatup.7266*

The deficit paradigm in care technologies: an outdated model?

The persistent narrative of the human as a 'deficient being', initially articulated by Herder (1772) and later elaborated by Plessner (1965)[1] and Gehlen (2016), continues to inform our understandings of human existence. This perspective sees humans as incomplete and fragile, requiring external means to compensate for their limitations. This deficit-oriented paradigm reduces the richness and spontaneity of human life to problems of efficiency and control, neglecting relational, emotional, and cooperative dimensions essential to human interaction and social life. It has also fundamentally shaped technological innovation: technologies are imagined not as means of supporting human relationality, but as tools for overcoming perceived shortcomings (Heßler 2025). This logic of technical compensation, rooted in the conception of the human as deficient (Plessner 1965; Gehlen 2016) has lately been challenged by Birnstiel (2016). He emphasizes that technology frequently acts as a promise to compensate for human deficits, thereby ignoring that incapability and vulnerability are constitutive aspects of human existence. Defining them instead as problems to be fixed by technological means legitimizes automation, standardization, and maximization of performance (Engster 2018). Technology is seen as superior – faster, tireless, reliable, and rational – while portraying the human mind and body as inefficient, error-prone, subjective, and emotionally unreliable (Heßler 2016). The deficit paradigm thus

1 Although Plessner himself did not explicitly address technological issues, his anthropological perspective provided an influential foundation for later technological interpretations.

co-determines what technologies are built and how they are made sense of culturally and justified politically (Frahm et al. 2022; Schicktanz and Schweda 2021; Heßler 2025).

These dynamics are particularly visible in care. Aging, illness, and disability are interpreted through the lens of deficiency, framed by technocratic visions that prioritize optimization over relational well-being (Nordenfelt 2009; Oudshoorn and Pinch 2005). Within this logic, aging bodies require surveillance, cognitive decline demands compensation, and care work is technically alleviated. Care recipients are reduced to passive dependents, caregivers to overburdened providers. Emotional and reciprocal dimensions of caregiving are sidelined or even problematized in favor of solutions that promise efficiency, rationality and control (Frigo et al. 2023). Yet some care technologies may produce affective experiences – such as comfort, predictability, or perceived companionship – even though they do not replace emotional reciprocity. From an ethical perspective, such interactions are best understood as technologically mediated affective relations: meaningful in practice, yet categorically distinct from human connections. Their value lies not in what they simulate, but in how they support embeddedness within human care relationships. Mistaking them for equivalent risks reinforcing illusions and obscuring structural deficits in care provision. Moreover, the deficit-oriented paradigm forms care technology development in significant ways. Such technologies are framed as fixes to human frailty, reinforcing replacement over support. A telling example is the claim that mechanical helpers "never get tired, are stress-resistant, never in a bad mood, and [. . .] always reliable. After a 24-hour shift, robots do not experience 'human error'" (Hoberg 2023, translated by authors).

In contrast, alternative narratives emphasize human embeddedness in social and natural systems, focusing on interdependence and relational becoming. Vulnerability is reframed as a constitutive dimension of human life. Human capacities emerge not in isolation, but through relations, with others, communities, environments. Frailty, illness, or aging are not simply deficits, but human conditions that can instigate collaboration and care. Humans are thus understood as cooperative beings shaped by reciprocal dependencies. Puig de la Bellacasa (2017) reminds us that care is not a functional burden to be optimized, but a compound of affective state, ethical-political engagement, and material practice, deeply embedded in socio-technical infrastructures. Care thus is about sustaining life through relationships, responsiveness, and mutual responsibility. This rethinking opens space for imagining technology not as corrective device, but as enabler of interdependence and collective well-being.

Against this backdrop, this article seeks to move beyond the uncritical reproduction of the deficit-oriented paradigms in care technology. Rather than accepting this narrative, we advocate for curiosity, experimentation, and openness, or what Mol (2008) describes as 'tinkering', to reimagine socio-technical care arrangements (Krings and Weinberger 2025). Rooted in technology assessment (TA) and drawing upon relational care perspectives (Puig de la Bellacasa 2017), we outline an ethics of abundance as a normative alternative that explicitly challenges deficit-oriented paradigms.

While we critically reject this generalized deficit-oriented view of humans, we explicitly recognize the reality of specific suffering, vulnerability, and concrete physical or cognitive limitations.

