


RESEARCH ARTICLE

Infrastructures of care: Ethics in everyday digital media use

Corinna Peil^{*,1} 

Abstract • This article conceptualizes digital media as infrastructures of care. Using care ethics, it explores the importance of maintenance and support for creating sustainable and equitable digital environments. Based on an examination of the challenges and user support relationships within digital media use, it proposes policy measures to enhance sustainability and inclusion, emphasizing the critical role of care in ensuring reliable digital infrastructures.

Infrastrukturen der Fürsorge: Ethik im täglichen Umgang mit digitalen Medien


Zusammenfassung • Der Artikel konzeptualisiert digitale Medien als ‚Infrastrukturen der Fürsorge‘. Anhand der Care-Ethik analysiert er die Bedeutung von Wartung und Unterstützung für die Schaffung nachhaltiger und gerechter digitaler Umgebungen. Auf der Grundlage einer Untersuchung der Herausforderungen und Unterstützungsbeziehungen, die mit der Nutzung digitaler Medien verbunden sind, werden politische Maßnahmen zur Förderung von Nachhaltigkeit und Inklusion empfohlen. Die zentrale Rolle der Fürsorge bei der Gewährleistung zuverlässiger digitaler Infrastrukturen wird dabei besonders hervorgehoben.

Keywords • media maintenance, repair, warm experts, environmental sustainability, social sustainability

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Introduction

This article conceptualizes digital media as *infrastructures of care*, focusing on practices of maintenance, upkeep, and customization in personal digital media environments. Drawing on empirical data, I illustrate how care is woven into human-technology interactions through both individual and collective acts of maintenance and support. This approach highlights often-invisible aspects of digital media use, such as disruptions, adaptations, and repairs, and their dependency on broader technological developments. Rethinking digital media use in this way reveals how strengthening social relationships and redefining priorities in political decision-making can shape a more inclusive and sustainable digital society.

Digital media, broadly defined to include all interconnected media technologies that facilitate communication, work, learning, and social interaction (Ytre-Arne 2023), play a fundamental role in the fabric of daily life. In this article, I propose understanding them as infrastructures, a concept that underscores their pervasive and essential role in everyday existence. Drawing on Star and Ruhleder’s (Star and Ruhleder 1996) framework of eight key characteristics of infrastructures, these can be applied to the digital media we regularly use. For instance, they are embedded in social structures and practices and learned as part of communities of practice, where social norms both shape and are shaped by the transmission of knowledge. One of the most notable characteristics of infrastructures is their often-invisible nature, which becomes apparent and prompts reflection only in moments of failure. This also applies to digital media, whose functioning we take for granted in everyday routines, often overlooking the crucial role that regular maintenance (Balbi and Leggero 2020) and updates play in ensuring their seamless operation.

Building on the understanding of digital media as infrastructures, this study employs the lens of care ethics to emphasize the crucial role of care practices. These practices are essential for maintaining technological functionality, for the management of which social relationships are sought and cultivated at the same time. Although largely underexplored in the context of digital media, these care practices merit deeper investigation and integration into policy-making, as they offer valuable insights

for achieving sustainability goals. Sustainability, defined in the Brundtland Report as the ability to meet present needs without compromising the future generations' capacity to meet theirs, is framed here within the 'three-pillar model', encompassing environmental, social, and economic dimensions (Purvis et al. 2019). Although it is a widely debated concept, it has not been a central focus of communication studies to date, with the notable exceptions of research on climate change reporting and, more recently, on the communication of climate activists and their use of networked media and digital platforms (e.g., Kannengießer 2022, pp. 19). Lately, the notion of digital sustainability (Sparviero and Ragnedda 2021), addressing the responsible use of technology to minimize ecological footprints and promote social justice, has gained prominence. This includes the socio-ecological impacts

practices. Building on Tronto's conception, this article further draws on perspectives that extend care to interactions with technological objects (Denis and Pontille 2015; Puig de la Bellacasa 2011). In her seminal work, María Puig de la Bellacasa posits that care practices towards technologies and things reflect how we incorporate non-human elements into our ethical and political thinking. By integrating care into our relationship with objects, we acknowledge a deeper connection and responsibility towards the material world, fostering sustainable technological practices. In this sense, care – understood as ongoing attention and maintenance – is inherently linked to sustainability, as it involves nurturing not only interpersonal relationships but also the technological and material systems that ensure the longevity and responsible use of technologies.

