

**Utilizing Technology to Address
Socio-Economic and Environmental Challenges:
Case Study from Japan's Society 5.0**





Society 5.0

• Japan

Author

Rizqi Ashfina

Editor

Anisa Pratita Kirana Mantovani

Designer and Layouter

Naufal Alatas Radityasakti



Summary

This paper argues that Japan's Society 5.0 is a new initiative under Shinzo Abe's administration, allowing the government to forge a fully innovation-driven society that addresses the most pressing socio-economic challenges in the country, namely the shortage of skilled labors as derived from aging population problem and revives the stagnant economic growth. This paper also puts a noteworthy discussion of how the initiative allows Japan to take the lead the fourth industrial revolution and becomes the role model for other nations. This paper argues that the degree of a nation's ability to conquer global uncertainty is indispensable from the involvement of innovation actors. The case of Society 5.0 creates a lesson to learn to other nations that maximizing the viable resource and comparative advantage can address their domestic problems.

Introduction

Japan is one of the nations that manage to resurrect its economic development from a developing to the developed nation until it becomes the leading nation in advanced technology as of today. Its ability to transfer the technologies through the import-substitution process has enabled Japan to have rapid economic growth.¹ It offers a new development strategy for other developing countries. However, Japan has grappled with pressing socio-economic challenges at the domestic level. A few problems to name are the sluggish economy, aging society and sinking birthrate that causes a shortage of labors, and climate change.

In responding to these challenges, the Japanese government launched Society 5.0. The strategy is part of Shinzo Abe's economic strategy (henceforth Abenomics). Abenomics is also known as a set of audacious economic policies that is comprised of monetary easing, fiscal stimulus, and growth strategy to revitalize Japan's economy.² In a broader sense, it also plans to employ technology to address the problems. At the same time, with the advancement of technology that leads the world to the fourth industrial revolution, Society 5.0 has an indirect benefit for Japan to conquer the global structural change.

Seeing this phenomenon, this case study aims to learn further the intersection of Society 5.0 in addressing the challenges and how the strategy has enabled Japan to conquer the fourth industrial revolution. This case study offers two contributions. First, this case study will showcase a study where a nation has been able to implement its competitive advantage to solve its domestic problems. Second, the utilization of full-fledged of technology has an indirect implication to conquer the fourth industrial revolution. This case study is critical because as the world is now entering the fourth industrial revolution, there is an on-going debate between nations to find the most effective way to respond the advanced development of technologies,³ such as the surging use of Artificial Intelligence to the economy.⁴ Furthermore, most of the literature is more focused only on analyzing either the opportunities or harms it might pose to nations. Hence, this paper intends to fill the literature gap using Japan as the case study.

This paper will highlight three key issues in Japan, such as the aging population, a stagnant economy, and environmental challenges. The first part of this case study discusses the overview of the concept of Society 5.0 and further explanation of it and how this is aligned with Abenomics economic goal. In the second part, this case study elaborates how the advanced form of technology, such as AI and robots are employed to resolve each issue, namely aging population and shrinking workforce, stagnant economic growth, and addressing the environmental challenge. In the last part, this paper examines how cooperation between innovation actors, such as industries or private sectors, universities, and governments is essential to boost Society 5.0 to succeed.

