QUESTIONING THE DIGITAL REFLEX

Xavier Verne
IT expert, Lean ICT project, The Shift Project

Wires and optical fibers in a datacenter

The Shift Project is a think tank dedicated to exploring ways to strip carbon out of the economy as part of efforts to combat the climate emergency. It publishes recommendations, modelling, and research applicable to all sectors (energy, construction, transport and digital,...) and addressing the institutional, corporate and government decision-makers that control the levers of the real-world economy, seeking to steer it toward a post-carbon model.

Xavier Verne trained as an engineer at Télécom Paris, is head of digital projects at French national railway operator SNCF, and an active contributor to The Shift Project since 2016, focusing on digital and the Lean ICT project whose publications he co-authors. A qualified teacher of mathematics, he is passionate about the sciences in general and digital sobriety in particular and is introducing digitally lean best practices at SNCF.

Digital plays a double-edged role in humanity's quest for the ecological transition that will ensure its continued existence. As a standalone industry, digital uses massive amounts of hard-to-recycle resources and energy. As an industry that services other sectors of the economy, digital can be a driver of massive savings in resource use and CO_2 emissions, providing enough thought goes into ensuring it is used in the most appropriate and effective ways. Otherwise the rebound effect is inevitable, leading to huge increases in direct and indirect CO_2 emissions. Questions and best practices are now emerging that help make sure digital is part of the solution not the problem, and that it contributes to a more sustainable future.

INTRODUCTION

Bringing people together, providing ways to reuse and share objects, setting up car pools and swapping repair hints and tips all contribute to the circular economy and are facilitated by digital. But digital itself is also a source of pollution, so what is the best way for us to reap the environmental benefits and adhere to the Paris Climate Agreement commitments?

DIGITAL GENERATES HIDDEN WASTE BEHIND THE PAPERLESS CLOUD

Let's start by deconstructing two pieces of received wisdom about digital. The first is linguistic: digital doesn't cause information to vanish into an ethereal and harmless-seeming cloud. In reality, this cloud comprises millions of servers packed into datacenters, processing data that is routed via cables, antennae and network equipment all the way to users' devices. All this hardware generates waste: 2019 was a record-beating year, with 53.6 million metric tons of electronic waste,[1] a 21% increase over a five-year period. Electronics that are part of our daily lives — such as monitors, PCs and residential broadband terminals — account for 21% of the total.

The second concerns recyclability. E-waste recycling is very poor, with a rate of just 17% worldwide. The fault lies essentially in three phenomena. First comes the technical difficulty of extracting rare resources from an end-of-life telephone, with some metals present in trace quantities that are almost impossible to separate and recombine. A second difficulty lies in the availability of recycling plants with the technologies needed to do this work. Their viability is reliant on the long-term price of the recycled commodity, relative to the cost of acquiring the same commodity from direct extraction. A third difficulty relates to the existence of parallel circuits that prevent recovery via official WEEE handling channels that, in Europe, capture around 50% of potentially recoverable waste: the remainder is processed via channels that are less scrupulous about respecting applicable health and environmental standards.

In digital, there are sources of potential environmental savings and performance just waiting to be discovered and exploited

Moreover, digital is seen in two distinct ways, as an economic sector in its own right, with its own value chain, clients and suppliers, but also as a tool that is used to fundamentally alter all other sectors of the economy, via the ubiquitous digitalization of processes. Let's look at these issues one at a time.

A SECTOR WITH A GROWING AWARENESS OF ITS ENVIRONMENTAL IMPACTS

As an industry, the sector's benefits are double-edged. It is resource- and energy-hungry and growing constantly year-on-year by 8 to 10%,[2] with little clear prospect of a disruptive technology that will dramatically lower levels of complexity, delivering the move to Low Tech,[3] without abandoning most, if not all, of this growth. But several strong signals give grounds for hope. First, the digital industry's awareness of environmental factors is very recent. Other industries, such as construction, via successive sets of thermal and environmental standards, and road transport, via the Euro 4, 5 and 6 emissions standards, confronted the issue some time ago and are subject to increasingly well-thought-out rules that take it into account. Recent reports by the French senate[4] and the country's national digital council[5] will sooner or later lead legislators to vote for regulations governing the digital sector, over and above the requirements to display CO_2 and environmental data that have already been passed and are in the process of being implemented. Companies that are prepared for this will have a clear and long-term competitive advantage. Turning to the circular economy, we are seeing the emergence of business models that are more ethically driven: in green design, Fairphone embodies the ideal of modular digital sobriety,[6] showing that it is possible to double the useable life of telephones, complete with all necessary updates. In terms of extending useable lives, the Ifixit[7] website takes this approach further and ranks high-tech items as a function of their repairability, thus creating a real purchasing criterion that is starting to gain traction. We are also seeing the emergence of the functional economy, with websites like Commown[8] offering electronic equipment for hire rather than sale. Lastly, I should also mention the increasingly regular campaigns, in both the B2B WEEE sector and to promote recycling of consumer electronics in the B2C sector, that are having beneficial effects by reducing — slightly — negative externalities.

