

The University of San Francisco
**USF Scholarship: a digital repository @ Gleeson Library |
Geschke Center**

Master's Projects and Capstones

Theses, Dissertations, Capstones and Projects

Spring 5-18-2018

起死回生 (Resuscitation): Japan's Search for Machines and their Meanings

Justin P. McDonnell

University of San Francisco, jpmcdonnell@dons.usfca.edu

Follow this and additional works at: <https://repository.usfca.edu/capstone>

 Part of the [Asian History Commons](#), [Asian Studies Commons](#), [Buddhist Studies Commons](#), [Inequality and Stratification Commons](#), [Japanese Studies Commons](#), [Other Philosophy Commons](#), and the [Social and Cultural Anthropology Commons](#)

Recommended Citation

McDonnell, Justin P., "起死回生 (Resuscitation): Japan's Search for Machines and their Meanings" (2018). *Master's Projects and Capstones*. 868.

<https://repository.usfca.edu/capstone/868>

This Project/Capstone is brought to you for free and open access by the Theses, Dissertations, Capstones and Projects at USF Scholarship: a digital repository @ Gleeson Library | Geschke Center. It has been accepted for inclusion in Master's Projects and Capstones by an authorized administrator of USF Scholarship: a digital repository @ Gleeson Library | Geschke Center. For more information, please contact repository@usfca.edu.

起死回生(RESUSCITATION):
JAPAN'S SEARCH FOR MACHINES AND THEIR MEANINGS

Justin Peter McDonnell

Abstract

Japan's lost decade(s) ushered in a new era of economic and societal malaise, marked by a shrinking population, an increased proportion of elderly people, inequality, neo-nationalism(s), uncertainty, and isolation. This project seeks to understand how Japan is trying to address these issues and reconstruct itself from the lost decade(s) with the use of artificial intelligence (*jinkou chihou*) and robotics along with the societal implications of this technology. This interdisciplinary research utilizes innovative, historical narratives (Morris-Suzuki, 1988, Hornyak 2006), and the socio-cultural milieu of Japan and its traditions (Allison 2013; Katsuno 2010) to further appreciate and acknowledge Japanese perspectives and thought on AI and robotics and their uses. Furthermore, investigating government-issued publications (*Innovation 25; New Robot Strategy; Japan Revitalization Strategy*), and contemporary literature by AI field experts (Harari 2017; Bostrom 2017; Frase 2016), this paper argues that Japan's futurist visions do not take into account the problematic ramifications of AI. In so doing, this paper critically reimagines a best response and re-envisioning of an unfolding and possible future. Research findings may also hold significance in other cultural and national contexts, particularly in nations with shrinking and aging populations, class stratification, and ethnic and techno-nationalism(s).

(Word count: 191)

Keywords: Technoculture, Japanese Studies, Artificial Intelligence, Robotics, Japanese History, Japanese Philosophy, Labor

TIMELINE

- 1603-1868** *Karakuri Ningyo* puppets are used during the Edo period for entertainment and religious ceremonies.
- 1929** *Gakutensoku* is the first robot created in Japan, with the ability to move its head and hands.
- 1945** World War II and Japan's imperial project (1890-1945) are brought to an end, ushering in a new period away from a militaristic expansionist agenda and toward technological nation-building.
- 1950** Alan Turing proposes the Turing Test.
- 1970** The first anthropomorphic robot, the WABOT-1 is built at Waseda University in Japan. This robot consists of a limb-control, vision and conversation system.
- 1974** Engineer Masahiro Mori releases *Buddha in the Robot*, discussing the metaphysical implications of robotics.
- 1989** Japan's asset bubble bursts, sending Japan into a generation-long stagnation.
- 2000** The UN estimates there are 742,500 industrial robots worldwide, with over half located in Japan.¹
- 2012** 8.7 billion devices are connected to the internet.²
- 2015** *New Robot Strategy* is issued, positioning Japan to become an AI and robotic nation ahead of the Tokyo 2020 Olympics.
- Experts predict that an AI world will occur within the 21st century, and AI will outperform humans in translation, writing, and trucks within the next 10 years.³

¹ United Nations, Economic Commission for Europe, "The Boom in Robot Investment Continues – 900,000 Industrial Robots by 2003 UN/ECE Issues Its 2000 World Robotics Survey," news release, October 17, 2000, Unece.org, accessed May 6, 2018, <http://www.unece.org/press/pr2000/00stat10e.html>.

² Tony Danova, "Morgan Stanley: 75 Billion Devices Will Be Connected To The Internet Of Things By 2020," *Business Insider*, October 02, 2013, accessed May 06, 2018, <http://www.businessinsider.com/75-billion-devices-will-be-connected-to-the-internet-by-2020-2013-10>.

³ Katja Grace et al., "When Will AI Exceed Human Performance? Evidence from AI Experts," Arxiv.org, May 30, 2017, accessed March 15, 2018, <https://arxiv.org/pdf/1705.08807.pdf>.

Japan hosts its first robot wedding.⁴

2016 Lee Sedol is defeated by AlphaGo, an artificially intelligent system designed by a team of researchers at DeepMind, owned by Google.

The Day a Computer Writes a Novel comes close to winning a Japanese national book award, bringing AI to new heights in the creative frontier.⁵

2017 Japan grants residency to robot, Shibuya (freedom).⁶

⁴ Danielle Demetriou, "First Robot Wedding Takes Place in Japan," *The Telegraph*, June 29, 2015, accessed May 06, 2018, <https://www.telegraph.co.uk/news/newstopics/howaboutthat/11705149/First-Robot-wedding-takes-place-in-Japan.html>.

⁵ Ben Schiller, "This Japanese Novel Authored By A Computer Is Scarily Well-Written," *Fast Company*, March 28, 2016, accessed April 19, 2018, <https://www.fastcompany.com/3058300/this-japanese-novel-authored-by-a-computer-is-scarily-well-written>.

⁶ Anthony Cuthbertson, "An AI Chatbot Just Became a Resident of Japan," *Newsweek*, November 06, 2017, accessed May 06, 2018, <http://www.newsweek.com/tokyo-residency-artificial-intelligence-boy-shibuya-mirai-702382>.

GLOSSARY

Artificial Intelligence (AI)	The theory and development of computer systems able to perform tasks that normally require human intelligence.
General AI	Artificial Intelligence that can perform any task that a human can perform.
Human Intelligence	The mental capacity to learn from experience, adapt to new situations, to handle abstract concepts. This includes high levels of motivation and self-awareness.
Intelligence Explosion	AI improves itself, exceeding the intellectual potential on human intelligence by great magnitudes.
Narrow AI	Artificial Intelligence that focuses on specifically solving one problem.
Superintelligence	Machines that exponentially surpass humans in general intelligence. ⁷
Trans-humanism	The belief that humans can evolve beyond their current physical and mental limitations, especially by means of science and technological advancements.
Technological Singularity	Made popular by the works of Ray Kurzweil, this refers to superintelligence that will result in unimaginable changes to human beings, their abilities, and ecosystems. ⁸
Techno-nationalism	The use of technologies for purposes of developing a national(ist) project. It is also how technology affects society and culture of a nation. ⁹
Turing Test	A test measure to determine whether a machine can demonstrate human intelligence in thoughts, actions, and language.

⁷ Ben Dickson, "What Is Narrow, General and Super Artificial Intelligence," TechTalks, March 16, 2017, accessed May 06, 2018, <https://bdtechtalks.com/2017/05/12/what-is-narrow-general-and-super-artificial-intelligence/>.

⁸ Peter Rejcek, "Can Futurists Predict the Year of the Singularity?" *Singularity Hub*, March 31, 2017, accessed May 06, 2018, <https://singularityhub.com/2017/03/31/can-futurists-predict-the-year-of-the-singularity/#sm.0000nqfa8hs8tdj9ti2294u0jsjyc>.

⁹ Marco Adria, *Technology and Nationalism* (Montreal: McGill-Queen's University Press, 2014), 45.

Introduction

Artificial Intelligence, particularly the fields of machine learning and robotics, is having a transformational impact on societies around the world. Massive amounts of computational power with the access to large structured and unstructured volumes of data sets has fueled the technological revolution in the early twenty-first century, in major areas such as health, science, military, transportation, and economics. Its power and presence will only magnify in the years and decades ahead as we continue to improve upon machines and their capabilities. Despite such promise, many scientists and philosophers are deeply concerned about the implementation and use of advanced machines that not only exceeds human intelligence (superintelligence), but can do tasks better and more cheaply than their human counterparts. Such usage, they warn, can also lead to a range of possible future scenarios—many of which are dystopic, broken, and unequal—i.e. systems penetrated by non-state actors with a motive to manipulate elections and/or kill others (or everyone via nuclear codes). Furthermore, the development of algorithms and machines raises questions about what it means to be human and what the physical and spiritual future of life may encompass, especially if machines can exhibit sentience, including self-awareness (with further potential for a deep-learning system that could give rise to human consciousness) and the ability to detect and respond to human emotions in real time.¹⁰

Utopian and dystopian tales abound, and the issues are the subject of intense debate. For now, human-level artificial general intelligence and superintelligence remains in its infancy. Today's AI is properly referred to as narrow AI, which can outperform humans but only in a specific and narrow task. Whether or not we will engineer our own extinction is difficult to

¹⁰ Nick Bostrom, *Superintelligence: Paths, Dangers, Strategies* (New York: Oxford University Press, 2017), 125-127.

predict, but it is imminent that machines will outperform humans at everything and the intelligence explosion is possible.¹¹

Oxford's Future of Humanity Institute in 2015 surveyed AI researchers to answer when an AI-centric world would occur. North American researchers predicted that AI will outperform humans in 74 years, while researchers from the Asia region expected it could happen much sooner, in only 30 years time. That may be because it is already being deployed in East Asian countries in ways unbeknownst to their western counterparts, especially in Japan.¹²¹³

Japan is a country that is embarking on a robot revolution and an AI future ahead of the 2020 Tokyo Olympics. Government and private sector publications on AI indicate a utopian vision and tone of confidence in AI's ability to address an aging and shrinking population, labor shortages, and even moral and social decay, which began in the 1990s. This project contextualizes—both historically and culturally—how Japan developed its affinity towards AI and some of the positive usages at the time. At the same time, this research examines the dangerous consequences of ignoring the fallout from the lost decade and of Japan's nostalgic vision of AI. Indeed, Japan is ignoring possible problems involved in the adoption of these evolutionary technologies. This essay argues that the implementation and social integration of algorithms and advanced machines will pose social and ethical challenges and negative consequences to the nation and its citizens in the post-postwar period, outweighing its benefits.¹⁴

¹¹ It was first described in John Good Irving's work in 1965, *Speculations* concerning the first ultra-intelligent machine.

¹² Katja Grace et al., "When Will AI Exceed Human Performance? Evidence from AI Experts," Arxiv.org, May 30, 2017, accessed March 15, 2018, <https://arxiv.org/pdf/1705.08807.pdf>.

¹³ *New Robot Strategy*, report, 2015, accessed March 25, 2018, http://www.meti.go.jp/english/press/2015/pdf/0123_01b.pdf.

¹⁴ Japan's AI budget is far less than the US and China, at an approximate \$720 million according to the draft budget. The US budget is estimated at 500 billion yen, and 450 billion by China. In the Japanese private sector, this number is about 600 billion yen annually, while the US invests more than 7 trillion. "Japan's Budget for AI to Be Less than a Fifth of That Planned

Literature Review

Contemporary Japan faces a multitude of challenges, which first surfaced during the lost decade(s) of the 1990's. This period disturbed the socio-economic stability and sense of home in the lives of its citizens. While it ushered in a period of broken human connectivity, it was precisely during this period that scientists began creating humanoid robots to interact with humans and enable more intimate relationships between humans and machines. Katsuno (2011) examines the concept of *kokoro* (heart, mind embodiment) in machines, to establish heart-to-heart relationships and emotional touch.¹⁵ It is not coincidental that humanoid robots and *kokoro* emerged during the lost decade to help restore a sense of lost humanity.

Today, current government publications and projections, including *Innovation 25* (2007), *New Robot Strategy* (2015), and *Japan Revitalization Strategy* (2017) position Japan as a robotic superpower with state-of-the-art artificial intelligence ahead of the 2020 Olympics. Their pronouncements are optimistic and reflect a utopian re-visioning of the future and a necessary component of Japan and world's evolutions. They also express hope at restoring a sense of lost

by U.S. and China," *The Japan Times*, February 25, 2018, accessed April 19, 2018, <https://www.japantimes.co.jp/news/2018/02/25/business/tech/japanese-government-spending-ai-less-20-u-s-china/>.

¹⁵Shinkawa Shin'ichi introduces Honda's humanoid robot, Asimo. "I want to tour all over Japan with this robot, giving children dreams . . . I want to use this robot to rescue children from suicide and social withdrawal. The robot can do it. Look at the smiles in this picture. That says everything! Most children nowadays in Japan don't smile like this, because they lack space in their hearts (*kokoro ni yoyu ga nai*) due to their academic mindsets focused on entrance exams and the accompanying reduction in intimate, human relationships (*ningenkankei ga kihaku ni naru*). In this condition, they don't have dreams to sustain their lives . . . [But] when people actually see a robot with their own eyes, they often say to me, 'The robot looks alive!' They have a vision of something that transcends our reality, something that lies beyond us . . . I think they feel the heart in the robot (*robotto ni kokoro wo kanjiteiru*). And this means that they restore and even develop imagination and sensitivities, heart and humanity in their interactions with the robot. The robot has such amazing, magical power. Hirofumi Katsuno, "The Robot's Heart: Tinkering with Humanity and Intimacy in Robot-Building," *Japanese Studies* 31, no. 1 (2011): 106, accessed April 1, 2018, doi:10.1080/10371397.2011.560259.

humanity. Furthermore, the publications reflect earlier reports dating back to the early post-war period, as the country began preparing and manufacturing its new technological advancements. The early publications, including the Industrial Structure Council's reports (1969,1981) were also utopian in tone as articulated by Morris-Suzuki (1988). However, less attention has been given to the ways in which artificial intelligence can create or be used to harness unfavorable disruptions and destruction.

