From Efficiency to Sufficiency in the ICT Sector

Reflecting on Fifteen Years of Trial and Error

Isabelle Dabadie

Abstract *This chapter draws on fifteen years of personal experience acquired at the interface between business and academic research, dedicated to steering the telecoms industry towards sustainability. From eco-design to sufficiency, it recounts the progress made, the disappointments encountered and the questions that remain unanswered in relation to a task whose immensity is matched by its urgency and criticality.*

1. Introduction

The worsening ecological crisis and growing public concern with ecological issues has led to more and more companies taking action to reduce their environmental impact. Yet, few of them have really started to question in depth the way they do business (Niessen/Bocken 2021). Such a shift seems even more unlikely in the Information and Communication Technology (ICT) sector, in which business models are still largely based on ever more use and on ever more powerful technological solutions for consumers (Jardim 2017). Although ICT firms do seek to reduce their environmental impact (with "green IT" initiatives) and try to offer technology that supports the ecological transition ("IT for Green"), the sector's ecological footprint continues to grow and it is still a very long way from a sustainable model (Ferreboeuf et al. 2021).

The literature extensively documents the environmental consequences associated with the ICT sector, encompassing telecommunications activities. According to the European Commission's evaluation (European Commission 2020), the sector's energy and environmental effects account for approximately five to nine per cent of global electricity consumption and over two per cent of total emissions. This figure of two per cent is comparable to the worldwide carbon dioxide emissions generated by the civil aviation industry. It is important to note that ICT operates interdependently with other sectors and, due to its pervasive nature, also has an impact on them. ICT plays a role in various aspects of our daily lives, both professionally and personally.

Considering the medium-term perspective, specifically until around 2030, the ICT industry represents a rapidly growing sector that will significantly contribute to addressing environmental challenges such as CO_2 emissions, raw material consumption and pollution, among others. The literature highlights rebound effects and the need for sufficiency policies to complement consistency and efficiency efforts in the ICT sector (e.g., Santarius et al. 2022). While the latter are not yet widespread, sufficiency policies are still in their infancy or even taboo, as we were able to observe in the field.

After having worked for fifteen years – from 2008 to 2023 – on projects at the intersection of business and academic research, seeking to steer the telecoms industry towards sustainability (understood as a development compatible with planetary boundaries), now seems a good time to take stock of my actions, which unfortunately appear to have had a limited impact. While previous research has studied "exemplary companies" (e.g., Gossen/Kropfeld 2022), I suggest looking back at an experience of "trial and error" in order for us to be able to learn lessons, question the course of action for the coming years and help implement the changes that are becoming increasingly vital in the short term. This is precisely the goal of this chapter, which aims to draw on the account of a personal experience, in order to shed light on the progress made and the setbacks encountered, and identify the challenges for academics and practitioners in the coming years.

This chapter aims to provide an original, authentic, sincere account that shares the efforts and mistakes made, and mistakes that will doubtless be made again. It retraces various stages in my career, from my position as program manager in an ICT firm from 2008 to 2012, where I was involved in setting up eco-design programs, to my role as doctoral student, then assistant professor, associate professor and researcher from 2013 to 2023, studying from an academic point of view, in close cooperation with business partners, the different paths that will lead from efficiency to sufficiency policies. This story reveals doubts and questions that are still open. It also illustrates the need for more radical changes: faced with the urgency of the climate situation, we can no longer afford any further digressions.

2. From efficiency to sufficiency: eco-design as a starting point

This story starts in 2008. Back then, I worked for Technicolor, a manufacturing firm in the IT sector, which provides network infrastructure and end-user equipment to service operators (telcos, cable, terrestrial or satellite operators). These operators provide voice, data and video services to customers who access them through devices usually composed of a box for internet access and a set-top box for television services. This equipment is traditionally sold by the manufacturer to the operator

who in turn rents it to end-users as part of their monthly subscription to the services.

My company had launched CSR initiatives, which included the implementation of an eco-design program. The objective of these programs was to integrate a method in the product and services development process aiming to control and reduce their environmental impact along their entire lifecycle, with a multi-criteria approach to avoid transfers of impact from one phase of the life cycle to the other or of one type of impact to another.