At the commercial and industrial levels, awareness of the impacts of digital is rising strongly, with (1) regular announcements from Big Tech on their measures to implement low-carbon or zero-emission strategies — which, however, currently overlook the manufacture of their gadgets when calculating carbon footprints — and (2) the adoption of responsible IT, an increasing feature of IT strategies over the past two years at a number of companies quoted on the Paris stock market, and higher standards demanded of the entire value chain as analyzed in the latest Shift Project report. The wastage is overwhelming, in both data storage and the ways that IT systems are built: these are all sources of potential environmental savings and performance just waiting to be discovered and exploited!

1 The Global E-Waste Monitor 2020 report, Global E-waste Statistics Partnership (GESP)

2 Towards Digital Sobriety, October 2018, The Shift Project: https://theshiftproject.org/en/article/lean-ict-our-new-report/

3 L'âge des Low Tech, Philippe Bihouix, pub. Seuil

4 https://www.senat.fr/notice-rapport/2019/r19-555-notice.html Pour une transition numérique écologique [For an ecological digital transition]

5 https://cnnumerique.fr/environnement_numerique Travaux Numérique et environnement [Digital and environmental studies]

6 https://medium.com/@sophiejeanwilson/how-fair-is-fairphone-f3f0e046e40d

7 https:ifixit.com

8 https://commown.coop/

Digital value chain to consider in a responsible digital strategy

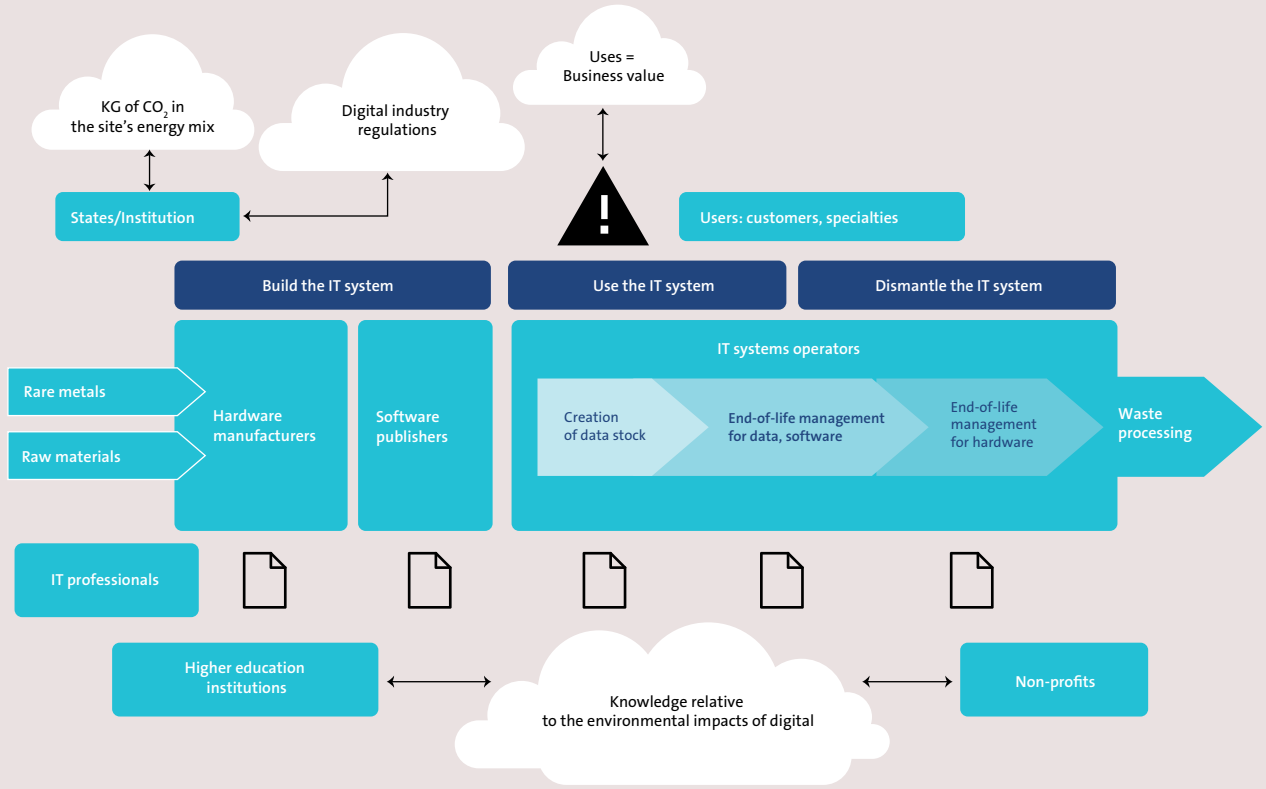


Figure 1

DIGITAL TOOLS: FROM PROMISES TO REBOUND EFFECT

Digital is also an industry at the service of other sectors of the economy, offering the promise of greater sobriety in industrial processes, lower CO_2 emissions and circular uses.

Digital is about the ability to bring things together, so that offer meets demand at a lower cost. In B2C, the website leboncoin.fr — well known for playing fast and loose with personal privacy[1] — has made reuse universally available, putting people from all over France in touch with each other in ways that were impossible in the past. In B2B, we are seeing the emergence of virtual marketplaces, such as Upply[2] for road freight. Unthinkable twenty years ago! The list is endless if we include car-share platforms, mailing lists and social media for lending equipment and swapping services.