The recent works of AI field experts provide cautionary assessments of an AI-centric future where the landscape of threats is increasing, and whereby creating the conditions to mitigate negative effects and ethical consequences, especially as AI begins to exceed human capabilities in ways that we haven't yet fully imagined, become more urgent. Harari (2017) postulates that an AI future will bring about a useless class of humans, humans who are neither employed nor employable. Frase (2016) and Bostrom (2017) rely on probability theory to navigate possible scenarios and also to argue that AI threatens humanity in the near and distant futures.

If AI truly poses a threat to humanity, social relations, and labor, then Japan's utopian vision of transformational change and a robotics future deserves further scrutiny. Japan is failing to fully consider the possible problems that AI creates, particularly in a country that is already one of the most automated in the world, with one of the highest densities in robotics. Do AI's benefits outweigh its consequences in a Japanese context or vice-versa? That is what I hope to answer in the following pages and sections.

Internal Machines and Historical Developments

In this section, my analysis investigates the historical and socio-cultural developments that have made it possible for the development and commercialization of this dynamic and fast-changing sector. In particular, I explore this question: How did Japan come to develop an affinity

for AI and robotics as well as a utopian vision of an AI-centered world? Furthermore, I scrutinize Japan's long-term economic stagnation that ensued from the lost decade(s), which contrasts to Japan's earlier global prowess. This examination helps us to understand how Japan got to where it is today, with social classes becoming more unequal country and life more precarious. To discuss the rebuilding of contemporary Japan via technological efforts, it is first essential to examine the lost decade(s) and the social and economic malaise that it brought about, which continues into the present day.

To begin, Japan has a long tradition with machines dating back to the 17th century. *Karakuri ningyo* (からくり人形) were traditional mechanical puppets dating back from the Edo period (1603-1868) used at festivals to tell stories and perform dances from Japanese history and legends, and to serve tea.¹⁶ They took on a techno-religious component as well, embodying the *kami* (spirits or natural forces like rivers or mountains) in the Shinto tradition. The use of machines in Japan illustrated a difference with Western societies in that period utilizing the advancement of automata for scientific knowledge as opposed to art and sociable development, if not religious and scientific compatibility and synergy.¹⁷

The Edo period would come to an end after Commodore Perry forced Japan to open relations with the West in 1854, ushering in a new period of economic and technological growth. The restoration of the emperor under the Meiji shifted national priorities, and Japan was reconstructed into a modern nation-state. The newly-established government took initiatives to advance industrial development via western modernization under *shokusan-kogyo* (encourage industry) and *fukoku kyohei* (enrich the country, strengthen the military). The effects of the

¹⁶ The *karakuri* is still existent today in many festivals throughout Japan, including at the Kamezaki Shiohi Matsuri where tribute is made to the late Emperor Jinmu.

¹⁷ Timothy N. Hornyak, *Loving the Machine: The Art and Science of Japan's Robots* (Tokyo: Kodansha International, 2006), 14-19.

modernization project could be felt in the early decades of the twentieth century as the country continued to become more acutely aware of the immense power of technology and industrialization, particularly in the face of war.¹⁸

The word *robot* was first introduced into Japan in 1921 with R.U.R (Rossums's Universal Robots), a play by Czech writer, Karl Capek about the creation of humanlike machines who turn on their masters and come to dominate the human race.¹⁹ It was staged in Tokyo's *Tsukiji* Little Theater in 1924, titled *Jinzo Ningen* (Artificial human).²⁰ Science fiction stories, films, and the first creations of early robots in Europe and the US a few years later in 1927 prompted discussion and intrigue in Japan as well an early boom in robotics. *Gakutensoku* (學天則, learning from natural law) was created by Makoto Nishimura to celebrate the crowning of Emperor Hirohito (裕仁) in 1928, and differed from the US Televox and England's Eric in that it resembled the image of a man, and could write Sino-Japanese characters like the *karakuri* that preceded it in earlier centuries. In the Osaka *Mainichi Shinbun*, on his creation he wrote, "if one considers humans as the children of nature, artificial humans created by the hand of man are thus nature's grandchildren."²¹ In Buddhism, this is referred to as the *banbutus dokon*, the idea that all things emanate from the same source. Rather than artificial humans being perceived as unnatural and threatening to the human race, Nishimura's creation positioned artificial life as natural and receptive to the interplay between humans and machines in everyday life.²²

¹⁸ Hiroshi Nara, *Inexorable Modernity: Japan's Grappling with Modernity in the Arts* (Totowa: Rowman & Littlefield, 2007), 3.

¹⁹ The word robot is derived from the Czech word for forced labor (*labori*).

²⁰ *Jinzo ningen* became robotto (ロボット) by 1928.

²¹ Timothy N. Hornyak, "The Face That Launched a Thousand Robots," *The Japan Times*, August 20, 2008, accessed April 19, 2018, <https://www.japantimes.co.jp/life/2008/08/20/digital/the-face-that-launched-a-thousand-robots/>.

²² Timothy N. Hornyak, *Loving the Machine: The Art and Science of Japan's Robots* (Tokyo: Kodansha International, 2006), 32-38.

From their early origins of *karakuri* and *Gakutensoku*, artificial life would find greater affinity with Japanese audiences, particularly after the suffering it both endured and inflicted in the Second World War. The defeat brought an end to imperial Japan and the industrial economy and military machine it began building in the 19th century. By the end of the war, approximately three million Japanese people died. The bombings of Hiroshima and Nagasaki on August 7 and August 10, 1945, which killed approximately 160,000 people, and the Soviet offensive in Manchukuo brought the war to an end. Emperor Hirohito's voice was heard across the country as he came over the airwaves asking his Japanese compatriots to 'endure the unendurable.' Stripping the emperor of all but symbolic power, the constitution imposed by the United States forced Japan to commit to peace. Economic and technological growth became the means by which a postwar and newly pacified nation would rejuvenate itself from its war-torn past. The Japanese redirected their motivations from military to economic and technological nation-building (*gijutsu rikkoku* 技術立国) in the postwar era, a movement interwoven with Japan's

cultural essence and national pride.²³²⁴ Technological prowess became an extension of cultural exceptionalism.²⁵²⁶

Japan in the post-war era became oriented toward transformational change, disruption, and the future. By the 1970's, the government and Ministry of International Trade and Industry (MITI) issued several papers, outlining the long-term transformation of Japan into an information society (*johoka shakai* 情報化社会), referring to a post-industrial society where information and intellectual creativity, not material goods would become the driving forces of the economy and social life. The information society forecasted a utopian vision, an irresistible transformation with the power and potential offered by computers and communication technologies.²⁷ Futurist sociologist Yoneji Masuda, who was hugely influential in shaping public

²³ Steven R. Weisman, "Enduring the Unendurable in Postwar Japan," *The New York Times*, April 11, 1999, accessed March 10, 2018, <http://www.nytimes.com/1999/04/12/opinion/editorial-observer-enduring-the-unendurable-in-postwar-japan.html>.

²⁴ Japan became a world economic power by 1970, though it was as early as 1962 that the term 'miracle' came to be associated with Japan's rapid urbanization and postindustrial growth, as first published in *The Economist*. From 1950, Japan's gross national product (GNP) would expand by an average rate of more than 10% for two decades. By the end of the 1970s, a sense of middle class was shared among the vast majority of Japan's citizens and there was an equitable income distribution. The ability to retain and invest in raw materials, prewar industrialization from the mid-Meiji period, wartime expansion and *fukoku kyōhei* (rich country, strong army), and an economic policy of growth as ideology galvanized people and the nation to achieve unprecedented acceleration. Additionally, given Japan's complex dependency on the US, post-war industrial developments (i.e. the war in Korea) and the special procurement of the US forces, brought about a rapid increase in production.

²⁵ Harry D. Harootunian and Masao Miyoshi, *Postmodernism and Japan* (Durham: Duke Univ. Press, 2003), 13.

²⁶ A receptiveness for artificial life can be seen in the literary and visual discourses and futuristic visions of Japan in early anime and manga of the post-war period, including the works of Osamu Tezuka (手塚 治虫), coinciding with the beginnings of AI research in Japan and Alan Turing's Turing Test. Rapid advancements began to take place in robotics and R&D expenditures to prepare for future technologies, as well as the growth of knowledge-intensive industries. He is most famous for his work *Atomu Taishi* (ambassador atom), a robot with a human soul. Tezuka's work would greatly influence later fictional works with robotics and machines, including *Ironman No. 28*, *Mobile Suit Gundam*, and *Neon Genesis Evangelion* to name a few.

²⁷ Tessa Morris-Suzuki, *Beyond Computopia* (New York: Routledge, 2015), 7-18.

policy, proposed an ideal comp-utopian new world order, a paradise on earth where humans would be set free from the industrial work force, communication technologies and computers linking and integrating all societies ,and homo-sapiens would become *homo intelligens*.²⁸ This exaggerated faith would bring an end to violence, war, inequality, and human suffering.²⁹ Japan's *computopia* and government planning of significant structural and technological changes emerging from the 1970's would continue into the 1980's when Japan was at the height of its economic power. But Japan's economic prowess would not last forever.³⁰

The good days of miraculous growth over the previous 30 years, however, would come to an end. The long-standing stagnation of the lost decade(s) would arguably have a larger effect on Japan than other industrial nations, given Japan's unique positioning in the postwar era where technological prowess was the mobilizing force and unifying ideology under the long-ruling political party, the Liberal Democratic Party (*Jiyū-Minshutō* 自由民主党) and an integral factor of the iron triangle, long credited with Japan's postwar miracle. The lost decade of the 1990's would lay bare the national psyche and the deterioration of Japan's postwar social compact.³¹³²

²⁸ Sam Inkinen, ed., *Mediapolis: Aspects of Texts, Hypertexts Und Multimedial Communication* (Berlin: Walter De Gruyter, 1999), 271-272.

²⁹ "If industrial society is a society in which people have affluent material consumption, the information society will be a society in which the cognitive creativity of individuals flourishes throughout...a society in which everyone pursues the possibilities of his or her own future...It will be global, in which multi-centered voluntary communities of citizens participating voluntarily in shared goals and ideas flourish simultaneously throughout the world." Yoneji Masuda, *The Information Society as Post-industrial Society* (Washington, DC: World Future Society, 1983), 147.

³⁰ By the turn of the decade, eight of the world's top banks were Japanese; Japanese firms were buying up luxury items and destinations in America and elsewhere around the world, and setting up plants overseas. Japan even began to revel in excess and rampant consumerism. There were cafes in the capital of Tokyo serving gold-leafed coffee for a time.

³¹ Iron Triangle refers to the LDP, the bureaucracy and Japan's corporation nexus. *Amakudari* or descent from heaven is the practice of bureaucrats being helped into roles within the industries they've spent their careers regulating.

³² "Iron Triangle," NUS Japanese Political Economy, March 12, 2012, accessed March 3, 2018, <https://wiki.nus.edu.sg/display/JPE2012/Iron+Triangle>.

Lost Decade(s)

The economic collapse and the lost decade (*Ushinawareta Jūnen* 失われた十年) was a dramatic turning point for Japan, from which the country is still trying to recover. It heralded a very long period of recession, undoing job stability. Those who entered the job market during Japan's lost decade in the 1990's formed the nation's lost generation, a nation newly defined by economic inequality and confronted with issues of a societal character: deviance, violence, loneliness, suicide, and a government-led nationalism to offset a wounded national pride. Artificial Intelligence and evolutionary technologies began to be built and were deployed by government and corporate sectors in order to heal Japan's economic and social wounds. These institutions did so without taking into full consideration the implications these machines might have in leading the lost generation further astray.

In December of 1990, the value of shares on the Tokyo Stock Exchange plummeted. The lost decade coincided with the beginning of the post-cold war period and the death of Emperor Hirohito (January 7, 1989), the same emperor who was stripped of his divinity by American occupiers 50 years prior and whose country had at the time of his death caught up to the US in terms of per capita GDP.³³³⁴ Property values fell 87%, after rising rapidly in the years leading up to it. At its peak, all the land in Japan was worth about 18 trillion dollars, which was approximately four times the worth of the entire United States. Stocks too went downward, and the banks tried to raise the interest rates to resuscitate the market. The banks were crippled, and

³³ R.A, "The Japanese Tragedy," *The Economist*, August 03, 2012, accessed March 11, 2018, <https://www.economist.com/blogs/freeexchange/2012/08/lost-decades>.

³⁴ Susan Chira, "Hirohito, 124th Emperor of Japan, Is Dead at 87," *The New York Times*, January 7, 1989, accessed March 11, 2018, <https://archive.nytimes.com/www.nytimes.com/learning/general/onthisday/bday/0429.html>.

company balance sheets were wiped out completely. The notion of never-ending growth was over.³⁵³⁶

Up until the time of the recession and financial crisis, Japan had operated under a Japanese corporate paternalist model, which promoted lifetime employment over profitability (*shūshin koyō*), a seniority-based wage structure (*nenkō jōretsu chingin*), and company-based unionism (*kigyōbetsu kumiai*). It was implemented to ensure a stable and harmonious social order. Each company too was recognized as a family unit. The *sarariman* (サラリマン) was the center of this model unit. The *sararimen* were corporate, middle-class employees who worked for large companies, which first became established in the early postwar period. The *sarariman* came to signify not only corporate culture, workaholics who extol long hours, but the pinnacle of an idealized masculinity and ideology, which other young men were to become

³⁵ The value of a single ward in Chiyoda-ku could purchase all of Canada. Additionally, land in Tokyo's Ginza shopping district would sell for \$250,000 a square meter. At the height of inflated prices, Japan's Imperial Palace was said to be worth more than France. Robert L. Cutts, "Power from the Ground Up: Japan's Land Bubble," *Harvard Business Review*, August 01, 2014, accessed March 10, 2018, <https://hbr.org/1990/05/power-from-the-ground-up-japans-land-bubble>.

