

VISION & VALUE



THE INTERNET OF BEINGS

THE NIGHTMARES AND DREAMS OF DIGITALIZING HUMAN BODIES

Francesco Grillo (Abstract – May 2023)



The Internet revolution is often compared to the Industrial ones that produced – in the 18th, 19th, and 20th centuries – the most spectacular growth in the wellbeing of humans in history. This is a mistake, which has led us to wrong expectations and wrong policy and business decisions. The Internet is – instead – more akin to a biological mutation, which is profoundly modifying the very mechanisms through which we transform data into knowledge and, thus, the nature of our species. This process, started in 1969 when the Pentagon found a communication protocol for computers to still talk to each other in the event of a nuclear war¹, is now picking up speed thanks to two discontinuities.

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¹ It was when Vincent Cerf and Robert Cahn invented the Internet Protocol to respond to a challenge launched by the Pentagon funded DARPA.

The first is the social experiment triggered by COVID-19, which made the world come to a sudden halt and digital technologies physically entered our daily existence to an extent never seen before². It is true that the expectations of those who were looking for a total turnaround of public services like healthcare which were the front-line of the emergency, may have been disappointed: and yet the experiment tore down several cognitive biases which may have obstructed technologically feasible possibilities³.

The second is the investments that global digital platforms are pouring into healthcare. This is a strategic choice meant to respond to the obsolescence of a model where the Internet was mostly about “social networks” and entertaining⁴ (with an impact on productivity which has been so far much lower than for previous industrializations⁵). Some would argue that this overlaps with the development of a novel digital infrastructure called the “metaverse”⁶, and yet in a sense the idea that the Internet “enters” into human bodies is opposite to a paradigm where lives are replicated into a virtual environment⁷: it is an approach with a much higher potential for gains than the one envisaged by companies like Meta, but which also presents more radical risks.

These two forces are about to produce a convergence between biology and computer science⁸, healthcare and artificial intelligence which will provide unprecedented possibilities⁹, but also risks that will dwarf current concerns on cyber security or privacy¹⁰.

*The Internet of Beings*¹¹, the latest book from the economist and management consultant Francesco Grillo, is an exploration of the “brave new world”¹² that is about to unfold. Its objective is to suggest a thesis of a transformation that may be beyond the capabilities of the analytical instruments we normally use. It is meant to suggest to governments, firms, and public opinion how can they get ready for it.

² George Abi Younes, Charles Ayoubi, Omar Ballester, Gabriele Cristelli, Gaétan de Rassenfosse, Dominique Foray, Patrick Gaulé, Gabriele Pellegrino, Matthias van den Heuvel, Elizabeth Webster, Ling Zhou, COVID-19: Insights from innovation economists, *Science and Public Policy*, Volume 47, Issue 5, October 2020.

³ This book, for instance, may have not even been conceivable without the use of video conferences with tens of experts living in very different countries, to which we got used during the pandemic.

⁴ Of course, entertaining can still have a role, as we will see, games and “gamification” can be extremely useful to reduce “digital divides” and enable the elderly easier access to digital health care services. And the Internet is much more than a social network. It has already transformed entire industries (as for Vision & Value report on the “Impact of global digital platforms on consumers, firms and governments”, 2022 <https://visionandvalue.com/portfolio/the-impact-of-global-digital-companies-on-consumers-firms-and-governments/>). And yet its relevance as instrument to solve basic problems is debatable.

⁵ It is the famous productivity paradox first measured by Nobel prize winner Robert Solow (Robert Solow, “We’d better watch out”, *New York Times Book Review*, July 12 1987, page 36.)

⁶ As for former deputy PM and now head of Meta’s corporate affair Nick Clegg (Making the metaverse: what It is, how it will be and why it matters”, 18 May 2022, The Medium)

⁷ This implies even two totally different routes towards artificial intelligence which we will describe in chapter 6 (by contrasting the idea of robots becoming humans – like in Blade Runner – with the one of human being enhanced by digital devices – like in Iron Man).

⁸ “The dawn of digital medicine” 2 December 2020, *The Economist*.

⁹ We will refer, for instance, to the possibility that “chips in bodies” may correct directly the signals that neurons are sending to the rest of the bodies when bugs happen within our fantastic, internal information system linking all our organs.

¹⁰ “Cybersecurity and data protection in healthcare”, 15 February 2022. Forbes

¹¹ The “Internet of Beings” has been a practice of Vision & Value (the consulting firm, Francesco is director of) since 2017 and the book will leverage some of its knowledge base. Others have been recently talking about the “Internet of Bodies”: the author believes that the “Beings” conveys better the implications of the new paradigm which is only about “bodies” (but also brains and, probably, souls). (Andrea M. Matwyshyn, *The Internet of Bodies*, 61 *Wm. & Mary L. Rev.* 77 (2019), <https://scholarship.law.wm.edu/wmlr/vol61/iss1/3>)

¹² Which indeed may share some similarities with Huxley’s dystopian view.

