Leadership in Nuclear Crises: Lessons from Three Mile Island and Fukushima

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Although leadership is vitally important to manage a crisis, it is not rational to attribute the cause of the crisis solely to leadership failure. This paper investigates Three Mile Island accident and Fukushima Daiichi nuclear disaster, from the perspective of Mitroff’s crisis management theory. As a result, it has become clear that inadequate preparation and structural problems, coupled with leadership failure, caused both crises. Lessons from both crises are criticizing failures of leaders is important, but recognizing structural problems and fixing them is equally or more important. It is only the process of learning from a crisis that allows leaders to do so. Therefore, it is no exaggeration to say that an essential part of the leadership is not only to deal with a crisis, but also to learn from a crisis.

1. INTRODUCTION

Political leaders often find themselves facing one crisis after another, ranging from natural disasters to man-made crises such as terrorism and armed conflict. As history repeatedly shows, the fate of an administration may hinge on the leader’s response to a crisis; presidents and prime ministers can earn valuable credit for dealing effectively with such situations; poor management, on the other hand, will cause them to lose credibility. Therefore, it is clear that a leader’s personal capacity and leadership skills, those required to manage a crisis, can be critically important. At the same time, however, it is irrational to expect a leader to inevitably find a panacea and solve all the issues when responding to a
According to crisis management theory advocated by Ian Mitroff of the University of Southern California, leadership is vitally important during a crisis, but what is equally important is preparation before the crisis arises in the first place and organizational learning afterwards.

The growing fear of nuclear crises is now salient due to the Fukushima Daiichi nuclear disaster triggered by the earthquake with a magnitude of 8.9 and subsequent tsunami on March 11, 2011. Although the crisis appears to be a natural disaster, it is also partly a man-made disaster, caused by combinations of leadership failures and structural problems. More importantly, the nuclear disaster that occurred in Fukushima shares many commonalities with Three Mile Island accident. That is to say, the history repeated itself and it may repeat again in the near future. Therefore, it is highly important to thoroughly re-examine both nuclear crises and learn critical lessons in order not to repeat the same mistakes any more. I will start off by touching upon Mitroff’s crisis management theory. In the following section, each event, namely Three Mile Island accident and Fukushima Daiichi nuclear disaster, will be analyzed from the perspective of this theory. Lastly, important lessons learned from both crises that should contribute to improve safety measures will be discussed.

2. CRISIS MANAGEMENT THEORY

So far, a number of works have been written regarding crisis management. For instance, in his pioneering work, Ian Mitroff claims that all crises go through mainly five phases: starting off from (1) early warning signals to (2) preparation, through (3) damage containment and (4) business recovery, and finally to (5) organizational learning. Different tasks are required at each phase of the process (Mitroff 1993). In a more concrete manner, Mitroff argues that crises leave a trail of early warning signals with very few exceptions. Therefore, in the first phase, signal detection, an organization should establish clear and open information channels and constantly probe and scrutinize their operations and management structures for potential errors or problems.

In the second phase, preparation and prevention, an organization should structure crisis management plans as well as teams and conduct training and
simulation exercises on the supposition of such critical situations. Its aim is to do as much as possible to prevent crises from occurring in the first place. However, even with the best signal detection and preparation activities, some crises inevitably occur.

In the third phase, damage containment, leaders’ function is critically important. Leaders are expected to play a leading role in conducting crisis management plans or formulating additional emergency plans if necessary. Well-prepared organizations can devote more time and resources to assure that damage containment mechanisms are in place and effective.

In the fourth phase, recovery, well-prepared organizations have programs of short-term and long-term recovery. Finally, learning, the last phase of crisis management, refers to adequate reflection and examination of the lessons learned from experiencing a crisis. Well-prepared organizations examine the factors that hindered them to perform well. It is obvious that the emphasis should be placed on improving future capabilities and fixing current problems rather than searching for scapegoats.

