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Reconciling digital transformation and environmental responsibility: the strategic role of digital sobriety in Belgian organizations

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Declaration

During the preparation of this master's thesis, the author utilized ChatGPT by OpenAI for the following purposes:

- Interview processing: To assist in the retranscription, translation, and summarization of interviews conducted for this research. To better organize his structure.
- Language refinement: To improve the grammar, clarity, and consistency of the text, particularly in technical and academic passages.

The author confirms that the AI was used solely as a support tool. All prompts were designed to reflect the author's own original thoughts and analysis, and the AI was not used to generate the core content or arguments of this thesis.

After using ChatGPT by OpenAI, the author diligently reviewed, edited, and validated the output. The author takes full responsibility for the final content presented in this thesis.
By signing this declaration, I affirm that the content of this master's thesis reflects my original work, augmented by the responsible use of AI.

Nicolas Meyers (04 July 2025)

Abstract

Digital technologies have become inseparable from the way businesses innovate, grow, and compete. In Belgium and beyond, digital transformation is no longer a choice; it is a strategic necessity. But this growing dependence on digital technologies has a sneaky cost as well: a large and fast-growing environmental footprint. From the extraction of rare earth materials to data use and the electronics waste boom, the digital sector is increasingly accounting for a larger share of global greenhouse gas emissions. This paradox, between technological progress and environmental degradation, has become one of the key challenge for organizations seeking to align with sustainable development goals.

As a reaction, a new concept is gaining ground: digital sobriety. Rather than promoting more and faster technology, digital sobriety invites organizations to rethink their digital practices through the lens of necessity, efficiency, and ecological responsibility. It encourages a shift from excess to relevance, limiting unnecessary hardware, streamlining digital services, and reducing energy and data consumption.

The thesis discusses how Belgian companies, operating in different industries, can integrate digital sobriety into their digital transformation strategies without compromising performance. Based on five qualitative case studies and interviews with professionals in IT, innovation, and sustainability, the research explores how companies perceive the concept, the barriers they face, and the strategies they develop to implement it.

The findings reveal deep tensions: short-term business goals and long-term environmental commitments often conflict, and the pace of innovation is not always aligned with ecological imperatives. Yet the report also finds heartening signs of change. Internal champions, green procurement, employee awareness, and closer collaboration between IT and CSR functions are emerging as enablers.

Rather than a limitation, digital sobriety is an opportunity for strategy. It is a chance to build stronger, leaner, and more sustainable digital strategies. By placing environmental responsibility at the heart of digital transformation, organizations can clear the path towards a more sustainable and future-ready digital economy.

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1 INTRODUCTION

1.1 Digital transformation and environmental paradox

For organizations across the globe, digital transformation is no longer a choice but a strategic imperative. The integration of technologies like cloud computing, big data analytics, artificial intelligence (AI), and the Internet of Things (IoT) has become fundamental to enhancing operational efficiency, innovation, and long-term resilience (Bharadwaj et al., 2013). This wave of digitalization carries the promise of a smarter, more connected, and more efficient world, and is widely perceived as an essential vector of modernization and performance (Billi & Bernardo, 2025). Yet, this pervasive techno-optimism is shadowed by a significant environmental paradox. While often positioned as an enabler of the ecological transition, digitalization is simultaneously a source of substantial and rising environmental pressure, creating a structural tension at the heart of modern sustainability (Hilty & Aebischer, 2015).

The environmental footprint of the digital sector is vast and material, manifesting across its entire lifecycle. It begins with the extraction of rare metals and conflict minerals, often under precarious human rights conditions (Amnesty International, 2016; Pitron, 2018), and continues through the energy-intensive manufacturing of devices. It extends to the exponential electricity demand of data centers and global communication networks and culminates in the escalating global crisis of e-waste (Andrae & Edler, 2015; Belkhir & Elmeligi, 2018). Recent data suggest that the share of global greenhouse gas emissions attributable to digital technologies was estimated to range between 3% and 4% in 2023 (Bieser et al., 2023; The Shift Project, 2021). However, this figure remains highly uncertain and difficult to predict due to methodological inconsistencies across studies and rapidly evolving technologies. The emergence of energy-intensive innovations, such as generative artificial intelligence and large-scale data processing, further complicates accurate forecasting, reinforcing the need for critical scrutiny of digital growth trajectories (Freitag et al., 2021). (See appendix 2,3)

This paradoxical situation, where digital technologies are promoted as solutions to environmental challenges while simultaneously contributing to resource depletion and emission has given rise to a well-documented “rebound effect” (which will be explained in depth later), where efficiency gains in one area, such as the dematerialization of services, are often offset by

increased consumption elsewhere, such as data storage and network traffic, neutralizing or even reversing environmental benefits (Gossart, 2015; Lange et al., 2020). The paradox is therefore clear: digital transformation is at once a potential solution for a better environment and a significant driver of environmental degradation. This observation is increasingly supported by recent policy reports and academic research, which highlight the need to reassess "digital progress" through the lens of planetary boundaries and sustainability priorities (Covucci et al., 2024; Santarius et al., 2023).

In response, the conversation has evolved from early "Green IT" initiatives focused on datacenter efficiency (Murugesan, 2008) to the more systemic and strategic proposition of digital sobriety. This approach, championed by think tanks like The Shift Project (2020), seeks to reconcile technological advancement with ecological responsibility by embedding restraint and sufficiency into the core of digital strategy, moving beyond mere optimization to question the very necessity and design of our digital tools.

1.2 Framing the problem: from climate urgency to a mandate for sobriety

The escalating climate crisis, underscored by stark warnings from the Intergovernmental Panel on Climate Change (IPCC) that demand urgent, deep emissions cuts (Calvin et al., 2023), has placed unprecedented pressure on businesses to address their environmental footprint. In this context, the digital sector, often perceived as intangible or "clean" can no longer be ignored. It is a significant and growing contributor to global emissions, already responsible in 2019 for approximately 4% of greenhouse gases, a footprint comparable to the aviation industry of the same year (Belkhir & Elmeligi, 2018; The shift project, 2019b). This reality forces a critical re-evaluation of digital practices, moving the conversation beyond simple efficiency gains towards a more profound strategic realignment in line with the objectives of the Paris Agreement to limit global warming to well below 2°C, preferably to 1.5°C, compared to pre-industrial levels (UNFCCC, 2015).

This urgency has laid the groundwork for the more radical approach of digital sobriety. Coined and popularized in Europe, digital sobriety moves beyond the technical fixes of Green IT to advocate for a strategic moderation of digital practices in line with ecological limits (Bordage, 2022). It champions a qualitative logic which is favoring sufficiency over acceleration, simplicity over complexity, and utility-driven innovation over speculative digital expansion

(Péréa et al., 2023). This directly challenges the dominant models of digital transformation that prioritize scale, speed, and disruption without accounting for their environmental externalities. It calls for a shift from asking "what *can* we do with technology?" to "what *should* we do with it?". Yet, despite growing institutional pressure and rising awareness, the operationalization of digital sobriety within corporate settings remains fragmented. Many Belgian companies, like their counterparts elsewhere, struggle to reconcile performance imperatives with sustainability goals, caught between the fast-paced logic of digital innovation and the long-term constraints of ecological transition. This thesis steps into that gap, seeking to understand how this crucial reconciliation can be achieved.

1.3 Research question, conceptual dimensions and objectives

This thesis is situated at the intersection of two powerful, often conflicting, forces: digital transformation and ecological sustainability. While digitalization is central to contemporary performance and innovation, its environmental footprint raises pressing questions about long-term corporate responsibility.

This research investigates how Belgian organizations can navigate this "twin transition" by pursuing necessary digital innovation while advancing their sustainability agenda. It also seeks to understand how these two imperatives can be aligned, leading to the central research question:

"How can Belgian organizations integrate digital sobriety into their digital transformation strategies without compromising performance, and to what extent can CSR practices and SDG alignment support this transition?"

This inquiry is twofold: it explores the potential trade-offs and synergies between technological advancement and ecological moderation, and it assesses the role of institutional frameworks like Corporate Social Responsibility (CSR) and the Sustainable Development Goals (SDGs) as critical levers. Reconciling these ambitions is not merely a technical issue, but a strategic, cultural, and governance challenge to find the right balance.

To explore this problem, the analysis is structured around interrelated dimensions. First, it critically examines the full scope of the environmental impacts of digitalization, from the material footprint of infrastructures to the often-overlooked implications of software design and usage behaviors. This leads to an exploration of the core tensions between innovation and

sobriety, contrasting the logic of acceleration and expansion with the principles of sufficiency and restraint. The study then investigates how the organizational perception and framing of digital sobriety, which is whether view as a constraint, or an opportunity, or a strategic principle, influences its adoption.

Consequently, the research identifies the barriers and enablers that hinder or facilitate implementation, including technical, financial, cultural, and governance-related factors. It then addresses the role of institutional frameworks, analyzing how CSR strategies and SDG alignment can legitimize and operationalize sobriety within corporate strategy. Taken together, these domains provide a structured lens to critically analyze the interplay between performance and sustainability, guiding both the empirical investigation and the theoretical discussion that follows.

1.4 Relevance and contribution of the study

This thesis addresses a critical frontier at the intersection of innovation, sustainability, and organizational strategy, aiming to provide clarity where paradox currently reigns. Its relevance is threefold, contributing to academic theory, managerial practice, and societal debate.

Academically, this research contributes by directly challenging the prevailing paradigms of digital transformation. It moves beyond general critiques by providing a grounded, empirical account of how the perceived "dematerialization" of technology masks a significant material footprint, rendering it strategically invisible. By deconstructing the perceived conflict between performance and sustainability into what the findings will show is largely a "false dilemma", the study enriches corporate sustainability literature, demonstrating how digital sobriety can redefine performance itself towards resilience and efficiency. This reconceptualization also aligns with Olivier Hamant's call to shift from a logic of performance to one of robustness, where sustainability is achieved not through acceleration, but through constraint and systemic coherence.

For managers and practitioners, this thesis offers a strategic roadmap to move beyond fragmented, low-impact initiatives and embed sobriety into the core of their operations. In a business environment increasingly shaped by the forthcoming EU Corporate Sustainability Reporting Directive (CSRD) and the uncritical "rush to AI", the findings are designed to be

immediately relevant. It provides the rationale for embedding the critical question: “Do we truly need this?”, at the heart of every digital project, transforming sobriety from a perceived constraint into a source of competitive advantage.

On a societal level, this research speaks directly to the urgent need for a more responsible digital future by informing critical policy debates. By empirically identifying top-down regulation as the most potent enabler for widespread change, the study provides evidence to support the convergence of more green and digital policy agendas in Belgium and the EU. It aims to shift public speech from a passive assumption that digitalization is inherently beneficial, to a critical assessment of the conditions under which it can support collective environmental goals. Ultimately, this work contributes by highlighting that the path to a sustainable digital society is not solely a matter of individual choice or corporate goodwill, but a systemic challenge that requires robust governance and a shared redefinition of what constitutes progress.

2 LITERATURE REVIEW

This literature review investigates the evolving relationship between digital transformation and environmental sustainability, with digital sobriety as the central analytical lens. It first defines digital transformation and outlines its major organizational trends and performance outcomes, while also highlighting the rebound effects that may undermine ecological progress. Building on this foundation, the review examines how digital technologies contribute to environmental degradation throughout their lifecycle, from raw material extraction and production, through energy-intensive usage, to complex end-of-life disposal challenges.

A critical perspective is then introduced through the concept of digital sobriety, which has emerged as a strategic response to the limitations of Green IT. This paradigm shift calls for a rethinking of innovation and performance metrics, moving from optimization towards moderation and sufficiency. The analysis explores the principles of digital sobriety and its implications for organizational practices and technological governance.

Finally, the review situates these debates within broader institutional frameworks by analyzing how Corporate Social Responsibility (CSR) and the United Nations Sustainable Development Goals (SDGs), particularly SDG 12 on responsible consumption and production, can act as

levers to embed digital sobriety into corporate strategy. Taken together, these sections provide a comprehensive foundation for assessing the tensions and synergies between innovation, performance, and environmental responsibility in contemporary digitalization processes.