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of digital media, from production to use, particularly in response to the growing demands of data-intensive services and everyday applications powered by special algorithms and artificial intelligence (AI). My reflections on care in digital media use engage both environmental and social sustainability, offering pathways for strengthening these dimensions.

Care ethics in digital media use

This article adopts the theoretical framework of the ethics of care, a paradigm that has gained prominence across disciplines such as philosophy, feminist studies, psychology, theology, and education, highlighting the significance of caregiving relationships and practices (Gottschlich et al. 2022). Care ethics (Gilligan 2003) underscores the importance of interpersonal connections and the moral obligation to respond to the needs of others, with an emphasis on the context and relationships involved in ethical decision-making. Joan Tronto has expanded this discourse by framing care as a fundamental social and political practice, extending beyond private contexts. From a feminist-ethical perspective, Tronto (1993) views care as a communal responsibility, critiquing the gendered division of care work that often goes unrecognized both publicly and academically. In her influential book, "Moral Boundaries: A Political Argument for an Ethic of Care", she emphasizes care's central role in achieving a more just society by maintaining and repairing the world – including bodies, selves, and surroundings. Additionally, her work also reveals and challenges power structures embedded in care

The intersections between care and digital media use are complex, ranging from providing affective care at a distance, high-tech support, and robotic services for the elderly, to the facilitation of traditional care practices such as "emotional labour" (Hochschild 1983, p. 7) and organisational tasks through digital media (Lai 2023). Gibson et al. (2021, p. 557) rightly argue that "[c]aring with and through communication media is central to methods and modes of being in the world with others". These forms of care point to various domestic labours that, despite being essential, are often rendered invisible or taken for granted. Feminist perspectives recognize these media practices as gendered, marginalized, and repetitive yet critical for managing daily life. This article shifts focus to a less obvious but equally significant aspect of care: 'care as material tinkering' (Lindén and Lydahl 2021). Inspired by Tronto's work, this approach accentuates the engagement with the materiality of media technologies as an essential aspect of digital media use, as further elaborated below.

Media maintenance: practicing care for the material environment

Care, framed as a responsive concept, underlines the necessity of reacting to the immediate conditions of our environment (Russell and Vinsel 2018). Rather than adhering to abstract principles, care responds to the contextual demands of everyday life, acknowledging the vulnerability and constant change of things (Denis and Pontille 2015). When applied to digital media use, care involves engaging with the impermanence and incompleteness of media technologies, necessitating regular maintenance,

updates, and troubleshooting. Elsewhere, I have described this ongoing technical labour, which involves both hardware and software, as a crucial part of the domestication of media technologies (Peil 2024). This labour is particularly relevant in the early appropriation phase, but remains significant throughout the entire domestication process, especially for digital networked technologies due to their specific nature and economic context.

provide assistance. Since then, numerous studies have focused on support relationships, either highlighting digital media's material nature as maintenance-intensive (Kennedy et al. 2015) or users' need for assistance, especially among the less proficient. Notably, many studies focus on older users, often conceptualizing them as uniform recipients of family support, yet findings indicate a diverse and varied reality; older users comprise multi-

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Maintenance practices are essential forms of care because they recognize the wear and vitality of matter, treating vulnerability as a natural state rather than a deviation from the norm (Denis and Pontille 2015). As Russell and Vinsel (2018) aptly put it, "maintenance is caring" (p. 259). In this regard, maintenance acknowledges that the function and reliability of media technologies as everyday infrastructures are continuously ensured through attentive care practices. Such practices require constant vigilance and adaptation, given the unpredictability of malfunctions, glitches, or technical disruptions. Thus, understanding maintenance as a form of care highlights the importance of these often-invisible activities in sustaining the daily functionality and reliability of digital media technologies, stressing the need for continual engagement and adaptation. This form of care also contributes to environmental sustainability by extending the lifespan of devices, reducing the need for frequent replacements, and fostering a more mindful, reflective relationship with technology.