It is a voyage¹³ inside what Grillo predicts to be the third phase of the Internet evolution. The first phase (“Internet of Computers”) linked all digital devices into a seamless, global information system called the World Wide Web (itself now undergoing further turnarounds); the second, the so-called “Internet of Things”, is integrating physical objects (from the engine of a Tesla to the light bulbs in remotely controlled homes) into such a network. The third is where brains and machines, living bodies (not only humans, but also other species¹⁴), and computers will be connected through sensors that are getting more invasive, intelligent, and capable of performing increasingly sophisticated functions¹⁵.

The book, then, foreshadows the far-reaching implications of such a transformation of the processes through which we monitor, protect, and treat our bodies. It is, quite literally, the most vital policy area and industry out there. It will analyze both trends that are already happening and that the author has been observing – together with his colleagues – within his academic work and consulting practice; and more futuristic developments as probable projections of existing technologies. It will tackle a highly complex question, and the author’s intuition is that “complexity” requires a pluri-disciplinary approach putting together the contributions of natural scientists, doctors, health specialists, economists, managers, political and computer scientists.

The book shows how the convergence is going to generate a leap in life expectancy¹⁶ and, at the same time, how this may further challenge welfare systems which already appear unable to deal with ageing populations. It will clarify how big data and remote monitoring may mean the end of diseases we believed to have no remedy¹⁷ and the sharp reduction in avoidable deaths (especially from heart attacks). It will describe why technologies may potentially lead to opposite outcomes like even bigger inequalities or, on the contrary, the possibility that remote areas and underserved segments of the population (including the elderly) are better covered by healthcare services¹⁸. It will explain why there is a concrete danger that non-democratic countries may get a competitive advantage¹⁹ and that the West may be surpassed by the Global South, which is not slowed down by the legacies of existing healthcare systems.

¹³ The book will be open to reference to the 1966 movie “Fantastic Voyage” (starring Stephen Boyd and Raquel Welch and based on Isaac Asimov’s script) which envisaged some of the innovations we are going to witness.

¹⁴ Later in the book we will see how wearables and sensors were, indeed, pioneered in tracking endangered species like bears and wolves.

¹⁵ “Wearable technology promises to revolutionize healthcare”; 5 May 2022, *The Economist*.

¹⁶ “How to add 45 billion years of higher quality life” 1 April 2022, McKinsey.

¹⁷ “Closing on in cancer”, 16 September 2017, *The Economist*.

¹⁸ HIELM, N. M. (2005). Benefits and drawbacks of telemedicine. *Journal of telemedicine and telecare*, 11(2), 60-70.

¹⁹ “Hacking Darwin: genetic engineering and the future of humanity”, April 2019, Jamie Metzl.

The Internet of Beings will be articulated in seven chapters that will tackle seven different groups of questions:

1. **The end of the illusion of ever longer lives as the trigger of a new era:** Why has healthcare (together with education) been so resistant to productivity growth for decades²⁰? How did the COVID-19 pandemic change that? Why did problems appear to last even beyond the end of the emergency and why are life expectancy dropping in many western countries? Why did different healthcare systems appear to be differently resilient vis-à-vis the emergency and why did the European systems appear to be more fragile than expected? Is the new (mRNA-based) family of vaccines, brought to the market by Pfizer and Moderna, the breakthrough that can make the pharmaceutical industry more similar to the software sector²¹? What lessons can we learn from the (mostly Asian) countries that made a better use of data to contain infections?

2. **The chips into your body as enablers of the process:** how is the Internet going to enter into human bodies? What is the evolution of sensors both in terms of invasiveness (from wearables to implanted, and from implanted to digestible) and functions (from monitoring to alerting, and from alerting to healing) that is about to enable the innovations? How will sensors recharge and are batteries a bottleneck? Can the Internet support/ replace the fantastic information system made by nerves transmitting signals to and from different parts of the body of living beings? How are sensors becoming (artificially) intelligent and capable of intervening in case of emergencies? To which pathologies can the new paradigm be more readily applied²²? Which kind of interfaces and applications are needed to make the elderly capable to access increasing digitalized health services? Can gaming be the bridge to overcome the greatest digital divides?

