Revisiting Risk vs. Risk – How Can Society Live with Complex Technologies?

By Kazumasa Kusaka

The two recent disasters involving the state-of-the-art Boeing 737 MAX are reported to have resulted in the highest insurance payments on record. The jet embodies high-level self-piloting technology and investigations are under way to find the causes of the accidents. In the meantime, the regulatory authorities have ordered all planes of the same type to be grounded.

How do societies react to such events? After a series of air accidents, do passengers change to cars or bicycles to cover long distances? Did energy users give up their oil and gas dependency after BP's Deepwater Horizon accident in 2010, which claimed 11 lives and destroyed the environment in the Gulf of Mexico? The death toll in annual road traffic accidents among OECD countries is 10 per 100,000 people, but the majority of people keep using cars. As a society, the best response remains adopting higher safety standards.

Governments regulate risky industrial systems in the hope of making them less risky. But as we have observed with the Three Mile Island nuclear accident in 1979, the space shuttle Columbia tragedy in 2003, and the Fukushima nuclear disaster in 2011, accidents will inevitably occur with such complex technologies. All the elements of these systems – designs, procedures, supplies and equipment, operators and the natural environment surrounding them – could be subject to the risk of failure, and we need to continue learning from such failures.

Protecting against complex combinations of external events that cause such failures is a real challenge. The risk-management challenges presented by nuclear power are in some respects analogous to those presented by deepwater drilling: they are derived from a dependence on highly sophisticated technologies, a low probability of catastrophic consequences from the risks generated, and a culture of complacency developed over time in the absence of major accidents.

Why are people's reactions different to accidents involving transport, industrial facilities and nuclear power generation? Though people talk about risk after a series of air accidents, driving to the airport is more dangerous in terms of the probability of an accident than taking a flight. People react more to the awfulness of an accident than to its probability. Fatal accidents in energy production in dam construction or upstream oil and gas facilities are also out of the public eye and regarded as a risk limited to workers at the sites. On the other hand, the Fukushima nuclear accident deeply affected the regional community through radioactive soil contamination and subsequent dislocation from their homes, spreading a much greater degree of dread. Responses to fatal accidents also depend on whether they are related to the victims' job, or caused by one's own decision to take a risk, or are felt as being collateral to someone else's decision.

Given these different social reactions, how can we tame such complex technological systems? In the United States the nuclear industry started self-policing as a supplement to government regulation through the Institute of Nuclear Power Operations and has worked closely with nuclear insurers and national regulators. A pool of highly-paid professionals and the financial and reputational pressure which insurance companies provide have proved essential to complement government regulatory authority.

Risk communication with society is also critical, but can risk be cut to zero? One familiar example notes that in order to reduce a headache, you decide to take an aspirin, but thereby induce a set of potential countervailing risks such as stomach pain or ulcers. In some cases, risk transfers occur, i.e. situations where risks shift from one population to another, as in the case of environment regulations. In tackling a target, risks can have unintended consequences, as the classic analysis *Risk vs. Risk: Tradeoffs in Protecting Health and the Environment* (1997) by John D. Graham and Jonathan Baert Wiener pointed out.

One unfortunate development in nuclear power generation is the myth of absolute safety that nuclear operators and governments adopt to gain public acceptance in locating plants. They failed to pay attention to more critical views and to progress in non-nuclear knowledge in science and engineering. In the context of the year 2070 for CO2 zero emission targets, experts say that in addition to renewable energy and carbon recycling, nuclear power generation has to be reappraised, and the challenge will be how to make it more acceptable to society.

The key point in society's reaction is involvement in decision-making. In accidents with collateral damage, others can be blamed and the technology concerned rejected. But when professional knowledge is openly shared and decisions are taken by independent discussions and a democratic process, they become similar to the decision to fly based on one's own choice.

The question of how to build a constructive relationship to be applied to emerging self-driving technology in our developing regulatory framework should involve the general public. The public needs to be part of the commitment to make the technology better and safer.

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