— GIVING STAKEHOLDERS THE FLOOR

ELECTRONIC COMMUNICATIONS AND AUDIOVISUAL DEPARTMENT OF THE CNMC (*Comisión Nacional de los Mercados y la Competencia*)

A new report on **IP interconnection in Spain**

In 2024, the *Comisión Nacional de los Mercados y la Competencia* (National Markets and Competition Commission, CNMC), in a similar fashion to Arcep, decided to begin periodic monitoring of the IP interconnection market, to keep track of its situation and evolution in Spain. This is why the Authority now carries out annual data collection from the country's main internet service providers (ISPs) and other leading stakeholders in the Spanish market: content and application providers (CAP), content delivery network (CDN) providers and transit service providers. To ensure consistency in the collected data, the information provided covers network traffic between 1 and 30 September.

The first report, covering data collected in October 2024 was published in June 2025.

According to the analysed data, the majority (56%) of the traffic relayed by the ISPs queried* is via transit services, with virtually all of the remainder being relayed via free peering, and scarcely 1% via paid peering. The country's four main ISPs (MasOrange, Telefónica, Vodafone and Digi) rely largely on transit, whereas the other, smaller ISPs exchange more traffic via peering. This is due to the fact that the transit operators owned by the same parent companies as the four main ISPs, are employed as the bases for these ISPs' interconnections.

Moreover, inbound traffic to each ISP's network is proportionately greater than outbound traffic. The asymmetry observed in September 2024 between inbound and outbound interconnection traffic stood at 5 to 1 for the four largest ISPs, and at 3.5 to 1 for the other, smaller ISPs queried.

As every major international transit provider, CDN operator and CAP is present and accessible in Spain, virtually all of the interconnections operated by ISPs take place inside the country, chiefly in Madrid. This does not exclude the possibility that, in the absence of direct interconnection between two ISPs, traffic may be routed via third-party interconnection located outside of Spain. The transit capacities contracted by the ISPs vary a great deal, from a few Gbit/s to several dozen Tbit/s. This means wide disparities in the prices reported for contracted transit services, even though they largely align with the prices observed in the most competitive markets, according to international reports. CNMC assessed the efficiency of on-net CDN**. For the four largest ISPs, the ratio between traffic relayed by CDN servers to end users (15.27 Gbit/s) and the traffic needed to fill those servers (2.52 Gbit/s) is 6 to 1, which represents a significant reduction in the interconnection capacity required and, in some instances, equal to the traffic on these ISPs' core network.

For the other ISPs queried, substantially less traffic is sent from CDN servers to end users (0.36 Tbit/s).

A data collection campaign was carried out in October 2025, on traffic measurements taken in September, with a view to publishing a new report in Spring 2026.

(*) Which represent 99% of ultrafast fixed and mobile connections in Spain.

(**) To find out more about on-net CDN and how they work, see the Arcep Barometer of data interconnection (in French and English) or the CNMC report (in Spanish).

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GONZAGUE DAMBRICOURT
Founder & Manager of BoucheCousue

IPv6 deployment with BoucheCousue customers

A company that specialises in networks, videoconferencing and managed services for very small, small and medium businesses, BoucheCousue is assisting its customers in their gradual IPv6 deployment.

Incremental dual stack deployment on customer systems

The company has opted for a dual stack approach, which consists of having IPv4 and IPv6 coexist on the same network. This method creates the ability to maintain current uses while adding IPv6 connectivity.

This means that IPv6 can be introduced incrementally, while maintaining current applications and limiting the risk of an interruption of service. It also facilitates the testing and adjustment phase, and remains suited to the various environments that BoucheCousue encounters.

This strategy thus makes it possible to accompany customers in their transition to IPv6 in a gradual fashion, without forcing a sudden change on users or technical teams.

Concrete improvements in traffic optimisation

Other positive effects are also being seen with some customers that require a lot of bandwidth. Integrating IPv6 can help optimise network equipment's performance, especially during peak traffic times. One concrete example: a customer in the hotel sector with a great deal of equipment that is connected simultaneously, especially at night. A large number of devices perform automatic backups to the cloud overnight. This generates huge spikes in traffic on the network.

After having activated IPv6 on their infrastructure, there was a noticeable improvement in UDM Pro router performance. CPU use in particular was reduced during these spikes.

