Resonant Sustainability: The Right to Repair as Resistance Against Acceleration

Per Fors
Civil and Industrial Engineering
Uppsala University
Uppsala, Sweden
per.fors@angstrom.uu.se

Sebastian Abrahamsson
Department of Sociology
Uppsala University
Uppsala, Sweden
sebastian.abrahamsson@uu.se

Abstract— **In order to mitigate the most severe consequences of climate change and other challenges related to environmental sustainability, Information and Communication Technologies (ICTs) have been promoted as important tools for among other things dematerialization and optimization of industrial processes. Still, the ICT industry also contributes greatly to environmental unsustainability, not least since ICT products tend to have a short useful life and are difficult to properly repair and recycle due to their complex material compositions, and the interplay between physical and digital properties within these products. This mismanagement of obsolete devices has resulted in e-waste being one of the fastest growing streams of waste globally. Simultaneously, as ICT continues to permeate various aspects of our daily lives, particularly with the advent of the Internet of Things (IoT), we find ourselves in a continuous cycle of adapting to and acquiring skills to operate new, frequently complex digital products. Skills that quickly become obsolete due to the relatively short lifespan of such products. The German sociologist Hartmut Rosa argues that modernization has always, under all its phases and wherever it has occurred, been characterized by acceleration and dynamization of various facets of society. Drawing on his theory of modernity, *Social Acceleration*, we show in this mainly theoretical paper how our current relation to ICT is characterized by alienation from the thing-world due to technical acceleration. We introduce the notion of the Right to Repair as an *island of deceleration* that can contribute to more resonant relations to technological devices, with positive outcomes for environmental sustainability.**

Keywords—Social Acceleration, Right to Repair, ICT and Sustainability, Resonance, ICT4S

I. INTRODUCTION

The technological devices that are increasingly becoming part and parcel of everyday life, such as laptops and smartphones, are deteriorating and becoming obsolete at an accelerating rate [1]. For decades, the environmental concerns related to the linear flows of materials in the ICT value chain have been discussed, including resource scarcity, electricity use and carbon dioxide (CO_2) emissions and electronic waste (e-waste). For example, estimates say that smartphones, the most resource-intense ICT product, are replaced with a new device every 2 years on average. Today, there seems to be consensus among researchers, policymakers, the public – and to some extent ICT companies – that the useful life of ICT needs to be prolonged in order to mitigate some of the problems mentioned above. This is exemplified by the intensified discourse around *Circular Economy* (CE) [2], and the recently proposed EU directive to promote the repair of consumer goods [3], sometimes referred to as the *Right to Repair* (R2R), including electronics. The notion that consumers should possess the right to repair their devices appears commonsensical, especially in light of the adverse environmental impacts linked to frequent replacements in the linear value chain. Nevertheless, the societal and individual benefits of establishing repair as the norm have received limited attention in research [1]. In societies characterized by increased and intensified speeds and rates of producing, consuming and discarding goods, this is perhaps not that surprising.

In this context, the German sociologist Hartmut Rosa, throughout several books and articles, has outlined a theory of late modernity called *Social Acceleration*. The theory articulates the notion that the speed by which different kinds of changes occur in society is constantly increasing. Rosa [4] writes that

> the experience of modernity and modernization has always, under all its phases and wherever it has occurred, been characterized by the acceleration and dynamization of history, society, culture, life, and even time itself (*translation from Swedish*).

There is a vast number of social scholars who express, each with their specific nuance, similar ideas about modernity, from the *runaway world* [5] to *time-space compression* [6] and *dromology* [7]. In this sphere of thought, Rosa's contribution lies in dissecting this state of increased dynamization. To achieve this, he classifies acceleration into three intersecting dimensions that influence various aspects of life: *technical acceleration, acceleration of social change*, and *acceleration of the pace of life*. While acceleration may seem inevitable due to ever increasing economic growth, climate change and technological innovation, Rosa claims that there are also categories of *inertia* that can contribute to either *deceleration* or *desynchronization*, i.e., that different interacting spheres are accelerating at different speeds [8].

Rosa argues that during classical modernity, social acceleration was essential for nurturing both individual and collective autonomy. However, in late modernity, the role of acceleration has shifted, and become a necessity for upholding stability and ensuring sustained levels of prosperity. Without economic growth and technological innovation, society will stagnate. Nevertheless, similar to many others, Rosa also recognizes that if too many aspects of life change too rapidly, people may struggle to keep up with the pace of time, and this is something we believe many can relate to. One of Rosa's key suggestions is that social acceleration eventually leads to *alienation*, understood as a distortion of our way of relating to the world in terms of space, time, the thing-world, other

people and not least our own actions [8]. *Alienation* may lead to feelings of detachment and a sense of being out of sync with one's surroundings.

Numerous scholars and social movements have proposed both empirical and theoretical ideas on how, amid acceleration, one can slow down. This ranges from concepts like *slow science* [9], *slow food* [10] and *slow tech* [11]. In this context, the so-called *degrowth movement* suggest that the constant quest for accelerated economic growth is not only most likely impossible, but also undesirable [12], [13], [14].