### 3. THREE MILE ISLAND ACCIDENT

In this section, Three Mile Island accident, the worst U.S. nuclear crisis that occurred in 1979, will be carefully examined from phase 1 to 5, as a case study, in light of the crisis management theory mentioned above.

**Phase 1: Signal Detection**

First of all, one of the main causes of this accident appears to be combinations of minor equipment failures such as water pumps and valves.\(^1\) However, as Report of the President’s Commission on the Accident at Three Mile Island (1979, hereafter Three Mile Report) concludes, the fundamental problems are people-related problems and not equipment problems. That is to say, Three Mile Island accident unexceptionally left a trail of early warning.

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\(^1\) Several pumps supplying water to the steam generators in the TMI Unit 2 nuclear power plant tripped and it triggered the accident. Moreover, a pilot-operated relief valve (PORV) broke down and it allowed a large amount of radioactive materials to flow out of the reactor (Three Mile Island Report 1979, 28)
signals, however, the Nuclear Regulatory Commission (NRC) made an organizational effort to deliberately disregard them.

To begin with, there is some evidence indicating that a large number of minor nuclear accidents had been reported to the NRC prior to the accident\(^2\). Dave Lochbaum, the director of Union of Concerned Scientists (UCS), stressed that “the plant’s cooling system valves had broken down 10 times before the accident, but instead of replacing the faulty valves, workers opened them manually to keep the plant operating” (“Three Mile Island 29 Years Later”). Besides that UCS had been giving notice of possible occurrence of nuclear crises, Gregory Charles Minor, Richard B. Hubbard, and Dale G. Bridenbaugh, who were engineers that resigned from G.E. in the wake of Brown Ferry nuclear plant accident, had given a warning in a Congressional testimony that they believed nuclear power presented a profound threat to mankind\(^3\).

Thus, a number of accidents and people were indicating the possibility of a crisis on a larger scale, and the NRC, whose primary function was to ensure the safety of nuclear energy, was expected to carefully investigate the minor accidents and take new measures to tighten the security of other nuclear plants. However, the NRC did not give new instructions to electric utilities or upgrade regulations. What makes the situation worse is the revelation of the NRC’s secret file, which also contained warnings that corrosion and radiation were weakening pipes and reactor vessels, pointing outing “the possibility of a potential disastrous situation” (Anderson 1981). Yet, Joseph Hendrie, Chairman of the NRC, explained, “he had not perceived of the information in the file” (Takagi 1980). There is no doubt that the NRC was dysfunctional and organizational efforts were made in order to ignore the signals. If the NRC had properly functioned, the crisis would have been possibly prevented.

**Phase 2: Preparation and Prevention**

*Three Mile Report* points out that neither the NRC nor Met Ed, the utility

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3 In Congressional testimony, Minor declared, “my reason for leaving is a deep conviction that nuclear reactors and nuclear weapons now present a serious danger to the future of all life on this planet” (Saxon 1999).
that was operating TMI Unit 1 and 2, made adequate preparations in order to prevent the crisis. It refers to the fact that the NRC had not demanded the utility organize crisis management plans in the licensing process. As a consequence, the utility was dogmatically making a series of impromptu decisions, not incorporating the NRC’s opinions and analyses. Furthermore, the report points out “most of the emergency plans rely on prompt action at the local level to initiate the needed evacuation or to take other protective action. We found an almost total lack of detailed plans in the local communities around Three Mile Island” (Three Mile Island Report 1979, 15). Therefore, crisis management plans (i.e. determining the clear role of agencies, such as the utility, the NRC, local communities, and the government) should have been created under the leadership of the government.

As stated above, the crisis was not caused by equipment problems but people-related problems; the TMI operators’ critical errors greatly contributed to deteriorating the accident. The operators had little knowledge of responding to extraordinary situations, which is attributed to the fact that the training of the operators was greatly deficient. Although it is possible to put the blame on the utility, the NRC should bear the responsibility as well. *Three Mile Report* concludes that the utility’s capacity to conduct training programs was restricted and the NRC did not pay enough attention to the training of operating personnel and operator procedures in the licensing process.