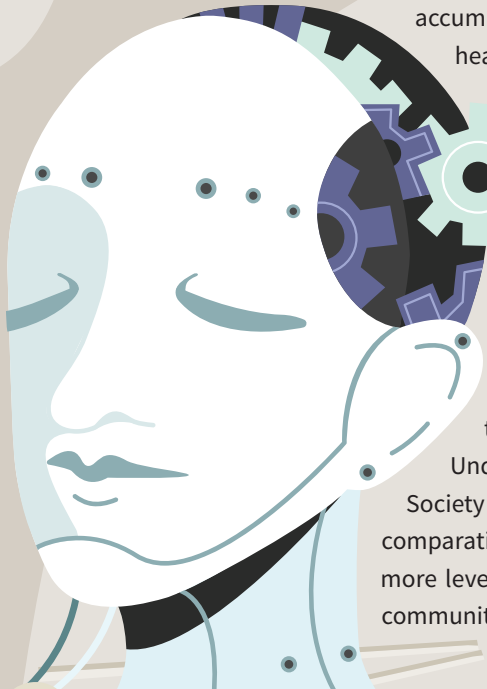
The Concept of Society 5.0

Society 5.0 is Japan's new initiative to create a super-smart, high-tech society. It incorporates the technological innovation of the fourth industrial revolution, namely the Internet of Things, big data, AI, robot, and sharing economy to grapple with modern-day problems. With this initiative, Japan has the ends to create healthier lifespan, mobility revolution, creating the next generation of supply chains, developing more pleasant infrastructure and towns, and financial technology.⁵ An important note of this initiative is that although it heavily focuses on the employment of technology to the fullest, Society 5.0 puts human in the center stage and primary actor, whereas technology is used only as means to attain the end to a prosperous society. Shinzo Abe introduced the comprehensive initiative as part of his economic strategy in the 5th Science and Technology Basic Plan and the adopted by the Japanese Cabinet in January 2016. It is the basic macro policy or orientation of the technology. The plan is derived from Japan's Science and Technology Basic Law. The plan is regularly formulated once every year.⁶



Historically, the first development of Society 5.0 was issued in Japan's first growth strategy in 2013. Along the process, there have been many revisions until 2017 where the strategy has fully developed the concept of Society 5.0.⁷ The idea of Society 5.0 is the continuation of humanity trajectory, starting from hunting society (Society 1.0), agricultural society (Society 2.0), then the industrial society (Society 3.0), and the information society (Society 4.0). Society 5.0 was then further developed, creating a new social structure to address the world problems caused by the increasingly globalized world.⁸ Where competition gets severe, wealth gets more concentrated, and regional inequality.⁹ In addition to that, this innovation-driven initiative is planned to anticipate any plausible implications of long-term global uncertainty.

Within the scheme of Society of 5.0, it allows the integration of cyber and physical space to generate data and create new values to formulate possible solutions. Another goal envisioned in this scheme is that to manifest a super smart society where the full-fledged implementation of technology may produce a considerable amount of high quality of goods and services necessary to meet basic societal needs.¹⁰ There are several reasons why the Japanese government selects the five sectors of technological innovation. First, the selected technologies are among the strategic sectors that Japan possess. In terms of big data, Japan has an abundant accumulation of real data from their universal health care system and operating data from manufacturing facilities. Second, as is well known, Japan is also one of the technologically developed nations. Japan has reputable attainment in manufacturing industries and experience in research. It allows Japan to produce goods and services based on the utilization of information technologies, such as Big Data and AI. Understanding its competitive advantage, Society 5.0 enables Japan to employ its comparative advantage in technology to have more leverage and appealing in the international community.¹¹



Society 5.0 in Addressing Socio-Economic Challenges in Japan

The growing aging society that leads to high demand for care of the elderly population and increasing medical and social security expenses and stagnant economic growth has become the underlying interest of Society 5.0 for the government. This section further analyzes the challenge and how Society 5.0 is a strategic tool employed to grapple the challenges.

1. Ageing Population and Shrinking Workforce

As is well-known, Japan is the nation with the highest life expectancy in the world. It is without a doubt that with the advancement of science and technology they possess the government can provide longer and healthier society. When people get healthier, they become more productive and contribute to run the economic wheel. However, this poses a trade-off when high life expectancy and low birth rate combined. As a result, the aging population exists, and the younger generation shrinks.¹² This demographic challenge confronts Japan today as the birth rate keeps on falling and its population is shrinking rapidly.¹³