Caring relations in media maintenance

A key aspect of contemporary media maintenance is the ongoing advancements in our digital environment. The rapid evolution of networked technologies such as smartphones and automated home devices, coupled with the myriads of individual configurations and potential error sources, have significantly made media usage more complex and sometimes challenging. This is further compounded by the economic imperatives of media environments, which prioritize profit over long-term-usability or simplicity, steering users towards continuous engagement and product dependency through frequent, but not always beneficial, updates and offerings. The increasing complexity and commercial pressures of these technologies can overwhelm users, making media maintenance more challenging. When individual media maintenance is neglected or becomes unfeasible, disruptions in usage occur, requiring assistance. Such support may come formally through service offerings and helplines, or informally within social networks. Two decades ago, when the internet was still new, Maria Bakardjieva (2005) introduced the concept of 'warm experts' to describe individuals within one's close social circle who possess relatively higher knowledge of the internet and

ple generations with distinct digital media experiences and skills (Hunsaker et al. 2019; Olsson and Viscovi 2018). This indicates that media maintenance, as a form of care, encompasses all individuals and extends beyond individual concerns as it involves collective problem-solving initiatives. Care practices in this context manifest at two levels: in the maintenance of technology's materiality and functionality and in the activation of interpersonal relationships towards a shared goal. This dual expression of care aligns with two pillars of sustainability as outlined in the three-pillar model (Purvis et al. 2019): First, environmental sustainability is fostered through attention to the material conditions of technology, including adaptation and customization, which likely extend the lifespan of devices and strengthen attachment, potentially reducing the frequency of replacements. Second, social sustainability is advanced by enhancing access, building digital competencies, and cultivating communal support networks to navigate the complexities of digital technologies.

Fieldwork

Data and methods

This study is grounded in a comprehensive corpus of qualitative data collected between 2017 and 2022, employing a multi-method approach to examine media maintenance practices and support relations. Derived from the theoretical exploration of media technologies as *infrastructures of care*, the research inquiries include

- a) identifying types of media maintenance tasks,
- b) exploring strategies employed to resolve issues, and
- c) examining the social relationships mobilized to address related challenges.

Participants were predominantly students of media and communication studies from Austrian and Southern German universities, selected via convenience sampling. All provided informed consent to ensure anonymity and confidentiality. The analysis focuses on five datasets (Tab. 1). The data sets were selected primarily for illustrative purposes and analyzed using qualitative con-

Sets	Study details
Set 1	Written Narratives (2022): Responses from eight undergraduate students at an Austrian university detailing their frustration experiences with media and related maintenance practices, articulated in a structured format based on specific prompts.
Set 2	Collective Diary (2022): Entries from 13 undergraduate students at an Austrian university documenting instances of media-related challenges over a semester on a GDPR-compliant platform, offering insights into everyday user experiences and support mechanisms.
Set 3	Support Network Diagrams (2019): Visual representations by nine graduate students at an Austrian university, illustrating the interpersonal networks involved in troubleshooting digital media issues, and highlighting the social dimensions of technological interactions.
Set 4	Written Responses (2017-18): Detailed accounts from 20 undergraduate students, providing a narrative of their encounters with media technology-induced frustrations and related maintenance activities.
Set 5	Written Responses (2018): Insights from seven students from a university in Southern Germany, focusing on their challenges and frustrations with digital media technologies and related maintenance activities.

Tab. 1 Overview of sample. Source: author's own compilation

tent analysis (Mayring 2014) with MAXQDA software, focusing on key dimensions such as identified problems, solution strategies, error phenomena, and consequences of errors. To ensure confidentiality, all personal identifiers have been anonymized.