2.1 Digital transformation: definitions, trends, and impacts

2.1.1. Definitions and scope

Digital transformation (DT) has become a cornerstone of modern organizational strategy, encompassing far more than the adoption of new technologies. It is increasingly understood as a holistic and systemic process of organizational change that reshapes business models, operational processes, value propositions, and engagement with stakeholders (Vial, 2019). While its contours can vary by sector and context, digital transformation generally refers to the integrated adoption and orchestration of digital technologies, such as cloud computing, artificial intelligence (AI), data analytics, Internet of Things (IoT), and automation, in order to improve performance, foster innovation, and ensure long-term competitiveness.

Several definitions of digital transformation coexist in academic and practitioner literature. Vial (2019) defines it as *"a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies."* This definition emphasizes the systemic and intentional nature of transformation, distinguishing it from mere digitization which we can briefly defined as the conversion of analog to digital and also digitalization which is the use of digital technologies to improve existing processes (Verhoef et al., 2021). (see appendix1: phases of DT)

From a strategic management perspective, digital transformation is not just about technology deployment but about leveraging digital capabilities to fundamentally change how value is created and delivered (Bharadwaj et al., 2013). This includes new forms of customer engagement, real-time data-driven decision-making, platform business models, and agile organizational structures. The transformation is therefore strategic, cultural, and structural, often requiring top-down leadership and cross-functional collaboration (Bonnet & Westerman, 2020).

While digital transformation (DT) is often framed as a universal necessity, its material implications and societal impacts are deeply contextual, these effects are not the same

everywhere. Indeed, digitalization is often portrayed as a global and inclusive phenomenon but even in 2025, in practice, it remains highly uneven across countries and populations. While high-income countries increasingly rely on ICT infrastructures to support economic activity, education, healthcare, and public services, a persistent digital divide separates connected from unconnected populations and generations (The shift project, 2019b). This divide is particularly visible between developed and developing countries, where unequal access to infrastructure, limited investment in digital skills, and weak institutional capacity hinder the effective adoption of digital technologies. As highlighted by the United Nations Conference on Trade and Development (UNCTAD, 2018), the lack of human and financial capital in least developed countries significantly impedes their digital transformation and risks exacerbating pre-existing socio-economic inequalities.

In the Belgian context, national and regional strategies have emphasized the economic potential of digital transformation. The "Digital Belgium" plan and the "Belgian roadmap for the digital decade 2030" reflect these ambitions, aiming to position Belgium as a digitally sovereign and inclusive society by 2030 (FPS Economy, 2023).

2.1.2. Key trends in organizational digitalization

Over the past decade, digital transformation has evolved from a technical shift to a strategic imperative, profoundly reshaping organizational structures, business models, and ecosystem relationships. Central to this transformation is the migration toward cloud-based infrastructures, which enable Belgian companies, greater scalability, flexibility, and cost efficiency by replacing traditional on-premise systems with service-oriented architectures (Vial, 2019). This has facilitated the rise of "as-a-service" models, enabling also smaller firms to access sophisticated IT resources without large capital investments. In parallel, the rise of big data analytics and predictive modelling has empowered organizations to generate actionable insights from both structured and unstructured data sources, thereby enhancing decision-making and customer intelligence (Verhoef et al., 2021).

From retail to manufacturing, Belgian organizations are increasingly using predictive analytics to optimize operations, personalize services, and anticipate market trends. Furthermore, artificial intelligence (AI) and machine learning are now widely used to automate processes, personalize services, and optimize supply chains, significantly expanding the scope of digital

value creation. Belgian enterprises have demonstrated remarkable leadership in adopting cutting-edge technologies, with 24.7% of Belgian companies utilizing at least one artificial intelligence application, ranking Belgium third in Europe compared to the European Union average of 13.5%. This adoption rate has experienced explosive growth, with AI utilization increasing by 80% in a single year (Acerta, 2025). In Belgium, public services have also embraced automation to enhance administrative efficiency, reflecting the broader "Smart nation" ambition at regional and federal levels. The widespread adoption of mobile-first and omnichannel experiences, especially in sectors such as retail, banking, and healthcare, has also redefined user expectations and competitive benchmarks. In Belgium, the national digital decade roadmap outlines strategic priorities for achieving a digitally sovereign, inclusive, and sustainable society by 2030. This includes investment in digital infrastructure, upskilling the workforce, fostering innovative ecosystems, and embedding sustainability into digital policy frameworks (FPS Economy, 2023).

2.1.3. Impacts and outcomes of a digital transformation

Digital transformation is frequently justified by its expected performance benefits, including increased operational efficiency, enhanced customer experience, improved data visibility, and the creation of new digital revenue streams (Sebastian et al., 2017). In manufacturing, technologies such as digital twins and IoT-enabled sensors facilitate real-time monitoring and predictive maintenance. While in the service sector, AI-driven chatbots and recommendation algorithms enable firms to personalize offerings and often reduce costs. Beyond these technological capabilities, recent empirical studies emphasize the strategic importance of customer experience and IT innovation as mediators of digital transformation's impact on firm performance. For instance, a study has shown that firms that actively align digital initiatives with customer-centric design and innovation processes experience significantly stronger performance outcomes (Masoud & Basahel, 2023). In Belgium, several companies have adopted industry 4.0 practices to streamline their production lines and reduce downtime through predictive maintenance; for instance, the company INSENS has developed RED, an IoT-based, self-powered sensor that monitors the electrical signature of industrial equipment in real time, enabling early detection of anomalies and optimizing maintenance operations in manufacturing environments.

However, these benefits are not without trade-offs and risks. The literature increasingly highlights the challenges and unintended consequences that accompany digital transformation initiatives. These include high implementation costs, organizational inertia, cybersecurity vulnerabilities, and the persistent shortage of digital talent (Vial, 2019). Furthermore, the ecological impacts of digitalization, long overlooked in mainstream business research, are becoming more pronounced. The energy-intensive nature of data centers, the rapid obsolescence of electronic devices, and the environmental impacts of streaming platforms have sparked concern among scholars and policy makers alike (Belkhir & Elmeligi, 2018; Freitag et al., 2021; Santarius et al., 2023).

Thus, while digital transformation remains a powerful lever for innovation and competitiveness, it is increasingly scrutinized for its broader societal and ecological externalities. This emerging tension between performance imperatives and environmental responsibility underscores the need for a more holistic and sustainable approach. In this light, the concept of digital sobriety, which advocates for strategic restraint and ecological alignment in digital usage, emerges as a timely counterbalance (a closer look at this concept will be done in the next sections).

2.2 Conceptualizing organizational performance in a digital context

The pursuit of enhanced performance is the primary catalyst for digital transformation initiatives. As highlighted in the introduction, organizations invest in digital technologies with the explicit goal of improving agility, operational efficiency, and competitiveness (Bharadwaj et al., 2013). However, the concept of "performance" itself is not monolithic because it is a multidimensional construct that has evolved with the digital economy. To critically assess the claim that digital sobriety might "compromise performance", it is essential to first deconstruct what performance means in a contemporary organizational context.

Traditionally, performance was evaluated through a narrow set of financial metrics such as return on investment (ROI), productivity or cost reduction. While these remain important, digital transformation has expanded the scope of performance to include several other critical dimensions. A broader framework, implicitly suggested by scholars such as Vial (2019), encompasses operational, customer-facing, and strategic performance.

Operational performance refers to the efficiency and effectiveness of internal processes, which digitalization aims to enhance through automation, real-time data analytics for decision-making, and the streamlining of workflows. In this context, efficiency relates to achieving desired outcomes using the least possible resources, such as time, energy, or capital, while effectiveness denotes the degree to which processes actually fulfil their intended objectives. Concurrently, customer-facing performance is centered on the customer experience (CX), where digital technologies enable new forms of engagement, personalization, and value co-creation (Masoud & Basahel, 2023). Success in this domain is often measured by metrics like customer satisfaction and the ability to create seamless user journeys. Finally, strategic performance relates to an organization's capacity to innovate and maintain a competitive advantage, which digital transformation is expected to foster by enabling agility and the development of new, data-driven business models (Sebastian et al., 2017).

The dominant logic of digital transformation assumes a positive and linear relationship between technological investment and these performance dimensions. More data, more features, and faster processing are inevitably equated with better outcomes. It is this very logic that digital sobriety challenges. The tension arises because the pursuit of performance, as traditionally defined, often leads to increased resource consumption with more powerful servers, larger data flows, and more frequent hardware renewals, which directly conflicts with the principles of sufficiency and ecological restraint. This thesis, therefore, does not merely question whether sobriety hinders performance, but probes whether the very definition of “performance” needs to be reframed to include ecological responsibility as a core component, shifting the paradigm from pure optimization to sustainable value creation.

2.3 The paradigm of technological innovation and its critics

Technological innovation is the engine of digital transformation. It is the process through which new digital capabilities are developed and integrated to create novel products, services, and business models (Vial, 2019). The prevailing paradigm of innovation in the digital sector has been profoundly shaped by a techno-optimist culture that prioritizes speed, scale, and disruption. This model, however, is increasingly subject to criticism for its significant and often overlooked environmental externalities. The dominant innovation paradigm can be characterized by three key features: a logic of acceleration, a logic of expansion, and a logic of obsolescence. The logic of acceleration, driven by methodologies like Agile and DevOps,

fosters flexibility and rapid deployment but also institutionalizes a culture of continuous updates and short innovation cycles (Bonnet & Westerman, 2020), a pace that often leads to "software bloat" and drives hardware obsolescence. Agile is an iterative project management approach originating in software development that promotes short development sprints, continuous feedback, and adaptability to change. DevOps, for its part, is a socio-technical framework that integrates software Development and IT Operations, aiming to automate and streamline the entire software delivery process, through continuous delivery, infrastructure-as-code, and close cross-functional collaboration. While these approaches enable organizations to innovate and release updates faster, they also risk reinforcing the unsustainable tempo of technological renewal, contributing to ever-increasing energy and material demands.

This is coupled with a logic of expansion, where innovation is frequently equated with adding more features, data, and connectivity, an approach rooted in the "attention economy" that incentivizes data-hungry services and contributes to exponential growth in energy consumption (The shift project, 2019b). Finally, a logic of obsolescence, drawing from a view of "creative destruction" means the digital economy often thrives on rendering existing technologies obsolete to make way for the new, fueling unsustainable production and exacerbating the global e-waste crisis (Baldé et al., 2017).

Critics argue that this innovation paradigm is a primary driver of the rebound effects that we are going to develop in the next section. While individual technologies may become more efficient, the systemic drive to innovate by expanding and accelerating leads to an overall increase in resource consumption (Hilty & Aebischer, 2015). The environmental cost is thus baked into the very definition of "progress". In this context, digital sobriety emerges not as an anti-innovation stance, but as a call for a paradigm shift in innovation itself. It advocates for redirecting creative efforts away from sheer expansion and toward new goals such as innovation through sufficiency, by designing solutions that meet core needs with minimum resources; innovation through longevity, by creating durable and repairable hardware and software; and innovation through efficiency, by focusing on lightweight code and optimized algorithms. This alternative paradigm reframes innovation as a qualitative, not just quantitative, endeavor. The central challenge for organizations, which this thesis explores empirically, is whether they can navigate this shift from an innovation model based on endless growth to one guided by ecological limits and responsible purpose.

2.4 IT for Green, Green IT and rebound effect

Digital technologies are often promoted as powerful tools to support environmental objectives. Through what is commonly referred to as "IT for Green", digital solutions can optimize resource consumption and improve energy efficiency across a wide range of sectors. Indeed, ICT can support energy transition through: smart grids which are intelligent electricity networks that use real-time data to balance supply and demand more efficiently, optimize transport via connected mobility and traffic prediction systems, help industry with industry 4.0, energy-efficient buildings through IoT and AI, and enable precision agriculture. Digitalization also enables public institutions to enhance transparency, improve service delivery, and facilitate access to essential services through e-government initiatives (UNCTAD, 2017).

However, the environmental potential of digital transformation must be assessed critically. The dematerialization of services like cloud computing, online platforms, data flows, can create a false sense of immateriality, obscuring the very real material infrastructure that underpins digital systems (The shift project, 2019b). This "illusion of dematerialization" fosters what Pitron (2018) calls an "imaginary opulence", masking the ecological burden of ICT devices and data centers, much of which is borne downstream in global supply chains.