³⁶ Yada Giichi encapsulates the feeling of anxiety during the recession period, which includes writings in the national newspaper about the end of mainstream consciousness. "For all of us who have been firmly confident about our mainstream life, the ground beneath our feet is shaking. With the economic future uncertain, enterprises have intensified their efforts at 'restructuring'. The stability of the work environment is crumbling. Real-estate prices, counted on as a source of collateral and capital, are plunging. Stock values, already hard hit, seem headed for a further decline. Interest rates are extraordinarily low, eroding the value of savings. Yet medical and other basic costs are steadily rising. In addition, the only growth sector in the working world takes the form of part-time or "temp" jobs. It is impossible for a regular full-time employee to continue at a job with any sense of security. There are no grounds for optimism. How does one live in an era when the once buoyant consciousness of the middle-class mainstream is surrounded by fog?" plunging. Stock values, already hard hit, seem headed for a further decline. Interest rates are extraordinarily low, eroding the value of savings. Yet medical and other basic costs are steadily rising. In addition, the only growth sector in the working world takes the form of part-time or 'temp' jobs. It is impossible for a regular full-time employee to continue at a job with any sense of security. There are no grounds for optimism. How does one live in an era when the once buoyant consciousness of the middle-class mainstream is surrounded by fog?" De Bary Wm. Theodore, Carol Gluck, and Arthur E. Tiedemann, *Sources of Japanese Tradition*, vol. 2 (New York: Columbia University Press, 2006), 1111.

through their life course.³⁷ With rapid industrialization emerged the public-private separation and gendered divisions of labor, with men occupying the public sphere of work, becoming the mainstay of the family. Women, however were located within the private sphere of family and child-rearing, in some ways as constrained as they had been during the early Showa period.³⁸³⁹⁴⁰

With the intensification of transnational globalization and market competition, and the prolonged state of economic stagnation and recession in the 1990's, businesses no longer felt compelled to keep the old paternalistic business model alive. The *sararimen* were often referred to as corporate warriors (*kigyo senshi*), a reference to an embedded samurai mentality from the feudal period and a devotion to duty. It's a telling reference point, as the *sararimen* like the samurai who preceded them would no longer serve as the rulers of the country in the face of technological disruptions. AI and robots were used to ease Japan's labor shortage, diminishing already scarce opportunities for the lost generation.

³⁷ David Rear, "Reforming Japanese-style Management: Destabilizing Hegemony through Discourse Intervention," *Contemporary Japan* 28, no. 2 (October 28, 2016): 209-211, accessed March 1, 2018, doi:10.1515/cj-2016-0011.

³⁸ Frank Jacob, "The Alteration of the Image – Women and Japanese Society (1600-2000)" *CUNY Academic Works*, 2015, https://academicworks.cuny.edu/qb_pubs/16/

³⁹ Ezra Vogel's book, *Japan's New Middle Class*, writes about the appeal of the *sarariman* dynamic and the paternalistic relationship between Japan's companies and their salaried workers. In it, he writes the following: "Although the search for security has rational components, as mentioned before, it has been heightened by the many upheavals in the lifetime of the average adult and by the difficulty which the contemporary urban parent had in finding a long-term livelihood when he was young. For the urban resident, a job in a large corporation is as close as one can come to the security that country relatives have by belonging to a household firmly attached to land and the local community. Just as obtaining land is thought to secure the future of a family in the next generation, so does a job in a large corporation provide long-range security and insure that one's children can be given a proper position in life." Ezra F. Vogel and Suzanne Hall Vogel, *Japan's New Middle Class: The Salary Man and His Family in a Tokyo Suburb* (Berkeley, Calif: University of California Press, 1991), 42.

⁴⁰ The *sararimen* were not only the breadwinners who supported their families, but the symbolic personification of a Japan transformed and restored from the defeat of war. Though their idealized masculinity was a model to be emulated, only one-third of those in the work-force in the 1970's at the height of Japan's economic power were in fact, *sararimen*. Alternatives to this rigid model emerged, especially as technological advancements began to pick up pace.

In 1995, there was a publication of a report by *Nikkeiren*, entitled *Japanese-style Management in the New Era (shinjidai no Nihon-teki keiei)*, in which emerged two keywords, including independence (*jiritsu*) and diversity (*tayosei*) to carry out a de-regulatory agenda. Workers had to think and act independently; no longer to rely on the tenure and long-term commitment at corporate firms, they would be paid on the basis of their merit, not their seniority. This new system stood in direct contrast to the *Nihon-teki keie* that preceded it, for firms to more closely align with globalization. This was a major shift, as it meant that Japanese society now asked its citizens to depend less upon the company and more on their own interests, self-reliance and individualism. Thus, both firms and the government would play a smaller role in citizens' lives, helping to usher in further uncertainty.⁴¹

Ongoing effects of economic stagnation led to steady deregulation and flexibility of Japan's capital and financial markets, weaker labor laws, and corporate pursuits of cheap labor in hopes of continuing to be globally competitive. A public loss of confidence and trust in Japanese institutions and corporations began manifesting at a critical juncture of recession and global divisions of labor, and as technologies became more cybernetic and ever more powerful, and as AI continued to make major breakthroughs and advances, including humanoid robots.⁴² Techno-

⁴¹ David Rear, "Reforming Japanese-style Management: Destabilizing Hegemony through Discourse Intervention," *Contemporary Japan* 28, no. 2 (October 28, 2016): 217-219 accessed March 1, 2018, doi:10.1515/cj-2016-0011.

⁴² By the 1990's, Deep Blue defeated chess master Garry Kasparov and the self-driving car was underway with the Mercedes Benz trip from Munich to Copenhagen. Honda and Sony introduced humanoid robots; Sony's Aibo was an intriguing creation, a robotic dog capable of interacting with humans. Mark Robert Anderson, "Twenty Years on from Deep Blue vs Kasparov: How a Chess Match Started the Big Data Revolution," *The Conversation*, May 11, 2017, accessed April 19, 2018, <https://theconversation.com/twenty-years-on-from-deep-blue-vs-kasparov-how-a-chess-match-started-the-big-data-revolution-76882>. Kayleigh DeMace, "The Rise of the Autonomous Car," *Industrial Outpost*, May 8, 2017, accessed April 19, 2018, <http://www.industrialoutpost.com/the-rise-of-the-autonomous-car/>. Sony, "Sony Launches Four-Legged Entertainment Robot," news release, May 11, 1999, SONY, accessed April 19, 2018, https://www.sony.net/SonyInfo/News/Press_Archive/199905/99-046/index.html.

scientific changes would lead to profound social consequences, a breakdown in social life and family, to which the Japanese business-government nexus have still not properly accounted for as it continues onward with a techno-centric, utopian vision it ushered in approximately 80 years ago as part of its post and post-postwar strategies.

ユートピア (Utopia) and AI

This section highlights the utopian visions linked to Japan's efforts to use AI in order to reverse the economic and social breakdowns that surfaced during the lost decade(s), as outlined in government publications, including *Innovation 25* (2007), *New Robot Strategy* (2015), and *Japan Revitalization Strategy* (2017). In looking at this vision through Japan's lens, we can better understand Japan's vision and some of the underlying reasons for the country's decision-making; at the same, I demonstrate that Japan's visions do not provide a clear recognition of dangers that are implicit in the emergence of artificial intelligence.

By the year 2000, it was estimated that half of the world's robotics were located in Japan. Robots and AI began being deployed for use in the service and civilian sectors with the intention to address the malaise from the lost decade(s), from which Japan is still trying to heal. Rather than usher in mass social disruption, Japan's government and corporate sectors believed technological innovations including AI and robotics could be harnessed to solve society's ills.⁴³

Among the many societal ills from the lost decade(s) are Japan's aging population and labor shortages. It is estimated that Japan's population over the age of 65 is 26% and the percentage is set to rise steeply to 38.8% by 2050. This will intensify the financial burden on the working-age population. Furthermore, 20 million people are set to disappear from workplaces in

⁴³Jeff Yang, "ASIAN POP Robot Nation / Why Japan, and Not America, Is Likely to Be the World's First Cyborg Society," *SFGate*, January 09, 2018, accessed April 19, 2018, <https://www.sfgate.com/entertainment/article/ASIAN-POP-Robot-Nation-Why-Japan-and-not-3237591.php>.

the coming years, especially in sectors that affect the elderly, including the nursing sector. In Tokyo, for example, there are already two job openings for every applicant. This suggests those who will retire in coming decades will face vulnerabilities.⁴⁴⁴⁵⁴⁶

To address and mitigate this shortcoming, the Japanese government under Prime Minister Shinzo Abe has proposed long-term strategic guidelines under *Innovation 25* and *Japan Revitalization Strategy*. The ambitious and well-intentioned project echoes the documents under Japan's Economic Planning Agencies and MITI in the late 1960's of a utopian vision of the future. The 25 of the title refers to 2025, when Japan will reinvent society with innovative technologies. A major component of this strategy is the proliferation of AI and robotics ahead of the Olympic and Paralympic games to be held in Tokyo in 2020. The strategy initiative outlines the eventual automation of everything, as well as mass-produced human-care robots who will make up for the shortage of able-bodies to care for the elderly. Some of these care-bots have already been deployed, including Honda's Asimo and Fujisoft's Palro, which can help the elderly and others with basic tasks and stimulate brain function. Additionally, there is Paro (personal robot), a therapeutic harp seal, which has shown to have positive effects on health, including mood and levels of stress of people in elder-care facilities. This market is set to increase to 3.7 billion by 2035, according to Japan's New Energy and Industrial Technology Development Organization and METI. This development occurs at a time when human

⁴⁴ Shoko Oda and Isabel Reynolds, "Tokyo Has More Than Two Job Openings for Every Applicant," Bloomberg.com, March 16, 2017, accessed March 01, 2018, <https://www.bloomberg.com/news/articles/2017-03-16/japan-s-matrix-like-dilemma-too-many-jobs-too-few-immigrants>.

⁴⁵ Frank Baldwin and Anne Allison, *Japan: The Precarious Future* (New York University Press, 2015), 45.

⁴⁶ Gavin Blair, "Why Japan Will Profit the Most from Artificial Intelligence," *South China Morning Post*, August 06, 2017, accessed March 11, 2018, <http://www.scmp.com/week-asia/business/article/2104809/why-japan-will-profit-most-artificial-intelligence>.

caregivers' abuse of elders has seen a steep rise.⁴⁷⁴⁸ Robots offer clear advantages over their human counterparts and can help decrease high rates of neglect and mistreatment. Because robots can be available 24 hours a day and store large amounts of computational data, they are effective for elderly people with cognitive impairments and memory loss; they ensure that patients can take the right doses at the right time. It also makes "aging in place" possible so elderly can stay where they choose and receive help they need for as long as they need.⁴⁹

To some degree, AI does have real benefits in offsetting the issues facing the elderly. Robots such as Paro and Roboear are utilized as a strategy to tackle issues of loneliness amongst the elderly. In 2000, a corpse was found lying at a home in Shizuoka Prefecture. The man died in the confines of his home, having laid there for three years without anyone noticing.⁵⁰ This case gained nationwide attention, a problem which has been coined as *kodokushi* (lonely death). It is estimated that 30,000 people a year die "lonely deaths", which will rise with the increase in the elderly population. Paro and other care-bots demonstrate initiatives for robotics to care for patients, and to ensure that those without family members are looked after and get the proper treatment they need.⁵¹⁵² Because these initiatives are still in their early phases, however, it

⁴⁷ *Innovation 25*, report, 2007, accessed April 2, 2018, <https://arxiv.org/pdf/1705.08807.pdf>.

⁴⁸ "PALRO Is a Chatty, Comforting Robot," PALRO(パルロ)富士ソフト, accessed April 19, 2018, <https://palro.jp/en/>.

⁴⁹ "What Is Aging in Place? - Age in Place Definition," Aging in Place, 2018, accessed May 07, 2018, <https://ageinplace.com/aging-in-place-basics/what-is-aging-in-place/>.

⁵⁰ Anna Fifield, "Cleaning up After the Dead.," *The Washington Post*, January 24, 2018, Accessed March 27, 2018, <https://www.washingtonpost.com/news/world/wp/2018/01/24/feature/so-many-japanese-people-die-alone-theres-a-whole-industry-devoted-to-cleaning-up-after-them/?noredirect=on>.

⁵¹ "Asimo, The World's Most Advanced Humanoid Robot," ASIMO by Honda | The World's Most Advanced Humanoid Robot, accessed April 19, 2018, <http://asimo.honda.com/>.

⁵² Anna Fifield, "He Lay Dead in His Apartment for Four Months. This Is the Japanese Crew That Took the Call.," *The Washington Post*, January 24, 2018, accessed March 11, 2018, https://www.washingtonpost.com/news/world/wp/2018/01/24/feature/so-many-japanese-people-die-alone-theres-a-whole-industry-devoted-to-cleaning-up-after-them/?utm_term=.df84ff032a67.

remains to be seen whether robots can ever replace human caregivers and family members who exhibit sensitivity and affection. While machine caregivers are increasingly able to fulfill patients' physical needs, their ability to create and foster empathetic relationships with humans is still largely met with skepticism.

