

Evaluating Digital Sobriety by Design: A Practical Assessment Grid for Digital Services*

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Abstract

Digital sobriety is increasingly recognized as a key issue for sustainable digital innovation, yet practical assessment tools remain scarce at the early stages of service design. This paper proposes a qualitative evaluation grid for assessing digital services in the fuzzy front end of innovation. Conceived as a lighter upstream complement to life-cycle assessment, the grid is intended to support reflection, comparison and decision-making before more comprehensive environmental analyses are undertaken. The framework distinguishes two dimensions: consumption and production. The former includes criteria such as regenerative potential, substitution effects, induced consumption, and temperance of use, while the latter covers infrastructure optimization, software optimization, responsible data management, and AI model frugality. Using a documented Likert-type scale, the grid generates partial and overall scores and supports portfolio analysis through a four-quadrant framework. The approach is illustrated through the case of kDrive. This work-in-progress paper contributes a practical assessment instrument for addressing digital sobriety explicitly in the design, evaluation and governance of digital services.

Keywords

digital sobriety; sobriety by design; Green IT; AI frugality

1. Sobriety by Design

What might sobriety by design, in the sense proposed by Aggeri [1], mean for a digital service? While digital sobriety is increasingly framed as a key issue for innovation, a methodological gap remains: organizations still lack a practical instrument for lightweight assessment in the early stages of the innovation process, particularly in the fuzzy front end. To address this gap, we propose a practical evaluation grid intended to make digital sobriety discussable before major technical and functional choices are stabilized. Here, digital sobriety is understood as the use of digital technologies only where they are genuinely useful, while minimizing resource consumption and extending the life of existing equipment. Rather than replacing life-cycle assessment (LCA), the grid is conceived as a lighter upstream tool that can support reflection, comparison and decision-making prior to any more comprehensive environmental assessment [3]. Such an instrument is especially valuable because quantitative evaluations are often hindered, at this stage, by limited data availability and by the incompleteness of existing measurement methods (p. 15) [13].

Digital services differ widely in their environmental implications. Bitcoin, for example, neutralizes hardware efficiency gains through its very design, while targeted advertising combines intensive data collection with increased physical consumption. By contrast, online video and videoconferencing may, in some contexts, reduce travel or the use of physical media [21]. The literature also distinguishes between two complementary perspectives: **Green IT**, which focuses on reducing the environmental burden of digital infrastructures, and **Green IS**, which examines how information systems can support wider sustainability goals [11]. Yet aligning sustainability with profitability remains a persistent challenge for firms [23]. To address this tension, we propose a framework structured around two dimensions: **consumption**, which concerns the purpose and

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uses of the service, and **production**, which concerns the infrastructures and technical choices that enable it.

2. Consumption-related Criteria

The first criterion is **regenerative potential**. Digital technologies may contribute to a regenerative economy, not only by reducing harm but also by helping restore ecosystems and strengthen social and economic resilience [5]. They can support lower-impact electricity grids, transport systems, agriculture and housing [7]. However, these uses coexist with more extractive ones, such as targeted advertising or purely recreational services [21]. The question, then, is whether a digital service contributes meaningfully to environmental, social and economic sustainability, in line with the Sustainable Development Goals.

The second criterion is **substitution potential**. Digital services may either increase or reduce physical flows. Some intensify them, as targeted advertising does by stimulating both data processing and the consumption of material goods [21]. Others support what may be called sobriety through digital technology, by substituting digital processes for physical ones [12]. Videoconferencing, for example, may reduce travel despite relying on digital infrastructures [21]. Such substitutions should ideally be verified through LCA, since dematerialization is not always environmentally beneficial. Berthoud and Parry show this clearly in cases such as parcel franking and document storing [3]. Even so, substitution remains a useful qualitative criterion: does the service directly reduce or increase physical flows?

The third criterion is **induced consumption**. A service may generate additional material demand because it renders existing devices obsolete or requires the purchase of complementary equipment such as connected objects or peripherals. This issue is visible, for instance, in controversies over hardware incompatibilities such as those associated with Windows 11. It is also increasingly relevant for connected devices, whose environmental impacts, especially in manufacturing and end-of-life processing, remain insufficiently explored despite their rapid expansion [7, 9]. The key question is whether the new service prolongs the life of existing equipment or accelerates replacement and acquisition.

The fourth criterion is **temperance of use**. Digital services often produce rebound effects, especially when optimized production lowers costs and makes access easier [8]. Yet designers can make deliberate choices about how usage is shaped. Interfaces may encourage compulsive behavior through dark patterns or cornucopian designs [2], or, conversely, support moderation through green nudges [17]. Even imperfect indicators may be useful if they encourage restraint and reduce pressure on infrastructures. This criterion therefore asks whether the service promotes necessary, moderate use or instead fosters over-consumption.

3. Production-related Criteria

On the production side, the first criterion is **induced investment**. Can the service rely on existing infrastructures, or does it require additional computing capacity? This question has become especially visible with large language models, whose training and inference demand substantial investments in hardware and energy [22], while also creating supply tensions [15]. A sober service should minimize the need for new technical capacity wherever possible.

The second criterion is **infrastructure optimization**. The growth of online services and cloud computing has been accompanied by the expansion of data centers [21]. Their environmental performance depends both on hardware characteristics, such as machine utilization and performance, and on broader design choices, including cooling systems, energy supply and location [12, 16]. A sober service cannot go hand in hand with infrastructural laxity; it must instead rely on infrastructures that are carefully designed and operated for efficiency.