3. **Big data as a game changer of medical research (and of the scientific method itself):** How will big data transform the way hypotheses are generated and tested? How will this change the way trials-based research is conducted and reduce its costs (and time to market)? Will this blur the boundaries between healthcare and research? How quickly will this bring to the personalization of drugs and vaccines? To what extent will genetic engineering techniques (like CRISPR gene editing) become routine? How will a big-data -based medical research make intellectual property less protectable and change the mechanisms through which pharmaceutical research is rewarded?

²⁰ The resistance of healthcare (together with education) to digitalization, has, in fact, been singled out as one of the reasons why labor productivity has stagnated since the beginning of the Internet era. Baumol, William J. (2012). *The Cost Disease: Why Computers Get Cheaper and Health Care Doesn't*. New Haven: Yale University Press. pp. 3–32. ISBN 978-0300198157

²¹ *The Economist* (27 March 2021), A new phaRNAcopeia

²² Patel, S. Y., Mehrotra, A., Huskamp, H. A., Uscher-Pines, L., Ganguli, I., & Barnett, M. L. (2021). Trends in outpatient care delivery and telemedicine during the COVID-19 pandemic in the US. *JAMA internal medicine*, 181(3), 388-391.

4. **The turnaround of healthcare systems:** How can the Internet and its most recent developments (including the 'Metaverse') drive a turnaround in the organization of healthcare systems? What kind of new organizational model is going to emerge? Will an "Amazon model" prevail with data collection become more centralized and delivery more distributed? Will hospitals much more specialized in a world where they will be increasingly assessed remotely? How will the job of the general practitioner change?
5. **The geopolitical consequences and policy recommendations:** How can European governments change a healthcare system that is politically charged as one of the pillars of the Welfare State that defines the EU "style of life"²³? Will it ever be possible to undertake a technology-driven reform of the US system that can eventually make it affordable and accessible to everybody? Will countries like India be able to leapfrog? Is it true that countries with less concern for human rights may have an advantage when it comes to experimenting and scaling up innovation which involves human bodies? How to reform 80-years-old institutions like the World Health Organization so that they can adapt to the need to govern a modernization where the risk-takers may win it all?
6. **The challenge to industries and the agenda for firms:** What are the implications for the very nature of industries – pharmaceutical and biotech; insurance; big tech including Internet giants like MAMAA (Meta, Alphabet, Microsoft, Amazon, and Apple) – which are going to be more heavily impacted by the transformation? How are industry boundaries themselves being changed? What should they do to adapt to the new context?
7. **The moral question:** Are Homo sapiens being transformed into a new species by a revolution we ourselves initiated? What kind of novel approach to artificial intelligence is emerging from the idea of humans becoming stronger by connecting themselves to machines? Is the "Internet of Beings" paving the way to an evolution that is just the opposite of the traditional vision of robots becoming more similar to humans²⁴? What are the antidotes to prevent the dreams of overcoming some of our limits (as in some versions of "transhumanism") from turning into a nightmare where machines will win²⁵?

The Internet of Beings shows us how technologies are already completely changing the way we live and even providing the possibility of surviving beyond limits we had deemed as impassable. However, unlike with the other great revolutions, which all had their great theorists, we are still navigating uncharted waters, sailing along without a tentative idea of what is over the horizon. We are still missing a thesis of what is happening and the instruments to develop one. In fact, it is possible that one of the problems we are facing is

²³ As Ursula Von Der Leyen defined it talking about welfare.

²⁴ The author will argue that, in a sense, the notion of sensors entering human bodies will lead us to a paradigm of artificial intelligence that may resemble more the vision of humans using machines implanted into their bodies (like in "Iron Man") than that of robots becoming more similar to humans (like in "Blade Runner").

²⁵ Krieger, D. J., BELLIGER, A. (2021). *Hacking Digital ETHICS*. Anthem Press.

that we have turned 'knowledge into information' (as Thomas Stearns Elliot famously said²⁶) by separating information into too many niches using different languages. It is this intellectual and epistemological challenge that the book ambitiously aims to respond to.

The Internet of Beings is the evolution of a project carried out by Vision (the think tank/ management-consulting firm of which the author is the director). The research is being conducted through interviews with experts whose competences will be used to prove (or falsify) its central arguments. It is broad-based in its scope and aims for an audience of students, academics, policy-makers, and citizens at large. It will draw not only on academic and scientific literature, but also refer to popular culture, including science-fiction movies, and to well-known public intellectuals.

It will try to make sense of a technological revolution that may define our times and the times of our children. The outcome of such a radical transformation will depend on a clash of conflicting wills, ideas, and interests and requires ingenuity, intellectual curiosity, passion, and enthusiasm: those human traits that regularly emerge when we are suspended between existential threats and the possibility to overcome some of our limits.

²⁶ The Rock, 1919.