How Can We Prevent Organizational Accidents?
A Managerial Analysis

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Abstract

The purpose of this paper is to discuss how to prevent organizational accidents and how to design regulations for organizations that force organizations to prevent those accidents. Organizational accidents can described as errors in organizational decision making, which involves a chain of individual decisions and some programmed decisions. Errors in organizational decision making do not come from unethical values, but from misunderstanding the consequences of alternatives or a set of alternatives. Those errors can be described as erroneous decisions (Type A errors), deviations from relevant programs (Type B errors), or misapplications of improper programs (Type C errors). The following measures are necessary to prevent these errors: (a) ensuring the communication of factual premises, (b) fostering proper values, (c) development and maintenance of programs, and (d) the management of switching from the process of applying a program to decision making. Effective regulations should ensure that organizations adopt these preventative measures by providing the proper incentives or forcing them by compulsory measures; however, it is difficult to design regulations that include all of these elements.

I. Introduction

The purpose of this paper is to discuss how to prevent organizational accidents and how to design regulations for organizations to encourage the prevention of accidents.

Over the years, serious organizational accidents have attracted the attention of the general public. In 1984, toxic gas escaped from a chemical plant owned by a subsidiary of Union Carbide in Bhopal, India. In 1986, a nuclear reactor accident occurred in Chernobyl, Ukraine, and people were frightened by the possible effects of radioactivity resulting from the accident. In 2003, the Space Shuttle *Columbia* disintegrated upon reentry, and the lives of seven crew members were lost.

Many other serious accidents, such as aviation accidents, railway accidents, nuclear incidents, food poisoning, explosions, etc., have taken place all over the world. Japan has experienced many organizational accidents, including the Tokaimura nuclear accident in 1999, the Amagasaki rail crash in 2005, and the poisoning of milk produced by Snow Brand Milk Products Co., Ltd. in 2000.

As Reason (1997) states, the aforementioned accidents are often classified as organizational accidents. Though the term “organizational accidents” is ambiguous, we can define organizational accidents as those that involve organizational activities (Reason 1997). In other words, organizational accidents are regarded as those that come from the organizational decision-making process. Organizational accidents are distinguished from those caused by a single person or a group because they are the result of a more complex decision making process. On the other hand, single person or group accidents are the result of one-time decisions.

Thus, we should analyze the decision making process within an organization in order to consider effective regulations to prevent organizational accidents. In this paper, I investigate how an organizational decision making process can produce an organizational accident by using the framework of organization theory and constructing a simple conceptual model of the causes of organizational accidents. Because the purpose of this paper is to examine the effectiveness of regulations, I simplify the organizational decision making process in order to construct the model. I also check the validity of the model by using several examples and then discuss possible organizational responses of prevention of organizational accidents. Finally, I consider what kind of regulations should be imposed based on the model.

The approach taken in my paper has not been examined by previous studies on this subject. In the sociology of law and related areas, many studies have been made on the effectiveness of regulations and their enforcement (e.g., Bardach & Kagan 2002; Hawkins 1984; Ayres & Braithwaite 1992; Gunningham, Kagan & Thornton 2003). These studies have mainly focused on regulative authorities, their regulative styles, characteristics, and decision-making

processes, and their interactions with regulated entities, which are mostly private companies, but did not focus on the internal organization of those entities. In addition, most of these studies explicitly or implicitly discussed intentional violations. For example, Ayres and Braithwaite (1992: 4-5, 35-40) stated that the style of regulation and enforcement should be dependent on *conducts* of the regulated industry and the companies within it. Even in studies on safety regulations–such as occupational health and safety (Brown 1994; Hutter 2001), food safety (Havinga 2006), and nuclear safety (Manning 1989)–do not investigate decision making processes related to organizational accidents. One exception was a study performed by Vaughan (1998). Using her study on the organizational process that resulted in the Space Shuttle *Challenger* accident (Vaughan 1996), she pointed out the importance of considering the organizational decision making processes when designing regulations. However, her focus was on the internal and external elements that affect organizational decision making, and she did not focus on organizational decision making itself.

On the other hand, the nature and causes of organizational accidents have been investigated in many fields. Among those, Reason (1990; 1997) investigated the organizational aspects of accidents from the perspective of safety engineering. Some sociologists have also explored the organizational elements of serious accidents (Perrow 1984; Shrivastava 1992; Vaughan 1996). Moreover, scholars of organization theory conducted studies of "highly reliable organizations," that is, organizations that have been highly successful in preventing accidents (Weick 1987; Roberts 1990; Weick & Sutcliff 2001). However, those studies were based on case studies and did not developed theoretical models to examine the decision making process within an organization.

