EDITOR LETTER

The Hardware Turn in the Digital Discourse: An Analysis, Explanation, and Potential Risk

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For quite a while, the digital discourse has been *immaterial*, not in the colloquial sense of unimportant, of course, but in the philological sense of interpreting the digital as *non-material*. At least for a couple of decades, in the nineties and the 2000s, the digital discourse – the mainstream and often implicit way of thinking and communicating about the transformations brought about by the digital revolution that also shapes and reflects power relationships and societal norms as well as expectations – has primarily focused on *soft*ware, *data*, *social media*, *online services*, *cloud* computing, *e-anything* (including *e-commerce* and the disappearance of shops, or *e-books* and the disappearance of paper), *virtual* reality, *digital* identities, *crypto*-currencies, *digital twin* cities, and many other phenomena accumulating in extraordinary quantities and at unprecedented speed and yet represented as seemingly weightless, intangible, invisible, ethereal. A popular book summarised that digital discourse well in a famous quote: "The change from atoms to bits is irrevocable and unstoppable" (Negroponte, 1995, p. 4). The end of "hard stuff" was in view. We were going to live like disembodied entities in a world made of impalpable digits.

Why such *immaterial digital discourse* gained so much traction, becoming so entrenched and often unquestioned in everyday life, is not the topic of the following pages. It might have been the infatuation with an epochal revolution: after all, the world's ontology was indeed changing before our eyes. We realised we would be the last generation to have experienced a reality that was still entirely and exclusively analogical. Or perhaps philosophical short-sightedness, also typical of the infatuated, prevented the discourse from acknowledging the obvious: the recalcitrant inescapability of the *physical* world (I shall clarify the distinction between *material* and *physical* presently). Or maybe it was a plan – if one wishes to indulge in some speculation about who promoted and gained from such a discourse – or just a conveniently sanctioned trend, which enabled the digital industry to shed responsibility for the bodies, the societies, and the environments that it was profoundly affecting while

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building the new habitat in which billions of people spend ever larger portions of their lives. A safe bet is that it was probably a combination of all of the above, plus many other factors, to be identified and explained, although not in this article. The point remains, and this is what I wish to explore here further, that the philosophical, ethical, and legal analysis of the digital revolution often concentrated on its *soft* or *immaterial*, rather than its *hard* or *material*, aspects. In alphabetical order (and the list is far from exhaustive), accessibility, accountability, authenticity, autonomy, bias, censorship, consent, cyberbullying, data ownership, equity, intellectual property, mis- and dis-information, net neutrality, privacy, security, surveillance, transparency and many other critical issues raised by the digital revolution became addressed primarily from a non-material perspective, minding the bits, and ignoring the atoms. Admittedly not always, and certainly not by everybody. Since the beginning of our digital age, some intellectual traditions[1] and many researchers[2] have stressed different aspects of the material nature of the digital revolution and maintained a critical approach to the "immaterial discourse". They have stressed that it is crucial to think systemically about digital technologies, in terms of a combination of atoms and bits. Ignoring such an Aristotelian *sýnolo* or organised wholeness means missing vital variables and, therefore, the ability to control or organise how the whole may function.[3] The socio-technical debate in STS and the philosophy of technology would be incomprehensible without such a unifying, systemic perspective. And yet, despite all this, even the digital divide came to be understood as a gap in *access* to digital technologies; the digital footprint as the digital *permanence* of online actions and their long-term consequences; the environmental impact as the ecological footprint of *producing* and *disposing* of digital technologies; the right to disconnect as referring negatively to the ability to *step away* from digital connectivity for personal well-being, almost as a sort of right not to be ethereal; and the non-territoriality of the law as the *de-materialisation* of norms. In terms of discourse, the critique of the immateriality of the digital remained academic or intellectual.

As a correlation (but a causal link may not be excluded), the ethereal discourse about digital technologies saw innovation and privacy rise to unquestionable dogma, banners of two opposite camps united by a single narrative: the immateriality of the digital. As if one did not know that innovation can be not merely unsuccessful (think of TwitterPeek, and if you need to google it, that is my point) but also *materially*

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[1] From a Neo-Marxist ideology, the material conditions of digital technologies have been analysed in terms of means of production and class relations. This encompasses the resources, factories, and workers involved in producing hardware; the economic systems that support and drive technological innovation; and the societal structures that determine access to and control of these technologies. I am grateful to Claudio Novelli for calling my attention to the need to add this clarification.

[2] The critical analysis of the scholarly debate about the immaterial discourse about the digital would require a study in itself which goes way beyond the scope of this article. Here I may just indicate the wide variety of studies, which include books as different as Lyotard (1984), Hayles (1999), Munster (2006), Kirschenbaum (2008), Gabrys (2011), Betancourt (2020), or Perriam and Carter (2021).