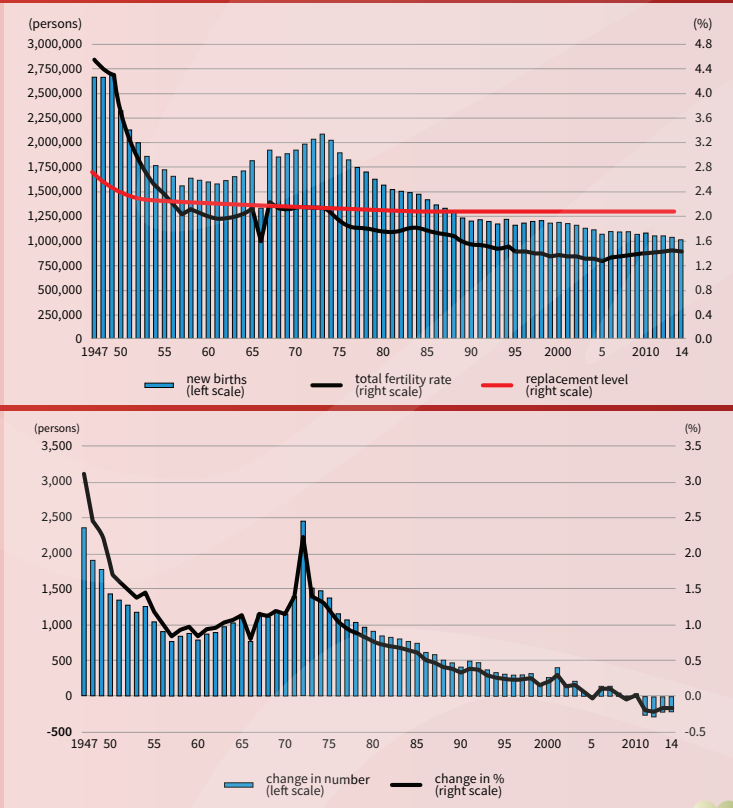
It is not a new problem in Japan and the discussion to address the aging population has been proliferated over the decades. The rapid shrink of population has made Japan enter the 'super-aged population' phase. This demographic challenge presents anxieties for many people in across sectors.

The problem of 'aging population' is subject to imputation as many argue that it is the causal factor of Japan's shrinking economy and productive workforce.¹⁴

To understand the issue, it is noteworthy to put into context that the emergence of the problem dates back to the pre and postwar era. Both determine the long-term development of Japan's fertility rate and life expectancy.

In the pre-war period, Japan experienced high fertility and mortality rates until the end of the Taisho era. In the 1920s, both mortality and fertility rate started to decline moderately. However, the declining fertility rate was not as prevalent as opposed to the postwar period. This circumstance urged the government to launch a new policy that rules every couple in Japan to give birth to five children starting in the next decade. This new policy is also known as "Beget and Multiply" (*Umeyo, Fuyaseyo*) policy. As a result of this, the fertility rate surged in the 1940s. However, the total fertility rate deteriorated after the end of World War II. Japan experienced a 50% reduction in their total fertility rate in a decade due to the massive abortion. The situation changed when the baby boom generation was born, and life expectancy increased at the same time, creating demographic dividend for Japan after WW II.¹⁵ The declining population rate may also be seen below.

Figure 1. Development of Total Fertility Rate Japan and Change in Population



Source: Ministry of Health, Labour, and Welfare "Vital Statistics" and Ministry of Internal Affairs and Communications "Current Population Estimates."

As illustrated above, the total fertility rate in Japan has been decreasing, and it leads to a drastic change in population. The increasing proportion of the aging population generates a problem where older adults retire and are no longer considered as a workforce. This situation puts Japan in a shortage of human resources to maintain productive activities. One primary feature in modern fertility behavior that creates drastic change is delaying first marriage and the increase of decision among the young population to "never get married." According to Satoshi Shimizutani (2016), the average of the young population to have their first marriage was around 25.9 for males and 23.0 for females in 1950.¹⁶ However, it changed in 2013 to 30.9 for males and 29.3 for females. Aside from delayed marriage, another detrimental factor is the increase of proportion between males and females who have never been married. The proportion of "never married" population up to age 50 and it accounts for less than 5%.¹⁷

