

# Moral dilemmas for Japan’s high-tech researchers

## Editorial

The line between civilian and military research has become more permeable in recent years. The increasing sophistication of weapons systems has prompted speculation of a “third revolution” in warfare, in which information technologies allow war to be fought at an unprecedented speed and intensity. While the darkest imaginings of Hollywood films like “Terminator” remain a distant prospect, researchers are increasingly forced to assess their involvement in programs that raise important moral and ethical questions.

Last week, for example, news that the Korea Advanced Institute of Science and Technology (KAIST) would open an artificial intelligence research center in cooperation with Hanwha Systems, a defense company, prompted 50 AI scientists to call for a boycott of work with KAIST because of fears that the research would “accelerate the arms race to develop [autonomous] weapons.” This will, said the signatories in a letter, “permit war to be fought faster and at a scale greater than ever before.... They have the potential to be weapons of terror.... This Pandora’s box will be hard to close if it is opened.”

The president of KAIST, Shin Sung-chul, responded by noting that the university was “significantly aware” of ethical concerns regarding AI, and it had no intention to develop “lethal autonomous weapons systems or killer robots” or “conduct any research activities counter to human dignity including autonomous weapons lacking meaningful human control.” He added that “As an academic institution, we value human rights and ethical standards to a very high degree.” At the same time, however, KAIST will continue cooperation with Hanwha’s defense business unit.

The KAIST boycott followed reports that Google employees had circulated a letter demanding that their company cease its collaboration with the Pentagon on an AI project to analyze drone footage that can be used in the war against Islamic State. “Google should not be in the business of war,” says the letter, signed by over 3,000 employees. While the company insists that the program is focused on “nonoffensive purposes,” the signatories countered that “We cannot outsource the moral responsibility of our technologies to third parties.”

AI has long been a sensitive subject for researchers. In 2015, thousands of them signed an open letter demanding a ban of weapons “beyond meaningful human control.” Twenty-two countries have since called for a pre-emptive ban on autonomous weapons and the United Nations is discussing the issue this week.

This issue has a special resonance in Japan, where the military application of civilian research has extraordinary sensitivity. In recent years, the Japanese government has promoted collaboration between civilian researchers in science and technology and the defense sector to ensure that Japan will remain on the leading edge of defense capabilities. As part of the effort, the Defense Ministry’s Acquisition, Technology and Logistics Agency launched in 2015 the National Security Technology Research Promotion, which provides grants for research that could be applied to defense equipment, and now has a budget that exceeds ¥10 billion.

That program prompted the Science Council of Japan (SCJ) in March 2017 to adopt a statement restating its earlier rejections of military research — made in 1950 and 1967 — and called on other research organizations to develop evaluation procedures to ensure that their work is not linked to the military. A year later, a SCJ survey showed that approximately one-quarter of 183 universities and research organizations have now established such screening systems. The Japanese Society for Artificial Intelligence drew up ethical guidelines in 2017, but they do not debate the issue of military research.

Last month, Kyoto University announced that it would not carry out military research at the school, arguing that such research could lead to threats to tranquility, human happiness and peace. At the same time, however, a standing committee will be established to discuss whether individual cases are appropriate.

Kyoto University’s ambivalence is not unique. Only 30 of 183 research organizations surveyed allow researchers to apply for Defense Ministry grants. Those organizations argue that a blanket refusal to accept such money could deprive them of essential funds and deter young professionals from joining for fear of being cut off from cutting-edge research. Others assert that research is needed to ensure that Japan can defend itself. Neighboring countries are engaged in such efforts and Japan must keep up. Moreover, Japan’s ally, the United States, is pursuing such initiatives and a failure to keep pace will lock this country out of vital defense and security projects.

There are no easy answers to this problem, but Japan must be prepared to make difficult — and painful — choices.

# Control of battery resources is key to EV leadership



In this column last month, I concluded that whoever controls the battery supply will command the electric vehicle industry. But what does this really mean? I would like to examine the assertion more closely.