These gains can be attributed to improved network traffic management with IPv6, to a reduction in the processing associated with IPv4 (notably the NATs) and, finally, to more efficient traffic distribution.

Ongoing issues

Despite the clear benefits, the prospect of widespread IPv6 adoption is still coming up against several technical, operational and organisational obstacles:

- Not all operators offer **IPv6 connectivity in all of their plans,** which can limit the ability of some customers to make the transition.

- There also continue to be restrictions in terms of **equipment and network administration tools.** In multisite environments, the centralised management solutions used to maintain a homogeneous configuration do not always enable complete IPv6 integration. For the sake of consistency and ease of operations, its deployment may therefore be postponed.

- Lastly, **VPN architectures** are another sticking point. A great many inter-site or remote access VPNs are still largely based on IPv4, and require supplementary checks to guarantee the continuity and security of communications.

These various elements show that, despite a willingness to adopt it, the widespread take-up of IPv6 still depends heavily on the ecosystem, operators, hardware, management tools and existing uses. Which is why the transition is taking place only gradually, apace with the evolution of these different actors.

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LUC HINDRYCKX
Director General of ECTA (European Competitive Telecommunications Association)

Open internet, competition and legal certainty: **the next decade**

Ten years after the adoption of the EU Open Internet Regulation, its benefits are clear. By ensuring that internet access providers treat traffic equally and that end-users can access and provide the content, applications and services of their choice, the Regulation has preserved the internet as a platform for innovation. It has also played a pro-competitive role in telecoms. For example, by limiting zero-rating, the Regulation prevented larger operators from turning preferential access to popular services into an advantage that alternative operators could not easily replicate. Zero-rating refers to commercial practices whereby selected online services do not count against a user's data allowance. While such offers may appear attractive to consumers, they can undermine net neutrality by creating de facto preferences for those services.

This framework has enabled the wider digital ecosystem to flourish. Content, cloud, application and platform providers have benefited from predictable, non-discriminatory connectivity for European users. Many major online players were able to scale because the internet access layer remained open and did not require case-by-case permission, prioritisation agreements or paid access to reach users. Net neutrality therefore remains a pillar of the digital single market.

At the same time, this success should not obscure the constraints borne by telecom operators. While the rules do not prevent investment in capacity, innovative services with strict latency or reliability requirements, such as remote surgery or automated driving, may benefit from clearer legal boundaries for specialised services. For alternative operators, legal certainty matters: uncertainty can deter the launch of enterprise, industrial or low-latency services, even where these would not undermine open internet access.

The next challenge is therefore not to reopen the core principle of net neutrality, but to improve legal certainty at its frontier. The market is moving towards 5G standalone, edge computing, network slicing, AI-assisted network management and software-defined capacity allocation. These technologies make quality more dynamic and granular, while blurring the line between application-agnostic quality-of-service options and specialised services. Operators need confidence to develop services for industrial automation, mobility, health, cybersecurity and business-critical connectivity where objective quality requirements justify optimisation and where general internet access quality is preserved.

A balanced approach should rest on four safeguards. First, the open internet must remain the default: no service should become a disguised replacement for internet access, and no player should be able to buy privileged access to users at the expense of others. Second, innovation in connectivity should be permitted where it is application-agnostic, transparent, user-controlled where relevant, and not based on commercial discrimination between equivalent traffic. Third, specialised services should be assessed using criteria adapted to network slicing and dynamic resource management, including guidance on capacity reservation, latency, reliability and AI-based orchestration. This is particularly important for mobile networks, where capacity is constrained by finite spectrum. Fourth, regulators should look beyond the network layer, as platforms and generative AI may also shape users' freedom of choice and the visibility of online innovation. They should also monitor how AI is used in network management and assess whether the current rules remain fit for purpose.

ECTA members support an open internet that protects users, enables innovation and preserves competition between telecom operators. The priority should be neither deregulation nor rigidity, but predictable rules combining strong non-discrimination safeguards with room for objectively justified, future-proof interpretation, enabling pro-competitive innovation in network services without eroding the open internet as a public good.

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RÉMY GERBET
Executive Director of Wikimedia

Keeping humans in the loop: the Commons versus automation

As Wikipedia celebrates its 25th anniversary, its knowledge-sharing model founded on human collaboration and verifiability is being challenged by an historical shift. The emergence of generative AI does not represent just a technological evolution, it is challenging the very viability of the digital commons that, paradoxically, fuel these new tools.