Proponents of *degrowth* advocate for a downscaling of economic activities due to their adverse effects on the environment. However, they also claim that slowing down various technological and economic systems would significantly benefit societies in terms of democracy and overall wellbeing, not least since current acceleration-based systems tend to widen economic inequalities and opportunities to live a 'good life.' Just like Rosa, they emphasize how current ways of organizing societies lead to an acceleration-induced experience of *alienation*, and in the case of Rosa, *uprootedness*. For the *degrowth movement*, *alienation* is tied to the exploitative nature of the growth-based economic system, and how the relentless pursuit of economic expansion undermines social relationships, cultural values, and ecological balance, leading to a sense of disconnection and *alienation* from oneself, others, and the world. For Rosa [8], however, *alienation* is expressed, for instance, 'in the growing feeling of not having any time (for what is "genuinely" important)', resulting in a *rasender Stillstand*, understood by Virilio [15] as the paradoxical condition of immobility, helplessness and stagnation, despite rapid advancements in and constant acceleration of various systems. Thus, while the *degrowth movement* mainly sets out to critique the systemic and structural factors that contribute to *alienation*, it is for Rosa more related to a sense of disconnection between the individual and the world around her. In Rosa's [16] own words:

> [it] denotes a situation in which the subject experiences his or her own body and feelings, material and natural environment, or interactions as *external, unconnected, non-responsive*, in one word: *mute*.

As emphasized by Prescott [13], the *degrowth movement* has furthermore leaned towards promoting *autonomy* as 'an overarching conceptual "north star" in its articulation of socio-economic, political and cultural aims.' Rosa, on the other hand, has proposed *resonance* as the 'remedy' to *alienation*, understood as a relationship between individuals and the world characterized by connection and attachment [16]. *Resonance* occurs when there is a harmonious and meaningful interaction between the self and the world, allowing for a sense of fulfillment, attachment, and engagement. Moreover, Rosa [16] is explicitly criticizing the quest for *autonomy* as one of the causes of *alienation*, since it underlies the desire 'to bring even more world within reach and under control.' Therefore, resonance is completely dependent on a tangible *limitation* of *autonomy*. While the *degrowth movement* sees *autonomy* as the *solution to alienation*, Rosa instead sees *autonomy as one cause of alienation*, and promotes *resonance* as alienation's 'other.'

In this paper we aim to do three things. First, we wish to put the discourses surrounding the R2R of ICT in relation to Rosa's claims about acceleration [8], in the sense that we conceptualize the relative lack of repair as both a sign of and

a catalyst to acceleration. Second, we introduce current efforts within the European Union (EU) to create a repair market through a R2R legislation [3]. This repair market in-the-making, we argue, could be seen as an attempt not only to mitigate the environmental, material and economic costs of the ever-growing mass of e-waste, it may also be read as an attempt to slow things down. Third, and most importantly, we aim to highlight the importance of resonance in a sociology of repair, building on our critique of the current R2R discourse promoted by said proposal, and recent research that has highlighted the importance of the concept in collaborative repair practices for *dealienation* [13].

II. SOCIAL ACCELERATION: A CRITIQUE OF LATE-MODERN SOCIETIES

Since the birth of modern sociology and, with that, the reflexive critique of modern society, the notion of dynamization and acceleration of history, time, society, life and even time itself has been present. Rosa, throughout his books and essays, shows how prominent figures, such as Marx, Weber, Simmel, Durkheim and so on, all acknowledge acceleration, but that the concept is largely ignored in their respective theories of modernity. For Rosa, this fatal negligence has resulted in serious and, in many cases, analytically careful sociological dissertations repeatedly echoing the fatalistic assertion that 'modernity accelerates "everything", more or less' (*translated from Swedish*) [4]. Rosa has thus dedicated his work to redefining modernity in line with an approach that places social acceleration at the core of analysis. A modern society, according to Rosa, is a society by which the mode of stabilization is *dynamization*, i.e., when it systematically requires (material) growth, (technical) acceleration and (cultural) innovation to reproduce its structure and maintain the institutional status quo [17]. By breaking down acceleration into various societal fields where dynamization occurs – some areas experiencing acceleration while others exhibiting outright deceleration – Rosa has demonstrated the occurrence of *social acceleration* and the driving forces behind it in his work. In doing so, Rosa found three dimensions or fields of acceleration, and five categories of inertia (*see Table 1*). The three dimensions of accelerations are *technical acceleration*, *acceleration of social change* and the *acceleration of the pace of life*. The five categories of inertia are the *natural limits to speed*, *islands of deceleration*, *slowdown as a dysfunctional side-effect*, *intentional deceleration*, and *structural and cultural rigidity*.

A. Three Dimensions of Social Acceleration and Five Categories of Inertia

Technical acceleration involves the intentional increase in the speed of goal-oriented processes, primarily the technological (or mechanical) pace of transportation, communication, and production processes. The ongoing modern *acceleration revolution* [7], akin to the Industrial Revolution and the contemporary digital transformation, is characterized by this kind of acceleration. The ability to reach anyone worldwide with a simple swipe on the smartphone, or the escalation of movement speed afforded by new means of transportation, contributes to a cultural, ongoing 'contraction of space' [6]. Furthermore, the possibility – and in late modern society, the *necessity* – of constantly renewing or replacing

material structures alter our relationship with and risks alienating us from the thing-world.

The *accelerating pace of social changes* often occurs in close connection to *technical acceleration* but must, nevertheless, be considered logically and analytically distinct from the latter [8]. Rosa argues that this concerns the pace at which, on the one hand, forms of practice and action orientations, and on the other hand, structures of association and patterns of relations, are transformed. Drawing on Lübbe [18], Rosa defines the *accelerating pace of social changes* as a 'contraction of the present' (*Gegenwartsschrumpfung*), where the 'present' is understood as a durable and stable time space in which the space of experience and the horizon of experience coincide [19]. This contraction of the present is a result of an accelerated social and cultural 'obsolescence rate' in conjunction with a socio-cultural 'innovation densification'. *The accelerating pace of social changes is* experienced as the present – as a temporal category – is shrinking across various domains such as culture, politics, economy, science, work, and family life, in line with Harvey [6]. In short, if *technical acceleration* can be understood as certain accelerations *in* society, the *accelerating pace of social changes* as amounts to the acceleration *of* society.