In 1991, Sony released the world’s first lithium-ion battery, which is now a central component of electric vehicles, plug-in hybrid vehicles (PHVs), and hybrid vehicles (HVs). Up until just a few years ago, Japanese companies commanded over half of the global market for lithium-ion batteries. Today, however, Chinese companies control 60 percent of the global market. Japanese companies now have fallen down to a market share of little more than 20 percent, while South Korea’s share is less than 10 percent.

There are about 200 battery manufacturers operating in China. This crowded field is led by Contemporary Amperex Technology (CATL) and BYD Auto.

The Chinese government has identified the promotion of the EV industry as a main pillar of its national strategy, and set a target of having 5 million new energy vehicles, including EVs, on the road by 2020. In China, the government sends clear policy signals to the market. More precisely, in certain strategic industries the Chinese government and corporations act in unison, with subsidies and regulatory measures (for example, setting sales quotas) used to stimulate consumer demand and create a new market.

Chinese battery manufacturers are significantly expanding their output capacity. CATL has declared that by 2020 it will have a productive capacity for 50 gigawatt per hours annually — almost six times larger than its current level.

Beijing will likely press foreign auto manufacturers operating in the Chinese market to build electric vehicles. Then, the Chinese government may use local content policies to ensure that these vehicles are equipped with Chinese batteries.

In that event, China’s geopolitical relations with not only Japan and South Korea, but also with the United States and Europe, will



A Tesla Motor Inc. Model 3 vehicle is displayed outside the company’s Gigafactory in Sparks, Nevada, on July 26, 2016, the day Tesla officially opened the facility in partnership with leading lithium-ion battery maker Panasonic. The factory is about 30 percent complete, but when it’s finished it will be about about the size of 262 NFL football fields. BLOOMBERG

cast a long shadow. Anticipating growth of Chinese demand, the South Korean lithium-ion battery manufacturers LG Chem and Samsung SDI built new factories in China. However, both companies were excluded from China’s list of manufacturers eligible for government subsidies. The friction between China and South Korea over the latter’s deployment of the THAAD (Terminal High Altitude Air Defense) system was deemed to have factored in the Chinese government’s decision.

China will likely require the use of Chinese batteries by all foreign carmakers operating into the Chinese market, along with prodding them for transfer of battery-related technology to local manufacturers.

European countries have made the entry of their automakers into the Chinese EV market a top priority. However, given the fact that Britain, France, and Germany have all adopted the transition to electric vehicles

as their own national policy, it is difficult to imagine that they will allow their domestic EV industries to remain dependent on Chinese batteries. At some point the European Union or Germany will attempt a counter-offensive with European batteries.

Meanwhile, China is attempting to widen the reach of Chinese standards on electric vehicles and batteries along its Belt and Road Initiative (BRI).

China plans to beef up its own satellite navigation system by increasing the number of its satellites from the current 24 to 35 by 2020. In addition, China will build roughly 2,000 ground stations across the Eurasian continent that will be spanned by the BRI. This will enable China to develop the type of high-precision navigation system with “centimeter-level accuracy” required for self-driving cars. This massive new infrastructure installation is intended for Chinese-made autonomous electric vehicles, equipped

Panasonic, Tesla, Toyota and the various Chinese makers are all rushing to discover the next generation technology to succeed the lithium-ion battery.

with Chinese batteries. This field is led by the company Baidu, which has embarked on the development of autonomous cars.

Whoever controls the battery supply will command the electric vehicle industry. Without taking the lead on batteries, we won’t be able to lead the competition in not just electric vehicles but all electrified vehicles such as PHVs, HVs and fuel-cell vehicles. At present, batteries comprises a full 70 percent of the total production cost of an electric vehicle.

Batteries represent the pinnacle of manufacturing. Manufacturers must figure out how to cram components into a small area while increasing energy density and electrical output. Batteries are also, in a sense, “raw goods” whose longevity depends on temperature control. It is a field where the magic of chemistry determines everything.