Elderly are not the only ones who find themselves alone and who can benefit. The *hikikomori*(ひきこもり), which translates as withdrawal and refers to people who shut themselves off from the world around them, affect over a half a million people, including an estimated 20-30% who identify as women. The number is disproportionately male, given the higher expectations that are imposed on Japanese men in society. *Hikikomori* find themselves on the periphery, and suffer from depression, pressure, and anxiety from a society that emphasizes total dedication to success and a stigma associated with social failure and standing. Rather than interact socially and work, they spend their time playing video games, reading manga, and watching television.⁵³ They are typically taken care of by their families, whose members aren't entirely sure how to help their children as opportunities have changed greatly over a generation. Up to 30% of social recluses have shut themselves in their home for 10 years or longer. Anti-social behavior has also led to incidents of violence, and brought the *hikikomori* into national spotlight. This includes the hijacking of a bus and stabbing of a passenger to death by a 17-year old recluse boy in 2000, as well as the Fusako Sano kidnapping, who was held in captivity by a

⁵³ *Otaku* is often used interchangeably with *hikikomori*. While many *otaku* can become *hikikomori*, *otaku* refers to someone who has obsessive interest, including in areas of manga, anime, and cosplay.

hikikomori for nearly a decade. The potential assistance that robotics can provide the *hikikomori* could go a long way toward reversing these trends.⁵⁴⁵⁵⁵⁶⁵⁷

The government wants to mobilize the country's social recluses, as well as deter high suicide rates, which is the second highest in OECD countries.⁵⁸ If robotics and AI can help in the medical industry—i.e. detecting cancer and other symptoms and diseases—they can also provide mental health support and services. It is proposed that technological developments and diffusion of robotics can help *hikikomori* and those with suicidal tendencies re-integrate into society, find happiness, and contribute to the world's third largest economy. If it is possible to alleviate anti-social behavior, then it may too be possible to alleviate incidents of violence associated with it.⁵⁹ This may bode well not only for the young *hikikomori*, but also the elderly age group, where there have been sharp rises in criminal offenses over the last decade, from

⁵⁴ For further investigation into anti-social behavior and violence, please refer to the Miyazaki Tsutomu killings and the killing spree by Tomohiro Kato in Akihabara in 2008. "Japan Executes Notorious Cannibal Killer," Google News, June 16, 2008, accessed April 22, 2018, <https://web.archive.org/web/20130709203449/http://afp.google.com/article/ALeqM5jNmP-nKTKmf5cYaGrRNZBaMtms2A>. Tomohiro Osaki, "Death Sentence Upheld for Akihabara Rampage Killer," *The Japan Times*, February 2, 2015, accessed April 22, 2018, <https://www.japantimes.co.jp/news/2015/02/02/national/crime-legal/death-sentence-confirmed-akihabara-rampage-killer/>.

⁵⁵ "Japan's House of Horror Trial Begins," *BBC News*, May 24, 2000, accessed April 19, 2018, <http://news.bbc.co.uk/2/hi/asia-pacific/761787.stm>.

⁵⁶ "Police Search the Home of Boy in Bus Hijacking," *The Japan Times*, May 7, 2000, accessed April 19, 2018, <https://www.japantimes.co.jp/news/2000/05/07/national/police-search-the-home-of-boy-in-bus-hijacking/>.

⁵⁷ Ishikawa Kiyoshi, "'Hikikomori': Social Recluses in the Shadows of an Aging Japan," *Nippon.com*, October 02, 2017, accessed April 19, 2018, <https://www.nippon.com/en/currents/d00332/>.

⁵⁸ Tomoko Otake, "Suicides Down, but Japan Still Second Highest among Major Industrialized Nations, Report Says," *The Japan Times*, May 30, 2017, accessed April 30, 2018, <https://www.japantimes.co.jp/news/2017/05/30/national/social-issues/preventive-efforts-seen-helping-2016-saw-another-decline-suicides-japan-21897/>.

⁵⁹ An ex-hikikomori, Kentaro Yoshifuji created a robot to help others ease their sense of loneliness. C. Custer, "How the Japanese Robot Avatar OriHime Fights Loneliness," *Tech in Asia*, May 15, 2015, accessed April 19, 2018, <https://www.techinasia.com/orihime-robot-fights-loneliness>.

roughly 80 per 100,000 residents between 1995 and 2005 to 162 per 100,000 residents between 2005 and 2015.⁶⁰ If the government's vision is true, then social stability will be created for various populations and groups—a worthy goal. While these positive outcomes are hypothetical, should it come to pass, the government and corporate nexus will be validated.

One development, however, pushes the boundaries of robotics in ways that could be dangerous and needs more oversight and examination. In particular, the government is proposing that AI can solve the labor shortage, birth rate issues, and take the place of jobs. But at what human cost?

The *New Robot Strategy*, part of Japan's *Innovation 25* blueprint first created in 2007, was published in 2015. It aims for a robot revolution, a robot-barrier free society where humans and machines interact and collaborate with one another. They will, according to the report, "help release humans from cumbersome tasks and enrich interaction for a higher quality of life than ever." The publication also states that further development of state-of-the-art AI technologies is essential as it continues to grow in importance and to continue to compete globally. Notably, other countries are also pursuing their own initiatives with AI systems, including Singapore's

⁶⁰ Elise Hu, "Golden Years, Iron Bars: Japan Sees Rise In Crime By The Elderly," *NPR*, November 22, 2016, accessed March 12, 2018, <https://www.npr.org/sections/parallels/2016/11/22/500040363/golden-years-iron-bars-japan-sees-rise-in-crime-by-the-elderly>.

‘Smart Nation Initiative’, China’s ‘Made in China 2025’ and South Korea’s ‘Comprehensive Countermeasures on Artificial Intelligence Society.’⁶¹⁶²⁶³⁶⁴

The government proposes that Robots and AI technologies will also result in the resolution of labor shortages. According to the report, Japan is now facing one of the worst labor shortages in its modern history. This stems from a consistently low-birth rate from the last decade. Another twenty million are set to disappear from workplaces in the coming decades. Japan and its citizens are already beginning to see robots make up for the labor gap and help with short-term economic growth and gains. The use of machines to reduce or replace human labor will bestow great benefits on companies to reduce their production costs, increase quality and profits. According to a study by Research Institute of Economy, Trade, and Industry (RIETI), Japan’s annual growth rate has averaged 0.9% between 1990 and 2011, contrasting 4.4% between 1970 and 1990.⁶⁵ It is also very cheap. The financial services company and investment bank, Citigroup estimates that the gains in use of robots in the automotive industry is less than one year in Japan.⁶⁶

⁶¹ *New Robot Strategy*, report, 2015, accessed March 25, 2018, http://www.meti.go.jp/english/press/2015/pdf/0123_01b.pdf.

⁶² Scott Kennedy, "Made in China 2025," Center for Strategic and International Studies, June 1, 2015, accessed April 19, 2018, <https://www.csis.org/analysis/made-china-2025>.

⁶³ Hyea Won Lee, "What Is Korea’s Strategy to Manage the Implications of Artificial Intelligence?" *World Bank* (blog), August 29, 2016, accessed March 2018, 30, <http://blogs.worldbank.org/ic4d/what-korea-s-strategy-manage-implications-artificial-intelligence>.

⁶⁴ "Many Smart Ideas One Smart Nation," Smart Nation, 2018, accessed April 19, 2018, <https://www.smartnation.sg/>.

⁶⁵ Fukao Kyoji, *JCER Productivity Research Report - Japan's Productivity Growth Rising, but Still Trailing the U.S.*, report, May 9, 2008, accessed May 15, 2018, <https://www.rieti.go.jp/en/papers/contribution/fukao/03.html>.

⁶⁶ Michael Osbourne and Carl Benedikt Frey, "The Great Escape: How Workforce Automation Is the Answer to Japan’s Secular Stagnation," *Nikkei Asian Review*, January 2016, accessed April 15, 2018, https://www.oxfordmartin.ox.ac.uk/downloads/news-items/Nikkei_Frey_Osborne_030116.pdf.

Examples include Vevo, a bear-shaped robot, who is filling much-needed schoolteacher vacancies in nurseries with a 2.17 job-to-applicant ratio, a profession that is low-wage and is known for having poor working conditions.⁶⁷ In healthcare, it is expected that four in five recipients will have support by robots by the year 2020.⁶⁸ Widespread deployment of AI and robotics can be seen in industries from farming, fishery, food and agriculture, social services, government, corporate and banking sectors, as part of Japan's goal to develop public use of AI by 2025.⁶⁹ By 2030, the country forecasts having a fully-integrated and merged AI ecosystem. The claim that robotics will offshoot labor shortages deserves further examination, especially when taking into consideration non-regular employees, women who continue to face discrimination and are relegated to irregular positions, and people outside the workforce who do not enjoy job security, or the benefits associated with full-time work. This will be explored in greater detail in the following section.

According to *Innovation 25*, robots can also revert the birth-rate drop. It is stipulated that the gains from AI could provide humans with new forms of leisure while allowing them to maintain their quality of life, not necessarily the obsolescence of labor. The report provides a glimpse in the day of the life of a fictional family 20 years into the future. Inobe-kun is a robot

⁶⁷ Alex Martin, "Day Care Facilities Test Robots as High-tech Solution to Alleviate Staffing Shortages," *The Japan Times*, September 7, 2017, accessed April 19, 2018, <https://www.japantimes.co.jp/news/2017/09/07/national/day-care-facilities-turn-to-robots-as-high-tech-solution-to-alleviate-staffing-shortages/>.

⁶⁸ Daniel Hurst, "Japan Lays Groundwork for Boom in Robot Carers," *The Guardian*, February 06, 2018, accessed April 19, 2018, <https://www.theguardian.com/world/2018/feb/06/japan-robots-will-care-for-80-of-elderly-by-2020>.

⁶⁹ In government, they are being tested to help civil servants draft answers for ministers during cabinet meetings and parliamentary sessions. In farming, there is the story of Makoto Koike who utilizes deep-learning algorithms to sort cucumbers and increase productivity at his family's farm in Shizuoka. Justin McCurry, "Japanese Company Replaces Office Workers with Artificial Intelligence," *The Guardian*, January 05, 2017, accessed April 19, 2018, <https://www.theguardian.com/technology/2017/jan/05/japanese-company-replaces-office-workers-artificial-intelligence-ai-fukoku-mutual-life-insurance>.

who is primarily tasked with household duties, taking care of the children and other services to free up the mother in the story to pursue other aims. This persuasive narrative encourages women to have children and to stabilize the traditional family model. This comes at a time when many Japanese people are delaying getting married. Japan is having far less children than it once did, and it's estimated that the population will decrease to roughly 86 million by 2060. (Having children outside marriage only constitutes 2%.)⁷⁰ Japan has also emerged as a relationless society (*muen shakai* 無縁社会), where young men and women are not having sex either. Single-person households have risen in recent years, and currently one-third of Japan's population lives alone.⁷¹ Toyota, which is investing heavily in AI technologies, introduced Kirobo Mini in 2016, a robot that mimics a real child and designed to trigger human emotions..⁷²⁷³ Though applications like Kirobo Mini are intended to encourage Japanese couples to bear children, they do not address the underlying reasons that have caused Japan's decreasing population. The intensification of transnational capitalist production has had far-reaching effects in Japan, including the dismantling of the corporate welfare system, unstable and fragile work conditions, and social and family disenfranchisement.

AI and robotics are undoubtedly the future. Half of all jobs in Japan could be performed by robots by as early as 2035, according to the Nomura Research Institute.⁷⁴ They will

⁷⁰ *Share of Births outside of Marriage*, SF2.4 (Paris: OECD, 2016), accessed October 13, 2017, https://www.oecd.org/els/family/SF_2_4_Share_births_outside_marriage.pdf.

⁷¹ Frank Baldwin and Anne Allison, *Japan: The Precarious Future* (New York University Press, 2015), 45.

⁷² "Baby Robot Unveiled in Japan as Number of Childless Couples Grows," *The Guardian*, October 03, 2016, accessed April 19, 2018, <https://www.theguardian.com/technology/2016/oct/04/baby-robot-unveiled-in-japan-as-number-of-childless-couples-grows>.

⁷³ 伊野辺家の1日, report, 2015, accessed April 12, 2018, <http://www.cao.go.jp/innovation/action/conference/minutes/inobeke.html>.

⁷⁴ Andrew Tarantola, "Robots Expected to Run Half of Japan by 2035," *Engadget*, July 14, 2016, accessed April 19, 2018, <https://www.engadget.com/2015/12/04/robots-expected-to-run-half-of-japan-by-2035/>.

strengthen productivity in the marketplace and economy, enhance workers' abilities to do their work more quickly and efficiently (as in the case of Makoto Koike), demand side management, and expand creativity.

Yet, with all these developments and potential solutions—to labor shortages, birth rates and jobs—and as intelligent software continues to outpace neural networks, many questions still remain about the ethical and social implementation of machines and what comes next for the human agenda. Some of the darker ramifications of biotechnological engineering and AI, in a period of physical scarcity and vulnerabilities in a Japanese context, raises concerns that are not fully explored or investigated. *Innovation 25* and *Japan Revitalization Strategy*, and its many predecessors dating back to the late 1960' expounds upon an ushering in a tech-driven utopic vision in an abundant harmonious society. But will it instead bring us something else entirely?

Technology will have unprecedented benefits and much progress has already been made in the field of AI and robotic sectors. Yet, it is also true that the country continues to bear the costs of the lost decade and social malaise, including a shrinking and aging population, inequality, neo-nationalisms, a rise in violence, and isolation. Various social and economic pressures, once reserved as state responsibility, have shifted to the individual in a post-insurance, cybernetic, and placeless society. Individuals, both young and old, bear responsibility for their own lives in a period of broken human connectivity. The world in which they live, far from resembling the day in the life of the Inobe family, is instead one of an increasingly fragile future of internal malfunctions and uncertainties. To what extent does AI and a robotic revolution really alleviate some of the aforementioned adverse conditions, as is postulated by the

government-business nexus, and to what degree will it further impact, if not accelerate some of Japan's internal malfunctions?

ディストピア(Dystopia) and AI

While the use of machines will bestow great benefits, particularly for companies, these developments may not be good for the majority of Japan's citizens. A range of observations, empirical evidence, and numerous predictions counter the government narrative and notions that AI is a positive development for Japan.

Japan began deploying humanoid robots during the lost decade(s), a period of lost human-to-human connectivity and malaise to address societal challenges facing the country, particularly in areas of health and social care for the vulnerable young and elderly communities. These communities are lonely, and AI signals further dehumanization of Japanese society as they forge human-to-machine connections. In areas of internet AI, research has indicated heavy use of social media platforms have led to increases in depression and further social isolation and suicide among Japanese adolescents.⁷⁵⁷⁶

While supporting the stigmatized and people in need is admirable, the notion of resolving emotional issues through AI is problematic. In a 2015 Pew Research survey, it was indicated that empathy could be connected virtually, but that it was only one-sixth as effective in making the recipient feel socially supported. In other words, a human-to-human hug far outweighed an emoji or text message. Using robots too may cause further social deterioration, particularly in

⁷⁵ "Japan Struggles with Social Media's Connection to Suicide in Wake of Zama Killings," *The Japan Times*, November 16, 2017, accessed April 30, 2018, <https://www.japantimes.co.jp/news/2017/11/16/national/social-issues/japan-struggles-social-media-suicide-zama-killings/>.