A vulnerable infrastructure of everyday life

The data analysis shows that disruptions in digital media use are common, highlighting their role as intrinsic elements of digital infrastructures. All participants easily documented incidents where digital media became conspicuously visible during malfunctions, shifting from their usual state of transparency to a prominent disruptor, compelling users to confront the underlying technological logics, idiosyncrasies, and flaws. One participant, a graphic designer, described a personal experience with technology: "Having used Macintosh computers since I was fifteen, I was initially surprised at how little most of my trained colleagues knew about the technology they used daily. This ignorance eventually transferred to me, and I often only realized my lack of understanding when problems arose, forcing me to confront the complexities behind the interface. The error messages prompted me to engage with the technology, though not all interactions led to increased understanding." This excerpt from a narrative highlights that digital devices are designed to interface with users primarily as consumers, not as informed operators, and only during breakdowns are users driven to engage with the technology on a more technical level.

Further complicating the user experience is the 'perpetual beta' state of digital infrastructures, characterized by relentless upgrades and a production logic geared towards constant change and improvement. This results in a digital landscape where errors are common, arising not only from user mistakes or insufficient skills but from an infrastructure inherently susceptible to various faults. The documented errors shed light on significant issues that were grouped into five main categories: unexpected application failures, mandatory software updates, connectivity issues, compatibility problems, and hacking vulnerabilities. These categories underscore both the unpredictable and often frustrating experience of digital media users and the intrinsic vulnerabilities of the underlying infrastructures. The highly individualized nature of errors, manifesting differently across devices, complicates troubleshooting efforts, as evidenced by participants

frequently finding that online solutions fail to align with their specific problems. "When I encounter problems, whose causes are unclear, I seek online solutions. However, these are often unhelpful because the described issues do not match my situation exactly or address different devices", remarked a participant. This specificity highlights the challenge of deriving generalizable knowledge from personal repair experiences and underscores the need for more tailored support mechanisms.

While technological disruptions are often initially perceived as trivial, the implications, as documented by participants, indicate a profound impact on daily functioning. These incidents not only illustrate the inconvenience of digital dependency but also highlight critical obstacles to unrestricted communication and access. Such experiences have led to an acute awareness among users of their reliance on digital infrastructures, which, when disrupted, render them inactive and unable to perform necessary tasks or access essential services. One participant expressed frustration with social media and online systems, noting the passive wait for software fixes, in contrast to hardware issues that can be temporarily resolved by resetting devices. The critical tension between user autonomy and the opaque operations of digital infrastructures draws attention to how visible breakdowns not only disrupt daily activities but also reveal the constraints of user control, as well as the far-reaching influence of these technologies on everyday life.

Maintaining infrastructure as a collective concern

This analysis continues to explore the nuanced dimensions of media maintenance as a collective responsibility, where technical upkeep and troubleshooting intersect with care ethics to shape digital media experiences. As digital systems and platforms expose the limitations of user control over technology, participants' narratives reveal a layered strategy when confronting technological failures. Initially, they usually engage in trial and error, reflecting a hands-on interaction with digital interfaces – restarting devices, logging out and back in, or refreshing applications. When these efforts falter, they resort to online searches for solutions. As challenges persist, the recourse to 'warm experts' becomes inevitable. This escalation from personal attempts to community-based assistance underscores the inherent social nature of media maintenance.