The third category of *social acceleration* is the *acceleration of the pace of life*. Rosa defines this as the increase of the number of actions or experiences per unit of available time. It can manifest in various ways, such as completing tasks more quickly to fit more into the same or a shorter time frame, or through the overlapping or simultaneous execution of actions, commonly known as 'multitasking'. 'Objectively,' this can be perceived as a densification of episodes of actions. 'Subjectively,' this is experienced as a sensation of having a 'lack of time,' or more specifically, stress for not being able to do anything properly, or not being able to keeping up with the ever changing and accelerating present, and the need to speed things up. An accelerated pace of life is often caused by *technical acceleration*, which is described by Rosa as a paradox which resides in the fact that technological progress should, theoretically, decelerate the pace of life, as it would provide us with more free time when more work can be done more efficiently with the help of technology, or outright outsourced to technological processes such as Artificial Intelligence (AI). Nevertheless, the surge in workload, indicated by the number of tasks individuals are expected to perform per unit of time frequently surpasses the efficiency gained from optimizing the tasks through technological innovation. Cowan's historical study of how the introduction of technological household appliances, such as the dishwasher, the microwave and vacuum cleaners actually meant more, rather than less, work for women is an exemplary case in point [20]. Similarly, someone who used to write letters but has now switched to sending only emails probably notices that, despite an email taking only half the time to write, they end up writing four times as many emails and consequently spending more time than before on daily correspondence [4]. The introduction of ICT at work or in everyday life frequently opens up possibilities and 'needs' that quickly become taken-for-granted [21]. Illustrative of this is the substantial data available from diverse (technical and social) processes within organizations, serving as a foundation for various quality controls and decision-making processes. Many professionals find themselves allocating less time to their primary work tasks – those for which they are employed – due to the continual demand for collecting and analyzing data for various control and quality purposes [22]. To summarize, we can speak of *social acceleration* when, for example, there is an increase of

the number of miles we are able to travel per hour (technical acceleration), when there is a rise in the number of fashion trends we see per decade (acceleration of social change), or when there is an increase in the number of discernable activities a person undertakes in the course of a day (acceleration of the pace of life) [17].

While Rosa contends that acceleration manifests within these three dimensions, he claims that there are also contributing factors that, if not leading to deceleration, at least result in a slowdown of acceleration within these dimensions. Thus, he introduces five categories of *inertia*, among them *dysfunctional side effects of acceleration*, e.g., that an increased use of cars eventually leads to traffic congestion, and *intentional deceleration*, e.g., the *Deep Ecology movement* [23] and more recent movements such as *tang ping* in China and *quiet quitting* in the US [24]. Furthermore, Rosa claims that there are *islands of deceleration* which can be found among groups of people who share certain practices, or in places where time seemingly stands still. For example, there is the current trend of 'digital detox' where individuals participate in offline retreats or cease using their smartphones to eliminate digital disturbances in their daily lives [25].

Acceleration/ Inertia	Description
Technical acceleration	The intentional, technical, and above all technological (i.e., machine-based) acceleration of goal-directed processes.
Acceleration of social change	An increase of the rate of decay of action-orienting experiences and expectations and as a contraction of the time periods that determine the present of respective functional, value, and action spheres.
Acceleration of the pace of life	An acceleration of the pace of life in modernity encompasses both an increase of the speed of action and a structurally induced alteration of the experience of time in everyday life.
Natural limits to speed	(Geo-)physical, biological, and anthropological limits to speed, i.e., processes whose duration and velocity absolutely cannot be manipulated or can be only at the price of a massive qualitative transformation of the process accelerated.
Islands of deceleration	Territorial and social niches or oases of deceleration that have until now been partly or entirely left out of the accelerating processes of modernization.
Slowdown as dysfunctional side-effect	Slowdown of technological and/or social processes as an unintended side-effect of an acceleration process.
Intentional deceleration	Deceleration as ideology and slowdown as a strategy of acceleration.
Structural and cultural rigidity	A paralyzing standstill in the inner development of modern societies complementary to the diagnosis of an acceleration of social change.

Table 1: Three dimensions of acceleration and five categories of inertia.

B. *Resonance as an Antidote to the Adverse Effects of Social Acceleration*

In *Social Acceleration: A New Theory of Modernity*, Rosa outlines modern society as one per definition affected by *social acceleration*, and shows in which ways and how different aspects of society and human life are accelerating [8]. He also outlines the effects of social acceleration on how

those affected by acceleration relate to various facets of life, and how such relations are often characterized by *alienation*. In his second major publication on the subject, *Resonance*, he sets out to unveil the effects of social acceleration and the 'antidote' to *alienation*, namely *resonance* [16]. He suggests that in the era of modernity, particularly in late modernity where dynamization serves as the dominating mode of stabilization, there is a 'structural compulsion' [16] driving persistent escalation and innovation. As we extend our control over various aspects of life, from relationships and careers to childbirth, aging, and even death, these domains turn into *points of aggression*, and a perpetual struggle emerges between our urge to shape and our longing to let life unfold naturally [26]. In a sense, our urge for control and predictability makes us lose touch of the world and our lives, that in this alienated mode is approached as a 'to-do-list,' due to the never-ending flow of challenges that need to be controlled and overcome. This approach leads to *temporal fragmentation*, a condition in which it becomes increasingly difficult to integrate the three levels of temporality (past, present and future). Instead, according to Rosa, the modern condition is characterized by a *rasender Stillstand* [15], a state where the conditions of life change constantly, but without rising within any natural and recurring cycles or being channeled into collective projects with shared goals. In this state, collective, political and individual life are seemingly without overarching patterns or goals [8]. Rosa suggests that merely "slowing down" is not enough to solve this, rather, what is needed is a vision of a resonant mode of being in the world.

