



Is the Fourth Industrial Revolution a Paradigm Shift?

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As economic development practitioners, we often wonder how emerging technological and social changes might affect the people we work with. How will new technologies affect the regions and value chains we work with? How will developing countries participate in global value chains and trade systems? What kind of skills will the workforce need?

Some believe that we may be on the cusp of the great Fourth Industrial Revolution that will determine the answers to these questions. While I appreciate the fantastic resources made available by the World Economic Forum, I do not fully buy into the concept of the Fourth Industrial Revolution as popularized by the WEF and so many techno-enthusiasts. I am not altogether convinced that we are facing the next single, huge, overarching industrial revolution.

Rather, it seems to me that many smaller mini-revolutions are taking place in certain domains. And their biggest impact is not the physical technological change, but the increasing pressure that they exert on the social institutions in our societies. Social institutions are being stressed because emergent technologies enable far more decentralized and rapid decision making, whereas public institutions are often slow, centralized and conservative. While physical technologies appear to develop exponentially, public organizations and social institutions develop linearly.

Paradigm shifts

The phrase "paradigm shift" was popularized in the writings of Thomas S. Kuhn (1922-96), a highly regarded philosopher of science. He described it as a fundamental change in the underlying concepts and practices of a scientific discipline. Kuhn argued that when a paradigm shift occurs, entirely new methods,

arrangements and ways of measuring performance are adopted. The old way of doing things is suddenly broadly understood to be sub-optimal and inefficient.

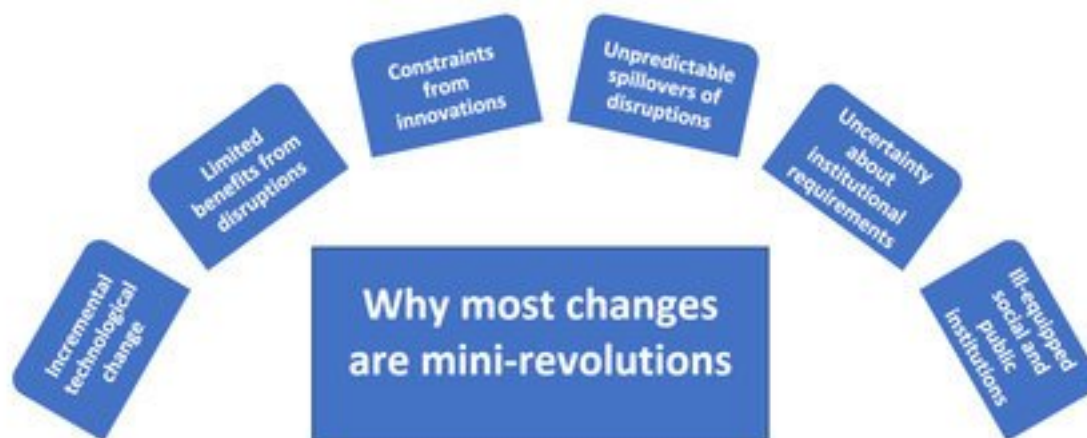
When people talk about the Fourth Industrial Revolution, they are often implying a single paradigm shift or several paradigm shifts taking place simultaneously. The challenge with a paradigm shift is that it is often only retrospectively coherent - you cannot see from the current prevailing performance curve what an entirely new curve might look like. This is not so much due to the characteristics of the physical technologies, but because we cannot imagine what the social arrangements, institutions and regulations and the broader infrastructure will be needed in the new paradigm.

So rather than predicting the trajectories of physical technological change, the discussion should be far more about figuring out whether:

- the right market-supporting institutions are in place,
- formal knowledge is being disseminated at the right level of detail or modularity for the society to engage with it in a meaningful way, and
- we are setting aside enough resources to enable experimentation.

Persistent market failures and high search and discovery costs, coordination costs or indivisibilities make it especially hard for entrepreneurs in developing countries to try out new business models or technologies. We need to focus on building the institutions that address these failures at scale to help developing countries navigate the very high uncertainty brought by all this technological change.

Allow me to sum up my argument in six sub-statements.



1. Incremental technological change

Most technological change is still mainly incremental rather than transformational. It builds on what already exists, which is especially applicable for product and process technology improvements. Within a particular technological domain, there could be disruptions (mini-revolutions), for instance when an entirely new way of performing an existing function becomes possible. These transformational changes can seem bigger than they are because of the media's increased attention to topics such as advances in robotics, artificial intelligence, autonomous vehicles or 3D printing.