In this paper, I focus on the decision making process within an organization and examine the causes of accidents. In doing so, I introduce the framework of modern organization theory that was developed by Simon (1997), March & Simon (1958), and others. Needless to say, there are several approaches for considering decision making processes within organizations, such as the garbage can model (Cohen, March, & Olsen 1972) or the incremental model (Lindblom 1969). In this paper, I need a simple model to discuss the effectiveness of regulations based on an examination of the organizational decision making process. For this purpose, the organizational decision making model based on (bounded) rationality that was developed by Simon (1997) and March & Simon (1958) would be suitable.

II. What is organizational decision making?

Individual and organizational decision making

Organizational decisions consist of the decisions made by the individuals in an

organization. It is noteworthy that no organization can make a decision without individuals. Individual decision making is a process where the decision maker lists possible alternatives, forecasts the consequences of those alternatives, and makes a choice based on an evaluation of consequences (March & Simon 1958: 52-53; Simon 1997: 77). In order to make a decision, the decision maker needs three kinds of information: (a) possible alternatives, (b) expected consequences of those alternatives, and (c) standards or goals in terms of which alternatives are evaluated (March & Simon 1958: 52-53). These kinds of information are defined as decision premises. Among these, (a) and (b) are called factual premises, since these kinds of information are related to facts and not to values or valuation. On the other hand, (c) is labeled as a value premises.

These decision premises arise in a decision maker's mind as a result of outside stimuli. In this sense, the information is "evoked" by the stimulus (March & Simon 1958: 35-36). In other words, decision premises are produced by a cognitive process, and thus, they do not contain *all* objectively possible premises. The decision premises in an evoked set may be insufficient to make a decision, i.e., the alternative chosen by a decision maker does not meet certain criteria. In this case, the decision maker begins a search to obtain more information (decision premises) and then makes another decision (March & Simon 1958: 48-50). Performing a search requires some cost; so a decision maker may avoid performing a search even though the chosen alternative is not entirely satisfactory, as long as the alternative is acceptable (March & Simon 1958: 173-174).

As previously mentioned, organizational decision making consists of decisions made by individuals. Decisions by individuals in an organization are connected to each other by communication and they result in an organizational decision. It is unclear in many cases, however, how those decisions are connected to each other. In an organization, some decision premises are not obtained by the decision maker, but are handed down from the organization. Simon describes this process: "the organization, then, takes from the individual some of his decisional autonomy, and substitutes for it an organization decision-making process" (1997: 7). Decision premises given by an organization, such as evaluation criteria or expectations regarding the consequences of alternatives, are produced as the result of decisions made by other individuals in an organization and are communicated to the decision maker. The decision maker then makes a decision based on those premises, and the result of that decision may also be communicated to another individual as a decision premise. This situation can be repeated until a final decision is made. It must be noted that decision making under the influence of an organization is different from "independent" decision making (decision making outside of the organization) in the sense that decision premises in independent decisions are of internal, and they are not provided by an organization. In other words, we cannot say that a decision in an

organization is based on free will, whereas we can probably say that a decision made outside of an organization is voluntary and based on free will.

Programmed decision

Decision making requires time and effort. Especially in situations that occur repeatedly, people try to conserve their time and effort by developing and using patterns of behavior to deal with situations, instead of making numerous separate decisions. This pattern of behavior is called a "program" (March & Simon 1958: 141) and is preserved as manuals (standard operating procedures), instructions, or facilities. When a decision maker applies a program, a decision is made automatically, that is, without considering any other alternative. In this sense, making a decision using a program is similar to a response to a stimulus.

Though a program is basically applicable to the situation for which the program was developed, people tend to think that it would also be useful for similar situations (March & Simon 1958: 173-174). In this kind of situation, the decision maker evaluates the result that will be brought by the application of the program and considers whether or not the result is satisfactory. If it is not satisfactory (unacceptable), then the decision maker initiates a search as described in the previous section. In this case the decision maker then makes a decision instead of applying the program.[1] In other words, the decision maker has to first decide whether to apply the program to the immediate situation. It must be noted that if there are several available programs to choose from, the selection of a program can be regarded as decision making; the selection of a program cannot be regarded as the application of a program in this case.