Resonance is a suitable metaphor for describing various qualities of relationships among human and non-human actors, and how humans relate to the world. Similar to the acoustic phenomenon, such as when one tuning fork induces vibrations in another despite they being physically separated, Rosa's theoretical concept 'describes a mode of being-in-the-world' where 'two entities in relation ... mutually affect each other in such a way that they can be understood as *responding to each other*, at the same time each *speak with its own voice*' [16]. Thus, contrary to the acoustic phenomenon, *resonance* is not merely about echoing, since echoing occurs mechanically and without variance. Since, as Rosa also emphasizes, *resonance* is a relation and not an emotion, negative emotions – such as frustration or loneliness – can lead to positive resonant experiences. However, '[any] scientific or technological relation to the world is a mute relation to the world' [16].

Rosa describes *resonance* as both a descriptive and normative concept. Descriptively, he argues, it is a basic human capacity and need. Neither identity nor sociality is possible without it, and humans are shaped by their longing for such relations. Normatively, it is established as a measure for a good life, and – since it is dependent on *resonant spaces* (e.g. nature, art museums or religious places) where such relations can emerge – we should craft resonance-facilitating institutions, practices and modes of socialization. However, our attempts to 'gain, accumulate, maximize, or optimize access to and control over a resonant experience may ... be the very thing that destroys it' [16]. Thus, *resonance* is only a possibility when the segment of the world we relate to speaks with its own voice, which necessitates moments of inaccessibility and contradiction. A resonant relationship is characterized by responsiveness by a counterpart which we

cannot completely appropriate or adaptively transform. Thus, Rosa [26] argues,

> resonance requires a world that can be reached, not one that can be limitlessly controlled. The confusion between reachability and controllability lies at the root of the muting of the world in modernity (*translated from Swedish*).

Such a mode is not characterized by aggression as a result of acceleration, but by *listening* and *answering* to the world. Listening refers to aspects of the world that are capable of creating and catching attention, that are calling, and that speak to someone (*Af←fect*). Answering means moving outwards towards that which is calling, open up to whatever that creates interests (*E→motion*). This means *resonance* is not a state, but a way of relating [26]. Such relations are also *transformational*, in the sense that we experience change when entering into such a relation. This can be exemplified with how engaging with art, music and religion has the possibility to affect those who do so. The last characteristic of resonant relations is *uncontrollability*, which among other things refer to the fact such relations cannot be controlled or meticulously crafted. After a brief review of the right to and effects of repair, we will argue for a sociology of repair based on resonance.

III. THE RIGHT TO AND EFFECTS OF REPAIR

Repair has often been evoked, in the research literature, as providing valuable insights into the opposition between breakdown and crisis on the one hand, and taken-for-granted routines on the other [27]. When a car works as it should, providing quick and smooth transportation for commuters, there is no reason to reflect on what it does and how it does it. If the battery of that car is flat, however, all affordances offered by it, previously taken for granted, will come into view. Hence, practices of repair contribute to an understanding of what happens when things break down, wear out and fall apart, but they also provide opportunities for scrutinizing what may be called 'normalcy' or order: social and material orders are an outcome of never-ending, and often invisible, repair and maintenance work [28], [29]. This literature asks us to foreground the fragility of things, and to look behind the scenes of the taken for granted orderings to better understand how these are accomplished.

ICT products, but now also increasingly home appliances, cars and watches, differ from most other products because they consist of both digital and material properties. This means that the problems that cause the malfunction could be located in the digital or the material, or in the intersection between the two. This is one of the important reasons why repairing ICT is getting increasingly more difficult and expensive, but the wear-and-tear culture surrounding ICT devices has not only arisen because products break and cannot be repaired. Rather, many products, especially smartphones, are replaced for entirely different reasons. For example, some mobile subscription plans allow their customers to replace their 'old' phone with a new one for free, and given a desire for novelty, having the latest technological gadget may also increase status even if the old – often fully functional – device fulfills almost exactly the same utility.

Aaron Perzanowski, in his book *The Right to Repair: Reclaiming the Things We Own*, argues that there are economic, social and environmental benefits of repair, but there are also individual benefits [1]. The economic benefits to repair should be self-evident, but there are obviously value

conflicts among the different stakeholders. Across categories, average product lifetimes are dwindling. Perzanowski shows that the lifetime of washing machines and refrigerators have decreased by several years over the last decade, and with ICTs the situation is even worse. For example, while the old Cathode-Ray Tube (CRT) monitors had an expected lifetime of around 15 years, contemporary flat screens and monitors are only used for an average of five years. With the introduction of higher resolutions, larger screens, application support, different connection socket standards, internet connection and other smart features, monitors are replaced frequently to keep up with the accelerated pace of technological development [1].

Most smartphones, in theory, last for between four and ten years, but in practice they are often replaced after between two or three years. With the current cost of a standard iPhone reaching approximately €1000, and considering the frequent need to replace various other devices and machines as well, individuals end up spending substantial sums of money each year just to maintain their current use of technological devices. Designing products with repairability in mind could thus help ease some of the financial strains associated with maintaining technological devices for the general public. Furthermore, society as a whole clearly benefits economically from increased repair. Technical products often consist of valuable materials, not least gold, and scarce minerals that only exist in any substantial quantities in specific locations, such as rare earth elements (REEs). This makes increased repair a compelling case from an economic point of view. More repair can also contribute indirectly to the economic development of society by fueling both the repair sector and the second-hand market. In a recent report, Custom Market Insights [30] assessed the refurbished device market at about USD 52.34 billion in 2021 and anticipates it to climb to USD 64.10 billion in 2022, with a projected increase to roughly USD 146.43 billion by 2030. It is, however, likely that normalizing repair will decrease the profits of ICT companies. The value conflict lies with the fact that it is oftentimes more profitable to design devices that are only used for a limited time and then replaced, rather than to maintain and repair devices that customers have already paid for.