It is crucial to remember that large language models (LLM) could not have come into being without digital commons. Wikipedia is one of the most valuable training datasets: structured, multilingual and sourced. Despite which, this creative cycle is now being threatened by the effects of disintermediation. By providing direct and summary responses, AI tools circumvent a portion of the audience for Wikimedia projects, and all or a portion of the web. Without visitors, there are fewer contributors; and without contributors, the source of new, reliable and neutral knowledge eventually dries up. This is the AI paradox in a nutshell: it threatens to undermine the ecosystem on which it depends for its own relevance.

When faced with AI, Wikipedia's strength does not lie in the amount of data, but in its governance. Where AI generates content based on statistical probability, Wikimedians build knowledge through consensus and primary source citations. Transparency is at the heart of this philosophy, as opposed to the "black box" effect of some generative AI tools. Every change on Wikipedia is traceable, discussed and reversible. Contrary to the opaque models, digital commons are often based on open access licences guaranteeing that the knowledge remains a global public good.

Generative AI can be an ally to volunteers (translation, vandalism detection). But the key is to always keep humans in the loop, thereby ensuring that the tool continues to be in service to knowledge, and not vice-versa.

AI training on synthetic data (produced by other AIs) poses a major challenge. Researchers are calling out the dangers of model collapse whereby, being fuelled by its own approximations, the AI model becomes steadily more impoverished and generates recursive loops of nonsensical outputs.

In this context, the digital commons produced by humans become a critical resource. Wikipedia acts as a conservator of authentic and verified human thought. Protecting this ecosystem is not only an ethical issue, but a technical necessity for the very future of artificial intelligence: without constant human input, AI becomes locked in a digital echo chamber.

Net neutrality, much cherished by Arcep, is inseparable from the vitality of the commons. Three essential pillars are required:

- Reciprocity: AI companies must help protect the future of the commons they exploit (through financial support and transparency)
- Attribution and sourcing: It is imperative that AI models systematically cite their sources, to enable users to find the original information
- Integrity of information: it is vital to protect trusted third parties like Wikipedia against automated content's pollution of the web.

In conclusion, generative AI is not necessarily the death knell for digital commons, but it does highlight a true emergency. The more the web will be inundated with synthetic data, the more precious spaces of human deliberation will become. Safeguarding these spaces means guaranteeing that the internet remains a common good for humanity.

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HENRI D'AGRAIN
General Delegate for CIGREF

Cloud: time to wake up

Today, in late April 2026, the changes taking place in the BtoB cloud market should be a wake-up call. The unprecedented technological acceleration that we are witnessing, propelled by the massive integration of generative and agentic artificial intelligence (AI), has altered our information systems forever. The cloud was there from the beginning, in what was ultimately a rather classic dynamic of industrialisation of computing power, storage and networks, a driver of technical updates to our enterprise IT systems. It has now gone well beyond the mere function of driver, and instead taken hold as the infrastructure permeating the European economy's nervous and cognitive system.

Behind the legitimate enthusiasm that these new capabilities can elicit, a particularly complex change in the market has taken place. Cigref members are observing and assessing it every day. We have gone from an approach rooted in controlled capital expenditure, designed to make our businesses more competitive, to an operating expenditure whose trajectory could increasingly escape the control of our IT departments.

The figures that we share within our community speak volumes. With an average annual increase in costs that is three times benchmark software inflation, very often justified by the integration by design of AI features whose productivity gains remain to be proven, our budgetary models are being pushed to their limits. This on top of the now well documented and potentially abusive practices that are making the market more rigid.

The aim here is not to deny the undeniable technological value delivered by the big, chiefly North American, tech companies, which today control more than four fifths of this market. But we are now being called, if not forced by the geopolitical context, to look reality in the face. This structural imbalance is arranging a de facto massive transfer of European economic value to extra-European actors, depleting our own investment and innovation capacities in equal measure. The dangers of a technological lock-in have become a very real vulnerability that is as much economic as geopolitical. Which is why now is not the time to sound the alarm. Now is the time for all of us to wake up.

