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Crisis Leadership: Human and Infrastructure Catastrophes: Theoretical Insights and Lessons Learned from Fukushima

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Abstract
This paper discusses the theoretical concepts associated with leadership during extreme events, with special attention paid to the extreme event at the Fukushima nuclear power plant. Evidence suggests that the Earth is flattening. Populations are more tightly coupled as ever in the history of mankind. This coupling ranges from air travel, social connections, infrastructure, cyber and beyond. For the extreme crisis leader, increased coupling necessitates more sensemaking, management skills, and the coupling creates new tasks for the extreme crisis leader. As the complexity of crises increases, each of the established crisis management, leadership, and decision-making theories has special applicability. A new world of extreme crisis leadership has emerged especially considering the transboundary effect of close coupling. Leadership innovation is needed now more than ever for the modern extreme crisis. This paper provides the crisis leader with lessons from Fukushima and provides theoretical insights on extreme crisis leadership as well. The events surrounding the Fukushima nuclear crisis present the manifestations of these new challenges. New tasks for the extreme crisis leader are presented.

Keywords
Extreme Crisis Leadership; transboundary; Fukushima; nuclear disaster; Black Swan; Emergency Planning

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1.0 Introduction

Lactantius was correct, the Earth is flat. Our world is more connected together today than ever. As a result, more populations are exposed to the risks of extreme events [2]. An extreme event is "a discrete episode or occurrence that may result in an extensive and intolerable magnitude of physical, psychological, or material consequences to or in close physical or psycho-social proximity to organization members" [3, p. 898]. Borderless countries, e.g. the European Union and others, facilitate the spread of the consequences of extreme events. Just recently the Ebola scare caused worldwide concern. Other examples include cyber threats, of course terrorism, and nuclear catastrophes. Extreme crises and their consequences spread much faster today than they would have just a few decades ago [4].

[1] Dr. Casto was the lead federal executive in Japan during the Fukushima nuclear crisis where he led a team for nearly one year responding to the extreme crisis.

Given the modern communication technologies, fear caused by extreme events travels around the world at light-speed. Especially with extreme events, massive amounts of fear spread not only quickly, but to the furthest reaches of the world [3]. Worldwide fear occurred from the first web streamed nuclear event at Fukushima. People in the western United States feared for the contamination of the air and sea. In the 20th Century (1986) the Chernobyl nuclear accident went almost unnoticed by the world until radiation was detected elsewhere in Europe. It took days and weeks for photographs to emerge and of course, never a web stream of the situation. In the 20th Century, most news was based upon the "Cronkite factor." That is, as long as Walter Cronkite was interested in the news items it was a significant story. When Cronkite lost interest, the news media lost interest. Even during the Three Mile Island accident, when Jimmy Carter traveled to Camp David (April 3) for further talks with the Egyptians and Israelis, Cronkite lost interest and so did most of the news media. In the 21st Century with the 24 hour news cycle, news remains news as long as a webcam is available to record events.

In 2011, cameras transmitted the images of nuclear plants exploding real-time at Fukushima. Fear spread around the world. Beyond the crises caused by the earthquake, tsunami, and nuclear plant disaster, a social crisis was initiated by the real-time images. In Japan, the social disaster was nearly as challenging as the natural and technological challenges. This challenge spread to countries around the world. Many countries were concerned not just for their land and sea, but they had citizens living in Japan. Decision were needed regarding the health of foreign citizens in Japan.

This international context was yet another leadership challenge for the Japanese. Foreign leaders wanted answers about the event immediately. These challenges, that is, the social and international crises raises new issues for extreme crisis leadership theories.

According to some researchers, the abilities of leaders are second only to the cause of the event itself in determining the outcome of a disaster [1, 5]. Especially due to the international political pressures that arise surrounding extreme events, the importance of understanding crisis leadership theories are essential to a crisis leader's success [6].

In short, the world is flattening: the consequences of extreme events are expanding; modern communications systems are cultivating the growth of fear; leadership demands for extreme events is increasing in complexity; and crisis management research slow to keep pace with these changes [7].