In order to avoid confusion, hereafter I use the word "decision making" to refer to the process of making a decision without using a program; the word does not refer to making a decision by applying a program. When I refer to making a decision with or without using a program, I use the word "determination," instead of decision making.

III. The nature of organizational accidents

The next problem that must be addressed is how we can analyze organizational accidents using the above framework. First, we must consider what differentiates organizational accidents from other kinds of organizational misconduct such as organizational crimes. In an organizational crime, at least one decision maker makes a decision knowing that that decision may have a harmful effect (Coleman 2002: 170-171). In a usual organizational accident, no one intentionally made a decision for the purpose of causing the accident. Instead, they usually fail to forecast the result of their decisions. If a decision maker predicts the final result of a decision (as a part of organizational decision making), that is, if the decision maker has factual premises

that are sufficient to forecast the result of a decision, she would not make that decision. If a decision maker does not have enough information about the consequences of alternatives or does not know some possible alternatives, she may make an erroneous decision, that is, a decision that results in an accident.[2] In other words, an organizational accident may come from an error in decision making resulting from a lack of sufficient factual premises.

As previously mentioned, when a decision maker realizes that evoked decision premises are insufficient to make a decision, she must initiate a search to obtain more decision premises. There are two possible cases in which the decision maker does not initiate the search process even though the decision premises are insufficient. The first is that the decision maker mistakenly believes that there are sufficient decision premises, that is, there is an incorrect belief that the result is able to be forecast. The second is that the decision maker cannot perform a search because of the high search cost even though the decision premises are known to be insufficient and the result is uncertain (for example, a time-pressured situation, see Reason 1997).

I define this type of error as a Type A error. It must be noted that Type A errors include errors regarding the selection of a program from several available programs. Reason (1997) referred to this type of error as a "mistake."

Type A: The decision maker does not choose a proper alternative because of the lack of sufficient factual premises.

The explanation does not include the use of programs and only mentions the *selection* of programs. However, the use of a program entails switching from applying a program to decision making by evaluating alternatives and selecting one from them. Thus, I should examine what kinds of errors occur in relation to this process (See Reason, 1990).

When a decision maker applies a program, a decision is made automatically. At the moment that a program is applied, however, the decision maker evaluates the result of applying the program and considers whether it is acceptable. When this evaluation is wrong, two kinds of erroneous decision may have occurred. The decision maker may have mistakenly believed that the result is unacceptable and thus did not apply the program, even though the program is appropriate for the situation. Alternatively, the decision maker may have mistakenly believed that the program is acceptable, even though applying it is an improper course of action. I refer to the former situation as a Type B error and the latter as a Type C error.

Type B: The decision maker does not apply a program that seems irrelevant to the situation, even though applying the program is a proper way to deal with the situation.

Type C: The decision maker applies a program that seems relevant to the situation, even though applying the program is not a proper way to deal with the situation.

Type B errors are often referred to as deviations from rules or "misventions" by Reason (1997). Though the deviation from a program is intentional, it is not intentional in the sense of an organizational crime since the decision maker does not knowingly cause the accident.[3] This type of error commonly takes place when the program that seems relevant is too cumbersome or too inefficient. In this case, there is a misunderstanding about the result of the decision.

On the other hand, Type C errors, or "mispliances" (Reason 1997), are usually not intentional. Instead, those errors may be the result of an overestimation of the applicability of programs or a decision maker's reluctance to make a decision (for example, in a time-pressured situation). Usually, people tend to rely on programs when making a decision because of the costs of decision making (Reason 1990). It is difficult to predict Type C errors. For example, Weick & Sutcliff (2001) emphasized the importance of the careful examination of situations and of decision making based on the understanding of the situations. In my opinion, this can be understood as the importance of a careful examination of the lack of factual premises and of a careful application of programs. That is, we often apply programs without carefully considering a situation; however, we should be careful when using programs since the result of applying programs thoughtlessly may be disastrous.

We should notice that these errors are not the result of unethical standards (value premises), but the result of a lack of proper factual premises. Nevertheless, the fact that value premises are not directly related to those errors does not mean that value premises do not affect the occurrence of organizational accidents. For example, if there is a culture that places great importance on communication and information sharing, it helps to smooth communication and contributes to the prevention of organizational accidents. For example, Vaughan (1996) identified "structural secrecy," a tendency of people not obtaining information from others, as a cause of the *Challenger* accident.