This wake-up call must come, first, from government authorities and competition regulators, both national and European. For years, digital market regulation in Europe has, no doubt with reason, focused essentially on maintaining low prices for consumers and on privacy protection. But this BtoC focus left the growing competition imbalances in the BtoB market in the shadows. If the Digital Markets Act was a major doctrinal step forward, three years after having designated the first gatekeepers, its application to the enterprise cloud market remains in Commission limbo.

We are not looking to take these institutions to trial, and are well aware of the complexity of their task. On the contrary, we are appealing to their capacity to take action. Legal tools exist. European competition law, like our own national law, notably Article L. 420-2 of the Commerce Code, that penalises both abuse of dominant position and exploitative abuse of the state of economic dependence, are powerful tools that warrant being marshalled more vigorously and with utmost speed. We urge regulators to seize these tools, not to punish technological success, but to guarantee that the asymmetry in cloud computing market power does not turn the competitiveness of the European economy into a system of stifling annuity, paying rent to our captors. Beyond competition law, the new prerogatives of technical regulation, seeking to impose interoperability and abolish exit barriers, such as supervising egress fees, as set out in the Data Act and, at the national level, the SREN Act that entrusts Arcep with its implementation, are both decisive first steps towards more open markets and greater freedom of choice for our businesses.

Cloud computing and AI are tremendous levers for our organisations, both public and private, on the imperative condition that we arm ourselves with the collective means to keep both technological and economic control of them. Without a doubt, there is no future for an advanced economy such as Europe without its own autonomous and at-scale digital industry. We refuse the dilemma of denial versus resignation. There is a path of rationality and resilience. This is the path that Cigref is inviting public authorities to travel with us.

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AND

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The DMA Is Not **Blind to AI**

When the DMA was drafted and negotiated, generative AI was still nascent and ChatGPT had not yet been released. The co-legislators therefore neither considered nor could have anticipated AI's transformative role. Since then, AI has reshaped competition and innovation in digital markets. Numerous competing and increasingly capable foundation models exist, and many DMA-regulated services—such as search engines, operating systems, and messaging services—have embedded AI functionalities. Looking ahead, AI will likely become more agentic, evolving into genuine personal assistants that make relevant economic decisions on users' behalf. Early examples, such as OpenClaw, illustrate this potential.

This evolution creates two competition risks: one immediate, one more distant. The immediate risk is that incumbents controlling markets on which AI agents depend may restrict third-party AI agents in favor of their own agents or to protect threatened core businesses ("foreclosure of AI agents"). The more distant risk is that AI agents themselves become gatekeepers and use their position to anticompetitively steer demand ("foreclosure by AI agents").

A key question is whether the DMA can address these risks or requires fundamental revision. Our conclusion, perhaps surprisingly, is that the DMA is neither blind to AI nor obsolete, but rather unexpectedly future-proof.

Regarding foreclosure of AI agents, the DMA's scope shows no major gaps. The most likely bottleneck is the (mobile) operating system (OS). OS are core platform services (CPS), and the main ones—iOS, Android, and Windows—have already been designated as gatekeepers. The DMA can help keep OS open to AI agents in several ways. First, OS gatekeepers must allow users to uninstall preinstalled agents unless essential, and must present a choice screen if their own AI agent is designated as a virtual assistant (Art. 6(3)). Second, they must grant third-party AI agents interoperability with hardware and software features available to their own agents (Art. 6(7)). Third, if an AI agent itself becomes a designated CPS, data portability must be ensured (Art. 6(9)–(10)). Together with other provisions, these rules can reduce both input foreclosure (denial of access to data or device functionality) and distribution foreclosure (preinstallation, tying, self-preferencing).

To further strengthen protection against foreclosure of AI agents, we propose two targeted reforms. First, to extend the click- and query-data sharing obligation of Art. 6(11) to virtual assistants, as such data is critical for contestability. Second, to add virtual assistants to Art. 5(7), so gatekeepers cannot force business users to integrate with their own assistants, thus preserving user choice and fostering competition among AI agents.

If AI agents themselves become gatekeepers, their providers could use demand-steering power to foreclose rivals, typically by leveraging into adjacent services through tying or self-preferencing. In that scenario, we propose to designate AI agents under the virtual assistant CPS category. Although that definition—focused on the processing of "demands, tasks or questions"—was drafted with voice assistants in mind, it can plausibly encompass AI agents. For greater legal certainty, however, the definition should be updated explicitly in a future DMA revision.