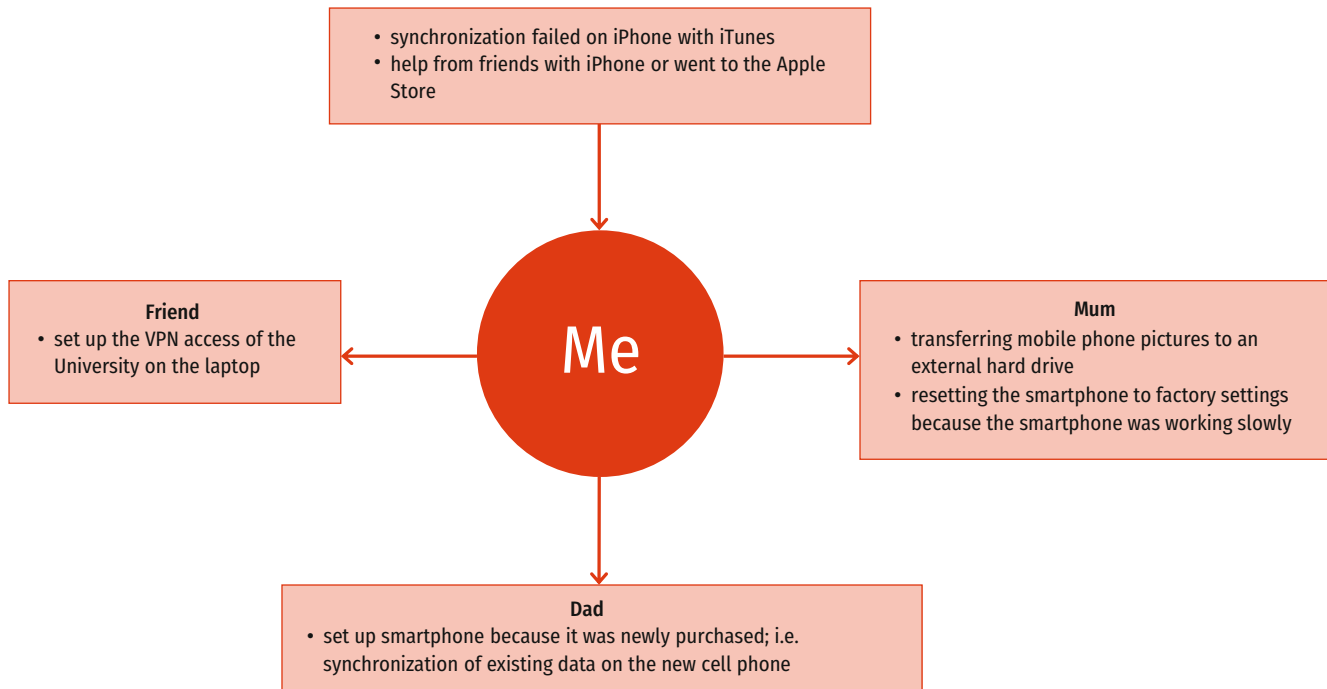


Fig. 1 Participant's support network diagram. Source: author's translation and compilation based on original by study participant

Support within digital technology use not only unfolds as a multifaceted social interaction, transcending skill level or age distinctions, but also reveals the unique character of problems encountered in digital media usage. Issues go beyond simple error correction; applications often remain inaccessible due to required settings adjustments or the initial setup of new devices. These challenges once again underline the individualized nature of engaging with digital technologies – processes that may not necessarily simplify with prior experience. As showcased in the support network diagrams (Fig. 1), the dynamic exchanges within these networks demonstrate a bidirectional flow of assistance, where individuals both give and receive support depending on the issue at hand. This illustrates the communal aspect of navigating digital complexities and emphasizes the importance of blending technical know-how with adaptive social strategies.

One participant noted the emotional and relational nuances of receiving support: “After being completely overwhelmed, I asked my mother for help, and she solved the problem with a few clicks in a few minutes. I felt both more upset and relieved afterward.” This account delineates the complex emotional terrain navigated in technological care, where relief at resolving an issue coexists with frustration over one's dependency. Interactions like this demonstrate the dual role of technological care: addressing immediate issues while fostering emotional support and relational ties. An illustrative example of another participant deepens this understanding: “My mother called me in desperation today because she couldn't access her email on the PC. She had no idea how to reset her password. I guided her, and after about 40 minutes, we managed to get her back into her email.” This scenario

highlights how care practices frequently emerge in moments of desperation, transforming the resolution of a technical issue into an opportunity for interpersonal interaction and support. The nurturing of these social bonds through technological assistance reveals a deeper layer of care that transcends mere technical help, extending into emotional and social support realms.

