

THEME 02

(in)Credible technologies

TECHNOLOGY

INNOVATION

EXPECTATION

Future visions rely heavily on emerging technologies, which are often far from practical or economically viable. Still, many business and political decisions are based on the conviction that those technologies will somehow mature and become genuinely valuable. Where do such expectations come from, and how do we separate the feasible from the fantastic?

Our observations

- Concepts as varied as the Internet of Things, a fully autonomous mobility system and the hydrogen economy hinge on a multitude of enabling technologies that are not quite “ready” yet. Proofs of concept may be available, and even some niche applications may be in use already, but on a component-level, much progress is still necessary in terms of performance (in whatever dimension), reliability or costs.
- Roadmaps of expected (or hoped-for) technological development underpin decision-making in public policy-making and industry. In politics, such roadmaps guide fund allocation for public research and development programs and legitimize favorable regulation (e.g. environmental rule-making hinges often on the availability of alternative technology, for example. substitutes for harmful **refrigerants**). For businesses, such roadmaps are also key to resource allocation and may also inspire M&A.
- There are several technologies which are popularly expected to be x-years away: **nuclear fusion** always remains decades away and the **hydrogen vehicle** is forever claimed to be ten years away. While all kinds of progress is made, the speed of development lags behind the promises of developers and other proponents.
- Artificial Intelligence still has not delivered on its promise, even though the notion has been around for some 70 years. This, however, is a typical example of a technological solution (or rather, a collection of solutions) that forms a moving target. Each time AI reaches a milestone (e.g. beating humans in chess), we tend to raise the bar (e.g. beating humans in every game).
- The well-known Gartner **Hype Cycle** describes how emerging technologies first go through a phase of “inflated expectations” during which technologies are surrounded by (far) too optimistic ideas about progress and commercialization. This hype phase is, inevitably, followed by a period of disillusionment, as the technology has not lived up to its promises. Often, but not always, the technology regains some of its credibility and eventually finds its way to the market.
- The valuation of highly specialized companies, whose fates rest on a single technology, is strongly related to the expectations of a specific technology. For example, the stock price history of Canadian fuel cell producer **Ballard** clearly reflects the hydrogen hype around the turn of the millennium.



Connecting the dots

In general, we tend to believe that all technology gets “better” once we invest time and money in its further development. At the same time, the specific expectations of progress that accompany an emerging technology are deliberate constructs that stem from technology developers (i.e. scientists or engineers) and other advocates of a given technological solution (e.g. NGOs or businesses with an interest in the technology). The arguments they bring to the fore, in an act of storytelling, are meant to convince others to provide them with resources in the form of capital or, for instance, favorable regulations (e.g. approval for field-testing genetically modified crops). In most cases, these emerging technologies, through their proponents, are in competition with other emerging technologies that promise to address the same problem or demand. All of these vie for attention, credibility and, ultimately, financial support. To illustrate this point, various nuclear fusion reactor designs compete with each other, and proponents need to assure potential supporters that their particular design will eventually deliver the best results. The typical storyline of an emerging technology entails some proof of concept, but it also needs to give an idea about what’s theoretically possible with that piece of technology in terms of performance and/

or costs. To be clear, the performance of a technology can never be reduced to a single metric (e.g. a battery must not only be capable of storing a lot of energy; rather, it must also be able to charge and discharge quickly, and without losing capacity). Because of this, credible stories about progress hinge on the availability of ways to realize the theoretical potential in more or less all dimensions; first in a lab, then in real-life applications.

Expectations of emerging technologies do not just relate to the technology itself. Technologies will only receive support when there are also clear ideas about the future demand from a business or societal perspective, their fit with other existing or emerging technologies, and their hard and soft institutional embedding. VR goggles, for instance, may develop in terms of image quality and costs, but their success will also depend on cultural “rules” (i.e. whether and in which contexts VR goggles will be societally acceptable). These expectations, beyond the technology itself, are often crucial when it comes to economies of scale or network effects that make the technology cheaper or more effective.

Implications

- To assess the credibility of specific expectations that surround an emerging technology, one obviously needs an elaborate understanding of a field of science or engineering. Nevertheless, even without such knowledge one can still deconstruct the promise of the technology and, in doing so, develop a more critical perspective regarding the technology’s future: what has been proven so far?; what is its potential?; what are the critical hurdles?; what is needed in terms of cultural and systematic change? And, perhaps most importantly, how do competitors respond to these arguments?
- Because proponents need to raise expectations about their technology, they often end up making overly optimistic claims and, as such, initiate a hype cycle. During this early phase of the hype, many good things may happen, as capital is readily available and many stakeholders are likely to join the effort. The question, however, is whether these benefits outweigh the damage that will be done during the subsequent phase of disappointment when stakeholders retreat, capital is no longer available and reputations get tattered. Ideally, stakeholders would cooperate to “manage expectations” and stabilize the highs and lows of the hype cycle, and create a steadier path of development, but this would require proponents to voice more modest expectations from the start and to potentially reduce their amount of support. On the other end, decision makers would have to make relatively long-term commitments to a technological trajectory (e.g. by spreading budgets over a longer period).