It is clear that both signal detection and preparation were not properly conducted in large part because the NRC was in a state of dysfunction. It is attributed to the fact that the NRC was split off from the old atomic energy commission, whose purpose was to separate the regulators from those who were promoting the peaceful uses of atomic energy. However, the regulatory practices of the NRC had been explicitly influenced by the old promotional principles.

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4 James Floyd, a TMI-2’s supervisor of operations, decided to transfer radioactive gases from a make-up tank to a waste gas decay tank, while the NRC was showing its concern about the transfer. The transfer resulted in the release of the radioactive materials into the air outside (Three Mile Island Report 1979, 132).

5 When a pilot-operated relief valve (PORV) stuck open, an operator closed a backup valve to stem the flow of coolant water, resulting in a partial meltdown of the fuel rods (Three Mile Island Report 1979, 122).
This was a typical case of regulatory capture problems and required the restructuring of the NRC. The identical structural problem can be seen in Japan, and this topic will be discussed later in this paper.

**Phase 3 and 4: Damage Containment and Recovery**

In retrospect, the leaders were at least expected to (1) put the nuclear reactor under control, (2) assure the safety of residents near the reactor, more concretely, planning and conducting evacuation plans and providing anti-radiation medicine such as iodine, (3) deal with radioactively contaminated food and water, and most importantly (4) convey the accurate information to public. In practicing such tasks, leaders had difficulty in acquiring the right information and comprehending the situation accurately.

To begin with, when the accident occurred, Met Ed did not report the information immediately to the local government, but instead it concealed the fact. Eventually, the news media revealed the accident, which enabled the leaders to finally realize the disastrous situation at Three Mile Island. When responding to the crisis, the leaders could not make quick and adequate decisions due to the conflictive information reported by the NRC and Met Ed. On the one hand, the NRC was exaggerating the situation, where they strongly claimed the necessity of immediate evacuation to the government. On the other hand, Met Ed was underestimating the situation and reporting very optimistic views to the government. Confronted with such dilemma, Governor Thornburgh issued a series of evacuation advisories, but most of them were simply following the situation.

Therefore, one of the primary tasks of the leaders who face such crises was to establish a communication system to link the agencies. As a matter of fact, President Carter sent Harold Denton to set up a special communication channel to link the White House, the Governor’s office, the NRC, and Three Mile Island. Yet, he cannot be highly regarded because it was almost four days after the accident that the president made this decision.

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6 A reporter at Harrisburg music station reported that the police and fire fighters were mobilizing in Middletown and eventually broke the story of Three Mile Island accident. Later, the associated Press filed its first story, a brief dispatch teletyped to newspaper, television, and radio newsrooms across the nation (Three Mile Island Report 1979, 81).
It is not only the local government and the White House but also the people, in particular, the residents near Three Mile Island, were very confused with the conflictive information. Thus, it was highly important for the leaders to convey the accurate and consistent information to the public. Denton gained valuable credit regarding this point due to his consistent stance in providing the truthful information to the public; he was never too optimistic or pessimistic. In addition, it was fortunate that the media were prudent enough to convey moderate messages that an unnecessary panic was not caused.

Phase 5: Learning

Two weeks after the accident, President Carter established a Presidential Commission to conduct a comprehensive study and investigation on the accident. Six months later, the commission published Three Mile Report, in which they made a numerous suggestions. It is noteworthy that the commission did not search for scapegoats and sharply pointed out the structural problems, for example, dysfunction of the NRC and inadequate preparation for the crisis. As a result, the NRC substantially restructured their management practices of nuclear power plants, created stricter rules and extended their control. Furthermore, the National Academy for Nuclear Training was established in 1985, in order to strengthen the efforts of the electric utilities to improve operators’ quality, and the NRC started to recognize the industry’s training and accreditation under this new training rule. Thus, the NRC, the government, and the nuclear industry effectively learned and reflected important lessons from experiencing this crisis.