⁷⁶ Hisayoshi Morioka et al., "Association Between Smoking and Problematic Internet Use Among Japanese Adolescents: Large-Scale Nationwide Epidemiological Study," *Cyberpsychology, Behavior, and Social Networking* 19, no. 9 (2016): 557, accessed April 21, 2018, doi:10.1089/cyber.2016.0182.

vulnerable communities where machine interaction can be utilized as alternatives to being sociable or getting emotional support from humans.⁷⁷ This could have deleterious effects for groups like *hikikomori*, who already withdraw themselves from society in the confines of their homes.⁷⁸

The growing use of robots also creates challenges and further breakdown in the area of sex and relationships. Robots and android dolls are being created for sexual gratification, raising serious ethical issues regarding consent and agency. In Japan, where many young adults are unmarried, lonely, and struggle to find companionship, in part because of socioeconomic stresses, the artificial love industry provides a level of convenience when love can be hard to find. But this industry's approach also raises major concerns about the relations between the sexes. Sentient sexboxes that have the capacity to simulate consent could foster rape, sexual abuse and violence, and a disrespect for the opposite sex with real humans. Furthermore, even more basic compliant robots that are on the market today, which are built to service their owners could have negative effects on understandings of the sexes.⁷⁹

Shin Takagi, who struggles with pedophilic tendencies, started a company called Trotlla manufacturing child-like sex dolls to help pedophiles fight their impulses, or rather to provide them a safer outlet by which to express their sexual impulses. While the company has not marketed autonomous sex robots (yet), it signals that Japan could begin to market AI child sex robots in the not-too-distant-future. Only in 2014 did the country's parliament ban child

⁷⁷ *Wall Street Journal*, "Is Technology Making People Less Sociable?" The Wall Street Journal, May 11, 2015, accessed April 30, 2018, <https://www.wsj.com/articles/is-technology-making-people-less-sociable-1431093491>.

⁷⁸ Evidence supports that isolation increases the risk of premature death. Alexandra Sifferlin, "Why Loneliness Is a Public Health Threat," *Fortune*, April 30, 2018, accessed August 07, 2017, <http://fortune.com/2017/08/07/loneliness-public-health/>.

⁷⁹ Robert Sparrow, "Robots, Rape, and Representation," *International Journal of Social Robotics* 9, no. 4 (2017): 745, accessed April 15, 2018, doi:10.1007/s12369-017-0413-z.

pornography, which did not include banning of manga and anime that feature children—which continues to be legal. Child sexual abuse is also increasing, hitting record-highs in 2017. While research has not yet been conducted as to whether or not child sex robots/dolls can stave off sex offenders, cognitive-behavioral theory suggests that engaging in sex with robots/dolls would lead to greater tendency to reoffend.⁸⁰

In re-examining *Innovation 25*, which was first released in 2007, Japan's posture to reinforce sexual divisions of labor becomes evident. In the fictional life of the Inobe family, Inobe-Kun takes on the role of substitute mother, allowing the mother in the story to pursue other aims and interests, including bearing children. The current administration has iterated that women's skills are not being properly utilized and made the empowering of women a part of the economic pillar of the government reform program, known as Abenomics. Yet Japan's global gender gap report by the World Economic Forum ranks Japan at 114 out of 144 countries.⁸¹ At present, the vast majority of women are relegated to part-time, non-regular positions. Many women too quit their jobs when they give birth, facing challenges as they return to work while raising children in male-dominated spaces that require long hours, forcing them to make a choice between a family and a career. There is also *matahara* (maternity harassment), which is the abuse of pregnant and post-pregnant women in the workplace.⁸² A futuristic Japan will not further the full use of women's capabilities, but instead re-emphasize the belief that women

⁸⁰Drew A. Kingston et al., "Pornography Use and Sexual Aggression: The Impact of Frequency and Type of Pornography Use on Recidivism among Sexual Offenders," *Aggressive Behavior* 34, no. 4 (2008): 348, accessed April 25, 2018, doi:10.1002/ab.20250.

⁸¹Till Alexander Leopold, Saadia Zahidi, and Vesselina Ratcheva, *Global Gender Gap Report 2016*, accessed April 20, 2018, http://www3.weforum.org/docs/GGGR16/WEF_Global_Gender_Gap_Report_2016.pdf.

⁸²Ava Hall, "Stamp out Maternity Harassment," *The Japan Times*, October 6, 2017, accessed April 30, 2018, <https://www.japantimes.co.jp/opinion/2017/10/06/reader-mail/stamp-maternity-harassment/>.

belong in the home and help ensure the traditional family model remains intact at a time when non-traditional families and single mothers are on the rise.⁸³⁸⁴⁸⁵

Artificial intelligence and robotics will also disproportionately affect those who are least equipped to bear them. Freeters (フリーター *furītā*), those who lack full-time employment, including part-time and temporary contract positions, are particularly vulnerable to the diffusion of advancing technologies. Part-time work now accounts for 40 percent of Japan's workforce.⁸⁶⁸⁷ These workers may work as many hours or more than full-time workers but receive less benefits than full-time colleagues. Many are not covered under national healthcare, do not receive pay hikes, bonuses, or allowances for retirement, and have less legal protections than full-time workers.⁸⁸ This phenomenon also reflects a loss of manufacturing jobs, and greater wealth disparity has begun to take shape and will continue into the foreseeable future as technologies continue advancing apace, undoing Japan's social equality, what is referred as "100 million all in the middle class (*ichi oku sochuryu*). Even if some jobs are not replaced, low-skilled jobs become more redundant, and their wages are suppressed.⁸⁹

⁸³ Jennifer Robertson, "Gendering Humanoid Robots: Robo-Sexism in Japan," *Body & Society* 16, no. 2 (2010): 10, accessed April 20, 2018, doi:10.1177/1357034x10364767.

⁸⁴ Akaishi Chieko, "The Plight of Japan's Single Mothers," Nippon.com, July 24, 2015, accessed April 30, 2018, <https://www.nippon.com/en/in-depth/a04603/>.

⁸⁵ Yuriko Koike, "Abenomics' Women Problem," *The Japan Times*, October 7, 2014, accessed April 30, 2018, <https://www.japantimes.co.jp/opinion/2014/10/07/commentary/japan-commentary/abenomics-women-problem/>.

⁸⁶ "Plight of Irregular Workers," *The Japan Times*, accessed September 30, 2017, <https://www.japantimes.co.jp/opinion/2016/01/05/editorials/plight-of-irregular-workers/#.WdAhF5OGNo4>.

⁸⁷ Freeter is composed of the word free in English and the German word *Arbeiter* (worker).

⁸⁸ Lillian Jung, "Labor Law Profile," International Labor Organization, June 17, 2011, accessed September 30, 2017, http://www.ilo.org/ifpdial/information-resources/national-labour-law-profiles/WCMS_158904/lang--en/index.htm.

⁸⁹ Michael Cucek, "Mr. Abe and His "100 Million,"" *Mr. Abe and His "100 Million"*, December 1, 2015, accessed April 30, 2018, <http://www.fccj.or.jp/number-1-shimbun/item/709-mr-abe-and-his-100-million/709-mr-abe-and-his-100-million.html>.

Neets (not in education, employment, or training) are also disproportionately affected by the disruptions of technological change. Neets are between the ages of 15 and 34, single, and are not actively seeking work. This is an important distinction, as Japan's Ministry of Internal Affairs and Communications announced that the unemployment rate had fallen 2.4 percent, bringing it to the lowest rate in 24 years.⁹⁰ The unemployment rate does not consider Freeters and unstable income, or Neets, who are not actively looking for work, and whose numbers have been growing over the long-term in Japan (from 480,000 to 640,000 between 1999 and 2009). Neets and Freeters are mainly comprised of the young with low-level educational attainment.⁹¹ Neets too are also those who are unwilling to work, contrasting the notion of the masculine, hard-working *sarariman*, which has been disintegrating for the past 30 years. Against the backdrop of transnational capital and AI, the *shinjidai no Nihon-teki keiei* and more flexible and precarious contract agreements, jobless youth are deeply vulnerable to long-term poverty and uncertainty. Labor-saving technologies and AI will make it ever more difficult for Neets to rejoin the workforce, and may discourage them from even trying. This mirrors historian Yuval Noah Harari's prediction that the AI revolution will create a new useless class (useless from a political and economic standpoint), those who are unemployed and unemployable.⁹²

⁹⁰ "Japan's Jobless Rate Falls to 24-year Low of 2.4% in January," *The Japan Times*, March 2, 2018, accessed April 30, 2018, <https://www.japantimes.co.jp/news/2018/03/02/business/economy-business/japans-jobless-rate-falls-24-year-low-2-4-january/>.

⁹¹ Matthias Pilz, Kirsten Schmidt-Altmann, and Mikiko Eswein, "Problematic Transitions from School to Employment: Freeters and NEETs in Japan and Germany," *Compare: A Journal of Comparative and International Education* 45, no. 1 (October 14, 2013): 76, accessed April 30, 2018, doi:10.1080/03057925.2013.835193.

⁹² Yuval N. Harari, *Homo Deus: A Brief History of Tomorrow* (New York: HarperCollins, 2017), 315.

While low-skilled jobs are more vulnerable to technological unemployment, they are not the only jobs susceptible to loss. In Japan, a wide variety of jobs could be given over to computers and AI with 55% of Japanese jobs at risk of loss, which is higher than the OECD estimation at 9%.⁹³ That number is significant, discrediting the assumption that AI will not be able to compete with white-collar positions in terms of cognitive and intellectual power. In 2017, 34 employees were replaced with AI's IBM Watson at the Fukoku Mutual Life Insurance Firm. And if Todai Robot, a machine that has been programmed to take the entrance examination at the prestigious University of Tokyo, is outsmarting 80% of other students, then AI can compete in any job sector.^{94,95}

According to the Joint Research Centre of the European Commission, 50% of US firms were founded after 1975, yet in Japan the number is at a dismal 2%. Unless there are incentives

⁹³Nobuaki Hamaguchi and Keisuke Kondo, "Regional Employment and Artificial Intelligence in Japan," March 18, 2018, accessed April 30, 2018, https://06ab0b75-a-62cb3a1a-s-sites.googlegroups.com/site/keisukekondokk/research/HK_REAIJ.pdf?attachauth=ANoY7cqTZWYBK7oGOEV6S6kF7zXeIkAlimTXss3z5rDhlL_QRcGsRyFgNrUUKA9a44O1X7h8i8QZbm bAgdisJmK_xT2ALr5h-AUnnTA4aER02FaXfngvU0_10g4tX80mIWyc4eIqx8r2unRWUuhZK1KEsEfZjc7ua3_W_SzUUIRFPt0TX3Wlq11zk1pgzvb4FcuMOUHDgJgFzBf1Bmsz7Ug2ljt3Nzu4ppoOU_URt0xV8hauCyhtMg%3D&attredirects=0.

⁹⁴ The examination consists of seven sections, including math, English, science, and an essay-writing portion. Chris Weller, "A Robot Did Better than 80% of Students on the University of Tokyo Entrance Exam," *Business Insider*, September 06, 2017, accessed April 30, 2018, <http://www.businessinsider.com/robot-beat-most-students-on-university-tokyo-entrance-exam-2017-9>.

⁹⁵ Justin McCurry, "Japanese Company Replaces Office Workers with Artificial Intelligence," *The Guardian*, January 5, 2017, accessed April 30, 2018, <https://www.theguardian.com/technology/2017/jan/05/japanese-company-replaces-office-workers-artificial-intelligence-ai-fukoku-mutual-life-insurance>.

for new businesses, ventures and ideas, it is very likely that AI will outpace job growth, and lead to further widespread socio-economic inequality and disparity.⁹⁶⁹⁷

While more and more people in Japan will be susceptible to technological unemployment, under-employment, and stability deterioration, one of the strong motivations for automation is to address Japan's demographic challenges. While economists and analysts have advised Japan to look to immigration to address increased labor shortages and an aging population, the country has been reluctant to open its doors to the outside. Immigration laws remain stringent; thus far, there have only been traineeships on temporary work visas.⁹⁸ In 2017, the country received nearly 20,000 applications from asylum seekers but only accepted 20.⁹⁹ Further loosening of immigration policy is politically difficult, and it is also largely opposed in the country where citizens fear that immigration could lead to an erosion of Japanese identity. Prime Minister Shinzo Abe and the LDP cited concerns of crime rates and less opportunities for Japanese citizens when discussing the issue of immigration.¹⁰⁰ Foreign residents in Japan make up a small fraction, at 2% of the population, with the majority hailing from neighboring countries including China and Korea.¹⁰¹

⁹⁶ *Kakusa Shakai* (a society of widening gaps) became a major buzzword in 2006 and 2007 to sum up Japan's new image, contrasting the 1970's and 80's when there was a sense that the country was becoming more affluent and equality was spreading

⁹⁷ Michael Osbourne and Carl Benedikt Frey, "The Great Escape: How Workforce Automation Is the Answer to Japan's Secular Stagnation," *Nikkei Asian Review*, January 2016, accessed April 15, 2018, https://www.oxfordmartin.ox.ac.uk/downloads/news-items/Nikkei_Frey_Osborne_030116.pdf.

⁹⁸ Craig Moran, "Will Immigration Rescue Japan, and the Region?" *World Policy*, September 18, 2017, accessed April 30, 2018, <https://worldpolicy.org/2017/09/18/will-immigration-rescue-japan-and-the-region/>.

⁹⁹ Justin McCurry, "Japan Had 20,000 Applications for Asylum in 2017. It Accepted 20," *The Guardian*, February 16, 2018, accessed April 30, 2018, <https://www.theguardian.com/world/2018/feb/16/japan-asylum-applications-2017-accepted-20>.

¹⁰⁰ Kyla Ryan, "Japan's Immigration Reluctance," *The Diplomat*, September 15, 2015, accessed April 30, 2018, <https://thediplomat.com/2015/09/japans-immigration-reluctance/>.