The environmental benefits of increasing the lifespan of technical products are immense. E-waste has for a long time been the fastest growing waste stream globally. As of right now, the value chain of ICT is more or less linear, meaning that most of the materials used in the actual products are extracted from the soil, and once the products are worn out, they are often landfilled or incinerated. From an environmental perspective, there are problems related to each and every phase of the product's value chain – from extraction, manufacturing and use, to disposal. In order to produce one iPhone, which itself weighs approximately 128 grams, miners around the world need to extract 34 kilograms of ore, meaning that only 0,03 percent of the extracted materials are actually used in the finished product [1]. The rest of what is extracted mainly ends up as waste, potentially posing harm to humans and animals in and around the mines. In most cases, virgin materials also need to be refined in various ways before they can be used in manufacturing. This is often a water and energy consuming process that creates all sorts of toxic byproducts. The manufacturing process of ICT devices, especially smaller devices such as laptops and smartphones, account for the absolute majority of the negative environmental impacts. This means that replacing devices for more energy-efficient counterparts is rarely a sustainable option, which makes repairing and maintaining these devices for as long as possible a more environmentally sustainable option [31]. In 2019, the UN disclosed that some 54 million tons of consumer electronics were discarded every year. The issue extends beyond sheer volume, with a remarkable 70 percent of the world's toxic waste being e-waste, containing substances like arsenic, lead, mercury, and other toxins. Only around 15 percent of this waste undergoes proper recycling [32], while much is recycled 'informally' in developing countries, with various environmental problems as a result [33].

There are also various social problems along the ICT value chain. The ICT sector depends significantly on conflict minerals, including tin, tantalum, tungsten, and gold (commonly known as the 3TGs). These minerals are mainly extracted in the Democratic Republic of Congo (DRC), often under harsh conditions resembling slavery, and have played a role in fueling violent conflicts involving various local militia groups. Informal recycling of valuable materials such as gold in developing parts of the world is often done without proper tools or protective equipment, leading to workers being exposed to mercury fumes, dioxins and cadmium dust. Making sure that ICT is repaired rather than replaced can alleviate some of the social and environmental issues described above.

Participating in repair practices can also have a positive impact on individuals and communities by fostering the acquisition of valuable technical skills and competencies. These skills become particularly useful during crises, such as the Covid-19 pandemic, when access to replacement products or professional repair services may be limited [1]. Under such circumstances, repair can promote much needed self-sufficiency. Furthermore, they can be useful in other situations as well, and contribute to an overall better understanding about the world around us. Moreover, unlike the minimal social interaction typically involved in purchasing new products, repairing items is often a social practice. It necessitates reaching out for assistance and providing help to both friends and strangers.

Recently the European Commission (EC) released a proposal for a *Directive on common rules promoting the repair of goods* [3]. In this R2R proposal, it is stated that consumers rarely seek to repair their products as they break, but discard them prematurely in favor of a replacement product. This, according to the proposal, leads to unnecessary waste and emissions, and the proposal seeks to deliver on 'the Commission priority of the green transition, specifically the European Green Deal and its objective of sustainable consumption'[3]. The overarching goal of the EC, as outlined in this proposal and other connected initiatives like the *Ecodesign for Sustainable Products Regulation* (ESPR) proposal, is to mandate the design of consumer products in a manner that facilitates easier repair. Needless to say, designing products that can be repaired more easily does not ensure that individuals will opt to repair them. Thus, the R2R proposal also provide a legal framework that prolongs active product warranties for ICTs and household appliances when they are repaired by professionals, mandating companies to provide repairs at a 'reasonable' cost and supply spare parts and tools, among other things. The proposal also aims to promote repair as a cost-effective and convenient alternative

to product replacement through financial support to the repair market [3].

While the proposal has the potential to yield positive environmental and economic outcomes for the union, the proposal does not explicitly create new opportunities for individuals and communities to repair items on their own. Consequently, it fails to harness the social and individual benefits discussed above. For this to happen, it is important that consumers are given the possibility to form attachments that are different to the ones implied by social acceleration.

IV. THE ROLE OF ICTs FOR SOCIAL ACCELERATION

A possible sign of *social acceleration*, and the ensuing *alienation*, is what elsewhere has been termed the rise of the 'throwaway society' [34], [35]. While the premise upon which the thesis of such a society has been questioned, i.e. that consumers are careless [36], the acceleration thesis and the increased rates with which things get discarded that we have discussed above would seem to suggests the presence of a pervasive throwaway culture in an accelerating society. The increased speeds with which consumer objects get produced, consumed and discarded not only creates ever-growing piles of waste, it also signifies a particular way in which people relate to their material surroundings. In this context, Rosa [8] writes that:

> Both the everyday objects that surround us and the material structures of our lifeworld as a whole become contingent and transitory…this greatly changes the relationship between persons and things. Due to the way objects ceaselessly become obsolete and out of date (the computer that promised acceleration yesterday is today already a brake in view of faster programs) and the economic rationality of discarding and replacing things instead of repairing them, identity-constituting processes of adapting to and growing accustomed to things become increasingly improbable.