The decrease of population and increase aging society causes concern for the government. Various efforts have been undertaken by the government to respond to the low fertility rate. A noteworthy observation is on the expansion of family policies and programs in three areas; [1] childcare services; [2] parental leave schemes; and [3] financial assistance in the form of child allowances. Starting from 1994, this program has been implemented to provide childcare services and encourage work to be more family friendly. As for parental leaves scheme, government since 1992, has imposed a policy to offer 12 months of parental leave for parents who meet the minimum work requirements. Parental leaves are now paid at 50% of monthly salary before leaves. In the last program, since 1972, the government has offered child allowance scheme to cover third, and higher-order children in households should receive the income below a certain threshold. Within this child allowance, the government covers the payment from children's birth to their high school education.

This allowance is possible to extend to cover first and second births should the households' income be the threshold.¹⁸



However, all the program schemes government provided are still inadequate to address the issue. Japan still experiences declining population growth. This implicates the shortage of labors and necessitates the government to open its immigration door for foreign workers. In 2017, it was estimated that Japan had 1.28 million foreign workers.¹⁹ Hence, the strategy through Society 5.0 initiative employs the full-fledged advanced technology that includes AI and robot to solve the shortage in labors. AI and robots are projected to do inspection and maintenance on various infrastructures, namely roads, bridges, tunnels, and so forth. Furthermore, the employment of this technology aims to minimize accidents risk and have efficient work. Therefore, productivity will increase.

Although Society 5.0 is yet fully implemented in Japan, several pieces of evidence show how Japan has begun implementing its advanced technology. Japan is recorded as the most significant users of robots at the global level. Japan employed 303 per 10,000 employees in 2016.²⁰ The implementation in real life situation is also vividly seen. For instance, humanoid robots are used widely to promote recent smartphones deals. AI and humanoid robots are employed on display at museums. In a larger picture, first, AI and robots will be employed most in health and social care sector in which Japan has the biggest headache of the labor shortage. Robots will assist people with mobility problems, the particularly elderly population in Japan. Second, the financial sector also potentially employs AI or robots. Nomura Securities can be an example in the financial sector on how Japan has begun using AI software to help in doing stock trading.²¹ This has showcased how the real implementation of Society 5.0 has already started in Japan across sectors.

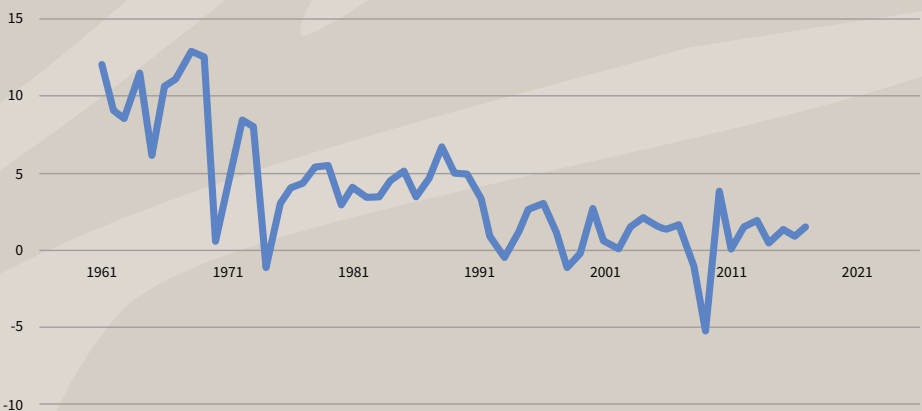
Although Japan is leading the advanced technological development, the decision to employ robots and AI to human's every day lives might still face some challenges. First, most robots and AI produced by Japan have inflexible skills in which they lack interpersonal skills and ability to analyze the social context, understand the meaning, and make choices. These skills are essential, particularly to address health and social care sectors where the workers need some degree of interpersonal skills and understanding of the contextual information to take care of the elderly population. Second, the launching of Society 5.0 poses a potential sense of fear that is widespread nationally. Japanese are afraid that their job will be taken away by robots and the only jobs that remain are the high qualification ones.