Digital is also about the ability to be better informed, which we use today to make our exchanges easier, as Asimov predicted in the 1980s when he anticipated videoconferencing.[3] It is used to promote responsible policies, inform people about recycling options, and compile and disseminate best practices in business, management and environmental responsibility. It would not be hard to imagine the businesses of tomorrow using dedicated platforms to help their customers cut direct and indirect carbon footprints via the services they offer. Using this ability to deliver information, digital is nurturing the emergence of completely new business models, such as repairs and websites like Spareka.com.[4] France's Anti-Waste and Circular Economy Act introduced the requirement that electronic goods display a repairability rating, which should give further impetus to this business model.

Lastly, digital is about the ability to save resources: for example, a simple temperature sensor cuts off the heating when a room is up to the required temperature or switches it on before frost and freezing can cause any damage. When connected to an overall system monitoring buildings or installations, it delivers substantial gains in terms of energy and resources. The latest report from The Shift Project[5] sets out a simple methodology for clarifying under what circumstances the introduction of a connected or digital

1 https://www.pixeldetracking.com/fr/le-bon-coin-donnees-personnelles-rgpd

2 https://www.upply.com/fr-fr

3 https://www.franceculture.fr/emissions/la-methode-scientifique/la-methode-scientifique-emission-du-vendredi-18-septembre-2020

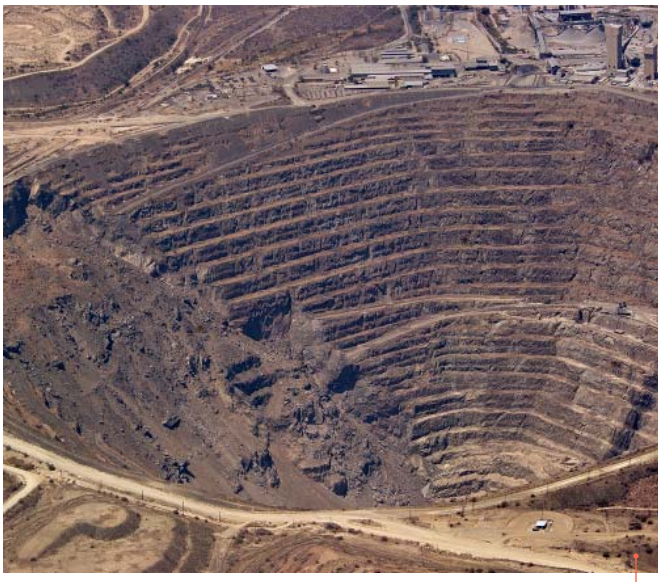
4 https://www.spareka.fr/

5 Towards Digital Sobriety, The Shift Project: https://theshiftproject.org/article/deployer-la-sobriete-numerique-rapport-shift/

layer is or is not relevant, using examples based on smart lighting and the introduction of a Smart Technologies Energy Relevance Model (STERM).