2.0 Infrastructure Emergency Planning and Crisis Response

Emergency planning is not enough to manage an extreme crisis that causes international transboundary fears. Successful crisis response is not guaranteed based on successful emergency planning. Crisis leadership failures come from slow and inadequate crisis leader response. For instance, in the Fukushima case:

An example of how crisis leadership can fail comes from an interview with author Yoichi Funabashi[2] regarding the Japanese governments' response to the Fukushima accident.

[2] Interview/Yoichi Funabashi: Fukushima nuclear crisis revealed Japan's governing defects, February 29, 2012, Asahi Shimbun

Q: *Do you feel the maturity of the Japanese democracy was tested by the crisis?*

A: *What was most tested at that time was the ability of the nation to govern, as well as the capability and structure for crisis management. Many of the problems related to governance emerged at the same time, such as risk-adverse thinking, stove piping, and bureaucratic turf battles.*

What was probably most lacking was the desire to form a partnership with the public to deal with the crisis. For example, there was no attempt to explain what the situation was and to provide context for the information to be supplied. Information has to be provided in the proper context along with explanations of what will be done in order to seek out cooperation from the people. While the stance, words, and presence of such a leader are most necessary to deal with a crisis, that is what was missing in the Fukushima case.

Q: *What sort of information should the government have released more quickly?*

A: *One problem was waiting until March 22 before releasing information from the System for Prediction of Environmental Emergency Dose Information (SPEEDI). Another major problem was not being able to measure conditions within the nuclear reactors because the measurement devices were not working. The problem then becomes one of what does the government tell the people when it does not have the information? It may have to admit ignorance, which is highly difficult for the Japanese government, as officials always want to believe that they know everything. If government officials said they did not have the information, they would face criticism from the media, and those officials would have to deal with that criticism.*

Beyond the issues discussed by Dr. Funabashi, other crisis leadership failure modes come from authority weaknesses, such as:

- Over/under exercise of authority
- Weaknesses in lines of normal authority grow into chasms during crisis
- Burnout of people in authority
- Authority conflicts
- Turf battles/confusion

For example, during the response to the 2011 earthquake and tsunami METI (Ministry of Economy, Trade and Industry) Minister and Chief Cabinet Secretary Yukio Edano was the primary governmental leader and spokesperson for the government's crisis response. Edano was constantly appearing on television to explain the situation at Fukushima. Because of the frequency of his appearances Twitter users began posting tweets suggesting that Edano get some rest. Twitter users started a hashtag "#edano_nero" based from the word for sleep (寝ろ nero) in Japanese.

Another crisis leader failure mode is a lack of or inadequate organizational coordination.

- Military command structures and control models usually cannot be applied during crises
- Loosening of the command and control structure may be required
- Crisis organizations need to "ask for" more than "tell"

- New crisis tasks add possibilities for coordination failures
- Magnitude of the crisis: increasing the magnitude of the crisis requires more coordination, and integration with emergent groups minimizes the effectiveness of the response

Example: A Japanese government investigation about the process Plant Manager Yoshida used to convey his request for additional batteries and materials, sought to know whether his request went through the Technical Support Center (TSC) or whether Yoshida called Tokyo directly. Either way, Yoshida's request miscommunicated. While some material was sent to Daiichi as Yoshida requested, much of the material made its way Fukushima Daini, the plant 8 km south of Daiichi. Moreover, significant emergency material found its way to J-Village, an assembly area 20 km from Daiichi. These coordination failures greatly complicated the rescue of the reactors.

3.0 The New World of Crises and Crisis Management

With a "flat" Earth, the world of extreme crisis is shifting. This shift poses new challenges for crisis leaders. For example, in an earlier century, extreme crises were dam failures, bridge collapses, hotel fires, etc. Today, those extreme crises are prevented and new crises have emerged, e.g. SARs, cyber-crime, terrorism, and electrical grids vulnerabilities. These new extreme crises pose new challenges for extreme crisis leaders.