2. Stagnant Economic Growth

In the 1980s, Japan along with other East Asian economies had shown a profound growth and rapid economic growth, social, and political transformation.²² This Asian Miracle that occurred offers a new development theory alternative called 'developmental state' in which state has the role in reshaping its industrial policy. It then changed the debate in development theories in which scholars put a noteworthy discussion to emulate Japan's economic policy prescription footsteps. Within this period, the Japanese economy ruled the world. However, the miracle in Japan's economy did not last long. Over the past years, Japan's economy experiences dismal.²³

Japan's government takes this as a serious for their underperforming economy. This year, the economy gets even worse in Abe's administration where the economic decline hits the lowest point. This also creates anxiety among the society where many complain about the slow growth and significant government debt. The anxiety is worsened given that there is a possibility of deflation and for the rapidly aging population.²⁴ Nikkei Asian Review undertook the opinion survey to know how anxious society towards the economic condition. Based on the survey, 39.8% of respondents are pessimistic to believe that their economic condition will improve and only 7.8% of respondents believe that the economy will be improving for the remaining span.²⁵ The stagnant economy in Japan is illustrated in the figure below.

Figure 2. Japan Annual GDP Growth (%)



Source: World Bank (2017).

As illustrated in the above figure, it is seen that Japan experience sluggish economic growth. One of the factors contributed to this is poor macroeconomic conditions that have contributed to the deterioration of the Japanese financial sector. According to Hoshi and Kashyap,²⁶ The stagnant economy implicates the banking system and then with the poor condition of the banking system, it impedes the national economic recovery. The problem in the Japanese economy is principally derived from the shortage of skilled labors and a considerable percentage of the aging population. In 2015, Japan's labor productivity based on purchasing power parity was amounting to USD 74,315.²⁷ This attainment made Japan in the lowest position among other nations in the Group of Seven. To fix the sluggish macroeconomic condition and labor productivity, the Japanese government responds by taking the initiative to employ full-fledged new technology that involves AI and robots. The two technologies will fill the shortage of skilled labors. This initiative will increase the potential sectors of Japan in the digital economy and the AI market. Having a competitive advantage in technology, it is estimated that the AI investments by Japanese companies will grow by 75%.

Moreover, the AI market will double its size every 18 months. Through this estimation, by 2020, the Japanese AI market is predicted to reach USD 200 billion and USD 770 in 2030. This level of percentage will cover one-third of the AI global market. As Japan is an advanced nation in technology and embraces AI in many forms, it is possible for Japan to increase its economic competitiveness.²⁸



Two things reflect the ability of Japan to utilize its competitive advantage to revive the stagnant economic growth. First, Japan has been the leading country in producing robots and for its industrial employment. It is estimated that Japan has exported robots amounting to USD 1.6 billion. Second, Japan has also been recognized as one of the most robot-integrated economies in the world. It is based on the total number of robots employed over the total of human employment in the manufacturing and industry.²⁹ Nonetheless, the surge of production of robots and industrial use might still face the challenges as discussed on the first section that the robots might not be able to think abstract things and have the ability to interpret the meaning as well as contextual understanding. It might be difficult for Japan to fully implement the technology across sectors if advanced technology does not acquire those things. Moreover, assuming that Japan might overcome its stagnant economic growth, the biggest question would be whether it would create inequality among the society as robots and AI take over the human role and only high qualifications that are offered. Low-skilled labors might find difficulties to find jobs that fit with their abilities.

