

Electrification: The Innovator's Dilemma

Current plans for utilizing renewable energy as the most cost-effective solution to reduce greenhouse-gas emissions look set to shake up many established business models

Almost thirty years ago, the business scholar Clayton Christensen coined the term "The Innovator's Dilemma."¹ His framework helps explain why even companies with a great track record tend to struggle in coping with disruptive innovations that redefine their markets.

Take incumbent utilities. Traditionally, managing electricity demand or digitizing their services has rarely been among their top priorities, nor did it need to be. Yet it is exactly these types of skills and business models that will be as essential as expanding capacity for the renewable transition to succeed. Ideally, electricity production should take place close to where and when it is needed, with demand responding to intermittent renewable production. None of this is going to be easy.² But the basic issues involved, including the need for electricity storage and the potential of electric vehicles and other "smart" devices to help smooth intra-day demand at the regional or even local level, has been recognized for decades.

Alas, as with any incumbents, the strength of utilities lies in sustaining technologies. Typically, this means catering to the needs of established, high-margin customers. The focus tends to be on incremental improvements to enhance existing products or services, rather than new niches. Among utilities, this typically means adding capacity – and, quite often, intentionally or unintentionally hindering innovations that would disrupt their traditional business models.³ The Innovator's Dilemma can help explain why countries that tried to push forward with their energy transition comparatively early tended to see incumbent utility companies resisting such necessary changes as "smart" metering.

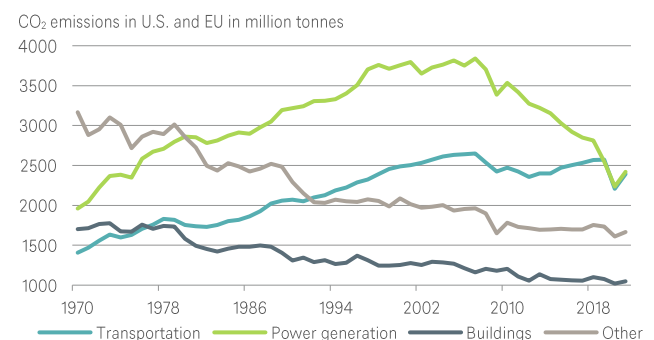
By contrast, disruptive technologies⁴ tend to be initially inferior for mainstream uses. Newcomers tend to focus on small, initially quite marginal niche segments neglected by incumbents. An excellent example concerns cars, even if it happens to be from 100 years ago. Well into the 1920s, sophisticated customers much preferred their nearly silent, easy-to-control and reliable electric cars. By comparison, early cars powered by internal combustion engines were

seen as inconvenient, dirty and not very reliable.⁵ Thanks to the electrification of car assembly lines and related product and process innovations, though, those high-emission gas guzzlers could soon be produced en masse, very cheaply.⁶ Ever since, they have been the sustaining technology of legacy carmakers, which organized their organizations and processes around it.⁷

Electrification of car assembly lines eventually helped spell the end, until quite recently, for electric cars. This episode highlights how, as disrupting, enabling technologies improve, they tend to shake up many established business models in unpredictable ways. To take a more recent example, when the iPhone was introduced, it was by no means clear that it would create new competition for taxi companies.

Transportation is the only major sector globally where carbon emissions continue to rise (see chart), even in regions such as Europe that are otherwise advancing well on their journey towards net zero.⁸ Governments and investors increasingly see it as an urgent priority. The distinction between sustaining versus disruptive technologies should make them cautious as to their ability to predict and pick potential winners. "Amid all the uncertainty surrounding disruptive technologies, managers can always count on one anchor: *Experts' forecasts will always be wrong.*"⁹

Carbon emissions by sector: Transportation still increasing



Source: Emissions Database for Global Atmospheric Research as of November 2023

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Footnotes

¹ Christensen, C. (2003 ed.) "The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail," Harper Business Essentials; the dilemma arises in terms of identifying how and why "planning better, working harder, becoming more customer-driven, and taking a longer-term perspective" can, in the face of disruptive technological changes sometimes lead to failure of previously successful firms. (p. xxii)

² [Getting the most out of tomorrow's grid requires digitisation and demand response \(economist.com\)](#), [The electric grid is about to be transformed \(economist.com\)](#) and, [to get an idea of how long many of the innovations now finally being implemented have been known and talked about, The dawn of micropower \(economist.com\)](#)

³ [On Germany in particular, see: Article | bne - Bundesverband Neue Energiewirtschaft e.V. \(bne-online.de\) and Smart Meters, Sluggish Policy? Germany Rejects Fast Smart Meter Rollout | Greentech Media](#)

⁴ As we explain in this article, disruptive technologies are, to quote Christensen, *ibid.*, and keeping in mind that this was written in the 1990s p. (xviii) "bring to market a very different value proposition than had been available previously. (...) In the near future, 'Internet appliances' may become disruptive technologies to suppliers of personal computer hardware and software."

⁵ According to car industry folk memory, those sophisticated fans of electric cars very much included Henry Ford's wife. See, for example, [As electric motors improve, more things are being electrified \(economist.com\)](#)

⁶ The shift in production technology towards interchangeable parts with subdivided labor and fluid movement of materials was only possible thanks to electrification. See: [Gas-Steam Engine, 1916, Used to Generate Electricity at Highland Park Plant - The Henry Ford](#)

⁷ Another, long lasting effect was how increasingly gigantic corporations enterprises came to be organized, with GM serving as an early role model. See, for example, McChrystal S., Collins, T., Silverman, D. and Fussell, C. (2015), *Team of Teams: New Rules of Engagement for a Complex World*, Penguin, pp. 188-198

⁸ For more details, also see: <https://www.dws.com/en-gb/insights/global-research-institute/transforming-transportation/>

⁹ Christensen, C. *ibid.*, p. 178 (*italics in the original*)

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as of 11/23/23; 098750_1 (11/2023)

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as of 11/23/23; 098751_1 (11/2023)