In Japan, Panasonic alone has made a good showing in this field. The technology of its state-of-the-art cylindrical lithium-ion battery is acknowledged to be the best in the world. Both Tesla and Toyota have sought out Panasonic for joint projects on battery development, and Panasonic and Tesla have together built a huge factory in Reno, Nevada, known as the Gigafactory.

Yet Panasonic, Tesla, Toyota and the various Chinese manufacturers are all rushing to compete in the “great transformation”: the race to discover the next generation technology to succeed the lithium-ion battery. Toyota is moving to the development of a solid-state battery.

There is yet another consideration. Countries are desperately seeking to secure access to the raw materials needed for manufacture of batteries, such as cobalt and nickel. Cobalt reserves are concentrated in the Democratic Republic of Congo, and already China is deemed to dominate access to over half of these reserves. Technological breakthroughs may allow countries to overcome economic constraints, but compelling geopolitical constraints — in this case, the need to secure scarce resources — remain.

Japan must strengthen its resources diplomacy in order to open up a new horizon in the electric revolution.

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# Why Pyongyang wants a deal with Washington

Can Vietnam serve as an inspiring example for Kim, or is it Belarus?

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NEW YORK  
THE GLOBALIST

North Korea leader Kim Jong Un’s No. 1 objective is surely the survival of his regime, and of himself as leader, preferably for several decades, given his youth. It is less clear how he can best achieve this. Outright collapse of the North Korean economy and mass starvation, or nuclear war with the United States are both bad outcomes from his point of view, because both would destabilize or end his regime.

Complete stasis is the alternative chosen since the 1950s by his father and grandfather. This keeps the North Korean people poor, but mostly not in crisis, while the U.S. and the West make no significant attempts to dislodge him.

At first sight, the ideal role model for a North Korean opening is Vietnam. That country is extremely open to foreign investment, at least by major corporations, and has a functioning stock market with several domestic corporations listed on it, although the largest companies are majority government controlled. However, Vietnam relies heavily on foreign investment, most of which is for production exported to rich-country markets. As a result, Vietnam is an exceptionally open economy, with exports amounting to almost 100 percent of GDP.

Even though its purchasing power parity GDP is \$7,300, four times that of North Korea, it is not a model Kim may wish to emulate. North Korea lacks several characteristics that make Vietnam successful. Its workforce is nowhere near as well educated. The country is highly isolationist, with very little contact with the outside world. In contrast, Vietnam’s workforce had little more than a decade when outside contact was low, with a high level of contact (at least in the south) before 1975 and after the Doi Moi

opening to the world, which began in 1986. North Korea is also dependent on China, which takes nearly 90 percent of its exports, which are only around 15 percent of GDP.

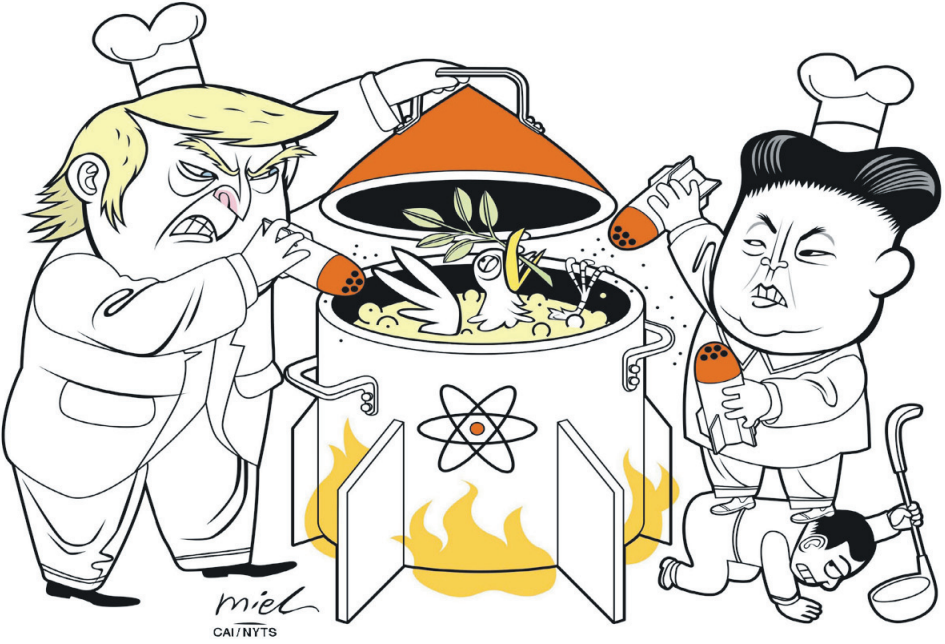
Given the nature of North Korea’s workforce, and the discomfort of both its leadership and its people with international involvement, the Vietnam strategy is really not available to them. It would involve a level of openness and foreign presence that would be dangerous to Kim, unacceptable to his supporters in the regime (who must somehow be kept on board) and disquieting to the North Korean people.

