

What Is AI's Place in History?

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LONDON – Everyone is talking about artificial intelligence as though it represented the next technological revolution. In fact, it is better understood as a key development within the still-evolving information-communications-technology (ICT) revolution, which started in the 1970s with the microprocessor. It then made a big leap in the 1990s when the US government handed the internet over to the private sector, and when both innovation and globalization were intensified.

AI may plausibly evolve as a third leap. But what is most important to recognize today is that ICT has already brought us to the threshold of a golden age. Recognizing this potential depends on knowing the crucial role of market-shaping public policy in improving social outcomes in all previous technological revolutions. Failing that, both AI and ICT more broadly will fall short of their potential to deliver broad-based social and environmental progress.

Why doesn't AI itself represent a new technological revolution? This question is not as pedantic as it may seem. Whether we are in the middle of a technological revolution or at the beginning of one has major implications for managing development strategies and shaping public policy. As I argue in [*Technological Revolutions and Financial Capital*](#), the early decades of each revolution are turbulent times of creative destruction across the entire economy, not just in a few sectors. They are periods when the state gets out of the way and allows financial markets to support experimentation by those who are journeying into the unknown.

During such periods of creative destruction, new technologies both create and eliminate jobs and the marketability of certain skills. We generally witness the rise of whole industries and regions alongside the demise of others, which creates fertile ground for populism. But once a revolution's potential is understood, and once social stability is at stake, a whole range of new appropriate institutions and regulations must be introduced to orient its constituent technologies toward maximal social gains. How we situate innovations in history thus matters for how investors, firms, governments, and households arrive at economic decisions.

Since the introduction of computers, the notion of technological change occurring through revolutions has become commonly accepted. Everything from "green" tech and cryptocurrencies to AI has been deemed "a revolution," owing to these innovations' potential to disrupt many parts of the economy.

But a revolutionary technology is not the same thing as a technological revolution. AI is almost certainly revolutionary in the sense that it will spawn new technology platforms, transform or eliminate many industries, and create new ones. But it belongs to a much larger technological revolution that is still in the middle of its diffusion process, having already passed through two major stages of innovation. The first was based on microprocessors, computers, and software, and the second on the internet and the globalization it enabled.

AI, robotics, and the Internet of Things (IoT) may well now constitute a third chapter. But the crucial point is that AI depends on the internet, which in turn depends on powerful microprocessors and computers. They are all part of the digital transformation, which centers around technologies that are mechanizing mental, rather than manual, work. Extrapolating into the future, one can imagine that the next technological revolution could be a wave of innovation combining AI with biotech, and a whole constellation of new materials. But we can still see them evolving within the deployment of an ICT golden age.

Historical Parallels

The ICT revolution has lasted much longer than previous ones. To understand why, it helps to start with a basic definition. As I put it in my book:

“A technological revolution can be defined as a powerful and highly visible cluster of new and dynamic technologies, products and industries, capable of bringing about an upheaval in the whole fabric of the economy and of propelling a long-term upsurge of development. It is a strongly interrelated constellation of technical innovations, generally including an important all-pervasive low-cost input, often a source of energy, sometimes a crucial material, plus significant new products and processes and a new infrastructure. The latter usually changes the frontier in speed and reliability of transportation and communications, while drastically reducing their cost.”

The key phrase here is “strongly interrelated constellation of technical innovations.” That is what transformed economies and societies during the industrial revolution beginning in the 1770s; the age of steam and railways from the 1830s; the age of steel, electricity, and heavy engineering from the 1870s; the age of oil, the automobile, and mass production from the 1910s; and the current ICT age since the 1970s. No single technology, however powerful, can propel “a long-term upsurge in development.”

What’s in a Revolution?

Technological revolutions are not only about technology. They also involve major transformations within government and society. In today’s context, the widespread rise of populism is typical of a mid-way turning point in the diffusion of a technological revolution and so is the establishment of new giant monopolies or oligopolies. Creative destruction – the process of replacing old technologies in the economy with radically new ones – has many

victims, and populism thrives on the resentment it sows. The support for Hitler and communism were extreme cases of this basic phenomenon: they flourished in the 1930s, mid-way along when the mass-production revolution, which began in 1913 with Henry Ford's assembly line and reached its full deployment in the welfare state during the post-war boom (1945-71). No single innovation, however powerful, can produce such wide-ranging effects.

As a major innovation that fits into an ongoing technological revolution, the latest advances in AI are analogous to the introduction of plastics mid-way through the mass-production revolution. With the industrial development of polystyrene (the plastic used in disposable cutlery and thousands of other products), nylon, and synthetic rubber (for car tires), the advanced economies of the 1930s realized the amazing potential of petrochemicals. The implications of these technologies were profound, though we take them for granted today. Like AI, synthetic materials had near-infinite uses. They soon penetrated every industry from textiles to construction, replacing natural materials, changing production methods, lowering packaging costs, and encouraging disposability. This inevitably displaced many human skills and destroyed the economies of several materials-exporting countries. But though synthetics were a revolutionary technology, they were not a technological revolution.