But the moment you roll out a technology that delivers efficiency gains — in terms of energy, performance or working time — the risk of using greater net amounts is all too real! This is the rebound effect which, whether direct or indirect, comes into full effect and prevents us from achieving net carbon gains. Take the example of the Internet of things, whose rapid development is accelerating digital transformation in industry and agriculture: industry 4.0. The idea behind applications for optimizing processes and procedures, or for predictive maintenance, is to fit sensors to production lines. The goal is (1) to predict breakdowns, boost the productivity and reliability of machinery to drive down costs, but also (2) to optimize use of resources such as water, energy, and raw materials, thereby reducing the environmental impacts of industrial processes. European projects such as CE-IoT exist to promote a circular economy model improved by the Internet of things.[6] This trend for what is known as Tech for Good is interesting, certainly from the climate standpoint. However, the greenhouse gas emissions involved in manufacturing, transporting, installing, operating, maintaining, removing, recycling and eliminating all these connected systems and sensors are only of any worth if they genuinely deliver net CO_2 emission savings once everything is taken into account. And the fact is that these calculations are not always made, even at the most superficial level. Why are our hard drives always almost full when their capacity has doubled every year over the past 35 years, faster even than predicted by Moore's Law?[7] Because this increase has been accompanied by ever larger photo and video files thanks to their higher resolutions, along with the ability of our smartphones to produce ever greater numbers of images! Similarly, European telecoms operators continue to lay transoceanic cables on behalf of Big Tech companies even though there has never been more capacity between Europe and North America.

Looking at other sectors shows that the rebound effect is not restricted to digital: in road transport, for example, great efforts are made to optimize flows of goods, trans-shipments, journeys, return legs loaded rather than empty, and so on. And yet never have there been more trucks on the road! Similarly, it has been demonstrated that Uber increases CO_2 emissions in cities where it operates.[8] And then there is the boom in home delivery services over the past decade, which continue to grow as a consequence of the coronavirus crisis. Global virtual storefronts, originally expected to cut the number of journeys made by private individuals and thus, ultimately, greenhouse gas emissions, have had exactly the opposite effect by making it easier than ever to purchase everyday goods and household



Aerial view of copper mine at Palabora, South Africa

appliances. And that's before we even start to think about the soil sealing that results from the construction of new warehouses, which is a further issue of real concern.[9]

In the car industry, two current phenomena are also worthy of mention. The constant increase in the weight and technology content of vehicles,[10] up 60% in 50 years, is directly caused by the fact that technologies for in-vehicle comfort and safety are available and ever more affordable. This is felt in the net impact per vehicle manufactured which, when added to increasing vehicle use over the same period, is in no way offset by efficiency gains in manufacturing and vehicles' improved immediate fuel consumption.

CONCLUSION

These numerous examples show us that it is important to question the digital reflex and that digital, like any technology, should be looked at on a case-by-case basis, with objective examination of CO_2 versus resources, benefits and possible rebound effects. Each and every negative externality impacts the future of all of us and of society.

All companies need to think in terms that reach beyond their product, collaborating with other actors across the entire value chain and asking their IT suppliers to take an objective approach to their social and environmental responsibilities; in other words, an end-to-end approach that includes scopes 2 and 3.[11] Then, and only then, will they become part of the solution not the problem.

6 https://cordis.europa.eu/article/id/413173-where-the-circular-economy-and-the-internet-of-things-meet/en

7 https://en.wikipedia.org/wiki/Moore's_law

8 https://www.forbes.com/sites/davekeating/2019/11/20/uber-adding-to-air-pollution-in-europereport/

9 https://www.banquedesterritoires.fr/centres-commerciaux-les-prefets-appeles-renforcer-la-lutte-contre-lartificialisation-des-sols

10 https://fr.motor1.com/news/266197/poids-moyen-voiture-augmentation-etude/

11 Scope 2: indirect energy emissions
Scope 3: other indirect emissions. Other emissions indirectly generated by the organization's activities that are not accounted for under Scope 2 but that relate to the total value chain. In digital, this may include manufacture of employees' computers, servers used in outsourced datacenters, and public network equipment. They represent a very significant portion of a company's carbon footprint, typically 15 to 20% for a services business.