Several DMA obligations would then have bite against foreclosure by AI agents. If a designated AI agent defaults users into another service, that default must be changeable (Art. 6(3)); self-preferencing in ranking is prohibited (Art. 6(5)); and equal interoperability with connected devices must be granted (Art. 6(7)). Additional obligations concerning data use and contractual restrictions would also apply.

In sum, the DMA ability to address (agentic) AI rests on two features: first, the likely sources of foreclosure of AI agents are CPSs already covered and designated, especially mobile OS; second, the DMA includes a broad virtual assistant category that can plausibly accommodate future AI agents.

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Why we need to better **assess the environmental footprint of AI**

AI (for the sake of simplicity, we speak of "AI" here, but these environmental issues have become especially pressing since the development of generative AI and its consumer applications) has a growing environmental footprint. The hardware and infrastructures that underpin the use of AI are responsible for multiple forms of pollution, from their production to end of life, whether in terms of carbon footprint, water consumption or the depletion of resources.

Work has been done in recent years on estimating these impacts on various scales. In terms of hardware components, recent studies by ADEME[1] and Hubblo[2] analysed the impact resulting from the manufacturing, use, and end of life of graphic cards, which are essential to AI model training and inference. Assessments have also been performed on AI services, such image generation[3], and are underway on video generation[4]. Shift Project[5] and IEA[6] reports examine the pressure that AI puts on data centres, both nationally and internationally.

These works have made it possible to assess the environmental footprint of AI and its evolution, and to analyse the sources of this footprint: hardware production or use? AI model creation or use? As part of Clément Morand's thesis work, we demonstrated that, despite hardware, software and decarbonisation optimisation, the environmental impact of AI model training continues to grow. This growth is not part of some unexpected phenomenon: it is the result of a process of technical optimisation. The progress in energy efficiency, achieved by the reduction in the size of the models, or improvements to graphic cards' performance, are in reality often reinvested in the development of larger models, to improve performance on benchmarks.

These studies of the environmental footprint of AI are coming up against difficulties in harmonising calculation methods and data transparency issues. The methods and data used to calculate environmental impacts are not always made public, which limits the ability to verify and compare the results, despite the existence of standards and specifications[7].

In addition to the impacts associated with its physical infrastructures, AI can also aggravate the impact of other sectors, by stimulating demand. In the entertainment sector, video recommendation systems increase content consumption. In healthcare, the automation of diagnostics can drive an overuse of resources. Very little work has been done on studying these impacts as they pertain to AI specifically, but the IT4Green project coordinated by ADEME offers a quantitative study of the direct and indirect effects of digitalisation on five use cases, which could be carried over to AI use cases.

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(1) https://librairie.ademe.fr/economie-circulaire-et-dechets/9103-10923-analyse-de-cycle-de-vie-de-gpu-cartes-graphiques-pour-l-intelligence-artificielle.html

(2) https://data.hubblo.org/gpu/docs

(3) https://inria.hal.science/hal-04346102v2

(4) Tristan Coignion Postdoctoral research, as part of the ENS Environmental Observatory of the impact of AI

(5) https://theshiftproject.org/publications/intelligence-artificielle-centres-de-donnees-rapport-final/

(6) https://www.iea.org/reports/energy-and-ai

(7) https://www.boutique.afnor.org/fr-fr/norme/afnor-spec-2314/referentiel-general-pour-lia-frugale-mesurer-et-reduire-limpact-environneme/fa208976/421140

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LAURENT DEVERNAY
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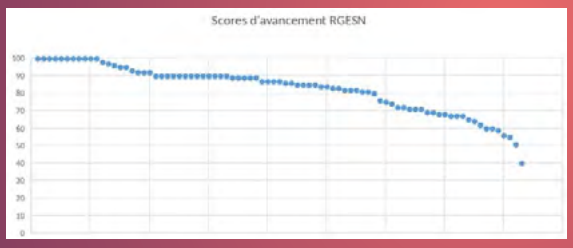
The RGESN, two years on

Since the publication in May 2024 of the latest version of the General Policy Framework for the Ecodesign of Digital Services (RGESN), there have been more than 80 declarations of conformity, listed here. Remember that RGESN audits can be performed without a declaration having been made.

