

2016 Davos Talk; Time available = 10 minutes Title: Innovation's Shadow

Slide 1 = title slide of tree

Slide 2 = montage of revolutions picture

Revolutions – technological, political or otherwise – are messy. They are disruptive in all senses. The colonization, child labor, and slavery that helped power the first industrial revolution created centuries of social disorder. The upending of old economies and industries left environmental footprints that still affect us. Of course, industrial revolutions – when they arrived, what they brought, and what they swept away – look different depending on whether one sees them from Europe, Asia or Africa.

Slide 3 = Tree Image again

But regardless of place or time, economists and historians often view industrial revolutions through the lens of innovation. Think of it as standing very close to a tree. You see get one detailed perspective but it's hard to see the forest. But once we leave innovation's shadow – stepping away from the tree, in other words – we start to get some new insights into the nature of industrial revolutions. I want to talk about three of these...

POINT 1 Slide 4 = technology ≠ things

Every year, I teach a course on the history of technology. At the start of the term, I ask my students to finish the sentence “Technology is...?” Their responses are predictable – to the average 20 year old, technology means the sort of stuff shown here: cars and computers and smart phones. At the end of the term, I ask the question again and the results are quite different. As they have come to understand it, technology is *more than about just things*. Here's one example...

Slide 5 = image of Bell Telephone switchboard

In the 19th century, engineers and entrepreneurs built vast systems for transportation and communication. These systems were complex and messy. To make something like what's shown here function properly demanded order and regularity. This meant adopting standards. Largely ignored, often invisible, standards created stability in technological systems.

Slide 6 = image of gauge blocks, standard screws, shipping container

Whether it's screws or shipping containers, standards transformed the novel into mundane, and made the local into the global. Making standards then or now wasn't about making new things per se...rather, it meant creating consensus about technology. These same sort of processes will be critical for any future industrial revolution.

Slide 7 = image of Ford melting pot

Industrial revolutions didn't just make standardized parts...they also tried to create standardized people. Here, we see Ford workers – recent immigrants to the U.S. – after graduating from the company's school. To be good Ford workers meant learning unfamiliar things like the English language and the demands of a new corporate culture.

Slide 8 = image of lab scientists

The standardization of people wasn't just limited to blue collar workers. Professional credentials and shared practices fostered the rise of corporate research in the U.S. and Germany during the 2nd Industrial Revolution. This legacy is still with us – think of the numbers that define people as they go through life, from school test scores to IQ measurements to credit reports.

Standards and quantification and an ideology of efficiency aren't *things* in the traditional sense...but intangibles like these gave an important foundation for past Industrial Revolutions.

POINT 2 Slide 9 = stack of stones with text “Technologies stack”

And, although technology is not *just* things, there's no denying its material basis. This leads to my *second observation*: technologies stack...their physical presence settles like sediment on top of one another. Over time, technologies form layers that a geologist can envision and a historian can understand.

Slide 10 = American progress

Look at this painting. Made in 1872, it's called *American Progress*. Here, liberty glides forward across the North American continent. Settlers follow in her wake. Natives and nature scatter before her. She holds a telegraph cable in her right hand and unspools it alongside the tracks of an advancing railway. On one hand, this is a portrait of American manifest destiny. Seen another way, it's a vivid example of how interdependent this era's transportation and communication systems were.

Slides 11, 12, 13 = maps of railway system and map of Internet

Here's another way to picture this. This is a map of an American railroad system from around 1900. [<click to get new image>](#) And from about a century later, this is a map of the Internet. [<click to next>](#) Should we be surprised that today's information superhighways sit on top of old railway and telegraph routes? And if we put a map of the electrical grid on top of this, we would see a near-perfect fit. And of course, the same energy sources that powered trains and telegraph systems still drives the Internet today. As they layer and stack, technologies persist over time.

Slide 14 = image of train and rickshaw

In addition to stacking, technologies co-exist with one another in fascinating ways. Here, this picture from 19th century Japan shows a world where steam and sail, railroads and rickshaws all shared common space. Industrial revolutions were distributed unequally in place and time. The technological world wasn't flat. Today, we *are still* living in this lumpy and bumpy world as technologies accumulate on top of each other. Historians' prevailing emphasis on the shock of the new can create a smokescreen. Novelty and innovation can obscure previous and often more important developments.

Slide 15 = picture of postage stamps and mail ship

For example, it's common to hear how the 19th century telegraph was like today's Internet. Except this isn't true. Sending telegrams was too expensive for most people to afford. For decades, it was an exclusive elite technology. However, what *was* innovative for the *majority* of people was cheap postage. So, during the heyday of the so-called Victorian Internet, transoceanic postal systems made communication cheap, reliable and fast. The flow of information became more widespread and democratic. Although hard to imagine today, bureaucrats and business

leaders alike spoke about cheap postage in terms that resemble what we hear for many emerging technologies today. But this story often gets lost in the shadow of the telegraph. So, again – as we escape the pull that novelty and innovation have on our attention, we can start to see these hidden histories.

POINT 3 Slide 16 = Isaacson book cover with text “maintaining the mess”

Speaking of hidden histories...recently, Walter Isaacson published a bestselling book called *The Innovators*. He tells a compelling story about geeky genius entrepreneurs, the collaborations they formed, and their revolutionary ideas for computer and electronics. But if we spend too much time thinking about innovation, we lose sight of what most scientists and engineers actually did – and still do. Most of them worked to make incremental improvements. Often, they also focused on maintaining existing systems.

Slide 17 = “Maintainers” image

So – imagine a book like *The Innovators*...but let’s give it a different title – maybe call it *The Maintainers*. This hypothetical book would reveal activities essential for sustaining industrial revolutions. This book would shift our gaze from Manchester, Detroit and Silicon Valley to a wider global infrastructure. This book would be more about continuity than disruption. It would tell stories about repair, re-use, and sometimes the rejection of innovation. Inventive people previously on the margins would come into view. People like these folks...

Slide 18 = Model T set up as washing machine

I love this image... Here, somewhere in Kansas, around 1930, a family’s car is hooked up to run a washing machine. The back story is that after Ford introduced the Model T, auto executives were shocked to learn that consumers used cars for more than driving. Insurance underwriters, in fact, sometimes had a hard time classifying automobiles – were they farm machinery? Transportation machines? For pleasure? As we can imagine it today, people like these shown here hacked the automobile. The result is a much more interesting picture; it captures the richness of what happens in Industrial Revolutions.

Slide 19 = conclusion – show montage of cairn; maintainers; not things

When we move away from the shadow cast by traditional innovation, we start to see the complexity of past industrial revolutions in new ways. We notice the stubborn persistence of older technologies; we appreciate the essential role of users and maintainers; and we notice the intangibles that try to make technologies more orderly. These histories show Industrial Revolutions to be about much more than just innovation and progress. Rather, the technology itself – the tangible and the ephemeral was – and remains – a work in progress. Thank you...