

How China and Japan are Using Robots to Fill Gaps in the Workforce

Facing an aging population and a shrinking worker pool, China and Japan are turning to robots to help keep their economies strong. This article explores the development of automation in both nations.

As the world's second- and third-largest economies, China and Japan have relied on their large workforces to drive economic growth over the past few decades. Both countries now face the challenges of an aging population and a shrinking workforce. These trends have led to a twofold issue — social systems burdened with elder care and factories that need laborers. To address these challenges, China and Japan have turned to automation, albeit in remarkably different ways. While Chinese policies encourage support from national and municipal governments in the form of direct investment into automation, Japan's policies have been markedly less interventionist: The government has provided subsidies, regulation removal, and guidelines in an effort to foster private innovation. These different approaches to automation ultimately serve to guide industrialized and newly industrialized countries that face similar population and demographic challenges.

China's Demographic History

China's demographic experiment is unlike any other in the world. The history of China's demographic evolution dates back to 1949. After taking control of the country in October of that year, the Chinese Communist Party swiftly implemented controversial economic and social policies, resulting in long-term consequences on the course of history for the country. Despite intending to transform the previously feudal and agrarian country into a planned economy, programs such as the Great Leap Forward and the Cultural Revolution had disastrous effects on the economic output of the country: Famines were widespread, the economy shrank, and in 1970, China ranked amongst the poorest countries in the world, according to the United Nations. These calamitous impacts on the economy, coupled with the country's rapidly growing population, led the Communist party to decisively implement the One-Child Policy in 1979, one

of the world's first, most extreme, and most controversial cases of government-mandated family planning. With few exceptions (for minority groups and rural villagers), the One-Child Policy mandated that each family have no more than one child. Those in violation of the policy would face hefty fines (estimated at 3 to 6 times the annual income), forced abortions, and in some cases, mandated sterilizations.

Over the next 30 years, the One-Child Policy shaped the demographics of modern-day China, greatly reducing the country's population growth. According to the United Nations, total fertility dropped from nearly 6 births per woman in 1960 to consistently below 2 in 1990. By some estimates from the Chinese central government, nearly 400 million births were prevented during this period due to the policy. At the same time, the economy grew rapidly and has since become one of the largest in the world. Now an industrialized economy, the country faces a different demographic issue. In China's most recent census, the population of 60 and older grew by 5.44%, while the population between 15 to 59 shrunk by 6.79%. This shrinking population of working-age adults and growing population of elderly retirees has put pressure on the country's workforce and social security system. In an effort to counteract some of these pressures, the government has taken targeted measures to reverse some of the impacts from the One-Child Policy. The country introduced a Two-Child Policy in 2015 and a Three-Child Policy in May 2021. At the same time, both private and public enterprises have worked to adopt uniquely innovative and automated solutions to address these issues.

China's Public and Private Sector

In 2014, President Xi Jinping called for a "robot revolution" that would transform China and the world. In order to address its demographic challenges and increase its competitiveness globally, the Chinese government

started the “Made in China 2025” initiative to push for high-tech manufacturing and gradually replace manual labor with robots. Local governments began to offer generous subsidies in order to promote conversion to automation. In 2017, the city of Dongguan, in the heart of the industrial hub of Guangdong province, invested ¥385 million (\$56 million) toward the automation of factories, according to the *South China Morning Post*.

Private companies have been driving automation to supplement their shortage of workers. Jennifer Pak, a China correspondent for Marketplace.com, reported in a 2018 interview that to many Chinese factories, “automating is not so much about saving money; it’s a matter of survival.” Otherwise, they would have to shut down due to lack of a stable workforce. For example, Ying Ao, a sink manufacturer company quoted in the *Financial Times*, spent more than \$3 million between 2012 and 2016 to replace the jobs of 140 workers with nine robots.

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A 2018 study by the Boston Consulting Group reported that Chinese manufacturers have invested heavily in the past decade to develop automation capabilities across different industries, such as the automotive industry. Between 2011 and 2016, Chinese automakers went from having one-third of the industrial robots that the U.S. automakers had, to reaching parity with the United States. By 2025, it is estimated that 5% of China’s workforce will be replaced by machines. By 2027, 2.28 million jobs in China’s banking, insurance, and securities sectors will be automated, “particularly those involving mechanical and repetitious operations.”

To Chinese people, this transformation will have mixed effects on their welfare. The Chinese government is invested in retraining its workforce, and it is offering subsidies to companies that reemploy laid off workers. According to Jenny Chan, an assistant professor of sociology at Hong Kong Polytechnic University, people who are losing their jobs to automation are trying to

convert to jobs in the growing service sector; however, due to the low-skill nature of the jobs, they often struggle to make a living wage. An optimistic view is that by automating low-skilled jobs, workers will be free to be entrepreneurs, create new companies, and drive innovation. The next decade will be critical in determining the future of China’s workforce and the relationship between it and technology. For a country that has so heavily relied on its cheap labor to drive economic development, China will inevitably be forced to adapt to a new landscape over the next few decades.

Japan’s Demographic History

Japan faces a unique set of demographic challenges that threatens its long-term working-age population. This shortage is caused by Japan’s gradually declining population coupled with a rapidly aging population. Factors such as low birth rates and low immigration are key for the former, whereas the latter is compounded by long life expectancy and high standards of elderly care.

Figures from the Japanese Statistics Bureau in 2020 show that since peaking at 128 million people in 2010, Japan’s population has been declining steadily, with the latest census in 2019 coming in at 126 million people. Crucially, this trend is expected to continue with the population projected to decline to 119 million by 2030 and even further to 93 million by 2060.