Analyzing the ICT value chain in terms of *social acceleration* shows that developments within ICT, including single components such as Graphics Processing Units (GPUs), Central Processing Units (CPUs) and more recently Solid-State Drives (SSDs), have resulted in smarter, faster devices with increased storage capacity. In short, *developments within ICT drive technical acceleration*.

For Rosa, it is *the acceleration of social change* that generates a desire for novelty (replace rather than repair) and makes consumers less likely to grow attachments to the things they own. At the same time, the lifespans of these devices are dwindling, as we have previously mentioned. Rosa, drawing on Lübbe [18], argues that modern societies are characterized by a self-generated contraction of the present that follows from an increased social and cultural 'obsolescence rate' [37]. It thus seems that that the dwindling lifespan of ICTs by design drives, but also that it is an effect of, *the accelerating pace of social change*.

Additionally, facilitated by the ever-accelerating pace of ICT, we can squeeze more and more activities into the same timeframe, and both in professional and private life people are expected to do so. For instance, in order to stay relevant within academia, researchers compete against one another for positions much based on the number of publications they can churn out per year. With the help of ICT – and more specifically AI – researchers can either accelerate their academic output or fall behind those who do. The time to actually engage in any serious way with research is dwindling

due to this external and internal pressure to keep up. In short, *ICT accelerates the pace-of-life of individuals*.

In summary, ICT and how it is currently developing contributes to *social acceleration* in all three of Rosa's dimensions [8]. This was also the conclusion of Santarius and Bergener [38], in their publications in the 2020 *Information and Communications Technology for Sustainability* (ICT4S) conference proceedings. With our focus on repair of ICT, we aim to contribute two additional insights on the social acceleration of ICT. First, that the dwindling life spans of ICT add to the increased pace of life also because there is a need to learn and unlearn how to operate new devices as the old ones are replaced, and that replacement usually necessitates comparing brands, performance and prices, exploring shipping options, and managing daily life without an essential device while awaiting the arrival of the replacement. Repair could therefore promote deceleration not only in the technical dimension but also of the pace of life of individuals. Furthermore, from the perspective of Rosa, that ICTs wear out or break down could in itself be seen as a form of *inertia*, in the sense that it is a *dysfunctional side-effect of technical acceleration*. However, this is not to say that the pace of life is necessarily decelerated only because our devices break down, rather the opposite. We are still expected to fulfil our daily quotas, only without the necessary tools to do so.

On the other hand, repair practices, particularly collaborative and organized initiatives like repair cafés and workshops, can be understood as a form of *inertia*. Here, individuals gain access to necessary tools and expert assistance to collectively tend to their worn-out devices. In his research on repair cafés, Prescott shows that repair itself is time consuming and, if engaged in by a novice, slow and – since 'time is money' – expensive. There are exceptions where a quick repair can save money, but Prescott [13] shows that these repairs are relatively rare among novices engaging in repair.

Therefore, collaborative repair practices can clearly be conceptualized as *islands of deceleration* where practitioners deliberately resist acceleration by opting for slower and economically suboptimal solutions. Most of the time, repair puts a spanner in the works of the economic motor that injects energy into *technical acceleration*. This is what Prescott [13] is referring to as the *decommodification of time* in the context of repair. However, this also implies that repair becomes first and foremost an ideological statement for most people, and not a fully rational choice. Therefore, we find it important to argue that repair can also generate resonant relations with the things we own and use.

V. RESONANT RELATIONS TO ICT THROUGH REPAIR

There are plenty of Japanese words that convey practices of forming long-lasting connections with things as they undergo wear and change, and to embrace this transformation. Take *kintsugi*, for example, which is the Japanese practice of mending pottery with gold-laced glue. The worldview or aesthetic underlying this practice is *wabi-sabi*, which is sometimes referred to as a view of beauty as imperfect, impermanent, and incomplete. Such relations to the thing-world are not confined exclusively to Japan. Within the realm of design, there has been research suggesting how to create conditions for shaping strong and long-lasting relations with objects, things and devices that improve over time. Examples include Jordan's book *Designing Pleasurable Products* [39],

Chapman's *Emotionally Durable Design* [40], Dunne's *Hertzian Tales* [41] and Verbeek's *What Things Do* [42]. And indeed, how things are designed have moral implications, not only since objects afford certain actions and behaviors through their design. However, although a smartphone with a permanently attached screen could potentially decrease repair opportunities, simply incorporating repair-friendly features through design does not ensure a more sustainable usage. This is particularly true because products are frequently disposed of long before any of their components necessitate replacement. Verbeek thinks that '[i]f someone's attachment to an object is only based on the way it expresses his or her lifestyle, then the object is vulnerable to being replaced by any other one with the same sign characteristics' [42]. Similarly, Verbeek claims, if the attachment to an object is merely functional, the product can simply be replaced with another product with better or more functionality. For him, in order to achieve cultural and material durability, human interaction with objects must extend beyond a solely nonmaterial focus and be directed toward the material object itself.

Some objects, indeed, are easily understood as precious, valuable and are, perhaps, even easy to love. Researchers in heritage studies, archaeology and museum studies are all interested in objects and things from the perspective of their materiality, stories and safekeeping [43]. Collectors (of trading cards, books, video games, stamps, etc.) have similar approaches to objects: they cherish them for their sociomaterial specificities, and not for their functionality or aesthetic attributes. The American sociologist Sherry Turkle [44] consider such objects *evocative*:

> We find it familiar to consider objects as useful or aesthetic, as necessities or vain indulgences. We are on less familiar ground when we consider objects as companions to our emotional lives or as provocations to thought. The notion of evocative objects brings together these two less familiar ideas, underscoring the inseparability of thought and feeling in our relationship to things. We think with the objects we love; we love the objects we think with.