4. FUKUSHIMA DAIICHI NUCLEAR DISASTER

On March 11, 2011, tsunami waves caused by a huge earthquake with a magnitude of 8.9 swamped the northern pacific coast of Japan, leaving a myriad of people dead and causing the worst nuclear crisis in Japan. This crisis is not

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7 The NRC was restructured as a new independent agency in the executive branch, headed by a single administrator appointed by the President and subject to the advice and consent of the senate.

8 “Training and Qualification of Nuclear Power Plant Personnel” was issued on April 26, 1993.
completely over at this moment, February 2012, and the information disclosure by the government is not sufficient. However, thanks to many journalists and experts who have written books and articles on the accident, it is possible to examine the crisis.

**Phase 1; Signal Detection**

Fukushima Daiichi nuclear disaster is seemingly a natural disaster. If so, it was unpredictable with no signal being detected. However, some evidence shows that many people actually predicted the crisis, and therefore, it is partly a man-made crisis. That is to say, Tokyo Electric Power Company (TEPCO) and Nuclear and Industrial Safety Agency (NISA) ignored some signals of the crisis.

Provided that the determinant factor of the crisis was the tsunami, TEPCO’s argument that the tsunami waves were exceptionally high and it was unpredictable sounds reasonable. However, the truth is some scholars had pointed out the possibility of huge tsunami caused by a gigantic earthquake. For example, Yukinobu Okamura, a prominent seismologist and Chief Manager at Active Fault Line and Earthquake Research Center, warned of a debilitating tsunami in June 2009 at one of a series of meetings held by the NISA. The official record of the meeting says that Isao Nishimura, an executive from TEPCO, rebuffed Okamura because his argument was mainly based on his research about Jougan earthquake, which hit northeast Japan with a magnitude of 8.3 in 869, and lacked sufficient scientific evidence (Record of Commission of Inquiry 2009). If TEPCO had listened to his warning at all, they would have relocated the emergency diesel generators that were flooded by the tsunami to safer places and possibly prevented the loss of electricity, and much more, the crisis. However, it is not reasonable to put the blame solely on TEPCO. Given that the NISA, whose primary function is to assure the safety of nuclear power

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9 The highest level of the tsunami was approximately 15 meters, twice or more higher than TEPCO had assumed; TEPCO had assumed that the highest level of tsunami would be 5.7 meters and built a 5-meter tide embankment.

10 The meeting was held to evaluate the readiness of Japan’s nuclear plants, including Fukushima Daiichi plant, whether to withstand a massive natural disaster (Record of Commission of Inquiry 2009).

11 The tsunami rendered all of the emergency diesel generators inoperable, resulting in a station blackout. A nuclear reactor cooling system was disabled and the meltdown eventually occurred in the next few days.
plants in Japan, had been also aware of the potential danger of tsunami but not taken any measures, it is partly the NISA’s responsibility as well.

Moreover, Hirose Takashi, a prominent journalist, implies the other potential factor behind the crisis, saying “a person familiar with Fukushima Daiichi nuclear plant’s situation acknowledged that the earthquake per se caused major damages to the reactors and equipment” (Hirose 2011, 95). Hirose infers that the vulnerability to earthquake resistance of the reactors and buildings ultimately caused the crisis. Further, he criticizes the NISA for not carefully investigating previous nuclear accidents, such as Kashiwazaki nuclear accident that occurred in 2007\textsuperscript{12}. The previous accidents did not result in new instructions or rules due to the dysfunction of the NISA. It is also a regulatory capture problem and comparable to the NRC’s problem. To sum up, TEPCO and the NISA would have possibly prevented the crisis, had they paid any heed to the signals.

\textit{Phase 2; Preparation or Prevention}

As for the training of operators, which was greatly deficient in the U.S., it is safe to say that TEPCO had good training programs. According to Toshihiro Okuyama, all operators are required to learn to restore electricity from a station blackout (Okuyama 2011, 35).