Discussion and conclusion

This article has examined some key aspects of digital media use that reinforce their role as infrastructures of care and situate media maintenance within the ethics of care. It demonstrates that all users, regardless of their expertise, are continuously confronted with the challenge of engaging with the materiality of ever-evolving digital media technologies. Engaging with media technologies often requires them to initiate, configure and occasionally repair digital systems to take advantage of their benefits. Recognizing the transient and vulnerable nature of technological artefacts fosters a politics of knowledge that focuses on the care and preservation of materials, illuminating the labour underpinning the creation of socio-material orders.

The maintenance and care of digital media, as outlined, extend beyond individual efforts, and underline the collective commitment needed to effectively manage these infrastructures. These activities demand political and institutional support to strengthen the informal care networks that are vital for inclusive and effective digital media use, thereby enhancing social sustainability. Establishing technology support centres and fostering warm

expert relations through community-based programs would be valuable steps, improving accessibility and user proficiency while formalizing the integration of community-based care practices into digital media usage. Particularly, in addressing skill disparities, this form of care helps to narrow the digital literacy gap, a crucial element that should be emphasized in policy measures aimed at creating a more socially sustainable digital society. While this commendable form of care is valuable, it should not obscure the technology sector's responsibility to reduce the overall need for technological care. Manufacturers must prioritize developing reliable, user-friendly technologies that enhance skills and understanding, rather than fostering greater dependency on digital products. The data from the present study,

economic considerations. Efforts to improve sustainability in the technology sector have tended to focus on the hardware level. Initiatives such as Austria's 'repair bonus', the European 'Right to Repair' legislation, and France's repairability index not only promote more sustainable consumer behaviours but also compel manufacturers to produce more maintainable products. While these are commendable steps in the right direction, this paper emphasizes the critical importance of also addressing the software dimensions of environmental sustainability. Frequent disruptions in digital processes, coupled with software incompatibilities or malfunctions, not only lead to substantial losses in time and productivity for users but also significantly increase data traffic, contributing to resource wastage through

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however, suggest a different outcome. Participants frequently reported feelings of powerlessness and lack of control when faced with technological breakdowns. As Bunz and Meikle (2018) argue, smart technologies often “de-skill[s] and disempower[s] the user” (p. 16) rather than offering empowering learning opportunities. Such user experiences, where poorly designed technologies reduce users to passive consumers or planned obsolescence disrupts digital practices, ultimately undermine competence and autonomy. Thus, the findings raise critical questions about the tangible limits of care activities. Socially sustainable care practices must therefore consider carefully how disruptions in media usage occur – whether due to skill gaps or flaws in digital services – and determine where assistance is needed, as well as how caring relations in digital media use contribute to the long-term development of user skills.

With respect to environmental sustainability, care practices involving the tinkering and maintenance of material technologies can similarly be viewed as a double-edged sword. On the one hand, such practices hold the potential to prolong device lifespan, thereby mitigating the environmental impact of production and disposal. On the other hand, the ability of individuals to undertake effective repair and customization is constrained by the structural limitations imposed by manufacturers. Thus, broader systemic change is required, including regulatory measures that mandate corporate responsibility for facilitating repairability and extending product life cycles. Recent policy developments indicate progress in this area, underscoring the need to integrate care ethics into technology policy frameworks. In doing so, the emphasis must shift towards sustainable technological infrastructures that balance social and environmental imperatives with

workarounds and data redundancies. These issues often stem from system failures, repetitive updates, and poorly designed software. Of particular concern is the vast data processing required by AI and algorithm-driven processes, which are increasingly integrated into everyday technologies, often unnecessarily and without user awareness. These integrations increase system complexity and introduce new errors while also relying heavily on data centres, many of which are still powered by fossil fuels, consume vast amounts of water, and depend on the extraction and refinement of raw materials necessary for data storage and processing (Taffel 2023). Addressing inefficiencies at the software level is therefore crucial for reducing greenhouse gas emissions and aligning with wider sustainability goals. By adopting strategic measures that target these challenges, the technology sector can foster a more equitable, sustainable, and resilient technological landscape that better serves the common good.

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