Tools of Labor and Thought:

The Imminent Intelligence Revolution

The Second Industrial Revolution provided dramatic leaps in productivity per laborer, accelerating per-capita economic growth and broadly increasing standards of living. The precursor to this, the appropriately named First Industrial Revolution, produced a major shift in how labor was performed. Human labor was displaced by machines, and as society became comfortable with a mechanized economy, a generation of ideas rooted in this new reality produced a tremendous wave of innovation: the Second Industrial Revolution. The Digital Revolution, by creating a new information economy, is the precursor to a much larger forthcoming revolution: The Intelligence Revolution. The Intelligence Revolution is destined to provide a dramatic leap in the productivity per information worker and usher in a step-change in economic growth and standard of living.

Tools of Labor

The Industrial Revolution occurred over two distinct periods. The First Industrial Revolution spanned from roughly 1760 to 1830 during which time machine tools and mechanized factories were introduced. Steam power enabled locomotives and steamboats. Machines, rather than human and animal labor, became the primary means of production. These innovations laid the groundwork for a much larger explosion of innovation that would follow.

By 1870, the Second Industrial Revolution was emerging, driven by an immense expansion in manufacturing capacity fueling this second, larger, burst of innovation. As demand for manufactured goods increased, manually operated machines initially met that need. However, as industries mastered these processes, automation began to be introduced, driving greater efficiencies and transforming production.

Innovations in industrial-scale iron production led to the Bessemer process, enabling mass production of steel. Early machine technology was organized into assembly lines, and interchangeable parts streamlined manufacturing. Cheap paper production fueled textbook and newspaper distribution. Telegraph and railroad networks were built out across nations to carry information and goods. Electric street cars shuffled people through cities. This prosperity facilitated the widespread adoption of gas, electricity, filtered water, and sewage systems to the home.

The Second Industrial Revolution, lasting until 1915, saw a greater increase in economic growth than any prior era. Living standards improved significantly, with many luxury items becoming attainable to the average person. People had more money, indoor plumbing, and could even communicate instantaneously over long distances with a telephone. This era in the United States is often referred to as the Gilded Age, highlighted by material excesses and rapid industrialization.

Tools of Thought

Just as the First Industrial Revolution laid the groundwork for the unprecedented economic growth of the Second Industrial Revolution, the Digital Revolution has laid the groundwork for an even more transformative era: the Intelligence Revolution.

The transistor was invented in 1947, marking the start of the Digital Revolution. This period would come to be known by several other names such as the Information Age, the Computer Age, and the Internet Age. There is debate about when history will show this period to have ended, but it will likely be marked between 2010 and 2020. During the 2010s several milestones were reached: the majority of the global population was connected to the internet, 99% of all recorded information was digitized, and mobile phones became ubiquitous. These milestones marked the completion of the infrastructure build of the Digital Revolution.

Computing advances during this Digital Revolution have enabled many technologies that power the modern lifestyle. Highlights of this era include the space age, which evolved from the first human flights in the 1960s to today's near daily rocket launches that bring satellites to orbit to provide GPS, weather monitoring, and global internet services. The adoption of personal computers through the 1980's allowed individuals and employees at any level to leverage the productivity gains afforded through word processing and digital computation. Mobile technologies have connected nearly every human on the planet to any other, on demand. And cloud computing has allowed global internet scale data to be stored, processed, and packaged into readily available software products.

This near universal availability of compute and network connectivity has enabled a new information-based economy. Novel business models have been developed that changed how society operates. News and entertainment are shared globally, in real-time, through digital networks. Anyone on the planet can command the flow of goods globally to be delivered to their doorstep. Entire industries, such as online advertising were born, and countless businesses offer customers digital software that creates value without the transfer of physical goods.

Just as the initial shift from human labor to mechanized production opened the door for the Second, and larger Industrial Revolution to occur, the first Digital Revolution was merely an era of digitizing and connecting the global economy. The second compute revolution, the Intelligence Revolution, will result in larger advancements in human productivity, a phenomenal increase in economic growth, and a step-change improvement to living standards.

Where the tools of the Digital Age enabled individuals to leverage computation, the tools of the Intelligence Revolution promise to automate thinking processes. Society's creation of a large information-based economy caused an immense demand for data processing, reporting, content creation, and more. That, as with the First Industrial Revolution, was filled with manual labor. Ever more powerful computers, massive data storage, and big data processing aid in worker productivity, but also laid the foundation for creating the automation around those very processes humans currently perform. Whereas the Industrial Revolution produced industrial robots to automate labor, the Intelligence Revolution will be punctuated by the creation of Artificial Intelligence to

automate knowledge work. Now that society has created the framework for a fully digital economy, we may begin to automate with Artificial Intelligence.

While some laborers were displaced, the Industrial Revolution did not eliminate manufacturing jobs, they in fact increased in overall numbers in the years ahead. The Intelligence Revolution will do the same. Some job roles will disappear, however each information worker's productivity will increase dramatically. With that will come an equally dramatic rise in economic growth. This economic growth will in turn provide a greater means for consumption of goods and services. Luxuries once reserved for the wealthiest individuals today will become commonplace in the future, just as they have in past cycles. The results will play out similarly to the past Agricultural and Industrial revolutions where society will achieve a new base level of prosperity.

Artificial Intelligence will enable every person to have an assistant with the collective knowledge of humanity, freely available to converse with. These AI assistants will have autonomy to complete tasks at the direction of the owner. Just as machines like the internal combustion engine gave an individual the power of a herd of horses, AI assistants will give an individual the labor equivalent of a team of college graduates. Every person will have the productive capability of an entire office of knowledge workers - we can only begin to imagine how this period of innovation will change human life in the decades ahead.

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