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When is a Technology Productive? When does it Function? – A Response to Hornborg’s Commentary

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I extend my sincere thanks to Alf Hornborg for his positive commentary on my article (Hornborg, 2024). Without question, Hornborg’s contribution to a fetish theory of technology is outstanding. In his commentary he once again highlights how our common ways of thinking about technology and machines are deeply unsettled once we consider the materiality of technology as socially constituted.

I briefly want to highlight two points, that emphasize how the approach to technology in my original article (Pieper, 2024) might add to such efforts.

- 1) The neoclassical economic concept of productivity can only be adequately criticized with regards to how it is entangled with beliefs in the extension of *human* capabilities.

Hornborg writes “[t]he illusion that capital is productive ‘in itself’ serves to mystify [...] the appropriation of embodied labour, land, materials, and nonhuman energy from throughout the world” (Hornborg, 2024). However, what does ‘productive’ mean in this context?

The purely monetary perspective on production and productivity goes back to the school of neoclassical economics (Bleischwitz, 2001, 7). If we take the self-referential logic of neoclassical economics seriously and think of productivity purely in monetary terms, it is hard to disagree with the statement that capital is itself productive. If we define productivity purely in monetary terms, the investment of capital does indeed yield more capital. In this sense, capital *is* productive ‘in itself’.

Hornborg’s understanding of productivity is of course one that transcends this monetary perspective through a focus on biophysical resources. From this biophysical perspective ‘productivity’ would mean that one can do ‘more with less’ (or more with the same) – to save time and space through engineering efforts in technology. Hornborg criticizes this supposed biophysical productivity of technology as it leaves

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out how technologically saved time and space in some parts of the world rest on the appropriation of time and space from other parts (Hornborg, 2003).

I would argue that this biophysical productivity of technology can be most clearly grasped if we understand it as the extension of human capabilities. Doing ‘more with less’ is at the core of extension concepts of technology. Thus, it appears to me that this understanding of technology as an extension is the real subject of critique for a fetish theory of technology.

It might not be possible to challenge the self-referential neoclassical logic of monetary productivity on its own terms. However, much critique of the neoclassical concept of productivity remains to be formulated by showing how the idea that capital is productive in itself is coupled to the central idea in the philosophy of technology that humans can extend their capabilities through technology (beyond a zero-sum-game logic).

- 2) The functioning of a technology is not just a physical, but a social question as well.

Hornborg writes in his commentary “that the work accomplished by a machine is in some sense illusory“, not in a physical but in a social sense. This is a key insight for a critical perspective on technology. I would argue that we might tackle this question best by deconstructing what we mean when we say that a technology is *functioning*. If we want to understand technologies as physical and social strategies at the same time, it is necessary that we consistently consider the *functioning* of a technology not only from a physical, but from a social perspective as well.

I have argued in the original article with reference to Luhmann’s concept of technologies as ‘functioning simplifications’ (Luhmann, 2021, 524) that while a technology relies on simplified physical and social causal relations to function, the functioning of a technology can be highly subjective from a social perspective (Pieper, 2024, 16). From a purely physical perspective, a technological artifact such as an electrical car functions if it drives from point A to point B. However, from a social perspective we must ask: for whom is the electric car functioning? While it might make the life of its owner more comfortable, the mining workers in Chile that provide the lithium or the copper for its manufacturing and suffer the consequences of toxic mining substances might have something else to say about it. For them the electrical vehicle might be a dysfunctional technology with regards to its detrimental effect on their health and environment. This is not a case of comparing apples with oranges. Instead, the argument rests on analytically giving equal emphasis to the physical and social nature of technologies. The Chilean miners are as essential to the physical functioning of the car as its wheels.

Especially in the so-called Anthropocene, it is important to take this global social perspective on the functioning of technology. Here we are confronted with crises that threaten the livelihoods of billions of people around the globe. In this context, the functioning of a technology must be understood with regards to how it affects and is entangled globally with these livelihoods.

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