An analysis of available declarations reveals several trends: most come from public structures, contain little proof of criteria validation, and around half are not reviewed by a third party. Added to which, the scores displayed are high, averaging over 82%, as illustrated in the following graph:



These high scores highlight a recurring misunderstanding: the result obtained from an audit is not a conformity score (as might be obtained following an RGAA audit of compliance with accessibility standards) but rather a progress score. The goal is therefore not to achieve perfection, but rather to progress, as part of a process of ongoing improvement that is central to digital ecodesign. The very nature of certain RGESN criteria makes a score of 100% purely hypothetical, added to which the highest-scoring declarations contain little supporting evidence.

Some criteria are based more on commitments than measurable results. Such is the case, for instance, with Criterion 6.1, which requires establishing caps on the size and number of requests per screen, without setting a specific threshold. This flexibility makes it possible to adapt to a range of situations, but also opens the way for low-bar validations, using sometimes very high thresholds. This choice nevertheless remains consistent with the aim of future-proofing the Policy Framework, provided each actor defines ambitious and relevant targets.

Here we come to a central purpose of the RGESN: to kickstart or assist in structuring an IT department's ecodesign process for digital services. It is up to everyone to then tailor it to their own situation, their means and their ambitions.

To help achieve this, a collective of experts was formed, via les Designers Éthiques: the RGESN Consortium to help improve the General Policy Framework for the Ecodesign of Digital Services, and to verify that it is understood and being adopted. This group delivers both proposals for changes and new criteria, and provides a forum for discussing the audits that have been conducted.

In the coming months and years, it will be crucial to watch how existing audits evolve, but also how the RGESN itself will be amended to adapt to changing needs. Foundational issues are already taking shape: utilisation of the audit results, updating declarations, and incorporating future evolutions of the RGESN.

To conclude, the results of the recent FFT (French Telecoms Federation) study on the impact of the ecodesign of digital services confirm the impact of RGESN recommendations using concrete examples.

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ANAËLLE BEIGNON
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Greener digital practices through design

Digital technology has undergone a profound transformation over the past several years due to the growing popularity of generative artificial intelligence (AI). Our Limites Numérique research team analysed the impact of design choices on AI features.

When digital interface design enables the adoption of new, more energy-intensive uses

Even before it became so popular, generative AI was heralded as a game changer: a narrative born in part from tech companies' communications and marketing, of course. But AI is also presented as an inevitability through the interfaces of a great many digital services. In 2024, with Thomas Thibault and Nolwenn Maudet, we examined the ways in which AI features had been incorporated into existing digital services*. At a time of criticism of and resistance to AI, we observed that tech companies were adopting a set of strategies to maximise take-up of this technology. The metaphor of magic, for instance, is ubiquitous, conveyed by sparkle emojis and the colour purple. Adding another layer to the metaphor, the goal of a magic trick is to elicit wonder, while deliberately hiding its secrets offstage. This served to acclimate users to a technology whose outcomes are hard to control, and potentially error prone. The research demonstrated that adoption is not just a matter of need or utility, but is also being pushed, here on a massive scale, by tech companies.

The need to promote less resource-intensive user journeys

Despite the already documented ecological consequences of the widespread use of generative AI, existing ecodesign tools and methods do not make it possible to connect certain design choices to their environmental impact. Even if these interface design choices are akin to well-known dark patterns** (e.g. pop-ups inviting user to try the AI tool that intrude on veteran online services), it is hard to assess the impact of features whose job is to prompt the use of less eco-friendly digital practices, or render them more appealing and convenient.

In another article co-written with Nolwenn Maudet and Aurélien Tabard, we demonstrate the importance of taking the intensification of usage phenomenon into account. In the current digital innovation paradigm, increasingly resource-intensive features are tending to be added to digital services, and to be promoted in the interfaces, which makes it challenging to adopt greener digital habits.

Serious attention needs to be paid to the effects of these design choices, as they are continually erasing ecodesign efforts. Faced with an ICT ecosystem driven by the economic interests of the Big Tech oligopoly, it has become urgent for industry professionals and organisations to take a stand against these practices, but also to regulate design practices that are part of a planned trajectory of increased consumption of data and computing power. Only we can re-shift the paradigm towards more sustainable and desirable digital technology***.

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* https://limitesnumeriques.fr/travaux-productions/ai-forcing
** Deceptive or manipulative interface design choices that are detrimental to users, and benefit the company running the platform.
*** Visit our inspiration library: https://inspirotheque.limitesnumeriques.fr/