The concept of an 'ethics of abundance' has appeared in various contexts, including geoethics, food justice and post-growth discourses. However, to our knowledge, it has not yet been systematically applied to the field of care technologies. In this article, we introduce an original conceptualization of the term, building upon relational and participatory traditions within care ethics, for example as articulated by Puig de la Bellacasa (2017). It does not imply material or technological excess, but emphasizes relational richness, meaningful participation, contextual sensitivity, and qualitative improvements in care practices. When we speak of relational richness, we explicitly refer to human interactions and emotional reciprocity. While technologies, including robots, can foster affectively meaningful relations, these relationships are ethically ambivalent and clearly distinct from human emotional connections. Following Mol (2008) and Puig de la Bellacasa (2017), we understand such interactions as technologically mediated: valuable insofar as they support, rather than substitute, human relational dynamics. To move from this relational understanding to a design-oriented perspective, we draw on the concept of conviviality as a normative and practical guide. The conception of convivial tools, as introduced by Illich (1973) and its later extension into the concept of "convivial technology" by Vetter (2018, p. 1778), provide a practical framework for operationalizing this ethics of abundance. While Illich emphasized individual freedom realized through interdependence and context-sensitive tools, Vetter expanded this perspective toward a systematic approach to socially and ecologically embedded technological design. Building on this expanded understanding of conviviality, we aim to propose a transformative conceptual approach that interweaves ethical, technological, and socio-political dimensions, contributing to inclusive, sustainable, and participatory care infrastructures.

From anthropological premises of deficit to convivial reorientation

To ground the previous critique conceptually, this section outlines the anthropological assumptions of the deficit paradigm, and situates our normative counterproposal of conviviality within a broader theoretical lineage.

The concept of the human as a 'Mängelwesen', a being defined by deficiencies, has profoundly influenced Western technological development (Plessner 1965; Gehlen 2016). It assumes that humans lack natural defenses, instinctual certainty, and the ability to function without external structures. Although the concept has sparked ongoing debates and controversial interpretations, there is common agreement about the high degree of ambivalences within (Heßler 2020). In the context of care, it has justified and surprisingly still is justifying a rational for increasing reliance on automation, robotics, and AI, strengthening the idea that care recipients and caregivers require technological assistance to function on schedule and efficiently.

This paradigm is reflected in the language of care technologies: For example, AI diagnostics promise to 'reduce human error', robotic assistants are designed to 'alleviate caregiver burden', and monitoring systems seek to 'compensate for declining autonomy' (Krings and Weinberger 2022, 2025). These narratives often equate vulnerability with failure, framing care as a technical problem to be optimized. Emotionally-based care work and social responsiveness are thereby devalued, while human limitations, fatigue, slowness, emotionality, are naturalized as flaws in need of technical compensation. Machines promise uninterrupted service and emotional neutrality; humans are cast as unreliable. While we critically reject this generalized deficit-oriented view of humans, we explicitly recognize the reality of specific suffering, vulnerability, and concrete physical or cognitive limitations. However, care technologies should respond to these real needs by offering supplementary support rather than as replacements or mere compensations, thereby enhancing autonomy and dignity.

As care work has become increasingly commodified over recent decades, the narrative of 'human deficiencies' has gained even more traction and serves to legitimize further technological interventions. This aligns with extractivist economic models that prioritize productivity over social, relational and ecological considerations (Heßler 2020; Davis and Nathan 2015). In this context, AI-driven care systems often rely on exploitative labor and resource-intensive infrastructures, exacerbating socio-ecological inequalities.

In contrast, we argue for a new normative orientation aligned with convivial technologies (Illich 1973; Vetter 2018, 2023). Building upon Illich's original concept of convivial tools (Illich 1973), Coeckelbergh (2015) has highlighted the relevance of conviviality for environmental ethics, particularly through the notion of 'environmental skill'. Vetter (2018, 2023) further expands this framework by explicitly integrating ecological sufficiency and degrowth-oriented design principles. Inspired by these theoretical insights, we propose five normative principles: autonomy, participation, resource sufficiency, social justice, and common-good orientation. These principles emphasize societal transformation, addressing relational and ethical dimensions of care technologies. Convivial technologies reject technological acceleration and deficit-compensation, prioritizing collective well-being relational embeddedness, adaptability, and care-centered values. Thus, convivial technologies challenge paradigms based on control and deficits, offering a radical reorientation toward social connectedness and democratic agency in socio-technological development.

Rethinking care technologies: conviviality in practice

As shown above, deficit-oriented thinking in care is not merely abstract – it manifests in concrete technologies that shape how care is organized and experienced. While such technologies promise solutions to demographic change and labor shortages (Dyb et al. 2021), they often introduce new dependencies, reinforce exclusion, and overlook alternative care modes (e.g. Glomsås et al. 2022; Endter et al. 2024).