Despite increased device efficiency, the overall environmental footprint of the Information and Communication Technologies (ICT) sector continues to grow. In 2019, ICT was responsible for approximately 4% of global greenhouse gas (GHG) emissions and was projected to double by end 2025 (see appendix 2 and 3) (The shift project, 2019b). The main reason for this growth lies in the rebound effects of digital innovation.

Originally formulated as Jevons' paradox, the rebound effect refers to situations where improvements in technological efficiency led to increased consumption, thus undermining the expected environmental benefits. In the context of ICT, three types of rebound effects can be identified (Gossart, 2015):

- First-order effects (direct rebound): Gains in device efficiency or reduced production costs lead to increased adoption. For instance, energy-efficient smartphones or laptops may consume less energy per unit, but if they are produced and sold in larger quantities, the overall environmental burden increases.

- Second-order effects (indirect rebound): ICT enables cost savings or efficiencies in one area, which are then spent on increased consumption elsewhere. For example, productivity gains from digital technologies can lead to increased consumption in non-digital domains, such as transport, leisure, or material goods.
- Third-order effects (structural rebound): Broader societal transformations triggered by digitalization (changes in mobility, lifestyle, or production models) increase resource demand systemically. Digitalization reshapes entire economic structures, altering energy consumption patterns in ways that are often difficult to predict or control.

A particularly illustrative case is the global rise of video streaming services. Thanks to major advances in video compression technologies (e.g., H.264, H.265), platforms such as Netflix, YouTube, and TikTok have significantly reduced the bandwidth required per video. However, instead of leading to overall environmental savings, this efficiency has enabled exponential growth in video consumption. Users now stream more content, in higher resolutions (HD, 4K, 8K), and across more devices. As a result, in 2018, video streaming alone accounts for about 80% of global data flows, generating an estimated 306 million tons of CO_2 per year (see appendix 4), more than the annual emissions of Spain in the same year (The shift project, 2019a). This is a clear instance of direct rebound effects, where perceived efficiency gains encourage higher usage volumes, ultimately undermining sustainability goals.

This exponential dynamic is further accelerated by Moore's law, which predicts that computing power doubles roughly every two years while costs remain constant. While this drives innovation and affordability, it also leads to increased device proliferation and faster replacement cycles, exemplifying a direct rebound effect.

Hence, digital technologies are not inherently sustainable. Their net environmental impact depends on how they are designed, deployed, and governed. As such, any IT for Green initiative must be coupled with a robust Green IT strategy and a critical understanding of rebound effects to avoid counterproductive outcomes.

2.5 The environmental footprint of digital technologies

The long-standing perception of digital technologies as "immaterial" or environmentally neutral is increasingly challenged by scientific data, and therefore more widely accessible to

understand. Far from being intangible, the digital ecosystem is underpinned by a material infrastructure of massive environmental significance. The digital sector relies on energy-intensive data centers, sprawling telecommunications networks, and billions of consumer devices. Its footprint is no longer negligible: according to GreenIT.fr (2019), the digital sector already accounts for 4.2% of global primary energy consumption, 5.5% of global electricity use, and 3.8% of greenhouse gas (GHG) emissions which for GHG is equivalent to 1.5 billion French employees going to work for 1 year (GreenIT.fr & Bordage, 2019).

These figures position digital technologies as a major environmental issue, equalizing the emissions of civil aviation from the same year. The problem spans the entire life cycle of digital systems: from the extraction of rare minerals, through manufacturing and usage, to e-waste disposal, often in regions lacking environmental protections.

2.5.1. Impact and issues at production phases

The production phase is the most impactful in terms of energy and material resources. GreenIT.fr reports in 2019, that 76% of abiotic resource depletion, 83% of water use, and 66% of GHG emissions from digital systems occur during the manufacturing of user devices. This is consistent with ADEME's estimates, which suggest also that 90% of a smartphone's lifetime energy consumption is generated before it is even turned on (ADEME, 2019).

Digital devices require large quantities of rare earths and metals (see appendix 5) such as cobalt, tantalum, and lithium, sourced predominantly from geopolitically sensitive or socially fragile regions. For instance, the Democratic Republic of Congo supplies over 50% of the world's cobalt, often under conditions involving child labor (Amnesty International, 2016). Additionally, China controls more than 90% of the global rare earth market, introducing strategic dependencies and supply chain vulnerabilities (Pitron, 2018).

The amount of weight of this digital world is staggering in 2019, the global digital ecosystem weighed 223 million tons, equivalent to 179 million cars, and was projected to grow to 317 million tons by 2025, driven by connected devices and network expansion (GreenIT.fr & Bordage, 2019). The environmental consequences of this growth are exacerbated by short hardware renewal cycles, particularly in smartphones, where updates are sometimes driven more by software obsolescence than physical degradation.

2.5.2. Impact and issues at usage phases

Firstly, from the point of view of hardware overconsumption, despite efficiency gains, usage-related impacts continue to grow due to rebound effects, where increased efficiency leads to increased overall consumption (Gossart, 2015). By 2025, GreenIT.fr (2019) had predicted a tripling of GHG emissions from digital technologies compared to 2010, largely due to device proliferation, screen enlargement, and the growth of connected objects (from 34 to 68.5 billion devices). Moreover, the always-on nature of many devices like routers, TVs, smartphones, and smart assistants, means that power is consumed continuously.

Secondly, we can also talk about software and data usage with the obvious dominance of streaming which is representing 80% of global internet traffic and the rise of cloud services that have dramatically expanded energy use across network and data center infrastructure (The shift project, 2019b). For example, to have an idea, a ten-minute video streamed in HD can consume more energy than using a smartphone for ten days. The Shift Project warns that streaming and cloud-based consumption models, while convenient, are rarely optimized for energy efficiency.

There is always an impact of usage in a digital world, even common workplace practices like sending emails with attachments, using heavy web applications, participating in video calls, entail non-trivial environmental costs. Despite improvements in data center efficiency, total energy use continues to climb because of surging demand. By 2030, data centers are predicted to emit triple the amount of CO2 annually compared to a scenario without the AI boom, reaching 2.5 billion tons, roughly 40% of the current annual emissions of the United States. The energy demand from AI-dedicated data centers is set to more than quadruple by 2030, and AI could account for nearly half of all data center usage by the end of 2025 (Dhanani, 2024). (see appendix 6)

2.5.3. Impact and issues at elimination phases

The end-of-life stage is marked by growing volumes of electronic waste called e-waste, much of which is poorly managed. In 2019, the world already generated 53.6 million metric tons of e-waste, expected to surpass 75 million tons by 2030. Yet only 17.4% of e-waste is officially collected and recycled (Baldé et al., 2017). Miniaturization and increasing complexity reduce recyclability. Many devices are designed with non-removable batteries, glued components, and rare metal alloys that are difficult to separate. Informal recycling practices in countries like

Ghana, India, or Indonesia often involve open-air burning or acid baths, with disastrous consequences for workers and ecosystems.

Europe, while only 7% of the global population, produces more than 25% of global e-waste (Baldé et al., 2017). This disproportion underscores the outsourcing of environmental and social risks to the global south, reinforcing what some scholars refer to as "digital colonialism."

2.5.4. Tensions between increasing digitalization and the ecological imperative

From rare mineral extraction and energy-intensive manufacturing to exponential data use and toxic waste, the environmental and social externalities of digital technologies challenge the dominant narratives of progress and dematerialization. The current trajectory of digitalization is marked by rebound effects, systemic inefficiencies, and transnational injustices.

This creates a central tension between the relentless pursuit of digital innovation and the ecological imperative of planetary boundaries. On one hand, digital transformation is viewed as a strategic lever for competitiveness, economic growth, and efficiency. On the other hand, its ecological debt, materialized through energy usage, pollution, and social exploitation, raises fundamental questions about long-term sustainability.

This paradox calls for a shift toward digital sobriety: a systemic approach that does not merely optimize technologies but questions their necessity, lifecycle, and embedded values. As the following section will explore, digital sobriety offers both a framework and a set of practices for reconciling innovation with responsibility.

2.6 Digital sobriety: from Green IT to strategic restraint

As digital technologies continue to penetrate every dimension of organizational life, concerns over their environmental footprint have gained increasing prominence. This shift in focus has led to the emergence of the concept of digital sobriety, which builds upon but also transcends earlier initiatives such as Green IT. While Green IT focused primarily on the energy efficiency and environmental optimization of ICT hardware and infrastructure, digital sobriety introduces a more strategic, systemic, and normative approach to digital sustainability (ADEME, 2019; Bordage, 2019).

2.6.1. From Green IT to a broader sustainability paradigm

The Green IT movement emerged in the mid-2000s in response to growing evidence of the ecological costs of ICT infrastructures. Its goals were largely technical and operational, targeting hardware energy consumption, server virtualization, e-waste management, and procurement of energy-efficient devices (Murugesan, 2008). While effective in reducing localized energy use and promoting eco-friendly technologies, Green IT remained limited in scope, often isolated within IT departments and disconnected from broader business strategies (Hilty & Aebischer, 2015).

By contrast, digital sobriety expands the sustainability agenda beyond hardware and infrastructure to address software design, user behaviors, organizational practices, and digital governance. Coined and popularized by French think tanks such as The Shift Project, the concept of digital sobriety is *"an approach that consists in designing and using digital technologies in a more restrained and thoughtful manner, with the goal of reducing their environmental impact"* (The shift project, 2019b, 2020). This means not only making digital systems more efficient, but doing less, differently, and better which is a call for sufficiency rather than optimization. Indeed, for The Shift Project (2020), the objective of digital sobriety is defined as "*Digital sobriety calls for using our analytical capacities and tools to build and use a digital system that, by reducing its consumption of material and energy resources to a level compatible with environmental constraints, preserves its essential contribution to society.".*

2.6.2. Principles and dimensions of digital sobriety

Digital sobriety has emerged as a strategic response to the growing environmental impact of digital technologies. Indeed, it refers to the moderation of digital usage and infrastructure to reduce energy consumption, greenhouse gas emissions, and the demand for finite material resources. Rather than treating digital growth as inherently desirable, this approach calls for a reassessment of digital priorities, focusing on essential functionalities and environmental efficiency.

According to The Shift Project (2019, 2020), digital sobriety is grounded in three core principles. First, sufficiency implies that organizations should avoid digital overconsumption and technological escalation by prioritizing what is truly necessary. This involves resisting the

reflex to systematically adopt new tools, applications, or services without evaluating their real utility or ecological cost. Second, sobriety requires the eco-design of digital services: developing software, websites, and platforms that are optimized for low energy use, reduced data flows, and minimal background activity. Simple practices such as compressing images, limiting autoplay features, or reducing the complexity of user interfaces can lead to significant environmental gains. Third, behavioral and cultural change is essential. Organizations and individuals must become more aware of the hidden environmental costs of everyday digital practices, such as unnecessary video streaming, excessive cloud storage, or the frequent renewal of electronic devices.

Digital sobriety can also be understood with two complementary dimensions. On the operational level, it aims to improve the energy efficiency of existing digital systems through technical measures such as server optimization, data compression, or lightweight interfaces. On the strategic level, it calls into question the necessity of digital projects themselves, urging decision-makers to assess whether certain transformations, like launching a new app or migrating to the cloud, are truly needed. This dual approach pushes organizations to move beyond surface-level "green IT" initiatives and toward a deeper integration of sustainability within digital governance. By reframing digital innovation through the lens of ecological responsibility, digital sobriety offers a pragmatic and actionable framework for aligning digital ambitions with planetary limits.

2.6.3. Challenges and organizational implications

Despite its potential to reconcile environmental responsibility with digital innovation, the implementation of digital sobriety faces significant challenges at both the organizational and systemic levels. One of the core obstacles is path dependency: many organizations remain locked into high-energy digital infrastructures due to past investments, competitive pressures, and inertia in IT governance. Even when more sustainable alternatives exist, firms often prioritize performance gains and scalability over energy efficiency. The Shift Project (2020) highlights that most business models in the digital economy are structurally tied to increasing content production and data consumption, an outcome of the attention economy which is a paradigm in which human attention becomes a scarce, monetizable resource (Vettehen & Schaap, 2023). Digital platforms are designed to maximize engagement and screen time through algorithmic targeting, personalized content, and interface design strategies that exploit

cognitive biases. This business logic fuels a perpetual demand for bandwidth, devices, and computational power, thereby reinforcing the environmental footprint of the digital sector.