While the root cause of some extreme crisis remains the same, e.g., nature, violence, and technological failure, today the consequences vary. The reasons for this include the following:

Transboundary conditions: Modern air travel availability and open boarders results in a transient population. Modern social communications have served to connect people. Such as the Arab Spring call to arms on social media or a young kid hacking computers in Holland who creates a virus affecting millions of computers around the world. Other examples include the collapse of the financial system in 2009, the SARS (severe acute respiratory syndrome) epidemic.

This escalation of transboundary conditions has exacerbated the "butterfly effect." A crisis in one country can lead to world-wide fear. In other words, modern society has resulted in new "highways for failure," [Boin, 8, p. 370; 9] which are escalated by technology, terrorism, demographic shifts, and shifts in global power arrangements, e.g., the European Union. Transboundary systems, e.g., electricity lines, computer lines, airlines, rail, etc., that connect countries for positive benefit can become "highways for failure" during an extreme crisis. For the crisis leader who is working to stop the escalation of a crisis, these links are difficult to sever. Thus, natural links become unnatural during the crisis. Decision on whether to sever links can be extremely difficult for the crisis leader because severing the link can greatly disrupt the normal flow of business.

Boin identified some characteristics of a transboundary crisis. His research added to the existing research on transboundary effects. In his research, Boin describes the characteristics as:

- Tightly coupled systems
- Extends cross-functionally and cross-nationally
- Transcends time boundaries
- No defined beginning, end, or ground zero

- Escalates quickly in unforeseen directions, exploiting linkages
- Causes unfathomable damage

Boin highlights the "escalatory power" of a transboundary crisis. Boin suggests that because globalization makes the world flatter, small perturbations may have drastic consequences [2, 8]. Boin acknowledges that governments cannot keep pace with this challenging and changing environment; therefore, governments have little capability to deal with transboundary issues [8]. The effects of the increasing rate of technological growth speeds up transboundary effects. International terrorism is another trend that creates opportunities to spread crises. Finally, escalation caused by demographic shifts and shifts in global power arrangements introduces new dimensions that can contribute to an escalation of crises [8].

For researchers, new theories have emerged because of these transboundary conditions. A relatively new theory called "transboundary effects" [8] has provided insights on the "flatter" Earth. Transboundary effects literature considers what Perrow would call the "coupling" of modern society [9]. The definition of the transboundary crisis considers the functioning of multiple, life-sustaining systems, functions, or infrastructures that are threatened by the crisis and cause an uncertainty of outcomes [8]. Transboundary effects can escalate a routine crisis through the coupling of systems between countries. The 2009 financial crisis was an example of a transboundary effect; not only was the United States affected, because of the worldwide financial connections, the crisis spread around the global economy.

Similarly, the research on "Black Swan Events," defined as unforeseen and unanticipated events [10] has added to the transboundary effects research. Nafday claims that unforeseen and unanticipated events are "unknown-unknowns," i.e., occurring "completely out of left field" [6, p. 194]. Often, these events are non-linear and cascading in their seriousness [6]. The Fukushima nuclear plant disaster (2011) was a "Black Swan" event. Fukushima was a natural event that cascaded into an artificial (man-made) event and then to a global societal event.

Other researchers of transboundary effects have developed complementary theories. For instance, Wachtendorf describes an effect she refers to as "transboundary social ruptures" [11]. Wachtendorf adds to existing research of transboundary social ruptures defined by Quarantelli, Lagadec, and Boin. Wachtendorf has described transboundary events as events that reach beyond social boundaries and disrupt multiple social systems [4, 8, 11, 12]. Social ruptures could become transnational as well (especially in the cases of the United States, Canada, and Mexico). According to Wachtendorf, transboundary effects create new challenges for the extreme crisis leader. The challenge of a tightly coupled world creates new tasks for the extreme crisis leader including readiness tasks, and tasks associated with event mitigation, and response strategies.