The data also show that Japan’s population growth throughout the 20th century was driven mainly by two baby booms in the post-war era (1947-1949 and 1971-1974). However, birth rates have gradually declined since then, reaching a pivot in 2005 where death rates exceeded birth rates for the first time – a trend that has continued. As reported in *The New York Times* in December 2018, historically restrictive immigration policies arising from domestic opposition have also prevented an external solution to the shrinking population, although recent changes are attempting to reverse that trend.

Japan’s aging population has also never been higher. As of 2019, 28.4% of the population was above the age of 65, far exceeding that of other developed nations such as the U.S. (14.6%), France 18.9%), and Germany (21.2%). Exacerbating this, the population of children (ages 0-14) in Japan reached a record low, at 12.1% of the total

population. The resulting workforce shortage is expected to affect sectors such as caregiving, construction, agriculture, and shipbuilding, with Prime Minister Shinzo Abe remarking in 2018 that Japan has to look at several measures including increasing female participation in the workforce, delaying retirement, and increasing the use of robots.

Japan's Public Sector

The Japanese government sees that robot technologies possess the potential for solving social and demographic challenges. In 2015, the Japanese Ministry of Economy, Trade and Industry (METI) published the “New Robot Strategy” and established the Robot Revolution Initiative (RRI) with 226 members from enterprises, governmental stakeholders, research institutions, and individuals. This membership had grown to 560 as of September 2021.

In the 2015 report, METI established five sector focus areas for Japan's Robot Strategy: (1) manufacturing, (2) service, (3) nursing and medical fields, (4) infrastructure, disaster response, and construction fields, and (5) agriculture, forestry, fishery, and food industry.

METI planned to provide R&D subsidies, standards development, removal of regulatory barriers, user-driven design, pilots and “social verification” projects. METI also planned to promote international collaboration, competition among research institutes by contest and award scheme, and introduce open innovation. The Robot Revolution Realization Council, hosted by the Prime Minister's Office, oversees the progress, and METI is responsible for the implementation of the strategy.

In the nursing and medical fields, METI's motivation is for robots to reduce the physical and mental burden of care workers, improve the quality of life of elderly, and enhance productivity and efficiency. METI also planned to provide acceleration of medical product approval process for care robots and to make rental of care robots eligible for public medical insurance. METI aimed nursing care robots to achieve market share of ¥50 billion by 2020.

In 2018, the government announced a robot hospital project with a target of establishing 10 model hospitals by the end of 2022. Per Nikkei Asia, the project is worth ¥100 billion through solicitation of private investments in robot development.

There have not been updates on the robot strategy. Due to the coronavirus pandemic, the World Robot Summit 2020 has been postponed, and METI has yet to establish when it will be held again. However, at the Robot Revolution and Industrial IoT International Symposium 2020, RRI did stress that automation will be accelerated by COVID-19, and that the goal is not just to overcome the crisis post COVID-19, but to become more resilient to crisis.

As the declining birth rates, aging society, and shrinking population of productive age advance, the Japanese government is investing in robot technologies to solve social challenges such as labor shortages, overwork, and productivity growth. The RRI envisions a society where “robots can be found in every corner of Japan.” As other countries are concerned with rising unemployment due to the robot revolution and automation, Japan is confident that the revolution would not impact the job market in the country. The unemployment rate in Japan continues to see a steady decline as robotic automation grows in the country. Perhaps Japan can set an example for other countries that are going through similar demographic changes.

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Japan's Private Sector

While the Japanese government is taking extensive measures to advance automation, much work is left to be done in the private sector. McKinsey & Company published a report stating that Japan has massive potential for automation, and “researchers estimated that automation could displace around 57 percent of the work activities being done across Japan, enabling companies to lower costs and boost productivity despite a shrinking workforce.” The largest area of potential for automation is in physical labor, and a number of companies are beginning to take action.

Telexistence, a robotics company, is using automation to displace work activities in one of the most visible places

in Japan: convenience stores. Backed by the Softbank Group, Telexistence created a kangaroo-shaped robot called Model T that can stack food and drinks on shelves throughout stores. A leading convenience store company, FamilyMart, plans to roll out the Model T in 20 of its stores in Tokyo by 2022. With over 56,000 across the country, convenience stores are an integral part of everyday life and a substantial part of the country's retail sector. Advancing automation will not only support the workforce in this area, but also familiarize the general public with interacting with robots.

Robots and automation are also being applied at greater scale in the building sector. *The Japan Times* reported that only 10% of construction workers in Japan are under 30 years old. Tracy Staedter of Northrop Grumman expounded on how major construction corporations like Obayashi, Kajima, and Shimizu Corporation have invested billions of dollars in robotics to counteract the problem of a shrinking labor force. Obayashi developed robots to make concrete dams; Kajima developed self-driving bulldozers to excavate and dump materials; and Shimizu Corporation developed Robo-Welder and Robo-Buddy to continuously weld and bolt materials. Labor shortages have forced Japan to produce innovative solutions, and with many countries soon to face the same problem of

aging populations, the Japanese private-sector companies have laid out a template to follow to compensate for the shrinking workforce.

Conclusion

China and Japan have turned to automation to address the issue of a shrinking working-age population. In some ways, they have taken similar approaches by advancing the manufacturing, construction, and service sectors, and both countries are using robots to meet the inevitable gap in the workforce supply. However, they also differ in approach, with the Chinese government making direct investment and subsidies for automation efforts, compared with Japanese companies using their own capital to develop specialized solutions to the shrinking workforce. While efforts are underway to progress automation to fill the gap in resources caused by a shrinking working-age population, it will take time to realize the full potential. Nevertheless, China and Japan stand out among industrialized nations for taking a proactive stance in solving a fundamental economic problem.

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