A second barrier is the invisibility of digital impacts (Péréa et al., 2023). Employees and decision-makers frequently underestimate the environmental cost of their digital behavior, as emissions and resource use are largely indirect and hidden from view. For instance, streaming one hour of HD video may emit more CO2 than using a refrigerator for a full day but yet this comparison is rarely known or communicated internally. Moreover, short-term performance pressures often overshadow sustainability considerations, especially when rapid digitalization is framed as a key driver of innovation and competitiveness. As such, ecological moderation is frequently sidelined in favor of growth metrics and user engagement KPIs.

Addressing these barriers requires a cultural shift in digital governance, moving from unchecked expansion to reasoned deployment based on environmental assessments. According to The Shift Project (2020), this involves three key organizational actions: (1) developing cross-functional awareness of digital environmental costs, (2) adopting robust tools to evaluate the energy relevance of digital projects, and (3) engaging top management in aligning ICT strategy with climate goals. For example, organizations can apply the "Smart Technologies Energy Relevance Model" (STERM) to assess whether the rollout of connected solutions, such as smart lighting or cloud migration, yields net energy savings when accounting for both production and operational phases. In several case studies, systems that appeared "smart" were found to be inefficient unless embedded within broader behavior-change programs.

Additionally, digital sobriety is not solely a technical challenge, it requires rethinking value creation itself. Strategic decisions, such as developing a new app, integrating AI features, or upgrading employee devices, must be scrutinized not only for their functional or economic benefits, but also for their ecological legitimacy. This shift implies reorienting performance evaluation frameworks to include environmental KPIs, limiting device turnover, and privileged tools that deliver high societal value per unit of resource consumed.

Finally, embedding digital sobriety in organizational practice demands more than isolated "green IT" initiatives. It calls for a coherent sustainability strategy that spans procurement, IT architecture, staff training, and executive leadership. As explored in the next sections, this is

precisely where CSR policies, SDG alignment, and digital governance tools can serve as powerful levers for change.

2.7 CSR and the SDGs: institutional levers for sustainable ICT

The growing awareness of the environmental footprint of digital practices has amplified calls for organizations to embed sustainability not only in their core strategies, but also in their digital infrastructures and innovation processes. In this context, Corporate Social Responsibility (CSR) and the Sustainable Development Goals (SDGs) have become essential frameworks for guiding the responsible integration of digital technologies within organizational ecosystems (Hwang, 2024). When strategically mobilized, these institutional levers can support the transition from fragmented Green IT initiatives to more holistic and measurable sustainable ICT policies.

2.7.1. Corporate Social Responsibility (CSR) and digital sustainability

As digital transformation becomes a cornerstone of business competitiveness, its environmental externalities have grown more pressing. Energy-intensive data centers, rapid device obsolescence, and massive data flows associated with cloud computing and AI are undermining the once-prevailing belief that digitalization is inherently clean or efficient. In this evolving landscape, Corporate Social Responsibility (CSR) offers a crucial lens through which to evaluate and reorient digital strategies toward sustainability (Covucci et al., 2024; Hwang, 2024).

Over the past decades, CSR has shifted from a voluntary, philanthropic endeavor to a strategic governance framework that directly influences innovation, compliance, and stakeholder engagement. Carroll's (1991) four pillar model with: economic, legal, ethical, and discretionary responsibilities, remains foundational, but the rise of digital corporate responsibility calls for an expanded understanding of firms' obligations (Carroll, 1991). As Delcon (2020) asserts, CSR must now encompass digital domains such as data governance, algorithmic transparency, environmental impact of software, and the lifecycle of digital devices. These dimensions are increasingly recognized by firms, regulators, and civil society as material concerns issues that affect not just operational efficiency, but long-term corporate legitimacy (Delcon, 2020).

A major challenge in embedding digital sustainability within CSR lies in the invisibility of digital impacts. While firms often showcase green buildings or low-emission logistics in CSR

reports, few address the energy usage of streaming platforms, the rebound effects of cloud migrations, or the environmental cost of high-frequency updates in digital services (Lauzer & Pironnet, 2023). This blind spot weakens environmental accountability and hampers meaningful change. To overcome this, CSR frameworks must be updated with robust digital KPIs. For example, emissions from IT operations, software energy efficiency, or metrics on device recycling and lifespan extension.

Furthermore, CSR acts not just as a reporting tool but as a governance mechanism. We have a bidirectional relationship between CSR and digital innovation: while digital tools can enhance CSR performance, for example via improved ESG data tracking, CSR also constrains the ethical direction of innovation (Huang & Shen, 2024). Firms that embed CSR principles upstream in their innovation process are more likely to question whether a new digital feature or platform contributes to societal well-being or merely amplifies ecological and social risks.

Importantly, digital sobriety, which is a principle advocating for moderation, necessity, and eco-design in digital usage, offers a valuable extension to CSR. Moving beyond superficial green IT solutions, digital sobriety promotes intentionality in digital investments, encouraging firms to prioritize low-carbon design, reduce unnecessary features, and align IT developments with planetary boundaries. This vision echoes the transformative mission advocated by Philippe de Woot, who emphasized that businesses must exercise “moral imagination” to go beyond compliance and embrace sustainability as a systemic obligation.

2.7.2. The Sustainable Development Goals (SDG) as a guiding framework

Alongside CSR, the Sustainable Development Goals (SDGs) and in particular SDG 12 (responsible consumption and production) offer an institutional framework for embedding environmental responsibility in digital strategies. Adopted by the United Nations in 2015, the SDGs provide globally recognized targets including for reducing waste, improving energy efficiency, and fostering sustainable innovation. Sub-goals such as SDG 12.5 (reducing waste through prevention and recycling) and SDG 12.8 (promoting awareness for sustainable lifestyles) are particularly relevant to digital sobriety. They call for companies to extend device lifecycles, optimize energy usage in digital services, and raise internal awareness about digital sufficiency behaviors, all of which are pillars of sustainable ICT strategies.

Lauzer and Pironnet (2023) note that although many firms include SDG logos or references in their sustainability reports, concrete implementation remains quite limited. Digital transformation projects, such as cloud migration, AI adoption, or platform expansion, are rarely assessed against SDG objectives, creating a gap between symbolic alignment and actionable integration. This disconnect is problematic, especially as regulatory frameworks such as the Corporate Sustainability Reporting Directive (CSRD) require companies to disclose not only general sustainability impacts, but also their specific contributions and detriments to the SDGs. Lauzer and Pironnet (2023) emphasize the need to embed SDG-based KPIs into project governance, and to promote cross-functional collaboration among IT, sustainability, and procurement teams to ensure holistic alignment.

Moreover, firms that succeed in aligning their digital strategies with SDG priorities often gain reputational advantage, stakeholder trust, and innovation resilience (Wu et al., 2024). The alignment enhances strategic clarity, enabling organizations to navigate the growing pressure from customers, regulators, and investors for more responsible digital behavior. In this sense, the SDGs serve not only as external expectations but also as internal coordination tools that help firms develop coherent, long-term roadmaps for digital sustainability.

2.7.3. Institutional levers, accountability, and strategic alignment

Together, CSR and the SDGs function as institutional levers because they embed environmental and ethical standards into the fabric of digital governance. They exert both normative pressure (what firms should do) and cognitive pressure (how firms understand and frame their responsibilities), particularly in sectors under strong ESG scrutiny (Delcon, 2020). Rather than treating digitalization and sustainability as separate trajectories, forward-thinking firms recognize that integrating CSR and SDG principles into digital transformation is a strategic imperative. It allows them to move from reactive compliance to proactive value creation, embedding ecological limits into technological ambition. This shift enables a new form of corporate digital responsibility (CDR), which is a governance logic where restraint, transparency, and ethics guide digital decision-making from design to deployment (Covucci et al., 2024; Herden et al., 2021).

Beyond CSR and the SDGs, the emerging concept of Corporate Digital Responsibility (CDR) offers a promising and more focused framework for governing the environmental and societal

impacts of digitalization. As argues Lobschat et al. (2021), CDR is not a replacement for CSR, but a necessary extension that addresses the specificities of digital transformation, particularly in terms of data governance, environmental footprint, and the ethical use of technologies such as AI and automation. By structuring corporate responsibility into four pillars: social, ecological, technological, and economic, CDR provides actionable guidelines to align digital practices with long-term sustainability goals (Lobschat et al., 2021).

Ultimately, digital sobriety tries to emerge not as a limitation, but as a catalyst with an approach that allows organizations to reconcile performance with sustainability, innovation with responsibility, and short-term efficiency with long-term planetary resilience. As de Woot would remind us, *"the true test of corporate leadership lies in the capacity to innovate not just for growth, but for the common good".*

3 METHODOLOGY

3.1 Research design: exploratory qualitative study

To explore how Belgian companies reconcile digital transformation with environmental imperatives through the lens of digital sobriety, this study adopts an exploratory qualitative approach. Rather than testing predefined hypotheses, the aim is to understand perceptions, practices, and tensions in depth within a complex and evolving context related to sustainable ICT. This interpretive methodology is particularly suited to examining under-researched phenomena and generating nuanced insights into organizational behavior and strategy.

The study is anchored in a systemic understanding of sustainability and digital transformation, seeking to link organizational practices with broader institutional and ecological dynamics. This grounded approach ensures that the data collected is not only descriptive, but analytically rich and connected to the theoretical frameworks outlined in the literature review.

3.2 Case selection and profile of participating organizations

In line with the research objectives, a purposive sampling strategy was adopted to ensure a rich diversity of perspectives across sectors, organizational sizes, and governance structure. Unlike case studies focused on a single niche (e.g. SMEs, particular companies, or public institutions),

this thesis adopts a deliberately broad lens. Firstly, the environmental impact of digital technology is systemic: it cuts across organizational types, industries, and governance models. Digital transformation and its ecological implications are not isolated phenomena; they are part of today's organizations and require a holistic vision. Secondly, a broad approach enables us to take a comparative view. By examining how digital sobriety is addressed in organizations of different sizes, sectors and requirements, this study is able to identify both common patterns and sector-specific nuances. It aims to formulate relevant strategic and policy recommendations in an attempt to affect the Belgian digital landscape as a whole.

In short, the decision to adopt a multi-case, cross-sector exploratory model reflects a commitment to studying digital sobriety as a complex, collective and adaptive challenge. Indeed, in light of the climate emergency, reducing the environmental impact of digital requires systemic thinking and inclusive solutions.

Five Belgian organizations were selected based on their explicit engagement in digital innovation, while also having demonstrated a tangible interest in environmental and social responsibility in order to have detailed views. The selection aimed to include both private and public actors, large companies and SMEs, as well as institutions active in education. The case profiles are as follows:

- Belgium Institute for Sustainable IT (ISIT Belgium): NGO/Think tank: Interviewee: Jules Delcon, sustainable digital transformation advisor

Founded in 2020, ISIT Belgium is a non-profit “think-and-do tank” dedicated to promoting sustainable, inclusive, and ethical digital practices in Belgium. Modeled on its French counterpart which is “l’Institut du Numérique Responsible” (INR), ISIT provides expertise, training, audits, and public advocacy to help organizations reduce the environmental and social footprint of their IT systems and usages. The organization collaborates closely with academic partners, including professors from UCLouvain, and engages both public and private actors in driving behavioral and systemic change in digital usage. Jules Delcon, former author of a master’s thesis on digital sobriety, currently leads sustainability initiatives within ISIT, combining consulting work and strategic foresight.

- NSI Group: large company: Interviewee: Benoît Pitsaer, ESG manager*

NSI Group is a major digital solutions provider headquartered in Belgium, operating in areas such as ERP integration, cybersecurity, 5G, artificial intelligence, and cloud infrastructure. With over 800 employees across multiple locations, NSI builds custom IT ecosystems for both private companies and public institutions. As ESG Manager, Benoît Pitsaer leads internal sustainability initiatives and participates in cross-sector projects aimed at embedding environmental, social, and governance (ESG) criteria into NSI's service delivery and innovation practices.

- Agence du Numérique (AdN): public sector: Interviewee: Louise Marée, expert in digital and circular economy.