2.1 Implementing eco-design: the first success stories

The eco-design program, led by the Quality Department, started with the implementation of a process and the training of R&D teams. On the business side, however, no precise objectives had been defined. Concerned with the environmental impact of an activity whose main purpose (entertainment, mainly via television) invites us to question its social utility, I decided to take up this issue. At the time, I was Program Manager in the Marketing & Sales Department. My role was to manage the development of a product on behalf of a customer (which was to be manufactured in tens or even hundreds of thousands of units over several years), from the signing of the contract (sometimes earlier) through to delivery of the finished product and its deployment. I was therefore at the interface of all the company's functions. My mission was to meet the project's objectives and to build a lasting relationship with the customer.

In this position, I was able to play a facilitating role in implementing eco-design. In 2010, a Life Cycle Assessment (LCA) was carried out for one of my products, which identified its main environmental impacts and led to the identification of areas for improvement. I asked the R&D teams to study the possibility of replacing PVC parts with recycled plastic. A multidisciplinary task force was set up. The mechanical engineers were not convinced, and neither was sourcing. Doubts were expressed as to the aesthetics of the final product and its acceptability to the customer, its solidity, the ability to source recycled material and the likely additional cost of this material. Despite these resistances, tests were launched. The results were surprisingly good: the difference was undetectable to the naked eye, the product passed all resistance tests, the material was available and its cost lower than that of virgin plastic. And to complete the picture, this positive experience helped to build new bridges between experts who had little opportunity to rub shoulders on a daily basis and gave new meaning to an industry going through difficult times (relocation, etc.). This first experience was a success and encouraged us to continue in this direction.

I was convinced, however, that in order to expand the scope of this endeavor, marketing would need to be more directly involved. Indeed, as long as the eco-design approach remained associated solely with a "quality" approach and without a

clear directive from management indicating that it should imperatively be implemented in product development processes, or a clear perception of the competitive advantage it could bring, it ran the risk of being perceived as an additional constraint and cost that would complicate an already difficult context, with strong pressure on costs, in particular. On the other hand, I was also convinced that eco-design could help create value, and that the efforts associated with its implementation could be a profitable investment for the company. These possible sources of value were manifold (e.g., cost reduction or creation of a competitive advantage).

In 2011, I therefore suggested developing an activity within the Marketing & Sales Department aimed at promoting eco-design, both through internal training efforts and external communication. Two thorny issues needed to be resolved: 1) How to make the improvements achieved through eco-design visible to our customer (service operators) and to their own customers?; 2) How to communicate on this subject without risking accusations of greenwashing? As regards the second point, claims of providing "eco-friendly" products could easily be attacked by those who considered that these "non-essential" products should not be manufactured at all. What was more, although this was first and foremost an improvement initiative, it was still difficult to justify the fact that our products were far from perfect in environmental terms, given that there was still a great deal of room for improvement. One main lever was therefore mobilized: cooperation with our customers who were also committed to a similar approach.

2.2 Disappointments and first steps towards sufficiency

In the early 2010's, eco-design was progressively being implemented but still lacked managerial support. No objectives were set in terms of the number of products to be evaluated by means of an LCA nor in terms of reduction of environmental impact from one product generation to the next. When the eco-design method was implemented, it led to improvements, but these remained marginal: e.g., eco-design of packaging, choice of more environmentally-friendly plastic materials, but these weighed little against the impact of the product over its entire life cycle (the most significant aspect of the impact being related to energy consumption during the use phase). Another challenge was linked to the difficulty of creating value in a B2B model in which the benefits of the approach accrue solely to the end-user, who attaches little importance to them. Indeed, in the case of manufactured products (set-top boxes, sold to an operator who rents them to the end-user), the eco-designed nature of the equipment (use of recycled materials, for example) is not a criterion considered by the customer when choosing their service operator. Energy savings are of little importance to most customers, who are not really aware of the energy consumption of this type of equipment, nor of the savings they can make. The environmental benefit is also difficult to communicate and promote.

Nevertheless, we continued our efforts to reduce the environmental impact of our activities. On the manufacturing side, hand in hand with our customer, we continued to focus on reducing the energy consumption of the set-top boxes, which had so far been characterized by the fact they consume almost as much energy on standby as they do when in use. There are two main reasons for this. Firstly, operators need to be able to access equipment during standby phases (to send information, updates, etc.). Secondly, the deeper the equipment is in standby mode, the longer it takes to restart when the user wants to access services. The configuration of equipment is based on a strong presupposition: customers do not want to wait. When they press the button on the remote control, the picture must appear immediately on the TV, a function they have always been used to. Old-fashioned analogue TV did not require a set-top box with a start-up time or the loading of information that is necessary today to display program guides, and so on.