Addressing Environmental Challenges

Japan is arguably one among other nations that is concerned about environmental protection. Until today, Japan has been actively advocating and contributing to protecting the environment. Its considerable progress sees it both in the national and international level. Domestically, Japan has introduced many environmental policies, laws, and institutions since the 1990s. One of the relevant environmental law was introduced in 1993. The new environmental law allows Japan not only to protect the domestic environment but also the global environment. Other than that, Japan is among consistent nations to actively contribute to the global level. Since 1992, the Japanese government signed the United Nation's moratorium on driftnet fishing, and it was into effect in 1992. Not only that Japanese complies to the international environmental laws, but Japan has also been the largest donor for international environmental programs.³⁰ However, seeing how the adverse effect of climate change and environmental degradation has been increasing, action on the level of signing and ratifying an agreement is not adequate to save the environment. Hence, under the scheme of Society 5.0, the employment of new technologies is expected to reduce GHG emissions, reduce food loss, promote more sustainable industrialization.³¹



Strategy to Implement Society 5.0

As synthesized from the discussion above, Japan is about to grapple their most-challenging societal problems through forging the innovation-driven society. With the abundant and competitiveness in new technological innovation, Japan will be able to address the shrinking skilled labors and the dismal economy as derived from the aging population problem. A further noteworthy implication of this strategy is that Japan will champion the fourth industrial revolution and become the role model for other nations. However, this should be taken into account that the successful implementation of Society 5.0 is indispensable from the involvement of varying actors, such as experts, society, particularly women and young people, and other important innovation actors. An important involvement of pertinent stakeholders is seen by how the Ministry of Education, Culture, Sports, Science, and Technology is in the process of adjusting the education system to fit with the objectives of Society 5.0 starting from primary school to university education. The radical approach is under deliberation to implement a more flexible education system, particularly in grade. In the traditional system, there is a failing or passing grade. In a flexible system, students who do not do well in mathematics subject, they can retake the coursework until they can fully understand the materials.³²

As we could also see from the previous discussion, the new employment of robots and AI implies that important innovation actors, such as governments, universities, and private sectors have created enabling environment to the growth of mass production of robots and its industrial use. Policies across sectors from education as mentioned above and technology and basic economic plan have synchronized with the concept of Society 5.0 and had an adjustment to the changing environment.

Conclusion

The case of Society 5.0 is a noteworthy discussion for the public discourse on how the fourth industrial revolution might not always be a challenge for nations to conquer. Amidst the discussion on what best strategies to cope up with the fourth industrial revolution, Japan has the leverage to maximize its comparative advantage of advanced technology. This paper argues how Japan utilizes its technology to address its most pressing socio-economic challenges, ranging from the aging population, shortage of skilled labors, stagnant economic growth, and environmental challenges. This is shown by employing full-fledged new technologies that involve AI, robots, financial technology, blockchain, and Internet of Things (IoT). Although the concept of Society 5.0 was fully developed in 2019, Japan has conducted early employment of advanced technology in its everyday lives. However, two things that Japan should take into account is that the implication of Society 5.0 might pose negative sides, such as the increase of fear from the society on losing their jobs and the ability of advanced technology to meet the needs of the specific sector with the most challenging problem. The critical component of the successful implementation of Society 5.0 if there is an active collaboration of essential stakeholders. Although it is not heavily emphasized, several ministries have taken action to adjust to the changing environment, such as changing the traditional curriculum to be more flexible. Private companies have also implemented advanced technology in their productive activities. As this case study explores Japan's ability to utilize its leverage on technology, the prescription might not be suitable for other nations. However, regardless of its no one-size-fits-all takeaways for other nations, particularly developing nations, this case study would at least provide an overview about the future of global economy and development where technology will have a role and how it is crucial to improve technological capabilities.

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Center for Digital Society

Faculty of Social and Political Sciences
Universitas Gadjah Mada
Room BC 201-202, BC Building 2nd Floor,
Jalan Socio Yustisia 1
Bulaksumur, Yogyakarta, 55281, Indonesia

Phone : (0274) 563362, Ext. 116
Email : cfds.fisipol@ugm.ac.id
Website : cfds.fisipol.ugm.ac.id