The Agence du Numérique (AdN) is a public institution of the Walloon Region, responsible for steering the region's digital transition agenda. Its mission is to enable a "responsible, inclusive and sustainable digital future" for Wallonia, with projects spanning e-governance, digital skills, and eco-design. Louise Marée works in the field of circular economy and digital policy, sharing insights into the regulatory, strategic, and ecosystem-wide dynamics that influence the adoption of digital sobriety practices within public institutions and SMEs. The agency also monitors the region's progress in terms of SDG implementation and digital maturity.

- Axolytech: SME: Interviewee: Ignacio Rondini, co-founder

Axolytech is a Belgian start-up that designs and develops eco-designed software solutions aimed at reducing digital footprints in organizations. The company's work is grounded in the principles of eco-design, agile development, and user-centered innovation, and it promotes awareness around sustainable software development among clients and partners. Ignacio Rondini, one of the co-founders, provided insights into how small companies can integrate digital sobriety principles into their business models from the outset, including trade-offs, client education, and market positioning challenges.

- UCLouvain en transition: education sector: Interviewee: Marc Servais, strategic advisor for sustainable development

UCLouvain en transition is an institutional transformation program launched by UCLouvain to integrate sustainability into its teaching, research, operations, and digital practices. Coordinated by a transdisciplinary team, the initiative covers several axes including mobility, food, energy,

and digital usage. Marc Servais, strategic advisor within the "service d'analyse, stratégie et prospective" (SASP), plays a key role in the implementation of the transition plan adopted in 2021. His experience sheds light on the role of higher education institutions as both role models and laboratories for systemic change.

These cases were chosen for their relevance to the research question and their ability to offer contrasted insights across institutional settings, helping to enrich the analysis of both tensions and synergies in digital sobriety implementation.

3.3 Data collection: semi-structured interviews

To collect in-depth qualitative data, semi-structured interviews were conducted with key informants in each organization. This method was chosen for its flexibility, allowing for rich narratives while ensuring comparability across cases. A general guide interview was adapted where necessary, based on each interviewee's expertise, allowing for conversational flow and thematic depth (see appendix 8). Interviews were conducted in French, either remotely or in person, depending on the availability and preferences of participants. Each session lasted between 45 and 75 minutes and was recorded with informed consent. Full transcripts were produced and form the basis of the empirical analysis (See other pdf interviews transcripts).

3.4 Data analysis: thematic coding

The interview transcripts were analyzed using a thematic coding process inspired by Braun and Clarke's (2006) methodology. This process involved identifying and organizing the participants' responses into recurring topics in order to compare perspectives across cases:

- Awareness and perceptions of environmental impacts of digital practices
- Organizational practices related to infrastructure, software and usage behavior
- Challenges and resistances to digital sobriety adoption
- Governance, CSR integration, and performance tensions
- Strategic and cultural implications of sustainable digital transformation
- Digital performance vs environmental responsibility

By systematically grouping the data around key topics, this method allowed for the examination of both convergences and divergences in the views expressed by different respondents.

4 EMPIRICAL FINDINGS

This part presents the empirical findings derived from our qualitative research, based on a series of in-depth, semi-structured interviews with key actors across the Belgian digital and sustainability landscape. The interviewees, representing institutional (UCLouvain), governmental (Agence du Numérique), advocacy (ISIT Belgium), large company (NSI), and entrepreneurial (Axolytech) perspectives, provide a multi-faceted view of the research problem. The analysis is structured thematically, moving from foundational awareness to reflexion on specific practices, barriers, and finally, to the strategic implications for governance. This progressive structure allows us to build a comprehensive answer to our central inquiry into how Belgian organizations can reconcile digital transformation with digital sobriety.

4.1 Awareness and perceptions of digital impacts

A foundational finding of this research is that while a general awareness of the environmental impacts of digitalization is growing, it remains unevenly distributed among Belgian organizations. While all experts interviewed acknowledged the materiality of the issue, their perspectives reveal significant nuances in how these impacts are perceived and prioritized. This initial stage of awareness is the first critical hurdle in integrating digital sobriety into corporate strategy.

The primary challenge identified is the abstraction of the digital footprint. As Jules Delcon of ISIT Belgium articulated, the digital world is often perceived as “dematerialized or virtual” a perception that masks its very physical reality of “mining, fossil fuel consumption, and waste production”. This perception gap means that while organizations may be conscious of tangible impacts like e-waste, the more significant environmental costs associated with data centers, network traffic, and most critically the manufacturing phase of hardware remain largely invisible and “which can sometimes contributes to a persistent underestimation of their ecological footprint” as said by Benoit Pitsaer. Marc Servais who is aware of the impact of digital, reinforces this, noting that their last carbon assessments at UCLouvain on digital confirm that “the biggest impact is the production of digital equipment” an impact that occurs far from the end-user. This lack of visibility, a recurring theme in sustainability literature, leads to a deprioritization of the issue. Jules Delcon's call for systematic “monitoring of the digital footprint” is therefore not just a technical recommendation but a strategic one because

measurement is the precursor to management, and without quantifiable data, digital pollution remains a vague concept rather than a concrete business metric to be addressed.

Furthermore, the very terminology used to discuss the problem presents sometimes a barrier. Louise Marée from the Agence du Numérique (AdN) revealed that the term “digital sobriety” is often avoided in official communications due to its political connotations of “deprivation,” which can be perceived negatively. The AdN’s preference for terms like “responsible digital” or “committed digital” underscores the cultural and political sensitivities that must be navigated to build a broad coalition for change. This challenge of framing reflects a core issue in the “twin transition”: the need for a shared language that can unite diverse stakeholders to move forward.

Finally, this awareness gap is mirrored on the client's side. Ignacio Rondini of Axolytech, a startup founded on the principle of eco-conception, stated bluntly that “a lot of education is needed” and that there is currently “no real interest in the market in Belgium for sustainably designed software.” This weak demand-side pull places the primary responsibility on voluntary corporate action and a proactive regulatory push, paving the way for the practical challenges organizations face when they do attempt to act.

4.2 Practices and challenges: infrastructure, software, behaviors

Our research examined the concrete practices and challenges across the three primary vectors of digital's environmental impact: hardware, software, and user behavior. The findings reveal that initial actions are often focused on “low-hanging fruit”, while more systemic issues remain largely unaddressed. According to Benoit Pitsaer (NSI), this is due to “the lack of clear standards and the inertia of user habits who remain major barriers to change”.

Firstly, infrastructure with the management of IT hardware, known as the most common starting point for an organization's sobriety journey. The most impactful practice identified is the extension of hardware lifecycles. UCLouvain, for instance, moved from an automatic five-year replacement cycle to an on-demand system which is a simple policy change with significant environmental and financial benefits. Similarly, Axolytech implements this by upgrading components like RAM on computers rather than replacing entire machines. However, this is often where the effort stops. As Rondini notes, many organizations “will just extend the life of their devices and it stays there.”

Secondly, software where the interviews revealed a growing understanding of software's role in driving hardware obsolescence, a phenomenon known as software bloat. The concept of software eco-conception was championed by both Ignacio Rondini and Jules Delcon as an essential lever, even if it has not been sufficiently developed. Rondini's startup, Axolytech, was founded on this principle, aiming to build lighter, more efficient digital services. A key challenge, however, is the lack of market demand noted earlier. A more significant barrier is the pervasive use of third-party software like Microsoft 365, where end-user companies have no control over the software's design or resource consumption. This effectively allows organizations to "push the problem onto others" said Ignacio Rondini, highlighting the need for ecosystem-level solutions, as suggested by Gossé (2025), where value chains, not just individual firms, are optimized for sustainability.

Finally, the impact of user behavior, which is a complex and debated area. The COVID-19 pandemic accelerated the adoption of videoconferencing, shifting energy consumption from centralized offices to decentralized homes. This creates what Marc Servais describes as an "almost mission impossible" to influence the behavior of thousands of individuals. Consequently, he advocates for centralized, systemic solutions, such as automatically setting lower default video quality on institutional networks, over relying on individual behavioral change, which is difficult to scale and sustain. This points to a preference for architecting sustainable systems rather than merely encouraging sustainable actions within them.

4.3 Enablers and barriers to implementing digital sobriety

The transition towards digital sobriety is shaped by a complex interplay of opposing forces. Our research identified several key barriers that maintain the status quo, which are counterbalanced by a set of enablers that could potentially accelerate a sustainable digital transformation.

On one side of this equation, the most profound barrier is a deep-rooted economic and cultural inertia. The prevailing economic system, predicated on continuous growth and consumption, creates a powerful headwind. As Jules Delcon described, this manifests as a cultural issue where the "NEW" is the most powerful marketing argument, driving rapid replacement cycles that make long-term, sustainable investments appear less attractive than short-term gains. This

systemic pressure is reinforced by what Delcon terms the “triangle of inaction” (see appendix 7) which is a conceptual stalemate where citizens, corporations, and political bodies each shift responsibility to the others. Citizens wait for regulations, companies wait for consumer demand, and politicians wait for a clear public mandate. This dynamic, where strategic mandates are often lacking, creates a powerful inertia. Compounding these systemic issues are significant practical barriers, particularly for SMEs, which, as Louise Marée noted, often lack the time, budget, and in-house expertise to even “know how to start.” Benoît Pitsaer highlights that change is still limited by market inertia, short innovation cycles, and the absence of client pressure for responsible digital. Finally, a major new barrier is emerging in the form of the current “rush to AI.” Ignacio Rondini argues that the frenzy to adopt AI, often without a clear use case, is “being crushed completely” by the nascent progress on digital sobriety, as its immense computational and energy costs threaten to dwarf previous environmental concerns.

However, counterbalancing these obstacles is a growing set of enablers that offer pathways forward. All experts agreed that top-down regulation is the most powerful of these. Louise Marée highlighted how European directives provide essential legitimacy for the AdN's work, while Jules Delcon argued that regulation is crucial to “changing the rules of the game” and ensuring a level playing field, preventing virtuous companies from being outcompeted. Supporting this regulatory push, financial incentives like subsidies were cited by Louise Marée as a critical enabler for SMEs, helping to bridge the gap between the immediate costs and long-term returns of sustainable investments. Foundational to any progress, however, is awareness and education. All interviewees stressed the importance of revealing the “the hidden face of digital,” and that peer-to-peer inspiration through success stories being a particularly effective strategy for convincing hesitant organizations. Finally, for large organizations, progress can be accelerated through practical implementation. Echoing points on user behavior, automated and centralized technical controls are seen as a far more effective and scalable lever, than relying solely on individual will to implement change, which is not yet a reliable solution.

4.4 Governance, CSR integration, and performance tensions

For digital sobriety to become embedded within an organization, it requires a formal governance structure. Our research indicates that such governance is still immature in most Belgian organizations. Where it does exist, it is often integrated into broader ESG or CSR frameworks, but the effectiveness of this integration remains a critical question.

A key finding is that CSR initiatives are often seen as secondary to core business objectives. Louise Marée observed that for most SMEs, “CSR or the SDGs are not particularly their primary concern,” with action often triggered by regulation or subsidies rather than proactive strategy. This suggests that digital sobriety is rarely a strategic driver and that many companies lack a coherent approach for integrating sustainability into their core strategy.

This leads to a central tension between perceived performance and sustainability. The dominant business logic equates innovation and competitiveness with the rapid adoption of the newest technologies. This directly conflicts with the principles of sobriety, which advocate for sufficiency and longevity. Ignacio Rondini noted that with the rise of AI, “all its notion of sobriety, currently it's remained something rather anecdotal”, as companies prioritize the perceived competitive necessity of AI over its environmental cost. This creates a strategic dilemma where organizations fear that embracing sobriety means sacrificing their competitive edge. As Benoît Pitsaer emphasized, “Without clear ownership and cross-functional coordination, digital sobriety risks remaining a good intention rather than a transformative lever”.

While CSR and the SDGs are not yet miracle solutions for combating the environmental footprint of digital, they are nevertheless essential structural catalysts. A formal CSR policy provides the mandate to elevate digital sustainability from a siloed IT issue to a strategic corporate priority. Aligning with SDG 12 (responsible consumption and production), for instance, provides an internationally recognized language to frame efforts. However, as our experts highlighted, these frameworks are often too generic for responsible digital (Servais) and primarily resonate with companies that are “already committed” (Rondini). Therefore, while CSR reporting (especially under the CSRD) is important for providing structure and forcing measurement, it is insufficient to drive deep transformation without a genuine underlying commitment.

