OPINION

BY ZHU WANG

Artificial Intelligence: Potentials and Prospects

We are at the dawn of a new technological revolution. The recent development of artificial intelligence (AI), especially the emergence of generative AI, has offered a plausible future in which machines will eventually free humans from a wide range of cognitive tasks, unleashing vast creativity and productivity gains.

Historically, AI technologies have progressed gradually, through cycles of optimism and disappointment. In recent years, however, the use of AI and machine learning technology has started gaining ground in various applications, such as search engines, targeted advertising, self-driving vehicles, language translation, and image recognition.

The most impressive leap is the rise of generative AI, marked most notably by the release in November 2022 of ChatGPT, which can generate text, code, images, and other data, often comparable to or surpassing human quality. The latest models of generative AI have demonstrated the abilities of solving novel and difficult tasks that span mathematics, coding, vision, medicine, law, and other areas, and they continue to improve at a fast pace. The use of generative AI is on the way to transforming a large variety of industries, including finance, software development, customer service, health care, entertainment, sales and marketing, art, writing, fashion, and product design, and the list is growing.

While the future of AI is thrilling, there are important questions about how to best harness the potential of AI and prepare for the challenges and risks along the way. In that regard, economic history and research can provide some useful thinking.

First, it may take a long time to achieve measurable, large-scale productivity gains from AI. History has shown repeatedly that revolutionary technological advancements often come with a "productivity paradox." At the turn of the 20th century, with the early adoption of electrical power, engineers were envisioning profound transformations enabled by electrification, but that vision did not materialize until two decades later, when electrification finally attained a 50 percent adoption level among U.S. households and manufacturing plants. Similarly, the increasing adoption of computers did not result in the widely anticipated productivity surge in the 1970s and 1980s; as Robert Solow remarked in 1987, "You can see the computer age everywhere but in the productivity statistics."

A fundamental reason for this delay is that it takes time and resources to develop complementary inputs associated with a technological breakthrough, including co-invention of new processes, products, business models, and human capital. The more revolutionary the technology advance, the more complex and costly the transition can be. This could show up as a slowdown or stagnation in productivity growth, and the benefits would not be harvested until years or decades later. AI is likely to be at the early stage of such an evolutionary path.

Second, technology changes can have a big impact on jobs and income distribution. Much as automation has replaced manual labor on the factory floor, AI can take over tasks from knowledge workers. In an optimistic scenario, this may enhance the productivity of knowledge workers or even move them up to more creative and better-paid jobs. But in a pessimistic scenario, AI may substitute knowledge workers or relegate them to less productive, lower-paid positions. Also, depending how AI is introduced and deployed, it could widen or shrink the digital divide between those who are privileged and those who are not, and this could have profound consequences on economic and social inequality.

Third, technology is a double-edged sword that can be misused. Nuclear technology is a familiar example that can be used for both beneficial applications, such as nuclear energy and nuclear medicine, and mass destruction. As the potential of AI continues to unfold, there are also growing concerns about harmful uses of AI. For example, AI can be abused to generate fabricated stories and fake images to spread misinformation; AI systems trained on biased or incomplete datasets can perpetuate societal biases and discrimination; and large-scale adoption of defective or malign AI algorithms can elevate systemic risks. For many, there is also an ultimate worry that unsupervised AI advances may create a superintelligence conflicting with human values that could lead to catastrophic outcomes, even possibly human extinction.

These thoughts and concerns highlight the potentials and perils of AI. They also point to the important roles that public policies can play in guiding AI development and implementation. It is essential for researchers, business practitioners, policymakers, and the general public to work together to develop effective policies and robust regulation to coordinate and facilitate the continuing progress and adoption of AI and address potential downside risks. AI has fantastic potential and needs to be developed and used responsibly for the benefit of all. **EF**

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