But a smartphone or a laptop are distinct from objects associated with practices of collection, of nostalgia, of love or emotion, or of strong attachments of any kind for that matter. With the widespread use of cloud-based storage, and instantaneously updated online servers where content is stored and that constantly communicate with ICT devices, laptops, smartphones and other devices are rather empty containers and thus easily replaceable. Indeed, most smartphone producers have developed brand-specific apps for seamless synchronization and transfer of data, apps and configurations to make their products easily dispensable and replaceable.

In late modernity, Rosa argues, technologies are mainly tools to increase our reach in the world and to control and form it as we wish, preferably in a convenient and efficient way [26]. He shows how technologies affect our relation to the world, and make us encounter it in a mode of *aggression*. But technologies are not only tools, and indeed we can form meaningful relations to them that, as every design scholar knows. Rosa [16] does take such relations into consideration to some extent, when he says that:

> Anyone who has ever learned, or better, acquired a special technical skill or technique for 'handling material' knows *that special feeling when said material seems to accommodate or respond to them.*

Recent research on the subject has described how repair can contribute to resonant relations with the thing-world [13]. This research has mainly focused on the experiences and sensations of people who have engaged with repair and their feelings of pride and power, pleasure and joy. Still, the inner workings of repair for resonance remain unclear.

Drawing on Rosa's concepts, we claim that a resonant relation is characterized by replacing the late-modern approach of *controlling/having* with the resonant counterpart *listening/answering* [26]. Engaging in repair practices is exemplary of this approach. Here, a malfunctioning device is not an obstacle that demands swift and efficient replacement, with a similar or more advanced device, in a pursuit of dominance and control over the world. Instead, a breakdown amounts to a rupture of the sociomaterial ordering that is afforded by the device. While such ruptures may lead to frustration, anxiety or anger, they are also invitations to do things differently, and to relate differently. While resonance can certainly occur among and between humans, we can also have resonant relations to things. Rosa [16] explains:

> even and perhaps especially in relation to the world of things, there exist reified, mute, or – in the sense elaborated here – alienated relationships that can make this world 'hush and stand still,' but also resonant relationships in which it begins to 'sing.'

Regardless of who or what we are approaching, a resonant mode of relating is according to Rosa [16] characterized by four crucial qualities (*see Fig. 1*), a ←*ffection*, e →*motion*, *transformation* and *uncontrollability*. A ←*ffection* should be understood as a call, a touch from the outside that makes us care about what is calling for its own sake. The object from which the call is received then appears as intrinsically, not instrumentally, significant or important. We begin to care about a technical product, not because we demand that it work in order to be used to control the world around us (in a mode of *aggression*), but because the thing itself requires care and attention. It speaks to us with its own voice [26]. This is ontologically separated from the mode of *alienation* in the sense that it is a bidirectional movement between subject and the world. E →*motion* means that we answer the call for attention and care, and react to it with body and mind. We approach that which calls with a deep interest and involvement. From this perspective, resonance occurs fully only when we, on our side, can reach the other side, when we feel actively and vividly connected to the world by being able to influence something in the world which, in turn, influences us. This can be understood as a dialogue where participants listen and respond to each other. In a repair situation, this arises during troubleshooting, trial-and-error, and functionality testing. By possessing or acquiring the necessary tools, skills, and competencies, the user begins to comprehend the inner workings of the system, unveiling it from its previously opaque state [21]. In a sense, both parties open up to each other. *Transformation*, then, refers to how we change when engaged in repair practices. According to Rosa, transformation should be understood broadly, from a temporary change in our mood (for better or worse) to a permanent change in us as beings. Still, the resonant relation transforms our relation to the world. For repair, this implies everything from the feeling of frustration when our attempts fail, or relief and excitement when a malfunctioning PC or smartphone finally boots up, to how we acquire new insights, skills and knowledge in the process. The device which we are tinkering with also transforms in this process, whether this is

through increased storage space, longer battery life or improved aesthetic properties. As Rosa [16] puts it:

> When we have repaired, altered, cleaned, or manipulated an object (e.g. a moped, a computer, a sweater) ... we and/or our idiosyncrasies have literally become part of it—just as, conversely, it has become part of us and changed us.

Lastly, resonance is always characterized by an element of *uncontrollability* or *illusiveness*. This means that resonance evades all our attempts to control it. As Rosa [26] suggests:

> [W]hen we try to control all subjective, social, special, temporal and atmospheric conditions and fully focus on making resonance possible, the candlelight dinner, the mountain in the break of dawn, the music from the most expensive seat in the concert hall ... leave us indifferent, so we are not touched and are unable to establish a connection. ... It's like when we try to fall asleep: the harder we try, the more difficult it becomes (*Translated from Swedish*).

Furthermore, and more importantly according to Rosa, resonance is *uncontrollable* since is impossible to foresee the way in which the relation will transform us. What we will learn or how we will feel cannot be controlled. Moreover, according to Rosa, the thing itself we relate to needs to have an *inherent uncontrollability*, which is not necessarily the case for a fully functioning device, but certainly for one in need of repair, especially until we figure out the exact problem which impedes its normal functionality. Concerning repair, it is clearly easier to find resonance when we finally succeed rather than when we fail, but it is impossible to foretell whether we will eventually fix our device or not, and how we or the device will transform in the process, but this is to a large extent the silver lining which makes repair an enjoyable and exciting activity.
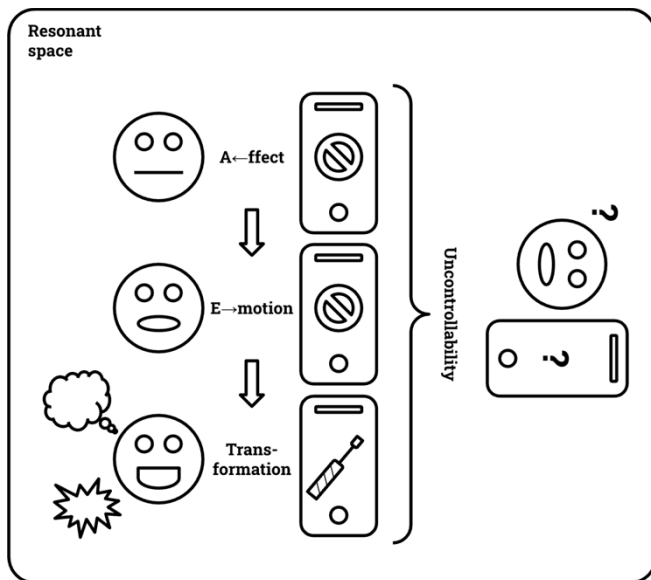