4.5 Strategic pathways: reframing digital transformation through sustainability

Overcoming these tensions requires a fundamental reframing of digital transformation itself. Pitsaer suggests sobriety could be reframed not as a constraint but as a vector for IT efficiency and sustainability, notably through better procurement criteria and lifecycle-based KPIs.

Our findings suggest a necessary shift from a technology-centric view, which is an endless cycle of adopting new tools, to a needs-driven, sustainability-led approach. The cornerstone of this reframing is questioning the need. Both Jules Delcon and Ignacio Rondini emphasized that the most critical act of sobriety is to ask, "Do I really need it?" before adopting any new technology. This challenges the techno-solutionist mindset that assumes every problem requires a digital solution. A sustainable approach would first define the business goal and then select the most appropriate and efficient tools, digital or otherwise.

This leads to a strategic pathway grounded in sufficiency and circularity, prioritizing:

- Longevity and repairability: Designing and procuring assets for durability.
- Efficiency: Optimizing software and infrastructure to deliver services with minimum resources. As Jules Delcon argued, eco-design can lead to needing "2 times fewer machines," resulting also in massive cost savings.
- Utility over novelty: Shifting the corporate culture to value functional utility over the status of novelty.

This reframed perspective positions digital sobriety not as a brake on innovation, but as a discipline that fosters a more resilient, efficient, and purposeful form of digital transformation.

4.6 Digital performance vs environmental responsibility: a false dilemma?

Ultimately, the empirical evidence suggests that the perceived conflict between digital performance and environmental responsibility is, in large part, a false dilemma rooted in an outdated paradigm. A more sophisticated, systems-level view reveals significant potential for synergy. As noted by Pochet (2017), digitalization is not intrinsically good or bad because its impact depends entirely on the "why?" and "how?" of its application (Pochet, 2017).

Efficiency emerges as a powerful shared objective: an eco-designed application that runs on less infrastructure is both more environmentally friendly and cheaper to operate. Resilience is enhanced through sobriety: a strategy based on extending hardware life is less vulnerable to supply chain shocks than one dependent on frequent replacement. Finally, constraint can be a catalyst for innovation, driving creativity in software engineering and business model design.

This is not to say trade-offs do not exist. There are clear tensions regarding short-term costs and cultural inertia. However, our findings indicate these are strategic challenges to be managed, not insurmountable contradictions. The consensus from our interviewees points to a future where sobriety will be, as Jules Delcon powerfully stated, “chosen or forced” on a finite planet. The organizations that proactively choose to integrate sustainability into their digital strategy will not only mitigate future risks but will also unlock new forms of efficiency, resilience, and competitive advantage. The most competitive Belgian companies of the future will be those that successfully resolve this false dilemma, turning environmental responsibility into a core pillar of their digital performance.

5 CONCLUSION

5.1 Summary of key findings

This thesis explores a critical paradox of our times: the structural tension between the acceleration for digital transformation, coupled with performance and innovation, and the urgent need for environmental responsibility. This challenge is not a theoretical concern because the direct energy footprint of digital technologies is increasing by a staggering 9% per year, and its share of global greenhouse gas emissions grew from 2.5% in 2013 to approximately 4% in 2019, a trajectory that is fundamentally unsustainable on a finite planet (The shift project, 2019b). A more recent study by GreenIT.fr estimates that, as of 2023, the digital sector accounts for approximately 3.4% of global annual greenhouse gas emissions which is a level equivalent to around 3,500 kilometers of car travel per user per year. This is yet another stark reminder of the sector's material and energy intensity, despite its often-perceived immaterial nature (Le Monde, 2025). Unfortunately, due difficult measurements and to a methodological overhaul in the 2023 edition, direct comparison with previous figures (such as those from the 2019 study) is not possible, making longitudinal tracking of the sector's environmental footprint more complex.

By asking how Belgian organizations can integrate digital sobriety into their strategies without compromising performance, and how institutional frameworks like CSR and the SDGs can act as enablers, this research has navigated the very challenging terrain where technological ambition meets planetary limits. Through an in-depth, qualitative study of Belgian organizations, this work moves beyond abstract principles, to provide a grounded account of the perceptions, practices, barriers, and strategic pathways shaping the future of sustainable digitalization.

The empirical investigation reveals a landscape of nascent awareness and fragmented action. A foundational finding, echoing the literature, is that while consciousness of digital technology's environmental impact is growing, it is hampered by a persistent perception of the digital realm as "dematerialized" (Cigref, 2020; Delcon, 2020; The shift project, 2019b). This masks its significant material footprint which occurs from the toxic extraction of rare minerals to the mountains of e-waste, rendering it largely invisible in strategic decision-making. Consequently, organizational practices often focus on technical optimization such as optimizing the energy consumption of their immediate operations, while more systemic and impactful levers like

extending hardware lifecycles and even more questioning the fundamental need for new technologies remain underdeveloped.

The transition towards digital sobriety is constrained by powerful barriers, including: a cultural and economic inertia predicated on novelty, a "triangle of inaction" (see appendix 7) where stakeholders defer responsibility, and a new formidable challenge in the form of the uncritical "rush to AI". Against these headwinds, this research identifies a consensus on the primary enablers: top-down regulation, financial incentives, and widespread education. Finally, the study concludes that governance for digital sustainability remains immature. CSR and SDG frameworks, while valuable, are often treated as secondary to core business objectives and are insufficient to drive deep transformation without real commitment from top management and the impetus of forthcoming regulations like the CSRD.

In direct response to the central research question, this thesis concludes that the perceived conflict between digital performance and environmental responsibility is largely a false dilemma rooted in an outdated paradigm. Integrating digital sobriety does not inherently compromise performance because rather, it redefines it. The findings strongly suggest that a strategy grounded in sobriety, prioritizing longevity, efficiency, and utility over novelty, can become a powerful engine for a more resilient and efficient form of performance. An eco-designed application is not only more environmentally friendly but also cheaper to operate and less dependent on fragile global supply chains. The key to unlocking these synergies lies in a fundamental reframing of digital transformation itself: a shift from a technology-centric approach to a needs-driven, sustainability-led strategy where sustainability is the goal and digital technology is a potential tool (Gossé, 2025). The most critical act of sobriety is not technical optimization, but the strategic discipline to first ask, "Do I really need it?".

5.2 Managerial contributions

The findings of this thesis translate into actionable imperatives for leaders aiming to build future-proof organizations. To bridge the gap between awareness and action, managers must embed digital sobriety into the very fabric of their strategy and operations.

First, to combat the primary barrier of invisibility, leaders must measure to manage with a full lifecycle perspective of digital practices. This requires organizations to systematically map, track, and disclose greenhouse gas (GHG) emissions for digital activities using the internationally recognized framework of Scope 1, Scope 2, and Scope 3 emissions (Redor, 2024):

- Scope 1 covers direct GHG emissions from sources owned or controlled by the organization, such as company vehicles or on-site data centers using their own energy generation.
- Scope 2 comprises indirect emissions from the purchase of electricity, steam, heat, or cooling consumed by the organization. For digital technology, this includes the operational energy used by in-house servers, data centers, and office IT infrastructure, even if the electricity is purchased from the grid.
- Scope 3 encompasses all other indirect emissions that occur outside the organization's direct control but are linked to its activities. This is typically the largest and most complex category for digital, as it includes: upstream emissions from the production and transport of IT hardware (computers, smartphones, servers), the digital supply chain, and downstream emissions such as the energy used by clients to access cloud services or the full lifecycle impacts of e-waste.

The distinction is essential: Scope 2 emissions reflect the operational impact that an organization directly influences through its energy purchases and use, whereas Scope 3 accounts for the entire value chain which is from raw material extraction and device manufacturing to end-of-life disposal, capturing the often hidden, yet substantial, embedded environmental burden of digital technology. Only by adopting this comprehensive, lifecycle-based approach can organizations ensure meaningful impact management and be fully accountable for their true digital footprint. What is not measured cannot be managed, and establishing clear KPIs is the first step to turning an abstract environmental problem into a concrete business metric.

Second, managers must actively redefine innovation from novelty to frugal utility. This requires challenging the deep-rooted cultural bias for the "NEW" and embedding the question of "Do we truly need this?" at the start of every digital project. Innovation should be measured not by

the speed of technology adoption, but by the ability to deliver lasting value with greater efficiency. This means fostering a culture of “frugal innovation” by developing “efficient solutions that are devoid of complexity and superfluousness” (The shift project, 2020).

Third, given that relying solely on individual employee behavior is difficult to scale, a more effective strategy is to architect for sobriety by default. Leaders should champion centralized, systemic solutions that make sustainability the path of least resistance. This includes setting lower video quality standards on internal networks, optimizing software, and establishing procurement policies that prioritize repairability and durability. Instead of an automatic 3-year replacement cycle for laptops, moving to a 5-year cycle with replacement on demand, can reduce the annual GHG emissions of that hardware by 37% (The shift project, 2019b). Extending hardware lifecycles is one of the most powerful levers an organization can pull, as the production phase accounts for the largest share of a device's environmental impact.

Fourth, digital sobriety must be elevated from a footnote in a CSR report to a core pillar of corporate strategy, through transversal governance. An effective approach requires coordination between IT, CSR, purchasing, HR, and all business units, guided by executive sponsorship (Cigref, 2020). This extends to the external ecosystem, where engaging with suppliers for transparency and collaborating with partners on integrated, sustainable value propositions is essential for success (Gossé, 2025).

Finally, as this research and the broader literature identify regulation as the most powerful enabler of change, managers should anticipate regulation by adopting the precautionary principle. Given the uncertainties surrounding the net impact of many digital technologies, organizations should conduct rigorous ex-ante environmental assessments before deployment rather than assuming a solution is inherently beneficial (Alter Numeris, 2024). By proactively adopting digital sobriety principles, organizations can anticipate regulations and mitigate future risks and build significant competitive advantage, positioning themselves as leaders in an economy where environmental responsibility will inevitably be, as Jules Delcon stated, either “chosen or forced!”.

5.3 Limitations and suggestions for future research

While this thesis provides a timely and nuanced exploration of digital sobriety within Belgian organizations, it is important to acknowledge its inherent limitations, and suggestions for future research.

The primary limitation of this study lies in its qualitative and exploratory nature. While the semi-structured interviews with key experts provided rich, in-depth insights, the findings are not statistically generalizable. The purposive sample of five organizations, though intentionally diverse, is very small and cannot capture the full spectrum of challenges across all industries and company sizes in Belgium. Furthermore, the participants were, by nature of their roles, already engaged with and knowledgeable about sustainability. This creates a potential for selection bias, as their perspectives may not represent those of organizations where awareness of digital sustainability is low or non-existent.

Beyond the methodological scope, this research is also bound by the specific institutional context of the study. The complexity of the Belgian political and administrative structure can be an additional obstacle to implementing the clear and coherent strategies that digital sobriety requires. Moreover, this study primarily focuses on organizational responses, and while it acknowledges the broader societal context, it does not fully delve into the deep-seated behavioral drivers of digital consumption or the systemic paradoxes of the digital age.

These limitations pave the way for several important suggestions for future research that can build upon some of the foundations laid by this work.

First, there is a clear need for research into proactive regulatory models for digital innovation. Digitalization is often a “non-stop journey” where technology is deployed rapidly, and its effects are only studied retrospectively. As Jules Delcon (2020) points out, future studies could explore new governance frameworks that, similar to the pharmaceutical industry, assess the long-term environmental and social implications of a technology before it is widely released to the market. This line of inquiry would investigate how innovation can be controlled and guided to proactively avoid negative rebound effects, rather than attempting to mitigate them after the fact which is much more complicated.

Second, this research highlights that a true paradigm shift requires changes in consumption. Therefore, future studies should focus on the behavioral roots of digital sobriety. A deeper understanding of the socio-psychological mechanisms that drive digital overconsumption is needed. Research could explore how to promote resilient consumption behaviors through educational initiatives, public awareness campaigns, and user-centric design that empowers individuals to regain control over their digital usage rather than being influenced by attention-capturing algorithms.

Third, this work points to the responsibility of the entire digital ecosystem. Future research should expand beyond user organizations to investigate the accountability of major digital service providers and educational institutions. How can large technology platforms be incentivized or regulated to promote sustainability over endless user engagement? What is the role of universities in developing new curricula and skillsets to equip a generation of professionals to navigate and lead the digital and energetic transitions simultaneously?