Three areas for improvement were identified. The first was technical. Equipment manufacturers and operators were engaged in research and development programs aimed at creating more efficient standby modes (with faster box wake-up) and more intelligent standby modes (incorporating a range of possible standby modes). The second was regulatory. The European Commission had proposed that players in the sector drew up "voluntary regulations", a "code of conduct", which would subsequently define obligations concerning box consumption in operation and standby, with a "true" standby at 1W. Not all players were playing the same game. While some argued for a soft form of regulation, we pushed for more stringent rules. As a matter of fact, we were resolutely committed to drastically reducing the standby power consumption of set-top boxes and providing advanced functions to minimize the inconvenience for both operators and end-users. The third area requiring attention was a consideration of the acceptability of such measures for both operators and their customers. The risk was that, if the constraint was perceived as too strong, set-top boxes would be delivered with an energy-saving standby mode by default, and this mode would be deactivated by users at first installation.

This was the beginning of the reflection on a form of "sufficiency" that did not yet dare to speak its name. A number of pertinent questions emerged: Did customers really need their set-top box to wake up instantly? How long were they prepared to wait? What risk, in terms of customer satisfaction, was the operator prepared to accept on this point? How could we explain to customers the environmental and economic benefits of using a deep sleep mode? Avenues were being explored around nudge, for example, or nurturing the feeling of participating in a collective action that makes a significant impact on a large scale. For example, by communicating an aggregate figure to users who would set their set-top box to an energy-saving mode, informing them of the level of savings achieved by all users who would have made the same gesture. The user might then have been likely to accept a slower restart and find value in this option offered by the operator.

2.3 Intermediate stage: PSS and circular economy

The eco-design track and the exploration of different paths to reduce the environmental impact of products and services led us to take a closer look at the possibilities offered by Product Service Systems (PSS). Service operators, for their part, are already a step ahead on this subject: the boxes used to access the Internet and digital television services are in fact leased to end customers. The operator retains ownership of these boxes and therefore retains an interest in optimizing product design and the entire supply chain (including the reverse logistics process) to ensure that they last as long as possible. This means, for example, designing products that can be repaired, upgraded and easily refurbished. Indeed, when a customer changes their equipment, it is systematically "refurbished" for deployment with another customer. As products must always be as good as new, this means, for example, providing a shell and front panel that can easily be replaced if scratched or manufacturing them from a more resistant material to prevent this problem from occurring.

This logic enables a shift into another area, that of the circular economy. As the operator has a "deposit" of material when they recover end-of-life products, it seems possible to work on reducing the impact of the end-of-life phase and to re-inject as much material as possible into the manufacture of new products. However, since the operator is not the manufacturer, it is not easy to close this loop.

In 2012, as part of a restructuring of my company, the eco-design function I had held in the marketing and sales department disappeared from the organizational chart, which prompted me to pursue this work outside the organization, as I shall explain in the following section.

3. Eco-design: an essential step but one that must be surpassed

Looking back on this experience, which lasted from 2008 to 2012, I asked myself several questions. The first related to the rebound effect, a concept which I was not aware of at the time. When measuring the results obtained, not only do our past efforts now seem derisory in relation to the issues of the time, and even more so in relation to today's challenges, but it also seems that we sometimes missed our target. Should we therefore admit failure, and make amends for having felt that we were among the forerunners in our field? Have our attempts to reach sustainability through efficiency masked the need for sufficiency? Or can we find reasons for satisfaction in the work we have accomplished? What lessons can we draw from these experiences? In an attempt to answer these questions, I interviewed a few former colleagues from my company, as well as from the operator with whom we carried out joint work. A few verbatims reflect the testimonies of two of them, E*, who was one of the pioneers on these subjects in his company and continues to push these

questions on a daily basis, and P*, who joined more recently. This reflective work is also an opportunity to evoke the emotions felt along the way.

3.1 The rebound effect: a statement of failure?

While we initially noted the limits of eco-design, which only provides marginal improvements, we progressively realized that our actions may have adverse consequences: as they become more efficient, our products enable new services to be offered to consumers which leads to an increase in consumption. As a result, the environmental impacts of our activity increase instead of being lessened. Without knowing it, we contributed to the rebound effect theorized by Jevons (1865) and blatantly observed in the IT sector (Gossart 2014; Santarius et al. 2022).