An equally impressive example is the introduction of electricity during the age of steel and heavy engineering, from the 1870s. During this period – which may be seen as the “first globalization” – “King Coal” and the steam engine were threatened by a new form of energy provision that could liberate factories from sprawling networks of conveyor belts. Each machine could plug in directly to the network, and soon railways could operate without the danger and inconvenience of steam.

Major changes followed, including an increase in plant sizes and greater reliability in the rhythm of production. Illumination became a defining characteristic of the ensuing Belle Époque, as theatres, music halls, hotels, restaurants, and city streets buzzed under safe lighting. Electric tramways allowed cities to grow much larger (cars were still a luxury item, next to horses and bicycles), and replacing hydraulics with electricity (and strong steel cables) allowed for the construction of skyscrapers. Eventually, as this diffusion was generalized, electricity changed the lives of every individual (homes, for example, became much safer without candles and kerosene lamps).

It certainly looked like a revolution. But electricity depended on the availability of inexpensive steel, without which neither electrical equipment nor long-distance distribution cables would have been possible. From the 1890s, electrical engineering became one more branch within the steel and heavy engineering revolution, alongside metallurgical, chemical, civil, and naval industries.

There are also earlier examples. In the 1860s, midway through the second revolution, the age of iron, steam and railways, Bessemer steel emerged to replace brittle, rust-prone iron, enabling an astonishing leap in the power and speed of engines. Not only could trains go further and faster, but giant sailing ships could be equipped with safer, more powerful gear,

before ultimately transforming into steamships. Additional innovations such as the open-hearth process subsequently reduced costs to the point that steel could become a key factor in the third revolution, which depended heavily on steel steam engines for transcontinental and transoceanic transport and communications. It was impressive and transformative, but not yet a revolution.

A Revolution at a Crossroads

Thus, every technological revolution creates the conditions for a succession of revolutionary technologies that will appear and then combine to form technological systems, and widely diffuse. This sequence helps us see where AI is today. In each case, the new technology either blends directly into a larger process, as petrochemical materials did, or it serves as a forerunner of what is to come. That is what happened with steel and electricity in their time, and with early computers in the 1950s and 1960s, before they became central to the ICT revolution following advances in microprocessors.

AI is certain to become an integral part of the current digital revolution, and it could also lay the groundwork for breakthroughs in biotech, nanotech, and other fields that may be at the center of an eventual sixth revolution.

It is understandable that most people regard the new AIs as the start of a new revolution. After all, the ICT revolution has already spanned generations, producing successive technologies that have opened opportunities for thousands of entrepreneurs to try their luck at becoming billionaires. Each of these stages has destroyed jobs and created new ones, and only those who were already adolescents in 1971 can remember how the current age began.

The maturity of the ICT revolution implies that we should know how to manage it now. But its trajectory remains highly contingent because technologies can always evolve in different directions. In some cases, they can help direct an economy toward more sustainable and inclusive growth. But if they are not properly directed, they can yield increasingly dysfunctional results. Just imagine an ever-more unequal economy in which many while away their time in the metaverse, while climate change runs amok.

An obvious starting point is to subsidize investments that will move technology in a greener direction, and to regulate industries and platforms to address known social harms. But the real goal should be to rein in rentier capitalism by recoupling the financial system with the real economy in order to force a change in capital markets, which are increasingly functioning like a global casino.

In principle, redirecting finance toward fairer, greener, more socially beneficial forms of growth could usher in the ICT golden age that has long been possible. But while the technologies are there, the politics are not. In the meantime, we will sink deeper into a reality characterized by income polarization, autocratic populism, wasted innovation, climate-related disasters, and a tsunami of desperate migrations.

This bleak scenario is no worse than that of the 1930s, which prompted bold, proactive responses from governments. Innovative policies designed to shape the mass-production revolution set the stage for suburbanization, the Cold War, the welfare state, and the Bretton Woods international stability framework. Today, an equivalent set of modern institutions, adequate to the ICT revolution, could tilt the playing field toward digital, green, fair and stable global growth. AI, as a technology will blend with and build on the other defining innovations of the ICT revolution. We will need to deploy all the tools that the state has at its disposal to shape the revolution by making it more profitable for innovators to do the right thing for the economy, society, and the environment.

AI – along with robotics, the IoT, quantum computing, CRISPR gene editing, and all the other technologies made possible by powerful microelectronics and the internet – will indeed play a major role in shaping the future. But if AI's development unfolds in a system where financial markets remain unregulated and decoupled from the real economy, it is unlikely to move us in a more environmentally, socially, or politically sustainable direction. Changing this broader political-economy context has become the most urgent task of our time.