¹⁰¹ "Record 2.38 Million Foreign Residents Living in Japan in 2016," *The Japan Times*, March 17, 2017, accessed April 30, 2018,

Whereas immigration can help solve some of Japan's challenges in the coming years and decades, the country is instead turning to humanoid robotics and AI. Robotics help sustain the notion of Japan as an ethnically homogenous nation and the uniqueness of their cultural identity. The re-emphasis of cultural neo-nationalism, racial and cultural homogeneity, largely an outcome or rather the failure of globalization, comes at a time when anti-immigration, protectionist stances are becoming more widespread globally. Prime Minister Abe is also looking to revise Article 9 of the pacifist constitution, which calls for the complete renunciation of war, and which was enacted by U.S. occupiers in 1947.¹⁰² In addition, robots and AI are being deemed by the government as preferable to immigrants from neighboring countries, in Korea, China, and Southeast Asia where historical issues and historical memory continue to haunt Japan's relations with its neighbors. Robots and AI play into the xenophobia that defined Meiji-era politics, the divisive war memories surrounding Japan's constitution and new remilitarization efforts.

Another development that requires more attention is the use of robots in the context of military and defense. While much focus has been placed on Japan's robot revolution ahead of the Tokyo Olympics in 2020, little attention has been given to the development and use of intelligent robotic weapons in the wake of a potentially amended constitution. Developments in exoskeletons and unmanned vehicles for Japan's Self-Defense Forces have already occurred, and an amended constitution would give Japan the ability to develop cutting-edge technologies including weapons with varying degrees of autonomy that have the potential to change the very

<https://www.japantimes.co.jp/news/2017/03/17/national/record-2-38-million-foreign-residents-living-japan-2016/>.

¹⁰² Motoko Rich, "Shinzo Abe Announces Plan to Revise Japan's Pacifist Constitution," *The New York Times*, May 03, 2017, accessed May 06, 2018, <https://www.nytimes.com/2017/05/03/world/asia/japan-constitution-shinzo-abe-military.html?mtrref=www.google.com&gwh=65342C310121FCA0EE337DECFBB8502E&gw t=pay>.

character of war, including the void of legal and human responsibility.¹⁰³ These developments further complicate the geopolitical situation in the Asia-Pacific, already the most militarized region in the world where an AI arms race is generating insecurity, where tensions remain high (on issues historical and territorial) and nationalist sentiment is evident.¹⁰⁴ The government and military sectors should further examine these applications so that they can propose ways to better predict, prevent, and mitigate the threats that AI poses in Japan and Japan's international relations.

Discussion and Further Research

Artificial Intelligence is a complex issue that requires knowledge and expertise in various realms from neuroscience and cognitive science to philosophy and the humanities. It is worth mentioning that many scientists working directly in the field of artificial intelligence view AI's problems as either implausible or a mere distraction, unlike scholars in the social scientists and humanities. While we are not certain if and when artificial intelligence will be to possess reasoning capabilities that are indistinguishable from human beings, we do know that machines raise urgent questions about the meaning and future of the human agenda and spiritual life.

In Japan, the techno-utopia that the country envisions is a Faustian bargain. By that, I don't mean that AI will inevitably lead to an existential demise or that it shouldn't be developed to its full capacity. Instead, I believe that in its current capacity, AI will accelerate development

¹⁰³ Regina Surber, "Artificial Intelligence: Autonomous Technology (AT), Lethal Autonomous Weapons Systems (LAWS) and Peace Time Threats," *Reaching Critical Will*, February 21, 2018, accessed April 20, 2018, <http://reachingcriticalwill.org/images/documents/Disarmament-fora/ccw/2018/gge/documents/ICT4Peace-and-ZHET>.

¹⁰⁴ Hiroyuki Sugai, *Japan's Future Defense Equipment Policy*, report, October 16, 2016, accessed May 15, 2018, https://www.brookings.edu/wp-content/uploads/2016/10/201610_japan_future_defense_hiroyuki_sugai.pdf.

for corporations but will not improve living standards or foster inclusive growth in Japan. It will further deteriorate an already precarious future for the vast majority of citizens, which began in the 1990's with the death of the *sarariman* and the implementation of *shinjidai no Nihon-teki keiei*. In the realm of social AI and robots, humanoid robotics will help offshoot labor shortages, but will further deteriorate human-to-human connectivity and bolster dangerous nationalist and xenophobic impulses.

Further research is warranted that examines public-opinion in Japan on AI and its implications. This is crucial as the visions that are outlined in *Innovation 25*, *New Robot Strategy*, and *Japan Revitalization Strategy* are dominated by profit-seeking corporations and governmental bureaucrats. Japan's public will be most affected by technological disruptions. The survey below—and other tools like it—can help us examine the complicated implications of AI, and fully examine Japan's posture to establish itself as an AI and robotic nation. It can uncover the concerns of Japanese citizens regarding AI in terms of sex and relationships, the relationship of power and inequality in human enhancement capabilities and establishing income and finding employment. The ultimate question we must seek to answer is this: Do the visions laid out by the government and corporate leaders align with the views of the Japanese public? If these two perspectives are in dissonance, what bridges can we build to reconcile them?

Afterword

While it is beyond the scope of this essay to conduct a survey, I have formulated one in order to offer a possible tool for future research. Data gained from such surveys represent positive first steps toward assessing AI and its impact on Japan (and in other national and cultural contexts):

Survey

1. When will AI exceed human performance?

10

20

30

40

50

60

70

80

90

100

More than 100 years

2. Japan's *Robot Strategy* and *Innovation 25* initiatives seeks to establish Japan as an AI and robotics superpower. Do you think that the benefits of AI will outweigh negative consequences?

Quite Likely

Likely

About Even

Unlikely

Quite Unlikely

3. Should Japanese society prioritize AI safety research?

Yes

No

4. Humans and robots will peacefully coexist.

Quite Likely

Likely

About Even

Unlikely

Quite Unlikely

5. AI will lead to the end of the human race.

Quite Likely

Likely

About Even

Unlikely

Quite Unlikely

6. AI will lead to the enhancement of the human race.

Quite Likely

Likely

About Even

Unlikely

Quite Unlikely

7. Would the enhancement of humans via biomedical technologies (i.e. gene editing and chip implants) lead to further inequality in Japan?

Quite Likely

Likely

About Even

Unlikely

Quite Unlikely

8. Scientists warn that rapid developments in AI and robotics threatens the prospect of mass unemployment. Do you think this is also likely in Japan, where 70% of companies face labor shortages and a declining population?

Quite Likely

Likely

About Even

Unlikely

Quite Unlikely

9. Do you believe massive unemployment is possible?

Quite Likely

Likely

About Even

Unlikely

Quite Unlikely

10. If you answered about even, likely, or quite likely, would you encourage a universal basic income in Japan?

Yes

No

11. Do you think humanoid robots can help solve social problems in Japan, for example with regard to loneliness in vulnerable communities, i.e. elderly and *hikikomori*?

Quite Likely

Likely

About Even

Unlikely

Quite Unlikely

12. Do you think child sex robots can be used to stop sex offenders?

Quite Likely

Likely

About Even

Unlikely, quite unlikely

13. If you answered about even, unlikely, or quite unlikely, should they be made illegal?

Yes

No

14. Where in Japan are you from?

15. Which age bracket do you fall under?

01-18 []

19-30 []

31-50 []

51-70 []

71-90 []

16. Please provide any comments, thoughts, or suggestions about any of the survey questions.



Finally, further research that takes into account the importance of Japanese value-systems in formulating a roadmap that integrates machine-learning ethics could become ever more important as threats and ethical concerns increase. While I have not learned of a Japanese charter on AI ethics, South Korea drafted one in 2007. In thinking about a Japanese AI charter, we must consider creating compassionate ethical machines as well as regulations that reflect a broad set of inclusive values; we might consider Buddhist and Shinto traditions and virtues in formulating what that might look like.

Acknowledgements

I want to thank my advisors at University of San Francisco for sharing the gift of their time to mentor me and help me bring this project to fruition. Specifically, I'd like to thank Professors Brian Komei Dempster, John Nelson, Geoffrey Ashton, and Leslie Woodhouse for their suggestions and ideas. I'd also like to thank Professor Maki Takata at UC Berkeley for her enthusiasm, support, and encouragement.

Bibliography

- 2017 Growth Strategy Japan. Report. June 30, 2017. Accessed April 1, 2018. <http://www.mofa.go.jp/files/000272312.pdf>.
- Adria, Marco. *Technology and Nationalism*. Montreal: McGill-Queen's University Press, 2014.
- Anderson, Mark. "Japan Is Hoping Robot Babies Will Encourage People to Have Real Babies." Quartz. December 08, 2016. Accessed April 19, 2018. <https://qz.com/816886/to-fix-japans-low-birth-rate-scientists-are-using-robot-babies-to-encourage-people-to-become-parents/>.
- Anderson, Mark Robert. "Twenty Years on from Deep Blue vs Kasparov: How a Chess Match Started the Big Data Revolution." *The Conversation*. May 11, 2017. Accessed April 19, 2018. <https://theconversation.com/twenty-years-on-from-deep-blue-vs-kasparov-how-a-chess-match-started-the-big-data-revolution-76882>.
- "Asimo, The World's Most Advanced Humanoid Robot." ASIMO by Honda | The World's Most Advanced Humanoid Robot. Accessed April 19, 2018. <http://asimo.honda.com/>.
- "Baby Robot Unveiled in Japan as Number of Childless Couples Grows." *The Guardian*. October 03, 2016. Accessed April 19, 2018. <https://www.theguardian.com/technology/2016/oct/04/baby-robot-unveiled-in-japan-as-number-of-childless-couples-grows>.
- Bakutyte, Justina. "After World's First Robot Citizen, Japan Grants Residency To An AI Chatbot." Konbini United States. November 08, 2017. Accessed April 19, 2018. <http://www.konbini.com/us/lifestyle/sophia-worlds-first-robot-citizen/>.
- Barnes, Julian E., and Josh Chin. "The New Arms Race in AI." *The Wall Street Journal*. March 02, 2018. Accessed April 19, 2018. <https://www.wsj.com/articles/the-new-arms-race-in-ai-1520009261>.
- Belson, Ken. "Swimming Against the Storm." *The New York Times*. November 16, 2012. Accessed March 1, 2018. <http://www.nytimes.com/2012/11/17/sports/swimming-against-the-storm.html>.
- Berlatsky, Noah. "Japan's Cutthroat School System: A Cautionary Tale for the U.S." *The Atlantic*. November 22, 2013. Accessed March 10, 2018. <https://www.theatlantic.com/education/archive/2013/11/japans-cutthroat-school-system-a-cautionary-tale-for-the-us/281612/>.
- Blair, Gavin. "Why Japan Will Profit the Most from Artificial Intelligence." *South China Morning Post*. August 06, 2017. Accessed March 11, 2018. <http://www.scmp.com/week-asia/business/article/2104809/why-japan-will-profit-most-artificial-intelligence>.
- Bostrom, Nick. *Superintelligence: Paths, Dangers, Strategies*. New York: Oxford University Press, 2017.

- Brasor, Philip. "Is Artificial Intelligence Killing Japan's Banks?" *The Japan Times*. January 27, 2018. Accessed April 19, 2018. <https://www.japantimes.co.jp/news/2018/01/27/national/media-national/artificial-intelligence-killing-japans-banks/>.
- Brogan, Jacob. "An A.I. Competed for a Literary Prize, but Humans Still Did the Real Work." *Slate Magazine*. March 25, 2016. Accessed May 06, 2018. http://www.slate.com/blogs/future_tense/2016/03/25/a_i_written_novel_competes_for_japanese_literary_award_but_humans_are_doing.html.
- Chiavacci, David, and Carola Hommerich. *Social Inequality in Post-growth Japan: Transformation during Economic and Demographic Stagnation*. London: Routledge, Taylor & Francis Group, 2017.
- Chieko, Akaishi. "The Plight of Japan's Single Mothers." *Nippon.com*. July 24, 2015. Accessed April 30, 2018. <https://www.nippon.com/en/in-depth/a04603/>.
- Chira, Susan. "Hirohito, 124th Emperor of Japan, Is Dead at 87." *The New York Times*. January 7, 1989. Accessed March 11, 2018. <https://archive.nytimes.com/www.nytimes.com/learning/general/onthisday/bday/0429.html>.
- Christopher, Robert C. *The Japanese Mind: The Goliath Explained*. Tokyo: C. E. Tuttle, 1995.
- Cucek, Michael. "FCCJ -." Mr. Abe and His "100 Million". December 1, 2015. Accessed March 11, 2018. <http://www.fccj.or.jp/number-1-shimbun/item/709-mr-abe-and-his-100-million/709-mr-abe-and-his-100-million.html>.
- Custer, C. "How the Japanese Robot Avatar OriHime Fights Loneliness." *Tech in Asia*. May 15, 2015. Accessed April 19, 2018. <https://www.techinasia.com/orihime-robot-fights-loneliness>.
- Cuthbertson, Anthony. "An AI Chatbot Just Became a Resident of Japan." *Newsweek*. November 06, 2017. Accessed May 06, 2018. <http://www.newsweek.com/tokyo-residency-artificial-intelligence-boy-shibuya-mirai-702382>.
- Cutts, Robert L. "Power from the Ground Up: Japan's Land Bubble." *Harvard Business Review*. August 01, 2014. Accessed March 10, 2018. <https://hbr.org/1990/05/power-from-the-ground-up-japans-land-bubble>.
- Danova, Tony. "Morgan Stanley: 75 Billion Devices Will Be Connected To The Internet Of Things By 2020." *Business Insider*. October 02, 2013. Accessed May 06, 2018. <http://www.businessinsider.com/75-billion-devices-will-be-connected-to-the-internet-by-2020-2013-10>.
- Davies, Roger J., and Osamu Ikeno. *The Japanese Mind: Understanding Contemporary Japanese Culture*. Tokyo: Tuttle Publishing, 2002.
- DeMace, Kayleigh. "The Rise of the Autonomous Car." *Industrial Outpost*. May 8, 2017. Accessed April 19, 2018. <http://www.industrialoutpost.com/the-rise-of-the-autonomous-car/>.