Finally, this thesis touches upon a profound paradox: the pursuit of infinite digital growth on a planet with finite resources. This opens a vital area for future research that questions the current "headlong rush" towards ever-more powerful and pervasive technologies. Studies could explore alternative development models that embrace sufficiency and a "slowing of the frenetic pace of our daily lives" underlined by Delcon. This would involve moving beyond efficiency and optimization to ask more fundamental questions about what a truly resilient and sustainable IT sector, aligned with human well-being and planetary limits, could look like.

5.4 General conclusion

Ultimately, this work demonstrates that the "twin transition" with digital and energy transitions presents both sharp divergences and untapped synergies for 21st-century organizations. As Pochet (2017) insightfully notes, the energy transition is clear in its goal but uncertain in its "how?". While the digital transition, moves fast without questioning its purpose, that is to say excels in "how?" but has lost sight of "why?". Digitalization tends toward a global scale, while energy transition encourages local resilience. Therefore, digital technology must be reframed not as an end in itself, but as a means in the service of sustainable prosperity.

Digital technologies are neither inevitably sustainable nor inherently wasteful because their net impact will depend on how we design and use it. Digital depends on the intentionality, governance, and cultural leadership exercised by organizations. Sober innovation, anchored in sufficiency, efficiency, and long-term value, is not just a constraint but a profound lever for resilient prosperity. The business case for digital sobriety is thus not about limitation, but about unlocking durable advantage and legitimacy in a finite world.

The journey toward reconciling digital transformation with ecological sustainability is not only desirable because it is strategically inevitable. Faced with tightening regulation, mounting societal expectations, and finite planetary boundaries, organizations must evolve. If adopted with strategic intent, digital sobriety can become a catalyst for resilience, stakeholder trust, and long-term value creation, enabling companies not just to do less, but to do better.

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7 APPENDICES

7.1 Appendix 1: phases of Digital Transformation

Strategic imperatives according to phases of Digital Transformation (DT) (Verhoef et al., 2021)

Table 1
Strategic Imperatives according to Phases of Digital Transformation.

Type	Examples	Digital Resources	Organizational Structure	Digital Growth Strategies	Metrics	Goal
Digitization	Automated routines and tasks; Conversion of analog into digital information	Digital assets	Standard top-down hierarchy	Market penetration, (product-based) Market development, Product development	Traditional KPIs: Cost-to-serve, ROI, ROA	Cost savings: More efficient deployment of resources for existing activities.
Digitalization	Use of robots in production; Addition of digital components to product or service offering; Introduction of digital distribution and communication channels.	[Above] + Digital agility, Digital networking capability	Separate, agile units	[Above] + Platform-based market penetration, Co-creation platform	Traditional and Digital KPIs: User experience, Unique customers/users, active customers/users	Cost savings & increased revenues: More efficient production via business process re-engineering; Enhanced customer experience.
Digital transformation	Introduction of new business models like 'product-as-a-service', digital platforms, and pure data-driven business models	[Above] + Big data analytics capability	Separate units with flexible organizational forms, internalization of IT and analytical functional areas	[Above] + Platform diversification	Digital KPIs: Digital share, magnitude and momentum, co-creator sentiment	New cost-revenue model: Reconfiguration of assets to develop new business models.

7.2 Appendix 2: Evolution 2013-2025 of the share of digital technology in GHG emissions (Andrae & Edler, 2015).

Even more worrying is the **growth rate of about 8% of GHG emissions due to digital technology**. Indeed, this growth must now be analyzed in the light of the objectives for reducing GHG emissions as defined at the COP 21. However, while we can expect a gradual decrease in total GHG emissions in the short term (2020, for example), the share of digital technology in these emissions will continue to increase and could **double by 2025 to reach 8%.**

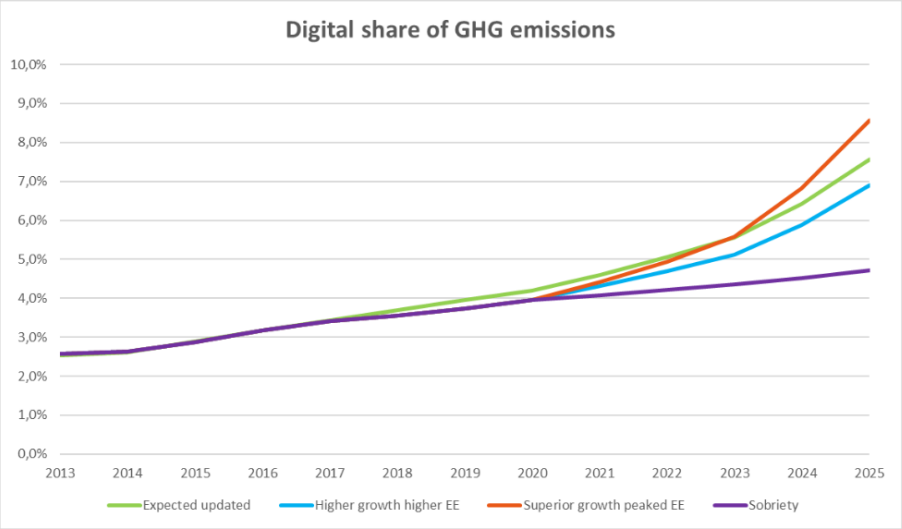


Figure 3: Evolution 2013-2025 of the share of digital technology in GHG emissions. The share of digital technology in GHG emissions.
[Source: [Lean ICT Materials] Forecast Model. Produced by The Shift Project from data published by (Andrae & Edler, 2015)

7.3 Appendix 3: Projections of ICT's GHG emissions from 2020 in the future (Freitag et al., 2021)

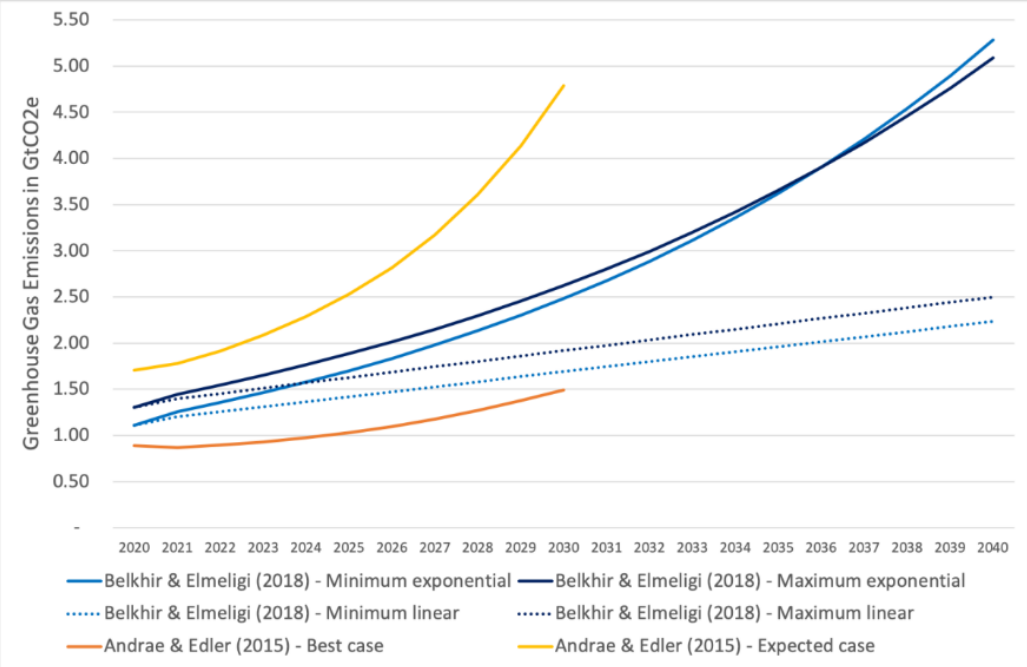
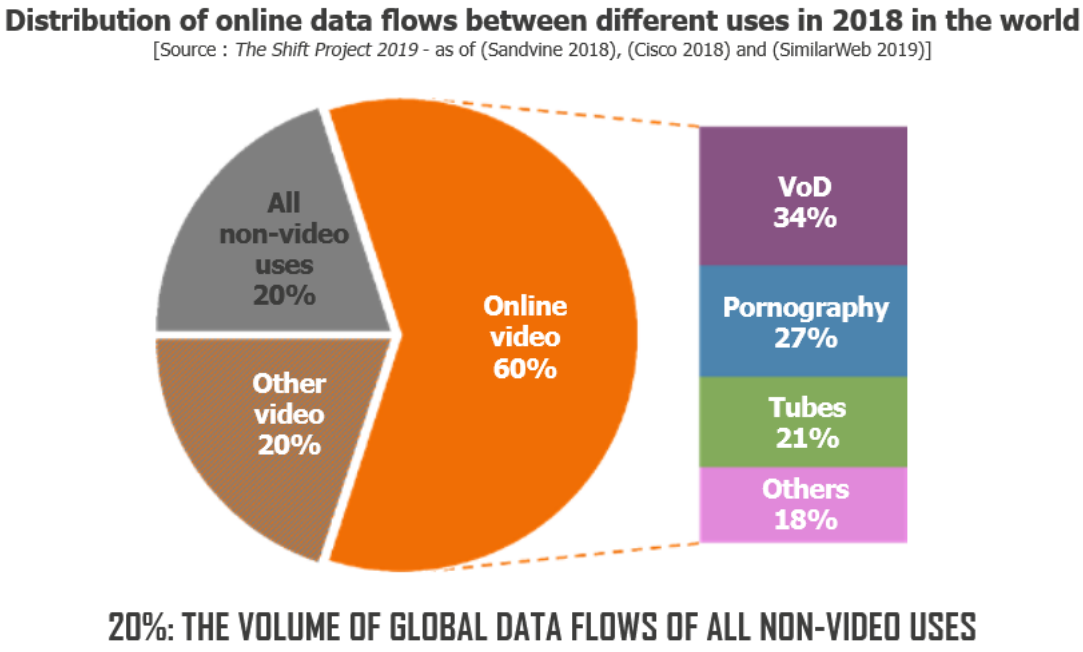


Figure 2.4 *Projections of ICT's GHG emissions from 2020. B&E judge their exponential scenario as most realistic while the linear growth scenario is more conservative and reflects the impact of mitigating actions between now and 2040. M&L [2018] did not make concrete estimates beyond 2020, but Malmodin suggests ICT's carbon footprint in 2020 could halve by 2030 – offering a 2030 estimate of 365 MtCO2e in a recent techUK talk [Malmodin, 2020].*