Fig. 1: Resonance Through Repair.

VI. CONCLUSIONS

In this paper, we have described how ICT, throughout its value chain, contributes to many negative social and environmental effects, not least climate change. Drawing on Rosa, we have shown how these effects are intensified through *social acceleration*, and that ICT development and use accelerate society in all of its three dimensions. Due to how our society is organized, according to Rosa, we are under constant pressure to speed up, just to maintain stationary.

Sustainability aside, Rosa argues that for individuals, this leads to a widespread feeling of standing not just in a slippery slope, but 'on terrain that is itself slipping away' [8]. Paradoxically, our to-do-lists keep growing despite technological advancements that promise greater efficiency and speed. Rosa shows how this leads to *alienation* from each other and the thing-world. In line with previous research, we have argued that collaborative repair practices do not only make us slow down, or decelerate, but can act as a 'antidote' to alienation towards the thing-world through maintaining resonant relation to the things we own and rely on in our everyday lives [13]. The main contribution of our research is to unveil the inner workings of resonant relations to things through repair practices.

As outlined in this paper, breakdown, deterioration and malfunction signify ruptures that slow things down by making visible the taken-for-granted, seemingly smooth, sociomaterial order of everyday life. Consider, for example, how a lost internet connection during an important Zoom meeting affects the users. With the connection lost, both sides will most likely engage in some serious troubleshooting, and repair, to join the meeting again. While such interruptions are unlikely to cause nothing but frustration in the short term, they also offer potential opportunities, long-term, to get to know the devices and infrastructures that surround us. Here, then, a broken device is not only a sign of breakdown but a call for acting differently. By engaging with devices through repair, those devices no longer appear as opaque black boxes to the user.

It is clear that the currently dominant approach to consumption cannot go on forever. Unlimited growth is not possible on a planet with limited resources. This is especially true concerning ICT and the 'technomass' accumulated through the consumption and disposal of electronic devices [45], [46]. While the CE holds some promise also for the ICT industry, there are intrinsic economic, technological and thermodynamic limitations related to its potential to radically transform the industry [47]. Despite the increased attention by industrial actors and policymakers in the past decade, the world as a whole is getting less and less circular every year [48]. Mann et al. [49], in an article in the ICT4S conference proceedings from 2018, argues that incremental sustainability improvements or marginal lifestyle changes towards sustainability within the current status quo is unlikely to result in the required transformative change. The conventional CE discourse proposes radical sustainability claims without problematizing the system within which consumption of goods takes place, and what drives this system. This is especially clear in the R2R proposal, where the role of the civil society is largely ignored. The proposal, instead, lays out the conditions for creating a repair market, where repair amounts to a service for consumers and organizations offered by a third party. While the creation of a strong (and lucrative) repair market may save devices from being prematurely discarded, it does not necessarily address the problems related to over-consumption, the social and cultural 'obsolescence rate' [37] and the desire for novelty. Instead, the idea seems to be that we should all just carry on as usual, while putting our trust in policymakers and industrial actors to 'close the loops' [2].

A different approach, that we have argued for in this paper, emphasizes the need to reevaluate our relations to objects and to technology. This demands substantial changes not only in the production of devices but, more significantly, in the values

attributed to objects, rather than superficial behavior change. Furthermore, it proposes empowering engagement, through collaborative and participatory repair practices, over proposed solutions. In contrast to the R2R proposal, where the kind of repair which is promoted is 'out of sight, out of mind' of 'consumers', resonant relations to technology benefit greatly from learning about the 'inner workings' of technology [21], [50]. Finally, while repair could be presented as a necessary evil required to uphold high levels of consumption, we see the repair norm as a largely positive and optimistic future [49], which contributes to dealienation from others and the thing-world.

Here and there throughout this paper, we have discussed the potential impact of repair cafés and workshops, communal sites where citizens are encouraged to bring broken or worn-out products and items and learn how to repair them. In our empirical work, we have interviewed people organizing such events, and the people who participate. Recent research has shown how resonance could be understood as a way of relating in such contexts [13]. In this paper, we have deliberately avoided to discuss the context in which resonant relations may or may not take place, but the fact that the context matters is unquestionable. For example, while resonance is inherently uncontrollable, listening to your favorite song through a streaming platform is quite different from hearing that song performed on stage [26]. Rosa calls the contexts in which resonant relations emerge *resonant spaces*, and although this particular concept is arguably underdeveloped throughout his books and articles, it is likely the case that also resonant relations formed through repair are affected by the sociomaterial space in which these are formed. Therefore, we aim in future research to utilize the analytical framework developed in this paper to investigate repair cafés and workshops and see whether these can be conceptualized as *resonant spaces*, and, if so, what characterizes such spaces in the context of repair.

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