- Demetriou, Danielle. "First Robot Wedding Takes Place in Japan." *The Telegraph*. June 29, 2015. Accessed May 06, 2018. <https://www.telegraph.co.uk/news/newstopics/howaboutthat/11705149/First-Robot-wedding-takes-place-in-Japan.html>.
- Dickson, Ben. "What Is Narrow, General and Super Artificial Intelligence." TechTalks. March 16, 2017. Accessed May 06, 2018. <https://bdtechtalks.com/2017/05/12/what-is-narrow-general-and-super-artificial-intelligence/>.
- Dower, John. "Throwing off Asia." MIT Visualizing Cultures. 2008. Accessed March 11, 2018. https://ocw.mit.edu/ans7870/21f/21f.027/throwing_off_asia_01/toa_essay02.html.
- Dumouchel, Paul, and Luisa Damiano. *Living with Robots*. Cambridge, MA: Harvard University Press, 2017.
- Fackler, Martin. "Take It From Japan: Bubbles Hurt." *The New York Times*. December 25, 2005. Accessed March 10, 2018. <http://www.nytimes.com/2005/12/25/business/yourmoney/take-it-from-japan-bubbles-hurt.html?mtrref=www.google.com>.
- Fensom, Anthony. "Asia: Whom Do You Trust?" *The Diplomat*. April 11, 2015. Accessed March 12, 2018. <https://thediplomat.com/2015/04/asia-whom-do-you-trust/>.
- Ferrer, Eduardo Castello. "Innovation 25: A Retro-futuristic World?" Eduardo Castello. Accessed April 19, 2018. <http://www.eduardocastello.com/innovation-25-a-retro-futuristic-world/>.
- Fifield, Anna. "Cleaning up After the Dead." *The Washington Post*. January 24, 2018. Accessed March 27, 2018. <https://www.washingtonpost.com/news/world/wp/2018/01/24/feature/so-many-japanese-people-die-alone-theres-a-whole-industry-devoted-to-cleaning-up-after-them/?noredirect=on>.
- Fletcher, Holly. "Aum Shinrikyo." Council on Foreign Relations. June 9, 2012. Accessed March 7, 2018. <https://www.cfr.org/backgrounder/aum-shinrikyo>.
- Ford, Martin R. *The Rise of the Robots: Technology and the Threat of Mass Unemployment*. London: Oneworld, 2017.
- Frantz, Douglas. "Top 8 Banking Firms in Japan, Magazine Says." *Los Angeles Times*. June 15, 1989. Accessed March 11, 2018. http://articles.latimes.com/1989-06-15/business/fi-2564_1_mitsubishi-bank-japan-japanese-banks-bank-nation-assets-deposits.
- Frase, Peter. *Four Futures: Life after Capitalism*. London: New York, 2016.
- French, Howard W. "Japan's Troubling Trend: Rising Teen-Age Crime." *The New York Times*. October 11, 1999. Accessed March 10, 2018. <http://www.nytimes.com/1999/10/12/world/japan-s-troubling-trend-rising-teen-age-crime.html>.

- Friedman, Uri. "Did Engineering Save Lives in the Japanese Earthquake?" *The Atlantic*. March 11, 2011. Accessed March 11, 2018. <https://www.theatlantic.com/international/archive/2011/03/did-engineering-save-lives-japanese-earthquake/348771/>.
- "The Future of Artificial Intelligence and Its Impact on Society." Council on Foreign Relations. November 3, 2017. Accessed April 19, 2018. <https://www.cfr.org/event/future-artificial-intelligence-and-its-impact-society>.
- Glass, Ira, and Brian Reed, prods. "Nummi 2015." In *This American Life*. WBEZ Chicago. July 17, 2015.
- Grace, Katja, John Salvatier, Allan Dafoe, Baobao Zhang, and Owain Evans. "When Will AI Exceed Human Performance? Evidence from AI Experts." Arxiv.org. May 30, 2017. Accessed March 15, 2018. <https://arxiv.org/pdf/1705.08807.pdf>.
- Hall, Ava. "Stamp out Maternity Harassment." *The Japan Times*. October 6, 2017. Accessed April 30, 2018. <https://www.japantimes.co.jp/opinion/2017/10/06/reader-mail/stamp-maternity-harassment/>.
- Hamaguchi, Nobuaki, and Keisuke Kondo. "Regional Employment and Artificial Intelligence in Japan." March 18, 2018. Accessed April 30, 2018. https://06ab0b75-a-62cb3a1a-s-sites.googlegroups.com/site/keisukekondokk/research/HK_REAIJ.pdf?attachauth=ANoY7cqTZWYBK7oGOEV6S6kF7zXeIkAlimTXss3z5rDhLL_QRcGsRyFgNrUUKA9a44O1X7h8i8QZbm bAgdisJMk_xT2ALr5h-AUnnTA4aER02FaXfngvU0_10g4tX80mIWyc4eIqx8r2unRWUuhZK1KEsEfZjc7ua3_W_SzuuUIRFPt0TX3WlqI1zk1pgzvb4FcuMOUHDgJgFzBf1Bmsz7Ug2ljt3Nzu4ppoOU_URt0xV8hauC yhtMg%3D&attredirects=0.
- Harari, Yuval N. *Homo Deus: A Brief History of Tomorrow*. New York: HarperCollins, 2017.
- Harootunian, Harry D., and Masao Miyoshi. *Postmodernism and Japan*. Durham: Duke Univ. Press, 2003.
- Holland, Tom. "Libido, Lost and Found: Why Talk of Japan's Decline Is Premature." *South China Morning Post*. May 15, 2017. Accessed March 11, 2018. <http://www.scmp.com/week-asia/opinion/article/2094173/libido-lost-and-found-why-talk-japans-population-decline-premature>.
- Hornyak, Timonhy N. "The Face That Launched a Thousand Robots." *The Japan Times*. August 20, 2008. Accessed April 19, 2018. <https://www.japantimes.co.jp/life/2008/08/20/digital/the-face-that-launched-a-thousand-robots/>.
- Hornyak, Timothy N. *Loving the Machine: The Art and Science of Japan's Robots*. Tokyo: Kodansha International, 2006.
- Hu, Elise. "Golden Years, Iron Bars: Japan Sees Rise In Crime By The Elderly." NPR. November 22, 2016. Accessed March 12, 2018.

<https://www.npr.org/sections/parallels/2016/11/22/500040363/golden-years-iron-bars-japan-sees-rise-in-crime-by-the-elderly>.

Hurst, Daniel. "Japan Lays Groundwork for Boom in Robot Carers." *The Guardian*. February 06, 2018. Accessed April 19, 2018. <https://www.theguardian.com/world/2018/feb/06/japan-robots-will-care-for-80-of-elderly-by-2020>.

Iles, Timothy, and Peter Matanle. *Researching Twenty-first Century Japan: New Directions and Approaches for the Electronic Age*. Lanham, MD: Lexington, 2012.

Inkinen, Sam, ed. *Mediapolis: Aspects of Texts, Hypertexts Und Multimedial Communication*. Berlin: Walter De Gruyter, 1999.

Innovation 25. Report. 2007. Accessed April 2, 2018. <https://arxiv.org/pdf/1705.08807.pdf>.

Inoue, Makiko, and Megan Specia. "Young Worker Clocked 159 Hours of Overtime in a Month. Then She Died." *The New York Times*. October 05, 2017. Accessed March 10, 2018. <https://www.nytimes.com/2017/10/05/world/asia/japan-death-overwork.html?mtrref=www.google.com>.

"Iron Triangle." NUS Japanese Political Economy. March 12, 2012. Accessed March 3, 2018. <https://wiki.nus.edu.sg/display/JPE2012/Iron+Triangle>.

Jacob, Frank, "The Alteration of the Image – Women and Japanese Society (1600-2000)" (2015). *CUNY Academic Works*. https://academicworks.cuny.edu/qb_pubs/16

"Japan Executes Notorious Cannibal Killer." *Google News*. June 16, 2008. Accessed April 22, 2018. <https://web.archive.org/web/20130709203449/http://afp.google.com/article/ALeqM5jNmP-nKTKmf5cYaGrRNZBaMtms2A>.

"Japan Struggles with Social Media's Connection to Suicide in Wake of Zama Killings." *The Japan Times*. November 16, 2017. Accessed April 30, 2018. <https://www.japantimes.co.jp/news/2017/11/16/national/social-issues/japan-struggles-social-media-suicide-zama-killings/>.

"Japan's Budget for AI to Be Less than a Fifth of That Planned by U.S. and China." *The Japan Times*. February 25, 2018. Accessed April 19, 2018. <https://www.japantimes.co.jp/news/2018/02/25/business/tech/japanese-government-spending-ai-less-20-u-s-china/>.

"Japan's House of Horror Trial Begins." *BBC News*. May 24, 2000. Accessed April 19, 2018. <http://news.bbc.co.uk/2/hi/asia-pacific/761787.stm>.

"Japan's Jobless Rate Falls to 24-year Low of 2.4% in January." *The Japan Times*. March 2, 2018. Accessed April 30, 2018. <https://www.japantimes.co.jp/news/2018/03/02/business/economy-business/japans-jobless-rate-falls-24-year-low-2-4-january/>.

- Johnson, Chalmers A. *MITI and the Japanese Miracle: The Growth of Industrial Policy: 1925-1975*. Stanford: Stanford University Press, 2012.
- Jones, Colin. "Why Robots Will Be Granted a License to Kill, in Japan and Everywhere Else." *The Japan Times*. March 11, 2018. Accessed April 19, 2018. <https://www.japantimes.co.jp/community/2015/03/11/issues/robots-will-granted-license-kill-japan-everywhere-else/>.
- Journal, Wall Street. "Is Technology Making People Less Sociable?" *The Wall Street Journal*. May 11, 2015. Accessed April 30, 2018. <https://www.wsj.com/articles/is-technology-making-people-less-sociable-1431093491>.
- Kaplan, Jerry. *Artificial Intelligence: What Everyone Needs to Know*. New York, NY: Oxford University Press, 2016.
- Katsuno, Hirofumi. "The Robot's Heart: Tinkering with Humanity and Intimacy in Robot-Building." *Japanese Studies* 31, no. 1 (2011): 93-109. Accessed April 1, 2018. doi:10.1080/10371397.2011.560259.
- Kawano, Satsuki. "Education after the "Lost Decade(s)"." In *Capturing Contemporary Japan. Differentiation and Uncertainty*. Honolulu: University of Hawaii Press, 2014.
- Kennedy, Scott. "Made in China 2025." Center for Strategic and International Studies. June 1, 2015. Accessed April 19, 2018. <https://www.csis.org/analysis/made-china-2025>.
- Kingston, Drew A., Paul Fedoroff, Philip Firestone, Susan Curry, and John M. Bradford. "Pornography Use and Sexual Aggression: The Impact of Frequency and Type of Pornography Use on Recidivism among Sexual Offenders." *Aggressive Behavior* 34, no. 4 (2008): 341-51. Accessed April 25, 2018. doi:10.1002/ab.20250.
- Kingston, Jeff. *Critical Issues in Contemporary Japan*. London: Routledge, Taylor & Francis Group, 2014.
- Kingston, Jeff. *Japan in Transformation, 1945-2010*. Abingdon, Oxon: Routledge, 2014.
- Kittaka, Louise George. "Juku: An Unnecessary Evil or Vital Steppingstone to Success?" *The Japan Times*. March 5, 2013. Accessed March 10, 2018. <https://www.japantimes.co.jp/community/2013/03/05/issues/juku-an-unnecessary-evil-or-vital-steppingstone-to-success/>.
- Kiyoshi, Ishikawa. "'Hikikomori': Social Recluses in the Shadows of an Aging Japan." *Nippon.com*. October 02, 2017. Accessed April 19, 2018. <https://www.nippon.com/en/currents/d00332/>.
- "Kobe Marks 23 Years since Great Hanshin Earthquake That Killed More than 6,400." *The Japan Times*. January 17, 2018. Accessed March 11, 2018. <https://www.japantimes.co.jp/news/2018/01/17/national/kobe-marks-23-years-since-great-hanshin-earthquake-killed-6400/>.

- Koike, Yuriko. "Abenomics' Women Problem." *The Japan Times*. October 7, 2014. Accessed April 30, 2018. <https://www.japantimes.co.jp/opinion/2014/10/07/commentary/japan-commentary/abenomics-women-problem/>.
- Kristof, Nicholas. "14-Year-Old Arrested in Japan for the Brutal Slaying of a Child." *The New York Times*. June 28, 1997. Accessed March 10, 2018. <http://www.nytimes.com/1997/06/29/world/14-year-old-arrested-in-japan-for-the-brutal-slaying-of-a-child.html>.
- Kurzweil, Ray. *The Singularity Is Near: When Humans Transcend Biology*. London: Duckworth, 2016.
- Kyoji, Fukao. *JCER Productivity Research Report - Japan's Productivity Growth Rising, but Still Trailing the U.S.* Report. May 9, 2008. Accessed May 15, 2018. <https://www.rieti.go.jp/en/papers/contribution/fukao/03.html>.
- Lee, Hyea Won. "What Is Korea's Strategy to Manage the Implications of Artificial Intelligence?" *World Bank* (blog), August 29, 2016. Accessed March 2018, 30. <http://blogs.worldbank.org/ic4d/what-korea-s-strategy-manage-implications-artificial-intelligence>.
- Leopold, Till Alexander, Saadia Zahidi, and Vesselina Ratcheva. *Global Gender Gap Report 2016*. Publication. 2016. Accessed April 20, 2018. http://www3.weforum.org/docs/GGGR16/WEF_Global_Gender_Gap_Report_2016.pdf.
- "Made in China." *Madeinchina2025*. Accessed April 19, 2018. <http://english.gov.cn/2016special/madeinchina2025/>.
- Madrigal, Alexis C. "If Buddhist Monks Trained AI." *The Atlantic*. June 29, 2017. Accessed April 19, 2018. <https://www.theatlantic.com/technology/archive/2017/06/how-do-buddhist-monks-think-about-the-trolley-problem/532092/>.
- The Malicious Use of Artificial Intelligence: Forecasting, Prevention, and Mitigation*. Report. February 2018. Accessed April 1, 2018. <https://arxiv.org/pdf/1802.07228.pdf>.
- "Many Smart Ideas One Smart Nation." *Smart Nation*. 2018. Accessed April 19, 2018. <https://www.smartnation.sg/>.
- Martin, Alex. "Day Care Facilities Test Robots as High-tech Solution to Alleviate Staffing Shortages." *The Japan Times*. September 7, 2017. Accessed April 19, 2018. <https://www.japantimes.co.jp/news/2017/09/07/national/day-care-facilities-turn-to-robots-as-high-tech-solution-to-alleviate-staffing-shortages/>.
- Masuda, Yoneji. *The Information Society as Post-industrial Society*. Washington, DC: World Future Society, 1983.
- McAfee, Andrew, and Erik Brynjolfsson. *Machine, Platform, Crowd: Harnessing Our Digital Future*. S.1.: W. W. NORTON, 2018.

