

Book review: Smil, Vaclav (2023): Invention and innovation. A brief history of hype and failure

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76

The history of inventions is a history of promises and expectations, shaped to a greater or lesser extent by seemingly glorifying or overly exaggerating imaginations. Illustrations from the 19th century already depict futuristic visions of air taxis or hyperloops – inventions that are still in their infancy and face challenges regarding their feasibility. Other inventions disappear entirely in the wheel of time, while some that were believed to be obsolete are revived decades later. What are the historic origins of these hypes? And are they driven predominantly by market-oriented, altruistic, or pragmatic intentions to push an invention to the next level? In this “modest reminder of the world as it is” (p. 10), Vaclav Smil explores the history of hype and failure of invention and innovation, exemplified by a variety of practical cases – and not short of a rather pessimistic but thought-provoking perspective for technology assessment (TA) and sustainability research.

Challenging common techno-centric believes

Smil deliberately challenges the existing narratives surrounding our expectations of technological progress. His basic assumptions are unmistakable: Media and governments are too unreflective in pushing techno-optimistic futures which are repeatedly loaded with false promises and unrealistic timescales by leading voices. Two core arguments of Smil’s standpoint become explicitly clear. Firstly, he confronts the prevailing expectation of exponential growth in our innovation capacity and fully rejects the assumption that we are on a path towards an all-knowing final state of innovation history, such as emphasized in the ideas of dataism (Harari 2017) or singularity (Kurzweil 2005). Secondly, and all the more intriguing for TA, he emphasizes the overly inflationary and undifferentiated use of terms to characterize in-

ventions: “Modern inventions thus carry the promise of brilliant salvations as they are to solve every problem we face [...] not just as some marginal or gradual advances but as changes best described by such adjectives as ‘disruptive’, ‘transformative’, or ‘revolutionary’” (p. 8). Smil underlines his restraint towards this mindset throughout the book with a variety of real-world examples and by emphasizing his critical stance towards forecasting the impact of inventions (p. 17): “A better, safer, more equitable world will require many truly transformative inventions, but we will know the extent or absence of these expectations only when looking back.”

In his introduction, Smil provides a concise overview of the co-evolution between invention and human history. He also distinguishes the terms invention and innovation, which are not always sharply differentiated in practice. Innovation describes the “process of introducing, adopting, and mastering new materials, products, processes, and ideas” (p. 3). Hence, there are many inventions without corresponding innovation due to systemic lock-ins (e.g., Soviet mass production that failed to continuously innovate, such as moving from open-hearth to basic oxygen furnaces). He also addresses, albeit briefly, a core problem of innovation research: how can we adequately measure innovation? In particular, he critically reflects on the frequent bias in favor of patents as quantifiable factor. Using some comedic examples, he illustrates that the explosion of patents in recent centuries is not synonymous with an equivalent increase in our capacity to innovate. Even if this argument is more of a subtext throughout the book, it reminds us to contextualize our understanding of every novelty before hastily speaking of breakthrough innovations.

A brief endeavor through invention history

The core of the book consists of three chapters, which Smil categorizes alongside certain types of hypes and failures. He illustrates each of these chapters with three specific examples and takes us on a historical journey through various inventions that (at least so far) have failed to deliver the promised outcomes.

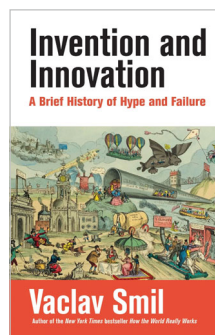
Firstly, he devotes himself to inventions that turned out from welcome to undesirable. The example of leaded gasoline demonstrates that short-term hype can prevail despite the knowledge of existing health risks if regulatory dynamics are not yet fully developed. While people often moan about bureaucratic deceleration, the opposite can also lead to unintended consequences.

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Moreover, it questions who holds the liability of an innovation, not only legally, but also in the perception of those affected by the outcomes. Secondly, he discusses inventions that were to dominate – and do not. The example of supersonic flight indicates that there are prevailing barriers to ever faster innovation. Because development was limited by excessive drawbacks in terms of comfort and cost, supersonic flight (to date) did not become “the next step in the ‘natural’ sequence of steadily rising transportation speeds” (p. 102). Thirdly, the author tackles inventions people keep waiting for, such as the everlasting hope for hyperloops and nuclear fusion. This chapter in particular reveals his disapproval and skepticism of techno-optimistic pioneers who exaggerate and trivialize the complexity of inventions.

Smil rightly refers to the term of artificial intelligence, whose public perception differs greatly from the definition and meaning of experts in the field (Jordan 2019). Nevertheless, in interpreting his arguments, there are doubtlessly elements that justify the relevance of TA – if research can free itself from exaggerated hypes: His arguments about expecting too much from one’s own capabilities certainly apply to some research ambitions and projects that claim to be transformative or innovative as well. Moreover, he argues that “we cannot judge the ultimate acceptance, societal fit, and commercial success of a specific invention during the early stages of its development”, especially if our experiences and evaluations rely on “experimental or trial stages” (pp. 151) alone. However, could this not be a call for more

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While he presents the cases in accessible language and provides a holistic perspective on the barriers and unforeseen challenges that the emerging inventions had to face, the connection to the bigger picture framed in the introduction is sometimes a little lost in his affection for historical accuracy and technological details. For instance, the multiple descriptions of various airship models may seem lengthy to some readers and distract from the nuances of the innovation process. Nevertheless, each case is an exciting and entertaining story in its own way, providing insights into the complexity of such pathways, especially for readers who have not previously focused on the history of inventions and innovations.

The risks and potential of hype and failure in technology assessment

Smil paints a sobering, if not devastating, picture of the sustainability transition and explains quite credibly why we cannot realistically come close to achieving any of the milestones we have set ourselves in the coming years and decades. We will need unprecedented efforts across multiple sectors on a global scale to accomplish decarbonization. It is fair to point out that he contradicts his own statement here at times, when he initially emphasizes that “we should restrain our ever-present compulsion to forecast how new inventions will shape our future (p. 17)”. Being convinced what will not happen is partly following the same path. Nevertheless, he makes a valid claim that breakthroughs towards sustainability are rather scarce and even small compromises entail a huge effort. Rather, society needs more reliable evaluation patterns for identifying the actual potential of breakthrough innovations.

If we were to take all his seemingly pessimistic arguments literally, the future would not look bright for TA. And there is certainly some truth in the fact that expert opinions and scientific evidence cannot compete with commercial or media-driven dis-

meaningful experimental research, that not only strives towards transformative impact (whether commercial or normative), but rather as research settings to objectively evaluate socio-technical outcomes? Understanding these approaches as ‘trial-and-error’, where failure can sometimes be more meaningful in retrospect than success, falls short of the book’s overarching argument. As we all know, this is an ongoing debate in TA for years that has led to several ideas and concepts, which – then again – often suffer from high ambitions as well. The policy transfer and response to technological hype is not sufficient and contemporary to cope with these challenges – but giving up trying might not be the most fruitful solution either.

Invention and Innovation is a more rational and pragmatic rather than elevating read. While Smil’s generalized skepticism towards today’s innovation capabilities might sometimes exceed its grasps, it helps to reflect our own research and thinking from a ‘down to earth’ perspective – and, potentially, reassess own expectations. Reading the book can inspire to ultimately develop more coherent success stories of finding problem-oriented solutions.

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