Our work on the energy efficiency of set-top boxes is a good illustration of this phenomenon. We worked hard on both the equipment manufacturer and the operator side to develop intelligent set-top box standby modes to reduce energy consumption without inconveniencing the user. However, the results did not always live up to expectations. Reflecting on the irony of the situation, E* explains:

> We had wake-up times. The dilemma was that we needed 45 seconds to wake up from standby mode. The customer couldn't stand waiting 45 seconds before accessing the TV. He'd leave his box ON. We fought to reduce the standby time. […] I remember a guy in the technical department saying to me: E*, do not worry, for the next generation, we are going to upgrade to two Gigas of RAM, so your problem will be solved. […] Instead of going from 45 seconds to 20, we went from 45 seconds to 1 minute 30. In fact, we had more memory, so we made a nice portal, adding complexity. On the one hand, the guys added RAM, and some of them thought: let's load it up to make a nice portal. That's the way it is. In fact, we are getting a little better. You play a bit with technique here and there. (E*)

However, these efforts were not completely useless. For example, this point has improved over time:

> Now it is quite a bit of time to get out of standby on small boxes, because they've improved the architecture. That means we need a new generation of boxes, so we will need more time. (E*)

While this example may seem anecdotal, we are well aware of the wider problem to which it gives rise. Is this a failure or an incomplete success? We cannot really answer that question, but we have learned a few lessons from these experiences.

3.2 Lessons learned: eco-design – a potential blind alley but a necessary stage

Do not bury your head in the sand. The road to hell is paved with good intentions. Eco-design, PSS and circular economy were all started with the objective of reducing environmental impacts in order to make products and services more sustainable. The observation of rebound effects shows that, while improvement is possible on a unitary basis, the objective is often not achieved overall. And yet, the eco-design approach has been put in place precisely to ensure, by scrupulous measurement of impacts on numerous criteria (water, air and soil pollution, resource consumption, etc.) throughout the product lifecycle (from the extraction of raw materials to the end of life) that there is no uncontrolled transfer of impact from one criterion to another or from one phase of the lifecycle to another. In other words, we make sure that we do not contribute to further degradation while thinking we are doing the right thing. The Achilles heel of eco-design, however, is consumption, a variable over which product or service designers have little or no control. An eco-designed product whose impact is halved and consumption multiplied by four does not solve the problem. It would be tempting to give in to discouragement. On the contrary, it seems preferable to pursue these efforts, which are necessary, while being realistic about the limits of these approaches. To do this, we need to take a systemic approach. We need to look not just at the impact of our own activity but also at the wider impact of the ecosystem in which we operate. For example, we might ask what new uses are facilitated by increased network performance. But we also need to take a broader time perspective. Some rebound effects are only visible in the medium or long term. This means we need to remain vigilant over the long term. We must also be vigilant as to the risk of moral licensing (cf. Blanken et al. 2015) in our professional activity. By giving us a clear conscience, eco-design allows us to continue business as usual. We have the feeling that we are doing things right, or the best we can, and do not feel a need for a more profound questioning of the way we do business.

Do not throw the baby out with the bathwater. It would be all too easy to say that eco-design does not solve any environmental problems. While it could well be used as part of a greenwashing strategy, we believe that it is also the starting point to think about a firm's environmental impact and explore avenues for its reduction. We have experienced rebound effects. A growing body of literature has described it in detail. However, we should not give in to "eco-design bashing", which some promoters of alternative models (such as low-tech, frugal innovation or sufficiency, which we also support) might be tempted to instil in people's minds. Instead, we should continue our efforts, offer massive training (not necessarily to train experts but at least to understand the ins and outs of this approach) and also inform about the limits.

P* provides a particularly useful reminder when, discouraged by this unfortunate rebound, we could be tempted to give up on methods, which are not sufficient but are still very much needed:

> "If you do eco-design, it is better than not doing it at all. On the other hand, you really shouldn't think that it is a big factor in changing the model. All we know is that it is essential. It is kind of the basic thing to do." (P*)

This is also something to bear in mind with late adopters of the method. The proverbial "better late than never" applies here. Even if we are further along the learning curve, we should inform newcomers of the pitfalls but not set out to daunt them.