A paradigmatic example, discussed in theoretical and exploratory workshops with caregivers within our project Movemenz[2], is the use of humanoid robots in elderly care. Designed to assist with tasks such as lifting or standing up patients, providing medication reminders, or simulating companionship, framed as relief for overburdened staff (Hergesell 2019). Yet, 'overburden' often obscures structural issues, like underfunding and inadequate staffing ratios (Gigerenzer et al. 2016; Daum 2017). Rather than addressing these systemic causes, robots are introduced to optimize workflows, reinforcing a logic of substitution rather than support. This reduces care work to functional tasks, neglecting its fundamentally relational and affective nature (Hergesell and Maibaum 2016). At the same time, these robots reflect a strand of the deficit discourse that valorizes endurance, precision, and standardization, over human qualities. However, while machines excel in repetitive or physically demanding tasks, humans bring emotional presence, contextual judgment, and relationship-building; qualities that cannot be substituted by automation. A caregiver working in a residential elderly care captures this tension during these theoretical discussions: "*Robots may help with physical tasks, but they create emotional distance. Many residents find mechanical caregiving more dehumanizing than helpful. They miss the warmth and genuine presence that only human interaction provides*" (Movemenz, Focus group with caregivers). By prioritizing automation over human con-

2 All empirical quotes in this article derive from individual interviews, focus groups as well as workshops conducted within the projects Movemenz (2014–2015) and QuartrBack (2015–2018). It has to be noted that all quotations presented throughout the article illustrate individual perspectives from qualitative exploratory studies and do not constitute representative empirical evidence.

https://doi.org/10.14512/tatup.7183

nection, such technologies risk deepening isolation among care recipients, reinforcing a model of care that views dependence as a deficiency rather than an inherent aspect of human interdependence. At the same time, in situations where human care is perceived as absent, overstressed, or emotionally unavailable, some users may find reassurance in the predictability and non-judgmental nature of robotic assistance.

Similarly, AI-based monitoring systems illustrate the challenges inherent in deficit-oriented technological solutions. Designed, to detect emergency situations, track vitals, or predict health risks, these systems compensate for the assumed caregiver limitations. Promising increased autonomy and caregiver relief, they often reflect a substitution logic, assuming human presence is inherently unreliable. In practice, direct interactions may be increasingly replaced by surveillance, shifting care relationships towards algorithmic decision-making (Niemeijer et al. 2015). In our project QuartrBack such an AI-supported monitoring system was practically developed and tests over several months. A developer from an informatics research institute involved in designing monitoring systems reflects on their practical implementation: "*We initially assumed that AI-supported monitoring would enhance autonomy, but in reality, users often feel monitored rather than supported. The system generates extensive data, yet users and their relatives frequently report that it cannot address the loneliness that arises from a lack of personal, social contact*" (QuartrBack, Workshop with developers, people with dementia, and their relatives). Similar technologies were discussed theoretically and exploratively in the Movemenz project. Here, a caregiver employed in a residential elderly care facility emphasized potential unintended effects during these conceptual discussions: "*Technology is often promoted as something that will simplify our work. In practice, automated systems frequently increase administrative tasks, diverting our attention from the relational aspects of caregiving. The part of our job that truly matters*." (Movemenz, Workshop 'Validate technology options'). Such technologies enhance safety, but rarely foster social inclusion or relational agency. Moreover, they reinforce a model in which care is provided at a distance, mediated through digital infrastructures that are not be accessible to all users. By shifting care toward data management creating additional administrative burdens and exacerbating caregiver strain.

Beyond their social impact, deficit-driven technologies also raise ecological and economic concerns due to high energy consumption, rare materials, electronic waste, and proprietary, commercial governance.

In our view, convivial care technologies could, on the contrary, present an alternative model of care technology: one that does not merely compensate for human limitations but actively enhances human agency, participation, and relationality. Instead of focusing solely on efficiency, convivial technologies are designed to align with the lived realities of users. They prioritize connectedness, accessibility, and contextual appropriateness, thus significantly improving overall quality of life. Rather than imposing fixed solutions, they emerge from 'tinkering' processes (Mol 2008), responding to specific care environments and their social relations. Such technologies do not claim to 'solve' care, but seek to complement and enrich it from within, guided by principles of resource sufficiency, social justice, self-determination, and interdependency (Vetter 2018, 2023).

For example, community-driven modular rollators invite users to modify and adapt them according to specific needs and physical capacities. A care recipient who lives at home and regularly uses assistive technologies noted the benefits of using such a modular rollator independently obtained outside the project context: "*The modular rollator doesn't just help me move; it allows me to participate actively in adapting it to my own daily life. It gives me a sense of control and dignity because it fits my needs rather than forcing me to adjust to something designed by others*" (QuartrBack, Interview). Such modular rollators are developed by smaller start-ups and research collaborations that explicitly involve communities and individual users in co-design and iterative prototyping processes, enabling Do-it-yourself modifications tailored to personal needs (see for example Fernandez-Carmona et al. 2022). These collaborative design practices are not only user-centered but resonate with convivial principles, as they foster autonomy, adaptability, and meaningful participation. Unlike deficit-oriented technologies, pre-configured to 'fix' limitations, convivial tools allow ongoing negotiation between bodies, environments, and social relations, shaped in use, responding to what care actually is, rather than defining what it should be. These tools emphasize resource sufficiency through simplicity and ease of repair. This stands in contrast to conventional medical equipment, which typically relies on proprietary designs, specialized maintenance, and planned obsolescence, reinforcing dependency rather than supporting independence.