2. Limited benefits from disruptions

Occasionally an existing company may be disrupted by an innovative product or process from a newcomer. However, incumbents can often integrate some of the novelty from disruptors into their established organizations and market channels. In this way, incumbent firms often contain or may perhaps even take advantage of disruptions, which limits the benefit for the innovators and even the markets. The same could be said about sudden breakthrough innovations by competitors. While it may cause discomfort and a rethink of strategies and priorities, in most cases incumbents are able to respond to the moves of competitors because of their resources, supply chains and market channels.

3. Constraints of innovations

Even innovative companies are constrained as to how much they can innovate based on their markets and the regulatory environment. This is especially true for designers and manufacturers of sub-systems that form part of larger architectures of technologies. For example, if we agree that a passenger vehicle is an architecture, then all the sub-systems (engine, doors, etc.) are modules. A change in a sub-system is often constrained by the architecture unless those companies that control the architecture agree to the changing of a module. For example, a passenger vehicle must still fit into the architecture of the transport infrastructure. That's why disruption takes a long time, even if at the moment it may feel as if it is happening very fast.

4. Unpredictable spillovers of disruptions

Disruption is most painful when ideas developed in one domain suddenly spill over into another. This means that the usual process of incremental improvement is pushed aside by a concept that was developed and refined in a completely different environment. Digital technologies are currently doing this in a variety of industries. A small business developed somewhere in the USA can overturn the tourism sector on another continent, with little warning. For companies, it means that simply listening to their customers is no longer enough as technological threats can come from unrelated fields. To cope with this, companies must constantly scan the horizon and new ideas must be assessed and tried before they can disrupt. While this is challenging in denser markets in the USA, Asia or Europe, it is even harder to do in thinner markets.

5. Uncertainty about institutional requirements

The real threat and unpredictability of technological disruption lie in the uncertainty of what kind of social, market supporting, or governing institutions may be required in the longer term. Even developing countries can quickly import and use cutting-edge physical technologies if the search, investment or coordination failures are overcome. However, nurturing social technologies in the private and public sector - such as establishing effective public organizations, policy networks or governing frameworks - is far more difficult.

6. Ill-equipped social and public institutions

While technologies appear to be changing exponentially, public institutions change linearly. They plan annually or perhaps for a few years at a time and spread their investments in new capabilities and new services over many different topics or constituencies. They are also often strongly influenced by the ideologies of politicians. In many countries, while public institutions should be preparing for more

knowledge-intensive and modular use of knowledge, their governments are instead focusing on low-wage competitive advantages and basic skills. Social institutions change even more slowly than public institutions because meta change is a very gradual process. A social institution could, for instance, be the expectation that young people should first study, then work for a larger employer, and once they have sufficient experience, go on to start a company. Another example of a social institution is the expectation that all young people must first qualify before they can get a job, which is true in many cases (for now) but not in all cases.

From technological changes to investment and innovation in social technologies

While physical technologies get all the attention, investments and innovation in social technologies are largely overlooked. It is harder to measure the performance of social technologies, yet they provide the glue that holds together groups of people to respond to change, innovate, build mechanisms of exchange, manage disagreement and adapt to changing circumstances. These social technologies must be promoted in a way that fosters decentralized experimentation, decision making and adaptation. This is the only way to ensure that an economy is resilient. The way to respond to technological disruption is to empower more people to learn, adapt and combine new ideas with what already works.

Investing in the diversity and technological savviness of market-supporting organizations is essential. These organizations reduce persistent market failures and induce structural change. They play a crucial role in disseminating knowledge and breaking new knowledge down into more granular and more absorptive modules. I would go so far as to argue that we should be purposefully introducing disruptive technologies into transforming economies. The intention should be not only to demonstrate or make physical technologies available but also to encourage experimentation with social technologies in new enterprises or to induce innovation in existing ones. We must reduce the costs and risks of experimenting with the new platform technologies that are emerging.

This is especially vital in developing and transforming countries, which are more vulnerable to technological disruption. Not only because the markets are thinner, and companies have less space to experiment in and less demand. More importantly, because the incentives to invest in social technologies are lower.

Technological or manufacturing extension centers, entrepreneurship support programs, and adult education centers all reduce the search, discovery, coordination and investment costs. They allow smaller enterprises, individuals and networks to gain access to knowledge that larger companies can often access internationally, allowing more combinations of existing and new knowledge. Public institutions can then disseminate this knowledge into the economy and increase the technological capability and social technologies in many workplaces and social structures.


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This article appeared in the June 2019 issue of Helvetas Mosaic.

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