3.3 Dealing with emotions in order to move forward

If doubt is the driving force behind our research, both in industry and academia, it is also the dominant feeling we have experienced, more or less painfully, over the years. If the implementation of eco-design helped me to restore a sense of direction in an industry that had lost its bearings, this moment of enlightenment was short-lived. I realized how difficult it was to give real scope to the efforts undertaken. Today, given the insignificant nature of the progress made, I cannot help questioning the legitimacy of our actions.

Are our efforts really worthwhile, or are they just a way of "saving our jobs"? How sincere are we when we think we can (must) change things from within?

The feeling that things are not going fast enough dominates. I often tend to see the glass as half empty. Progress is being made, but rebound effects limit its scope. We are looking for more radical solutions, we are hoping to find a solution to the "impossible decoupling" of growth and resource consumption, and we have the impression that there are far more problems than solutions in this area. We have the feeling that we are perpetually lagging behind the issues at stake, particularly in the current period of accelerating disasters linked to climate change, which are making the latter more visible. At the same time, we regularly observe that many players are still far removed from these concerns. For some, awareness is still in its infancy, while for others, there is considerable perplexity as to how to tackle the problem, and how to identify courses of action to get started. So, finally, are we too early or too late? How can we share our progress and setbacks without sounding judgmental or pessimistic?

We are well aware of the limits of our efforts. So, when I ask E* if everything we have done in the last 15 years has been for nothing, and if it would be worse if we had done nothing, the answer is yes, but mixed:

> Yes, I think it would be worse. But the trends are still there. I do not regret what I've done. I am really happy with what I am doing. But you realize that in the end, it is a drop in the ocean. And I think we have even been… We have been a lever for growth. And yet, we have contributed to… […] I haven't thrown in the towel. But there are not many signs. (E*)

A circular economy expert, who has recently started work on these issues, acknowledges that it is difficult for those who have been exploring these subjects for years to remain optimistic.

> I think it takes a lot of resilience. When you've been working on a subject for a long time and you've been pushing it for a long time, but you haven't managed to motivate many people, [the risk is] to say, 'But there are too many things to do, there are too many problems to solve.' I think it takes a lot, a lot, a lot of resilience. (P*)

The challenge is huge, and we need to speed things up, but we have also got to hang in there.

> "There are always people who are not convinced, but more and more people see that there are problems, think it is important, want to change things. There's a solid basis for change. After that, I would like things to move a lot faster." (P*)

Things are changing. Even if those who have been involved for a long time are going through moments of doubt, newcomers, like P*, are instilling new hope:

> "I feel I've come at the right time, a time that's relatively easy for me, easier than it was for you, I think, 15 years ago. In that sense, I have the impression that [the company] is moving in the right direction." (P*)

This is too little, too slow, but change is in progress:

> I've been working on it with the team for six months now. Are we moving fast enough? No. Do people notice? No, and I wasn't necessarily aware of it before. What we need to do from an environmental point of view in a company like [ours] to try and align ourselves with the objectives we want to achieve over time, is to acquire more knowledge, so the more we train people, the more they'll realize that we are not moving fast enough. (P*)

4. The path towards sufficiency

4.1 From business practice to academia

In 2012, the project to promote eco-design within the Marketing & Sales department of my company was put on hold. This marked a turning point in my career, as well seeing a shift in research interests towards exploring new avenues to reduce the environmental impact of products and services. The eco-design track had already led me to study PSS alternatives. I decided to pursue research in this domain by leaving the industry for the academic world and embarking on a doctoral thesis on collaborative consumption. As a matter of fact, this phenomenon appeared an interesting way to look at PSS from a consumer perspective. The partnerships forged with a number of industry players, either through commercial relationships or independent working groups while I was in the industry, continued, notably with the operator with whom I had worked on various eco-design and energy efficiency issues. This enabled me to develop numerous teaching and research partnerships, both during my PhD (from 2013 to 2017) and in my subsequent position as associate professor in Management Science at the university (starting in 2018).