Furthermore, TEPCO had prepared crisis management teams. That is why they could set up “Saigai Taisaku Honbu”, disaster countermeasures headquarter, and “Genshiryoku Kinkyu Taisaku Honbu”, nuclear emergency countermeasures headquarter, in no more than half an hour after the earthquake struck. Yet, presumably they had not made crisis management plans or made simulation exercises, inferring from the fact that operators were coping with the crippled reactors without radiation protective suits or even warder boots. As a result, 11 operators in total have been carried to a hospital so far\textsuperscript{13}.

Yukihiro Akutsu, Parliamentary Secretary of Cabinet Office, acknowledged that the government had not formulated any nuclear crisis

\textsuperscript{12} An electric transformer caught fire and a cooling system was destroyed due to Nigata Chuetsu earthquake with a magnitude of 6.8. Well-trained operators effectively dealt with the situation and successfully put the reactors under control in a few hours.

\textsuperscript{13} TEPCO never admitted that they were suffering from radiation sickness.
management plans (Iwabuchi 2011, 51). Thus, during the crisis, the government, in cooperation with the local communities near Fukushima Daiichi nuclear plant, made an impromptu evacuation plan. Yet, they failed to effectively conduct the plan and left some people in the evacuation zone\(^{14}\). Given the aging society of Japan, it is imperative to build well-thought-out evacuation plans for a nuclear crisis, defining each role of municipal officers, police officers, fire fighters and Self Defense Forces.

**Phase 3 and 4: Damage Containment and Recovery**

As shown in Three Mile Island accident, effective leadership in a crisis hinges on whether leaders can expeditiously acquire the critical information. In hindsight, Prime Minister Kan’s failure to manage the crisis can be attributed to his inability to create an effective communication system for collecting the important information.

In the initial phase of the crisis, “the information was conveyed from TEPCO to the NISA, through the Ministry of Economy, Trade and Industry, and finally to the Cabinet Office”, said Katsuya Ogawa, who was, at the time, Deputy Ministry of Defense (Iwabuchi 2011, 89). It was, indeed, a very complicated communication system and, as a result, some miscommunications between the government and TEPCO occurred\(^{15}\). It was March 15\(^{th}\), five days after the occurrence of the crisis that the Prime Minister Kan finally established “Nuclear Emergency Response Headquarters”, in which the government and TEPCO shared the information. By then, however, 3 nuclear reactors had suffered from a full meltdown.

In addition, Prime Minister Kan apparently rejected international assistance. A senior DPJ member familiar with the matter acknowledged that Kan turned down the U.S. government’s offer to provide all necessary means (i.e. equipment and expert knowledge) to deal with the crippled reactors (“The Japanese Government’s Rejection”). It was a critical decision mistake and it is

\(^{14}\) According to Japan Press Media, 11 people are at least still left living in the zone (“11 People in Evacuation Zone”)

\(^{15}\) Banri Kaieda, Ministry of Economy, Trade and Industry and Komori Akio, Managing Director of TEPCO, held a joint press conference on March 12\(^{th}\), in which they stated that the situation of the Unit 1 reactor was critical. Yet, actually the Unit 2 was in a very vulnerable situation at the time (Okuyama 2011, 138).
no exaggeration to say that the leadership failure caused the crisis.

**Phase 5: Learning**

11 months later, January 13th 2012, the government admitted that no records of the task force’s meeting were kept. Therefore, it is highly likely that no official investigation on Fukushima Daiichi nuclear disaster will be conducted. As mentioned above, a thorough investigation and reform of the NISA is imperative in order not to make the same crisis again, but as long as the government and TEPCO are repeating the term “unexpected natural disaster“ as a convenient scapegoat, its possibility is very low.