There are other transboundary effects, specifically the relationships between risk, crises, and leadership [13]. In responding to an extreme crisis, the leaders strive for clarity in response to extreme events. Leaders strive to simplify readiness and response, and thereby desire to limit uncertainty. Crisis look for "one-way" to lead through a crisis. However, in an extreme crisis, adaptation can be essential in dealing with the uncertainty often associated with "Black Swan" events. However, crises are often "clumsy" and might require "clumsy" solutions [13, p. 406].

Lagadec, whose focus is on innovative thinking in the context of transboundary crises, concludes that, "in our cultures and in our selection of leaders, creative thinking is punishing

and punished" [4, p. 483]. Lagadec argues that nonconventional thinking is needed in a nonconventional crisis. Innovation in crisis response is antithetical to the norm of crisis organizations. Crisis organizations often use emergency drills and exercises to strive for certainty through procedures and processes. These drills and exercises can drive out the organizational ability to innovate during an extreme crisis.

The research on transboundary effects has identified new challenges and tasks for the extreme crisis leader [8]. Five important tasks for the extreme crisis leader tasks:

1. Preparing in the face of indifference
   - Preparation is expensive
   - It is hard to plan for Black Swans (rare, unimaginable events)
   - Political tension: who to protect, against what, and where, along with who pays?

2. Making sense of the evolving crisis
   - Pace of the crisis makes it hard to "make sense" of the problem
   - Missed signals
   - Development of a "common operational perspective" as the complexity of the crisis increases

3. Managing a large response network
   - The locus of control often shifts in complex crises
   - Small fragmented response groups may be unaware of the common operational perspective
   - Lines of communications extend beyond decision-makers' reach

4. Offering credible answers
   - One of the most crucial leadership tasks is to explain what is happening and what they are doing about the crisis
   - Stress and lack of information may result in a leader not knowing the common operational perspective
   - Others (outsiders) frame the crisis for you, e.g., media, advocates

5. Learning under pressure
   - Conducting good lessons learned evaluations
   - Taking the opportunity to incorporate lessons
   - Political reflex may impose new sanctions

4.0 Discussion

As a Black Swan, extreme crisis, the Fukushima nuclear plant accident was a high impact, difficult to predict, and complex disaster. Driven by the forces of nature and physics, it was also a cascading event – caused by a natural event, leading to a man-made event, and resulting in a significant human tragedy. The Great Eastern Japan earthquake damaged infrastructure and required a large-scale disaster response that led to the isolation of the nuclear plant. Due to the infrastructure damage, there was a loss of first responders, and the event dangerously stretched disaster management resources. Infrastructure damage contributed to the pressure buildup and eventual explosion of Units 1, 3, and 4, requiring even more disaster response with limited communications, data, and infrastructure. The

disaster response needs and infrastructure damage overwhelmed the abilities of the locals and the company. Many organizational systems failed, including government and company response systems.

In the end, the Fukushima event teaches us that Black Swans are real. There must be a fundamental understanding within the company and government that an extreme event *can* happen. Disaster preparedness plans must anticipate the loss of emergency management organizations, e.g., first responders; they must have a long-term response capability; and they must have close coupling with technical resources. What we have learned from the human and infrastructure catastrophe of Fukushima is that emergency managers must assure the organizational elasticity of their systems. Infrastructures, both physical and organizational, must be elastic enough to respond to extreme crises.

5.0 Summary

Extreme events are unique in that they are usually unpredictable, unpreventable, and result in nearly intolerable physical, psychological, or material consequences. Research concludes that the abilities of leaders are second only to the cause of the event itself in determining the outcome of a disaster [1]. Regardless of whether a crisis is man-made, natural, or natural-technological, in many ways, the "reach" of a crisis around the globe is increasing. The Earth is flattening. As the first web-stream nuclear accident, this was particularly noteworthy for the Fukushima event. Due to the international political pressures brought on by any extreme event, the importance of understanding extreme crisis leadership is more important today than ever before.

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