- McCurry, Justin. "Japan Had 20,000 Applications for Asylum in 2017. It Accepted 20." *The Guardian*. February 16, 2018. Accessed April 30, 2018. <https://www.theguardian.com/world/2018/feb/16/japan-asylum-applications-2017-accepted-20>.
- McCurry, Justin. "Japanese Company Replaces Office Workers with Artificial Intelligence." *The Guardian*. January 05, 2017. Accessed April 19, 2018. <https://www.theguardian.com/technology/2017/jan/05/japanese-company-replaces-office-workers-artificial-intelligence-ai-fukoku-mutual-life-insurance>.
- Metz, Cade. "In Two Moves, AlphaGo and Lee Sedol Redefined the Future." *Wired*. June 03, 2017. Accessed April 19, 2018. <https://www.wired.com/2016/03/two-moves-alphago-lee-sedol-redefined-future/>.
- Moran, Craig. "Will Immigration Rescue Japan, and the Region?" *World Policy*. September 18, 2017. Accessed April 30, 2018. <https://worldpolicy.org/2017/09/18/will-immigration-rescue-japan-and-the-region/>.
- Mori, Masahiro. *The Buddha in the Robot*. Tokyo: Kosei Publ., 2005.
- Morioka, Hisayoshi, Osamu Itani, Yoneatsu Osaki, Susumu Higuchi, Maki Jike, Yoshitaka Kaneita, Hideyuki Kanda, Sachi Nakagome, and Takashi Ohida. "Association Between Smoking and Problematic Internet Use Among Japanese Adolescents: Large-Scale Nationwide Epidemiological Study." *Cyberpsychology, Behavior, and Social Networking* 19, no. 9 (2016): 557-61. Accessed April 21, 2018. doi:10.1089/cyber.2016.0182.
- Morris-Suzuki, Tessa. *Beyond Computopia*. New York: Routledge, 2015.
- Murakami, Haruki. *Underground: The Tokyo Gas Attack and the Japanese Psyche*. Translated by Alfred Birnbaum and Philip Gabriel. London: Vintage, 2013.
- Nara, Hiroshi. *Inexorable Modernity: Japan's Grappling with Modernity in the Arts*. Totowa: Rowman & Littlefield, 2007.
- New Robot Strategy*. Report. 2015. Accessed March 25, 2018. http://www.meti.go.jp/english/press/2015/pdf/0123_01b.pdf.
- Nobumasa, Akiyama. *Examining Japan's Lost Decades*. London: Routledge, 2015.
- Oda, Shoko, and Isabel Reynolds. "Tokyo Has More Than Two Job Openings for Every Applicant." *Bloomberg*. March 16, 2017. Accessed March 1, 2018. <https://www.bloomberg.com/news/articles/2017-03-16/japan-s-matrix-like-dilemma-too-many-jobs-too-few-immigrants>.
- Onishi, Norimitsu. "Crime Rattles Japanese Calm, Attracting Politicians' Notice." *The New York Times*. September 05, 2003. Accessed March 10, 2018. <http://www.nytimes.com/2003/09/06/world/crime-rattles-japanese-calm-attracting-politicians-notice.html>.

- Osaki, Tomohiro. "Death Sentence Upheld for Akihabara Rampage Killer." *The Japan Times*. February 2, 2015. Accessed April 22, 2018. <https://www.japantimes.co.jp/news/2015/02/02/national/crime-legal/death-sentence-confirmed-akihabara-rampage-killer/>.
- Osbourne, Michael, and Carl Benedikt Frey. "The Great Escape: How Workforce Automation Is the Answer to Japan's Secular Stagnation." *Nikkei Asian Review*. January 2016. Accessed April 15, 2018. https://www.oxfordmartin.ox.ac.uk/downloads/news-items/Nikkei_Frey_Osborne_030116.pdf.
- Otake, Tomoko. "Suicides Down, but Japan Still Second Highest among Major Industrialized Nations, Report Says." *The Japan Times*. May 30, 2017. Accessed April 30, 2018. <https://www.japantimes.co.jp/news/2017/05/30/national/social-issues/preventive-efforts-seen-helping-2016-saw-another-decline-suicides-japan-21897/>.
- "PALRO Is a Chatty, Comforting Robot." PALRO(パルロ). Accessed April 19, 2018. <https://palro.jp/en/>.
- Pilz, Matthias, Kirsten Schmidt-Altmann, and Mikiko Eswein. "Problematic Transitions from School to Employment: Freeters and NEETs in Japan and Germany." *Compare: A Journal of Comparative and International Education* 45, no. 1 (October 14, 2013): 70-93. Accessed April 30, 2018. doi:10.1080/03057925.2013.835193.
- "Police Search the Home of Boy in Bus Hijacking." *The Japan Times*. May 7, 2000. Accessed April 19, 2018. <https://www.japantimes.co.jp/news/2000/05/07/national/police-search-the-home-of-boy-in-bus-hijacking/>.
- R.A. "The Japanese Tragedy." *The Economist*. August 03, 2012. Accessed March 11, 2018. <https://www.economist.com/blogs/freeexchange/2012/08/lost-decades>.
- Rear, David. "Reforming Japanese-style Management: Destabilizing Hegemony through Discourse Intervention." *Contemporary Japan* 28, no. 2 (October 28, 2016): 209-28. Accessed March 1, 2018. doi:10.1515/cj-2016-0011.
- "Record 2.38 Million Foreign Residents Living in Japan in 2016." *The Japan Times*. March 17, 2017. Accessed April 30, 2018. <https://www.japantimes.co.jp/news/2017/03/17/national/record-2-38-million-foreign-residents-living-japan-2016/>.
- Rejcek, Peter. "Can Futurists Predict the Year of the Singularity?" *Singularity Hub*. March 31, 2017. Accessed May 06, 2018. <https://singularityhub.com/2017/03/31/can-futurists-predict-the-year-of-the-singularity/#sm.0000nqfa8hs8tdj9ti2294u0jsjyc>.
- 伊野辺家の1日. Report. 2015. Accessed April 12, 2018. <http://www.cao.go.jp/innovation/action/conference/minutes/inobeke.html>.
- Rich, Motoko. "Shinzo Abe Announces Plan to Revise Japan's Pacifist Constitution." *The New York Times*. May 03, 2017. Accessed May 06, 2018. <https://www.nytimes.com/2017/05/03/world/asia/japan-constitution-shinzo-abe->

military.html?mtrref=www.google.com&gwh=65342C310121FCA0EE337DECFBB8502E&gw
t=pay.

- Robertson, Jennifer. "Gendering Humanoid Robots: Robo-Sexism in Japan." *Body & Society* 16, no. 2 (2010): 1-36. Accessed April 20, 2018. doi:10.1177/1357034x10364767.
- Robertson, Jennifer. *Robo Sapiens Japonicus: Robots, Gender, Family, and the Japanese Nation*. Oakland: University of California Press, 2018.
- Ryan, Kyla. "Japan's Immigration Reluctance." *The Diplomat*. September 15, 2015. Accessed April 30, 2018. <https://thediplomat.com/2015/09/japans-immigration-reluctance/>.
- "Saya: Big Ambitions for Japanese 'digital Daughter'." *BBC News*. October 08, 2016. Accessed April 19, 2018. <http://www.bbc.com/news/world-asia-37548733>.
- Schiller, Ben. "This Japanese Novel Authored By A Computer Is Scarily Well-Written." *Fast Company*. March 28, 2016. Accessed April 19, 2018. <https://www.fastcompany.com/3058300/this-japanese-novel-authored-by-a-computer-is-scarily-well-written>.
- Schodt, Frederik L. *Inside the Robot Kingdom: Japan, Mechatronics, and the Coming Robotopia*. Tokyo: Kodansha International, 1990.
- Schoppa, Leonard J. *Race for the Exits: The Unraveling of Japan's System of Social Protection*. Ithaca, NY: Cornell University Press, 2008.
- Schreiber, Mark. "The Changing Motives behind Juvenile Crime in Japan." *The Japan Times*. January 31, 2015. Accessed March 10, 2018. <https://www.japantimes.co.jp/news/2015/01/31/national/media-national/changing-motives-behind-juvenile-crime-japan/>.
- Shaw, Debra Benita. *Technoculture: The Key Concepts*. Oxford: Berg, 2008.
- Sifferlin, Alexandra. "Why Loneliness Is a Public Health Threat." *Fortune*. April 30, 2018. Accessed August 07, 2017. <http://fortune.com/2017/08/07/loneliness-public-health/>.
- Sony. "Sony Launches Four-Legged Entertainment Robot." News release, May 11, 1999. SONY. Accessed April 19, 2018. https://www.sony.net/SonyInfo/News/Press_Archive/199905/99-046/index.html.
- Sparrow, Robert. "Robots, Rape, and Representation." *International Journal of Social Robotics* 9, no. 4 (2017): 465-77. Accessed April 15, 2018. doi:10.1007/s12369-017-0413-z.
- Stearns, Peter N. *Sexuality in World History*. London: Routledge, 2009.
- Sugai, Hiroyuki. *Japan's Future Defense Equipment Policy*. Report. October 16, 2016. Accessed May 15, 2018. https://www.brookings.edu/wp-content/uploads/2016/10/201610_japan_future_defense_hiroyuki_sugai.pdf.

- Sugimoto, Yoshio. *An Introduction to Japanese Society*. Melbourne: Cambridge University Press, 2014.
- Surber, Regina. "Artificial Intelligence: Autonomous Technology (AT), Lethal Autonomous Weapons Systems (LAWS) and Peace Time Threats." *Reaching Critical Will*. February 21, 2018. Accessed April 20, 2018. <http://reachingcriticalwill.org/images/documents/Disarmament-fora/ccw/2018/gge/documents/ICT4Peace-and-ZHET>.
- Tarantola, Andrew. "Robots Expected to Run Half of Japan by 2035." *Engadget*. July 14, 2016. Accessed April 19, 2018. <https://www.engadget.com/2015/12/04/robots-expected-to-run-half-of-japan-by-2035/>.
- Tegmark, Max. *LIFE 3.0: Being Human in the Age of Artificial Intelligence*. S.l.: Penguin Books, 2018.
- "Testing times." *The Economist*. December 31, 2011. Accessed March 10, 2018. <https://www.economist.com/node/21542222>.
- Theodore, De Bary Wm., Carol Gluck, and Arthur E. Tiedemann. *Sources of Japanese Tradition*. Vol. 2. New York: Columbia University Press, 2006.
- Tipton, Elise K. *Modern Japan: A Social and Political History*. 3rd ed. London and New York: Routledge, 2016.
- United Nations. Economic Commission for Europe. "The Boom in Robot Investment Continues – 900,000 Industrial Robots by 2003 UN/ECE Issues Its 2000 World Robotics Survey." News release, October 17, 2000. Unece.org. Accessed May 6, 2018. <http://www.unece.org/press/pr2000/00stat10e.html>.
- Vogel, Ezra F., and Suzanne Hall Vogel. *Japan's New Middle Class: The Salary Man and His Family in a Tokyo Suburb*. Berkeley, Calif: University of California Press, 1991.
- "WABOT." Waseda.jp. Accessed May 06, 2018. http://www.humanoid.waseda.ac.jp/booklet/kato_2.html.
- Weisman, Steven R. "Enduring the Unendurable in Postwar Japan." *The New York Times*. April 11, 1999. Accessed March 10, 2018. <http://www.nytimes.com/1999/04/12/opinion/editorial-observer-enduring-the-unendurable-in-postwar-japan.html>.
- Weller, Chris. "A Robot Did Better than 80% of Students on the University of Tokyo Entrance Exam." *Business Insider*. September 06, 2017. Accessed April 30, 2018. <http://www.businessinsider.com/robot-beat-most-students-on-university-tokyo-entrance-exam-2017-9>.
- "What Is Aging in Place? - Age in Place Definition." *Aging in Place*. 2018. Accessed May 07, 2018. <https://ageinplace.com/aging-in-place-basics/what-is-aging-in-place/>.

- White, Merry. *Coffee Life in Japan*. Berkeley: University of California Press, 2012.
- Williams, R. John. *The Buddha in the Machine: Art, Technology, and the Meeting of East and West*. New Haven: Yale University Press, 2014.
- Wu, Wendy. "China Tops Global Poll for Faith in AI Creating Jobs, Improving Lives." *South China Morning Post*. February 09, 2018. Accessed April 19, 2018.
<http://www.scmp.com/news/china/society/article/2132743/china-tops-global-poll-faith-ai-technology-creating-jobs-and>.
- Yamazaki, Makiko. "Japanese Firms See Big Future for Small-scale Industrial Robots." *The Japan Times*. April 24, 2018. Accessed April 24, 2018.
<https://www.japantimes.co.jp/news/2018/04/24/business/corporate-business/japanese-firms-see-big-future-small-scale-industrial-robots/>.
- Yang, Jeff. "ASIAN POP Robot Nation / Why Japan, and Not America, Is Likely to Be the World's First Cyborg Society." *SFGate*. January 09, 2018. Accessed April 19, 2018.
<https://www.sfgate.com/entertainment/article/ASIAN-POP-Robot-Nation-Why-Japan-and-not-3237591.php>.