7.4 Appendix 4: Distribution of online data flows between different uses in 2018 in the world (The shift project, 2018).



7.5 Appendix 5: Architecture of a smartphone with metals used (OrangeLabs, 2017)

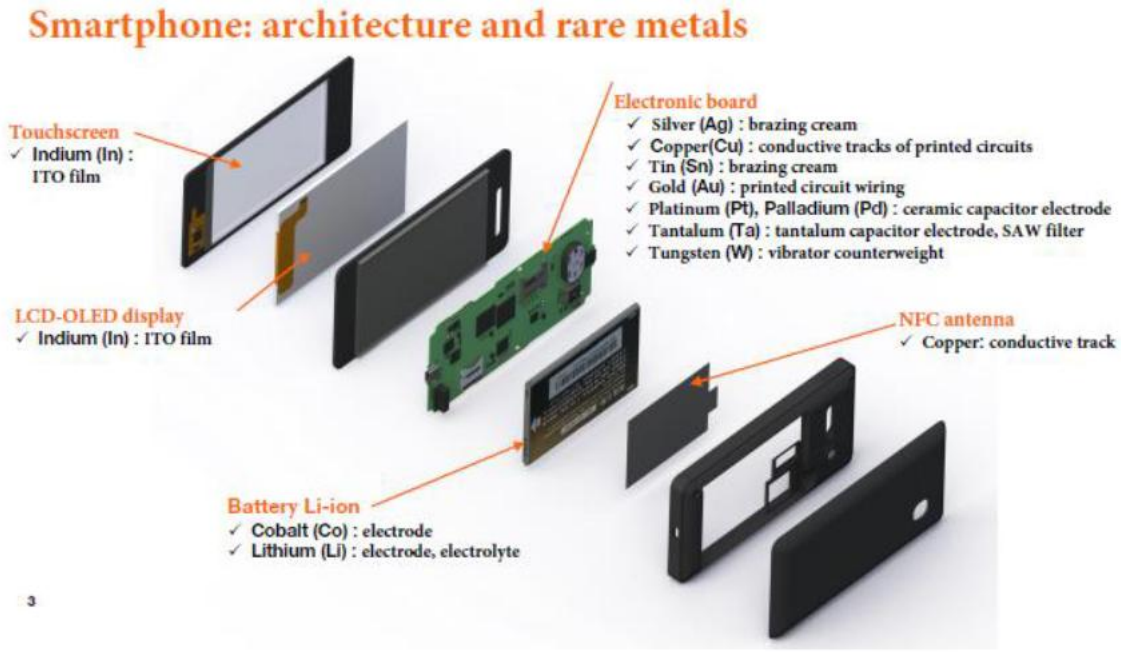
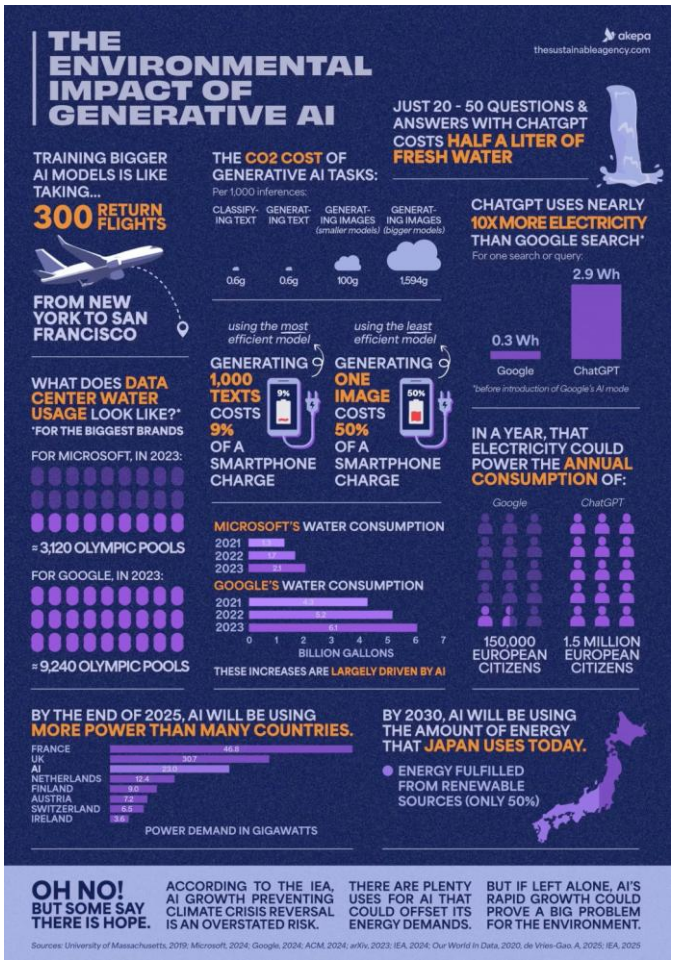
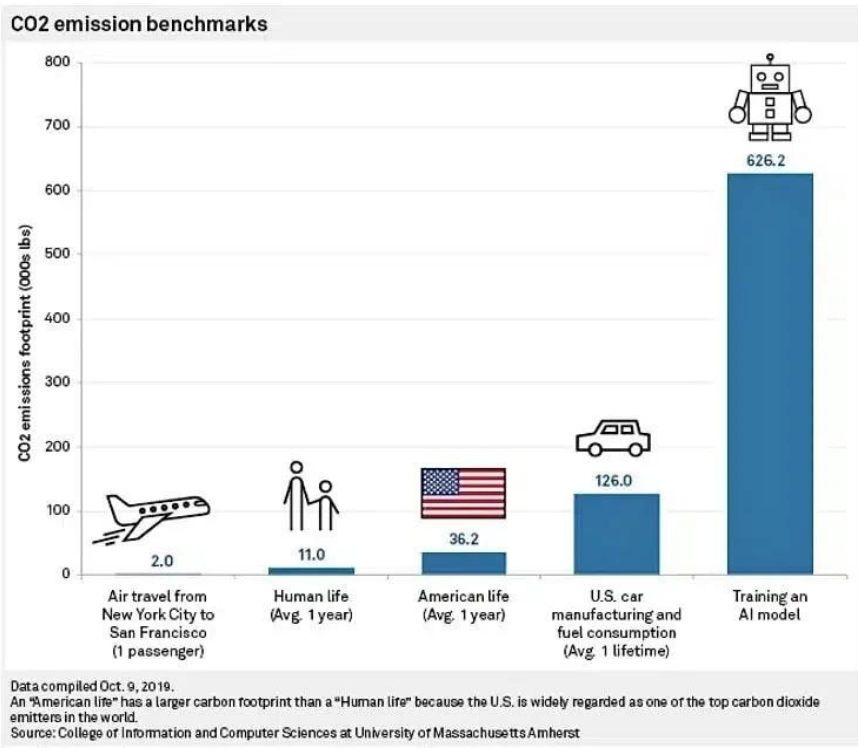


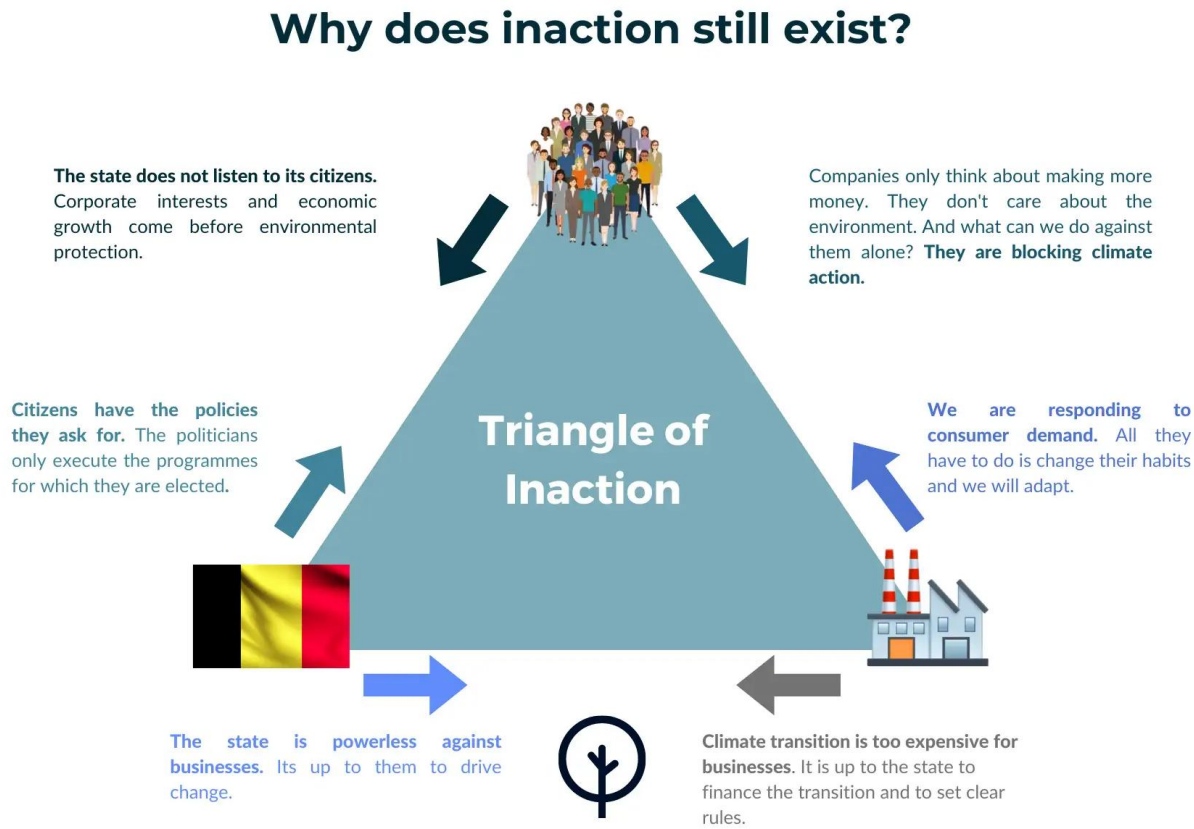
Figure 10: Architecture *of a* smartphone with metals used *(Orange Labs, 2017)*

7.6 Appendix 6: The environmental impact of generative AI (University of Massachusetts, 2019)





7.7 Appendix 7: Triangle of inaction (Pierre Peyretou, 2023)



7.8 Appendix 8: Interview guide: general structure

Introduction and context in order to remind the objective of the research and interview:

Thank for accepting my request for an interview and for your time. My name is Nicolas Meyers, and I am currently in the final year of my Master's degree in Business Engineering with a major in corporate sustainable management (Philippe De Woot) at UCLouvain, within the Louvain School of Management. As part of my Master's thesis, I am focusing on the environmental challenges associated with the digital transformation of organizations, with a particular emphasis on the concept of digital sobriety.

The title of my thesis is: "Reconciling digital transformation and environmental responsibility: the strategic role of digital sobriety in Belgian organizations."

The objective is to explore the tensions and synergies between, on the one hand, the imperatives of performance and technological innovation, and on the other, the reduction of the environmental impact of digital practices within Belgian organizations.

My main research question is: **"How can Belgian organizations integrate digital sobriety into their digital transformation strategies without compromising performance, and to what extent can CSR practices and alignment with the SDGs support this transition?"**
I adopt a qualitative approach and conduct semi-structured interviews with actors involved in digital and sustainability initiatives.

Purpose of the interview: The goal is to better understand how Belgian companies can incorporate digital sobriety into their digital strategies without compromising performance and innovation.

Interview introduction: This interview is part of my Master's thesis in Business Engineering at UCLouvain. I am studying how Belgian companies can integrate digital sobriety into their digital transformation processes without undermining performance or competitiveness. The interview may be interrupted at any time if you wish, and it can remain confidential. Do you consent to this conversation being recorded for transcription purposes? I have prepared a few questions in order to help me stay on track, but I would love to hear any additional information that seems relevant.

Interview themes:

- Presentation of interviewee, role and organization
- Perceptions digital transformation and its environmental impacts
- Understanding of digital sobriety
- Integration of sustainability into digital strategy
- Practical actions and tools to reduce the digital footprint
- Tensions between technological innovation and digital moderation
- Organizational enablers and barriers for the adoption of sustainable digital practices
- Influence of CSR and ESG frameworks on digital strategy
- Reference to the Sustainable Development Goals into sustainable priorities
- Governance mechanisms
- Role of public policies and institutions
- Future outlook of the digital world
- Final comments and additional insights

Conclusion:

Interview conclusion: Thank you very much for your support. Your insights are extremely valuable to my research and help me better understand the concrete realities of implementing more responsible digital transformation strategies, as well as the concept of digital sobriety and its practical applications. If you wish, I will gladly send you a summary of the findings or a copy of the thesis once it is finalized. Please do not hesitate to reach out if you would like to add anything later or receive feedback.

Abstract :

Digital technologies have become essential to how businesses innovate and compete. In Belgium and elsewhere, digital transformation is now a strategic necessity. Yet this growing reliance on digital tools comes with a hidden cost: a rapidly increasing environmental footprint. From the extraction of rare materials to energy-intensive data use and growing electronic waste, the digital sector contributes more and more to global greenhouse gas emissions. This paradox challenges organizations trying to reconcile innovation with sustainability goals.

In response, a new concept is emerging: digital sobriety. Rather than encouraging constant technological acceleration, digital sobriety promotes more intentional and responsible digital practices. It emphasizes necessity over excess, aiming to reduce hardware consumption, streamline services, and lower energy and data usage.

This thesis explores how Belgian companies from different sectors can adopt digital sobriety without compromising performance. Based on five qualitative case studies and interviews with professionals in IT, innovation, and sustainability, the study examines how the concept is understood, what obstacles companies face, and which strategies help make it a reality.

The results highlight structural tensions between short-term business goals and long-term environmental commitments. Yet they also reveal promising practices: employee awareness, sustainable procurement, and better collaboration between IT and CSR teams are key enablers.

Ultimately, digital sobriety is not a brake on progress because it is a strategic opportunity to rethink performance through the lens of sustainability.

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