[3] Many thanks to Jessica Morley for calling my attention to this crucial aspect. For an early reference to the complexity of the overall approach, Weaver (1948) remains a great classic.

dangerous.[4] As if one should care more about the data than the health of the bodies to whom the data belonged, as happened during the pandemic. Privacy as a dogma may seem natural if a person is conceived only as a disembodied data subject.

Any careful observer of societal changes knows that we are now witnessing a *hardware turn*. The discourse is increasingly focusing on the material aspects of the digital revolution, much more than fashionable futurologists imagined only a decade ago. There is a *plausible explanation* for such a turn, and at least a *potential risk* implicit in it that is worth analysing. They are related, although I shall discuss them separately. But first, a quick clarification about what I mean by "hardware turn" is in order. For the idea is intuitive, but it is better to be explicit.

I use the expression "hardware turn" to refer to a shift in focus, in the digital discourse, from considering solely digital services, applications, interactions and their effects or outcomes, to *also* examining the resources, infrastructures, and devices that make them possible, constrain and orient them. From this perspective, the hardware turn does not replace but broadens the scope of digital ethics, by recognizing the Governance, Ethical, Legal and Social Implications (GELSI) of all aspects of the digital revolution, including the mining of rare earth minerals (Klinger, 2017), the production and market of semiconductors (Pasricha & Wolf, 2023), the manufacturing of all kinds of digital devices (not only smartphones, laptops, or robots) and digital components for analogue technologies (e.g. cars and aeroplanes), the creation and location of immense data centres,[5] the ownership, laying, and maintenance of land and undersea cables (Ganz et al., 2024), the launch, management, and control of satellite networks, the energy required to make all this work (Cowls et al., 2021) and, importantly, the human labour involved (International Labour Office, 2021) and the inevitable impact on natural and social environments (Gómez & Lorini, 2022), (Sforcina, 2023).

The focus on the material aspects of the digital revolution and its GELSI is not a new scholarly phenomenon. On the contrary, researchers have been discussing material GELSI of digital technologies for decades; see, for example, the debate about semiconductors from (Forester, 1981) to (Miller, 2022). However, it would be a mistake to think that it was the scholarly and ethical emphasis on the need for a hardware turn that ultimately brought attention to the design, construction, ownership and control of the materiality of the digital. The opposite is the case. As long as society believed in, and business power benefitted from, an immaterial discourse about the digital, the latter remained prevalent. Only once political power became aware of the importance of owning or at least controlling the digital (primarily through regulations but not only, think of economic incentives to attract investments) did the material aspects of the latter finally appear essential. After all, the material aspects are where power can get a firm grip on the digital and control it. This is the explanation of the hardware turn that I wish to articulate next.

To summarise, there is no point in stressing that the digital has always been also material, but its material nature has become crucial only recently. Not thanks to

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[4] For example, asbestos-containing products, once used widely in construction for insulation and fireproofing, were later discovered to cause serious diseases, including lung cancer and mesothelioma; or lead paint, which was used extensively until the late 1970s, before discovering that it can cause lead poisoning, particularly in children, leading to developmental disorders and other health issues.

[5] For example, China Telecom Data Center occupies 10,763,910 square feet, that is, ca. 166 football fields.

intellectual efforts, sadly, but once political power realised that it needed to own, or at least control, who can do what to whom, when and where, in what circumstances and according to which wills and norms.[6]

The material infrastructure (to use an all-encompassing expression) is the *substratum* necessary for any digital connectivity and interaction, so its study is as old as the digital revolution itself. But today, the digital discourse finally focuses on the material aspects of its nature, scope, and development because of the need for countries and other organisations to own and control it (e.g. in terms of data flows and information usage), safeguarding against undue influence or manipulation by other actors, protecting their rights to self-determination and to govern their own infosphere, and gaining influence about the economic and financial aspects (including taxation) of digital markets. In short, the hardware turn in the digital discourse is not a scholarly novelty, but its importance has emerged due to the pursuit of digital sovereignty and the fight for it (Floridi, 2020).

Although the hardware turn is a consequence of the emergence of digital sovereignty's need to own, control, regulate and patrol the infosphere, this does not mean that the immaterial perception of the digital revolution is mistaken. Instead, it is misunderstood. This is the risk we should avoid: jumping out of the frying pan of a digital discourse that is solely immaterial into the fire of a digital discourse that is exclusively material. Let me explain.