4.2 Research projects at a crossroads

Discussions between the university and industry players started mainly through educational projects including lectures on eco-design based on feedback from experience. In 2018, the combined awareness of the deceptive nature of collaborative consumption studied during my PhD – a "revolution" touted by its promoters as a solution to the environmental, social and economic problems posed by traditional models, which in fact turned out to be a way of reinforcing them and maintaining consumption levels – and of the disappointments of my experience of eco-design in the industry led me to turn to the study of sufficiency. Faced with various forms of rebound effects in both fields, sufficiency appeared as an unavoidable path. In a rather disruptive way, some of my colleagues in the industry had already started the debate in their company. In 2019, we participated in the organization of a research day on the theme of digital sufficiency in which we jointly presented a paper around the following questions: How can value creation and sufficiency be reconciled in a telecoms sector that is culturally very far removed from such considerations? And how can marketing contribute to this? As a matter of fact, sufficiency seems to be a particularly difficult path to follow in the ICT sector, where belief in technological progress as a solution to environmental problems seems hard to shake, and where the very essence of technological progress seems unstoppable (Dabadie/Vautier/Bertin 2021). Furthermore, in the particular case of telecom operators, while it is possible with a modicum of R&D effort to increase the energy efficiency of their

infrastructure, it is more difficult to limit the amount of traffic going through their network – and as a result the total energy consumption of their activity. As a matter of fact, telecom operators have little or no control of the services developed and promoted by content providers which take advantage of increased capacity of networks (e.g., larger bandwidth, decreased latency, etc.) to encourage unbridled consumption of services like video streaming or online gaming. If they sought to encourage a more responsible use of networks, this would result in a decrease in their average revenue per user (ARPU) and a subsequent decrease in company profitability, which might in turn not be acceptable for shareholders. In a highly competitive market, pursuing such a strategy is no small feat.

From 2018 onwards, several types of projects were launched. On the teaching side, student projects in partnership with a telecom operator were initiated to study various issues. For instance, students analyzed consumer perceptions of a new sufficient telecom service devised by the operator, and its implications in terms of advertising. On the research side, several collaborative projects followed, notably within a larger collective, EcoSD,[11] an association composed of academics and practitioners founded in 2012, to promote design for sustainability. In 2020, I participated in a project centered on frugal innovation. In 2021, work continued as part of a project in which we studied low-tech viability. The idea behind these projects was that ecodesign alone is not sufficient in itself to really have an impact, that a change of model is necessary and that needs have to be questioned. In 2022, a three-year project supported by EcoSD was started specifically on this issue and that of the discrepancy between consumer needs, market offers and the effective use of products and services. Looking at this question from different angles within a multidisciplinary team (a mix of practitioners and academics in engineering and social sciences), the first results allowed us to measure intended and unintended deviations. The next steps will consist of identifying ways to improve design for sustainability methods in order to limit the rebound effects that these deviations generate.

While they bring useful insights, these projects also bring questions, which remain unanswered. Among them, we wonder whether initiatives such as frugal innovation or low-tech are compatible with large corporations. We also question the role of marketing and its ability to contribute to a change in the value creation model, a topic also currently addressed in partnership between academia and practitioners as part of ongoing doctoral dissertations and research contracts on sufficiency marketing and business models.

1 www.ecosd.fr

5. Conclusion

As I write this chapter, along with a growing community of researchers and practitioners, I am continuing my work to better understand how sufficiency can be put into practice, based on the assumption that it is necessary to curb environmental impacts. Many questions remain open as to how to implement it and how to avoid encountering rebound effects yet again. Mixed feelings of doubt and hope still prevail. Are we too optimistic when we attempt to change the model from inside? Mixed feelings of satisfaction and skepticism also arise when the issue of sufficiency suddenly became a national concern in France in September 2022, thanks to the acute energy and ecological crisis that France is experiencing as a result of geopolitical events (for instance, war in Ukraine and threats to fossil fuel supplies) and climatic events (repeated disasters in the summer of 2022, including mega-fires in Southern France). The term sufficiency, hitherto seen as particularly incongruous when associated with marketing, and deemed unpronounceable within certain companies where disruptive discourses have opened up the debate, is suddenly becoming the focus of attention. While I am delighted about this, it is hard to suppress my doubts as regards this sudden turnaround. Are we really talking about the same thing? Who is really prepared to promote a reduction in consumption when, at the same time, the question of growth and purchasing power remains at the heart of public debate and company strategies?

Other questions beset me. Is sufficiency simply yet another blind alley? Are we going fast enough? Taking this retrospective angle on fifteen years of work leads me to make a few calculations and realize that 2030, the date set for many programs aimed at limiting the effects of climate change, is almost visible on the horizon. We will be there in less than seven years… What have we achieved in double that time? What can we hope to change in such a short space of time? Is the pace of academic research adapted to the urgency of the situation? Am I in the right place to change things?