There is however an alternative route. At present, North Korea is unacceptably dependent on China, with whom it shares 90 percent of its limited foreign trade. With only one buyer and one seller, it is very unlikely that North Korea gets a fair deal in its trading relationships. However, Russia also shares a 17 km land border with North Korea. In the past, they have had cordial relations.

Russia’s heavy industry-oriented economy can make use of North Korea’s mineral resources, and it also has a substantial private sector that after 25 years of freeish-market operation can certainly provide know-how to North Korea on adaptation to the new world.

Russia under President Vladimir Putin has shown a strong wish to develop “satellite” economies in its “near abroad” with strong links to Russia, mostly for strategic reasons. Such a position does not require the degree of openness to international trade and the Western world that a Vietnam has. Yet, it can still result in considerable economic development from North Korea’s present position.

Examples of such countries, with different degrees of development and dependence on the Russian economy, are Kyrgyzstan, Uzbekistan, Tajikistan and Belarus. None of these countries is free in the Western sense (Kyrgyzstan is the freest, Uzbekistan the worst). Yet, all of them are substantially richer than North Korea in terms of purchasing power parity GDP per capita, although in the case of Kyrgyzstan and Tajikistan the



advantage is modest (\$3,100 and \$2,200 against North Korea’s \$1,800).

Uzbekistan at \$5,600 and Belarus at an astounding \$17,000 are far richer than North Korea, yet both are unpleasant dictatorships with strong traditions of Soviet central planning. These countries’ economic openness varies roughly with GDP, with Belarus having exports around 55 percent of GDP and Tajikistan the lowest at 16 percent of GDP. All are more open than North Korea, none as open as Vietnam.

It should be noted that North Korea has an enormous advantage over the Central Asian members of this quartet — it has access to the sea, and hence to international trade routes.

In addition to its new possible Russian orientation, North Korea could conduct limited experiments in non-Russian foreign investment, notably from its neighbor South Korea, but also from the West which would gradually open its economy to world commerce as a whole.

From Kim’s vantage point, the ability to do this would keep Russian and Chinese investors “honest” and prevent the undue domination of the North Korean economy by outside forces, which Kim and the North Korean people both want to avoid. Western bank credit would also be useful to lubricate the process.

North Korea’s ideal to aim for, therefore, its shimmering vision of a more prosperous future, is not Vietnam but Belarus. To achieve a development of the North Korean

economy and its re-orientation toward Russia, Kim probably needs two treaties — not just one.

With Trump, he needs a treaty ending sanctions on North Korea and allowing it to make arrangements with the Western private sector in its own interests. With Russia, he needs a treaty of alliance and assistance, ideally funded by the Western banking system.

Both these treaties should be available, given goodwill and competent negotiating by Kim and his colleagues. The main sticking point will be North Korea’s nuclear and missile programs.

Giving up the missiles might well shorten Kim’s life expectancy, since his military chiefs are very attached to those programs. Without the nuclear arsenal, they lose their sense of purpose, their position in North Korean society and, in the long term, their funding.

A Trump-Kim summit, if it happens, or indeed a three-way Trump-Kim-Putin summit, offers a chance for a deal that is beneficial to all sides, and to the North Korean people.

The incentives are there. The question is whether all sides are “smart” enough negotiators to attain an acceptable outcome.

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