The digital experience remains largely and inevitably immaterial in that, for example, we do not perceive our identities as constantly monitored by commercial services or attacked by malicious actors. However, this should not lead to the conclusion that we must embrace a materialist ontology. The digital remains intangible to the analogue, yet it is made possible by the analogue, and those who want to control the digital need to control the analogue. So far, so good. But because of its immaterial experience, the digital is also transforming our way of conceptualising reality, that is, our ontology, from mechanistic and material to networked and immaterial (Floridi, 2023). And this is a feature, not a bug. Political power is exercised on bits primarily through atoms, not least because it is to atoms that the law applies more easily. But in their turn, atoms need to be interpreted, and in a slightly paradoxical way, the immaterial discourse can help. Instead of modelling the world bottom-up, as if it were made of independent elements that, like Lego bricks, come together to give rise to more complex constructs, one may model it in terms of networks in which nodes are not primary but rather outcomes of processes, relations, or functions, like crossroads. Our new *De Rerum Natura* does not need to be *atomistic* but can be *relational*. This non-substantial but relational way of understanding reality is *physical*, but does not have to be *material*. And if this sounds too philosophical, here is a simple clarification. "Material" refers to the composition, properties, and characteristics of a particular substance or matter from which something is made. In other words, materiality emphasises the specific components or elements that constitute an object.

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[6] See for example the EU debate about the 5G infrastructure https://commission.europa.eu/document/download/af444130-5a3e-44f2-bea6-5b9ddcb46012_en?filename=Communication_Long-term-competitiveness.pdf and https://www.euractiv.com/section/digital/opinion/on-the-digital-highway-destination-a-competitive-europe/ for a synthesis.

For example, when discussing the materiality of a smartphone, one might consider its glass screen, metal frame, plastic casing, and electronic circuits. These tangible features make up the material structure of the device. "Physical" typically refers to the broader concept of the tangible world and the laws governing it. It encompasses not only the material aspects but also the interactions, forces, and phenomena that occur within the physical realm. When used in contrast to materiality, physicality refers to the behaviour, properties, and dynamics of objects and systems. In our example, the physical but non-material aspects of the smartphone include its functionality, such as touchscreen interactions, wireless communication, and computational processes. Thus, the physicality of the smartphone encompasses not only its material composition but also its capabilities and the physical phenomena with which it engages.

Whether the physical may be reduced to the material (as in a materialist philosophy) or the material may be eliminated from the physical (as in an idealist philosophy) is a metaphysical question not to be addressed here, not least because I have argued (Floridi, 2009) that it is also an *absolute* question that is pointless to ask (i.e. one devoid of any reference of a level of abstraction and hence a teleological criterion to discriminate what may be a correct answer). Instead, the distinction is helpful to clarify that the immaterial experience of the digital should not lead one to an immaterial discourse – pragmatically and in terms of control, the digital is made possible by a substratum or infrastructure that is the effective terrain where powers compete against each other. However, rectifying the immaterial discourse should not lead one to interpret the substratum in material and substantialist terms, focusing only on atoms and their properties, e.g. the glassy and metal nature of the smartphone. Instead, it can help us see how even the materiality of the infrastructure is a question of *relations,* some *physical*, other *social* and including hegemony, control, power, legitimacy, delegation, authority, and so forth. In short, the immateriality of the discourse could usher in a relational ontology (mind, not a metaphysics: I use "ontology" to indicate that we are talking about the nature of models of reality) that is physical but not material. I have argued (Floridi, 2023) that this paradigm change – abandoning an ontology of *things* in favour of one of *relations* – is a welcome consequence of the digital revolution, and that it may be necessary to conceptualise our information societies more fruitfully and successfully in terms of identification of the most profound challenges they face and their resolution.

The hardware turn should mean the end of the immaterial discourse about the digital – on the bright side, one may thank political power for breaking the impasse – yet not the beginning of a materialist ontology of it. For it is not only compatible with, but complementary to, a relational approach to our *physical* understanding (call it model) of reality (call it system) that does not pretend to achieve the impossible – a metaphysics that captures the essence of Being in itself, the system – but, in a Kantian sense more modestly and realistically, offers an epistemic ontology of it, with a tolerant plurality of comparable (hence assessable as better or worse, depending on the purposes pursued) models. Arguably, such relational ontology could offer all the advantages of a materialist one—it is still a case of a physical description of reality—while being more in line with our current scientific understanding (structural realism, (Floridi, 2003, 2008)) and able to take into account normative, social

and political phenomena the GELSI of which are not dependent on a substantialist/materialist approach (Floridi, 2023).

I am not very confident that an immaterial experience of the digital (without an immaterial discourse about it) and a relational ontology of its physical infrastructure (without a materialist ontology or metaphysics behind it) will inform our culture and philosophical understanding of our digital age and new realities. In this article, I shared my hope that they will, and argued that they should. But independently of whether they may, one element will remain unresolved and require new forms of sensibility and education: the tension between the biologically analogue bodies that inhabit the infosphere and the immaterial experience of the latter. There is, of course, a radical solution: the "physicalisation" (in the previous sense of physical but not material) of the infosphere and its experience, that is, some kind of virtual (or perhaps just augmented) reality that may overcome the immaterial experience of the digital. It is because I doubt that this may be the future or even successful should it be – it is because I do not share the view that the next, successful step in the digital revolution is the Metaverse (Floridi, 2022) – that I believe we will need to put more emphasis on how we approach the tension itself.

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