4. **LESSONS OF THREE MILE ISLAND AND FUKUSHIMA**

1) **SIGNALS WERE IGNORED DUE TO THE STRUCTURAL PROBLEMS**

In both crises, signals were detected by the electric utilities and the regulatory agencies, but organizational efforts were made to deliberately ignore them. It is a classical “regulatory capture” problem. The regulatory practices of the NRC were heavily influenced by the old principles of the Atomic Energy Commission. Likewise, the Ministry of Economics, Trade and Industry has undoubted influence on the regulatory practices of the NISA. The Ministry and TEPCO have created collusive relationships\(^{16}\), so it is inevitable that the NISA, under the jurisdiction of the Ministry, did not rigorously oversee TEPCO.

Therefore, it is highly recommended that every country that relies on nuclear energy should establish an independent nuclear regulatory agency in the executive or cabinet office. In addition, another independent agency that constantly scrutinizes the regulatory agency and provides expert knowledge on nuclear technologies and radiological protection should be established as well. In the case of Japan, the government needs to restructure the NISA as an independent agency and strengthen the authority and capacity of the Nuclear Safety Commission to oversee the NISA.

2) **CRISIS PREPARATION WAS NOT ADEQUATE**

\(^{16}\) TEPCO offers lucrative posts to high-ranking bureaucrats, and the Ministry tacitly agrees to uphold TEPCO’s business strategies. This practice is called “Amakudari” in Japanese.
The electric utilities, the local communities, and the government had not adequately organized crisis management plans. As a consequence, they made a series of impromptu and inconsistent decisions. In particular, it was very challenging to make detailed plans and execute large-scale evacuations in a short period of time. Thus, the government with local communities and electric utilities should make a grand strategy for a nuclear crisis, defining the role of each agency during a crisis.

Furthermore, given that the complex communication systems disabled the leaders to acquire the crucial information, the government, in cooperation with electric utilities, needs to formulate a strategic plan about effective communication systems to share the information.

Lastly, Fukushima Daiichi nuclear disaster illustrated that a nuclear crisis is not only a domestic issue but also an international issue, which is to say, it is highly important to develop mechanisms for international cooperation in order to mitigate future crises.

3) LEADERSHIP WAS NOT EFFECTIVE WITHOUT FUNCTIONAL COMMUNICATION SYSTEMS

Both crises demonstrated that whether the leaders could acquire the accurate information immediately was the key for effective leadership. The leaders needed to act on the crisis in the initial phase in order to keep damage to a minimum. Yet, the electric utilities were reluctant to share the comprehensive information with the government when the crisis was still small. Moreover, miscommunications among the agencies greatly continued deteriorating the crises. Therefore, it is highly important for the leaders to establish the effective communication systems and understand the comprehensive situation.

As stated above, crisis management plans should include a strategic plan to develop effective communication systems, but suppose they do not, the first thing that leaders need to do during a nuclear crisis is to create their own communication systems.

4) LEARNING WAS VERY IMPORTANT TO SOLVE THE STRUCTURAL PROBLEMS
Both crises provided a good opportunity for the leaders to review and solve the structural problems. As a result, the White House thoroughly examined the role of the NRC and conducted a radical organizational reform. On the other hand, the Japanese government has not utilized this opportunity to do so. Without a thorough investigating and fixation of structural problems, it is highly likely that the same crisis will inevitably occur. Thus, the reflection of a crisis, that is, the process of learning is crucial.

6. SUMARRAY

Although leadership is vitally important to manage a crisis, it is not rational to attribute the cause of the crisis solely to leadership failure. Thus, this paper investigated Three Mile Island accident and Fukushima Daiichi nuclear disaster, from the perspective of Mitroff’s crisis management theory. As a result, it has become clear that inadequate preparation and the structural problems, coupled with leadership failure, caused both crises. Therefore, what is important is not only criticizing the failures of leaders but also recognizing the deficiency of preparation and the structural problems and fixing them. It is only the process of learning from the crises that allows the government and leaders to do so. Therefore, it is no exaggeration to say that an essential part of the leadership is not only to deal with a crisis, but also to learn from a crisis.
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