The third criterion is **software optimization**. Efficient infrastructures are of limited value if the software running on them is unnecessarily heavy. Software sobriety depends on programming language choices, efficient algorithms, performance testing, and the deliberate control of functional scope [2, 4, 6, 21]. In this respect, sobriety is not only a hardware issue but also a design and engineering discipline.

The fourth criterion is **responsible data management**. More data implies more storage, more computation and more network capacity. Limiting the quantity of data processed, stored and transferred helps maintain services within existing technical capacities and delays hardware renewal or infrastructure expansion [21]. Sobriety therefore requires asking not only what data can be collected, but what data is truly necessary.

The fifth criterion is **AI model frugality**. AI has become a key environmental concern. Schwartz *et al.* contrast Red AI, marked by high costs and heavy environmental impacts, with Green AI, which favors efficiency and accessibility [19]. As models grow larger, both financial and ecological costs increase, prompting a renewed interest in smaller and more specialized models [22]. This criterion asks whether a service relies on oversized connectionist models or instead adopts a proportionate approach, using only the level of AI genuinely required.

4. From Individual Services to Portfolio Analysis

These criteria can be combined into a synthetic evaluation grid based on a documented Likert scale ranging from -2 to +2 (see Appendix 1). With adjustable weighting, the grid produces an overall digital sobriety score as well as two partial scores for the consumption and production dimensions. The objective is not to replace detailed environmental accounting, but to provide an actionable discussion tool for designers, managers and decision-makers. We demonstrate how the framework can be applied to the evaluation of the kDrive online storage service offered by the Swiss company Infomaniak (see Table 1). On a grading scale ranging from A (+2) to E (-2), with weightings equal to 1, the overall score for kDrive is B, with a B for consumption and a A for production.

Table 1
Assessment of the digital sobriety of the kDrive digital service (Infomaniak)

Criterion	Score	Justification	
kDrive is an online storage service based on a high-performing sovereign Swiss cloud, extending the lifespan of users' hardware, but without any mechanism that automatically limits use.			B
Consumption			B
Regenerative potential	0	Limited regenerative potential. Positive impact on collaboration, and improved data sovereignty (open-source foundation, compliance with the GDPR and the revised FADP).	
Substitution potential	1	Reduced need for individual external hard drives. Fewer printouts and duplicates. Less physical transport of documents.	
Induced consumption	1	No new hardware required, with multi-OS support. Reduced need for local storage, which may extend the lifespan of existing equipment.	
Temperance of use	0	Neutral interface; no dark patterns and no features that automatically limit use.	
Production			A
Induced investment	0	Use of existing data centers or the pooling of several services, resulting in only marginal additional investment.	
Infrastructure optimization	2	Efforts in the design of data centers (see D4): low PUE, outside-air cooling, use of renewable energy, and heat recovery.	
Software optimization	1	Optimized code (eco-design), automatic compression, continuous profiling, and technical debt kept under control according to internal documentation.	
Reasoned data processing	1	Volumes are determined by users. Retention is configurable. No systematic data collection, but potentially large volumes of data.	
Frugality of the AI model	2	No resource-intensive AI model. No need for specialized processors.	

More broadly, the two partial scores can be used to position digital services within a four-quadrant framework (see Table 2). This makes it possible to analyze a portfolio of services within an organization and identify improvement priorities. In doing so, the tool adopts a logic that is both

similar and complementary to that proposed by Sneed for planning improvement operations on legacy systems [20]. The most problematic quadrant, **digital voracity**, combines compulsive use with heavy infrastructure. The most desirable, **exemplary sobriety**, combines restrained use with frugal infrastructures. Two intermediate cases can also be identified: **apparent sobriety**, where uses remain limited but infrastructures are insufficiently optimized, and **paradoxical frugality**, where the technical system is efficient but the service still promotes excessive use. In this way, the framework provides not only an assessment tool, but also a heuristic for guiding digital innovation towards more sustainable trajectories.

Table 2

The magic quadrant of digital sobriety

Consumption	Moderate use	<u>Apparent sobriety</u> A virtuous user experience masking a heavy infrastructural footprint.	<u>Exemplary sobriety</u> An ideal type characterized by limited use and frugal infrastructure.
	Compulsive use	<u>Digital voracity</u> Uses and infrastructures that are cumulatively problematic, with an overall adverse impact.	<u>Paradoxical frugality</u> A technically optimized system but compulsive uses, resulting in partial, contrasting sobriety.
		Low optimization	High optimization
		Production	

The proposed evaluation grid is not intended to replace established architecture evaluation or project management approaches, but to complement them upstream. As a lightweight instrument, it would still require empirical validation across different types of digital services, in comparison with more comprehensive assessment approaches, and through tests of scoring consistency across evaluators. One promising perspective would be to explore its articulation with ATAM [10], by translating the grid's outputs into evaluation scenarios, risks and trade-offs. Another would be to investigate its integration into Scrum at key stages such as Product Goal definition, backlog refinement, Sprint Planning, Definition of Done and Sprint Review [18]. Such perspectives also resonate with emerging work on the integration of sustainability concerns into agile development, and more specifically into Scrum-based processes [14]. In this sense, digital sobriety could be treated not only as an ex post evaluation issue, but also as an explicit concern for design, architecture and governance throughout the innovation process.

Declaration on Generative AI

The author utilized ChatGPT Plus to translate text from French to English and subsequently helped refine the phrasing for better clarity, conciseness, and style.

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