Convivial technologies thus represent a fundamental shift: from technologies compensating human 'deficiencies' to enhancing human interaction and shared responsibility. This shift is crucial to overcome escalating technological superiority that exacerbates e.g. social isolation.

Toward an ethics of abundance: implications for technology assessment

The ethics of abundance, as conceptualized here, explicitly contrasts with a material or technological notion of abundance that seeks continuous growth, escalating complexity, and resource-intensive solutions. Instead, our notion of abundance emphasizes relational richness (fostering strong human relationships), participatory depth (encouraging active involvement and self-determination), contextual appropriateness (promoting locally adaptable, user-centered designs), and qualitative improvements (enhancing quality of life and dignified care). Consequently, convivial care technologies guided by resource sufficiency align precisely with this perspective. They consciously

 https://doi.org/10.14512/tatup.7183

reject technological overcompensation, material excess, and relentless optimization, focusing instead on fostering meaningful interactions between people, their care environments, as well as technologies.

Building upon these considerations, we advocate for a reorientation from the 'deficiency concept' toward an ethics of abundance. This approach shifts the focus from mere compensation and optimization to participation, relationality, and the common good. Rather than treating vulnerability as a flaw, it recognizes care as a relational practice embedded in interdependence.

This shift implies evaluating care technologies not only by functionality, formal control and cost-efficiency, but also by their impact on relationality, inclusion, and resource sufficiency. Technologies should support – not replace – the social dynamics and conditions enabling dignified care. A convivial perspective places care technologies within a broader socio-ethical context, encouraging innovation grounded in attentiveness, responsiveness, and situated knowledge.

To practically operationalize these ethical considerations, we propose a convivial TA that is participatory, situated, context-sensitive, and future-oriented. Crucially, this approach emphasizes that prior to and throughout the technology development, a thorough understanding of users' demands as well as their living and working conditions must be established. From this foundation, (potential) users, caregivers, and community actors should actively and directly participate throughout the entire process, from the initial conception to final implementation. Rather than imposing universal solutions, convivial TA employs co-design, participatory prototyping, and real-world experimentation, adapting care technologies to users' needs and living realities through contextual tinkering and collaborative exploration.

At the heart of this framework lies the concept of relational autonomy, an understanding of autonomy not as independence from others, but as the ability to live well with others. Convivial technologies support this by enabling mutual care practices and shared responsibilities. For example, digital platforms that allow families, neighbors, and volunteers to coordinate care do not merely increase efficiency; they redistribute responsibility and strengthen social cohesion. Technology thus serves not as a substitute for care, but as an enabler of collective agency. Moreover, convivial care technologies must align with ecological and social justice. This includes modularity, repairability, local adaptability, as well as rejecting extractivist logics that rely on global supply chains, energy-intensive infrastructures, or built-in obsolescence. Convivial infrastructures foster not just technical durability, but resilience in social and ecological terms.

Ultimately, an ethics of abundance reframes care technologies from mere solutions to human deficiencies into means of supporting interdependence and relational well-being. Integrating convivial principles, care technologies become more inclusive, democratic, and cultivate resilience. Thus, conviviality advocates for a deeper cultural and ethical shift, from which from which more demand- and care-oriented technological alternatives can emerge. Instead of striving for ever more efficient technologies, we should prioritize those aligning with ecological and social sustainability, fostering collective well-being. Bridging micro- and macro-level perspectives, the convivial approach guides the practical development of care technologies and critically informs broader technology policies and innovation cultures. It thus advocates for a comprehensive cultural and ethical shift toward valuing relational, ecological, and communal flourishing over relentless technological optimization. In doing so, conviviality could create the socio-technical conditions necessary for sustainable, inclusive, and resilient care infrastructures.

Funding Information · This article received no funding.

Competing interests · The authors declare no competing interests.

Ethical oversight · The authors confirm that all procedures were performed in compliance with relevant laws and institutional guidelines.

Acknowledgements · We sincerely thank all collaborators and colleagues for their valuable insights and engaging discussions on care technologies. Additionally, the authors acknowledge the use of ChatGPT 4.5 as large language model for translations.

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