This introspective work leads me to make a few very humble recommendations. Firstly, we should be very realistic and develop awareness with regard to the limits of our attempts to contribute to reducing the environmental impact on the production side. The rebound effects pointed out by Santarius (2016) are difficult to escape. But at the same time, we must not give in to discouragement and should instead help build momentum around these issues. Secondly, in order to make progress, it seems essential to continue to work hand in hand with practitioners who are faced with the difficulty of changing the way of doing business and are the driving force to make the necessary changes happen. Finally, we need to question our priorities in light of the urgency of the situation, which leads to another question: How can we accelerate this topic when we should simultaneously decelerate to limit the negative impacts of social acceleration both at personal and macro-ecological level, as

highlighted by Hollstein/Rosa (2023)? This collective work provides an invaluable opportunity to collect and share thoughts on these pivotal issues and can hopefully act as a springboard for debate, reflection and further action.

References

Blanken, Irene/van de Ven, Niels/Zeelenberg, Marcel (2015): "A Meta-Analytic Review of Moral Licensing" In: Personality and Social Psychology Bulletin 41/4, pp. 540–558. https://doi.org/10.1177/0146167215572134.

Dabadie, Isabelle/Vautier, Marc/Bertin, Emmanuel (2021): "'Your 6G or Your Life': How Can Another G Be Sustainable?" In: Emmanuel Bertin/Noël Crespi/Thomas Magedanz (eds.), Shaping Future 6G Networks: Needs, Impacts and Technologies, Hoboken: John Wiley & Sons Ltd, pp. 55–67. https://doi.org/10.1002/9781119765554.ch5.

European Commission (2020): "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Shaping Europe's digital future." Brussels, 19.2.2020, COM (2020) 67 final, 25.7.2023 (https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52020DC0067).

Ferreboeuf, Hugues/Efoui-Hess, Maxime/Verne, Xavier (2021): "Impact environnemental du numérique: Tendances à 5 ans et gouvernance de la 5G." 25.7.2023 (https://theshiftproject.org/article/impact-environnemental-du-numerique-5g-nouvelle-etude-du-shift/).

Gossart, Cédric (2014): "Rebound Effects and ICT: A Review of the Literature." In: Lorenz M. Hilty/Bernard Aebischer (eds.), ICT Innovations for Sustainability. Advances in Intelligent Systems and Computing, Cham: Springer, pp 435–448. https://doi.org/10.1007/978-3-319-09228-7_26.

Gossen, Maike/Kropfeld, Maren Ingrid (2022): ""Choose nature. Buy less." Exploring sufficiency-oriented marketing and consumption practices in the outdoor industry." In: Sustainable Production and Consumption 30, pp. 720–736. https://doi.org/10.1016/j.spc.2022.01.005.

Hollstein, Bettina/Rosa, Hartmut (2023): "Social Acceleration: A Challenge for Companies? Insights for Business Ethics from Resonance Theory." In: Journal of Business Ethics 188, 709–723. https://doi.org/10.1007/s10551-023-05506-w.

Jardim, Elizabeth (2017): "From Smart to Senseless: The Global Impact of Ten Years of Smartphones." 8.12.2023 (https://www.greenpeace.org/usa/research/from-smart-to-senseless-the-global-impact-of-ten-years-of-smartphones/).

Jevons, William Stanley (1865): The Coal Question; an Inquiry Concerning the Progress of the Nation, and the Probable Exhaustion of Our Coal-Mines, London, New York: The Macmillan Company.

Niessen, Laura/Bocken, Nancy M. P. (2021): "How Can Businesses Drive Sufficiency? The Business for Sufficiency Framework." In: Sustainable Production and Consumption 28, pp. 1090–1103. https://doi.org/10.1016/j.spc.2021.07.030.

Santarius, Tilman (2016): "Investigating Meso-Economic Rebound Effects: Production-Side Effects and Feedback Loops between the Micro and Macro Level." In: Journal of Cleaner Production, Special Volume: Transitions to Sustainable Consumption and Production in Cities 134/A, pp. 406–413. https://doi.org/10.1016/j.jclepro.2015.09.055.

Santarius, Tilman/Bieser, Jan C. T./Frick, Vivian/Höjer, Mattias/Gossen, Maike/Hilty, Lorenz M./Kern, Eva/Pohl, Johanna/Rohde, Friederike/Lange, Steffen (2022): "Digital Sufficiency: Conceptual Considerations for ICTs on a Finite Planet." In: Annals of Telecommunications 78, pp. 277–295. https://doi.org/10.1007/s12243-022-00914-x.