Based on the framework of Simon (1997) and March & Simon (1958), I constructed a simple conceptual model of the causes of organizational accidents. In summary, the model can be explained as follows: organizational accidents are caused by an error (or errors) in decision making (Type A) or in the process of switching from applying program to decision making (Type B and Type C) in an organizational decision making process. A switching error can be a deviation from the relevant program (Type B) or the misapplication of an improper program (Type C). Though this model fits the idea provided by Reason (1997), we should investigate the

validity of this model by applying it to several examples.

Many organizational accidents can be regarded as a result of Type B errors. The Tokaimura nuclear accident in 1999, a critical accident at a nuclear fuel plant in Tokaimura, Ibaraki prefecture, Japan, is a good example. In this case, workers who were engaging in the production of uranium fuel (uranyl nitrate solution) violated the standard operating procedures and put too much fuel into a tank (See Okamoto and Konno, 2003). This deviation caused the worst nuclear incident to date in Japan.[4]

Other accidents, including the *Challenger* accident, can be regarded as the result of Type C errors. Vaughan (1996) indicated that, contrary to the prevailing view, the decision of the launch of the Challenger was rule based. She showed that the most important causes are the structural factors such as "structural secrecy" and the "culture of production," that is, the idea that NASA should continue launching while accepting a certain level of risk. In addition, the poisoning of milk produced by Snow Brand Milk Products Co. Ltd is another example. This poisoning was caused by an interruption of the power supply in a milk producing plant. Because of this incident, the milk that was processed during the outage was contaminated by toxins produced by bacteria. However, people in the plant believed that sterilization was sufficient to produce safe milk, even though in reality the toxins could not be killed by sterilization. Because of this incorrect belief, the contaminated milk was shipped and resulted in the food poisoning of consumers (Taniguchi & Koyama, 2007).

It seems to me that fewer accidents are caused by Type A errors when compared to Type B and Type C errors. One possible reason for this is that there are comparatively few programs that are applicable to specific situations. For example, standard operating procedures are made for specific situations, so for a specified situation there is only one standard operating procedure that is applicable.

IV. Preventive measures for organizations

Next, we must consider what kind of measures should be taken by organizations to prevent accidents. It should be noted that all Type A, B, and C errors should be avoided in order to prevent organizational accidents. It may be true that the prevention of Type B errors is more important than errors of Type A or C in some organizations, but even in such organizations, we should prevent all types of errors since all types may take place in any organization.

First, I should point out that all of the previously mentioned errors come from the lack of sufficient factual premises. Thus, (a) ensuring the communication of factual premises is vital for preventing organizational accidents. For example, Rochlin (1989) pointed out that the flight operators of an aircraft carrier constantly maintain multiple channels of communication and

verification. This is necessary to discovering critical elements before they cause problems. Vaughan's (1996) notion of "structural secrecy" also stresses the importance of communication.

In addition, (b) the fostering of proper values is important for preventing all types of errors, even though value premises are not the direct cause of organizational accidents. The influence of organizational culture was stressed by many scholars, including Vaughan (1996) and Reason (1997). The notion of a "culture of production" indicates that a certain level of carefulness when applying an organization's own rules–their own programs–is necessary to avoid errors (especially Type C errors). Reason (1997) pointed out the importance of an "informed culture" and a "reporting culture," cultures in which people share their knowledge and communicate with each other. These notions also indicate the importance of communication that was mentioned above.

Furthermore, (c) the development and maintenance of programs is also important, since decision makers can depended on those programs and not worry about the possibility of Type C errors (Reason, 1990).

Finally, (d) managing the switch from the application of a program to making a decision is required to avoid organizational accidents. People usually depend heavily on programs (Reason 1990). If we depend on programs too much, however, Type C errors will occur. On the other hand, if we do not rely on programs, Type B errors occur. Thus an appropriate switch from the application of a program to making a decision is absolutely necessary to prevent organizational accidents. In order to assist decision makers to properly make the switch from applying a program to decision making, enhancing ability to identify whether or not programs are applicable to the immediate situation and the ability to make proper decisions is needed. The notion of mindfulness explained by Weick & Sutcliff (2001)—the careful attitude toward the applicability of programs—shows the importance of proper switching.

V. Regulatory design

The last step of this paper is to explore what kinds of regulations should be imposed based on the discussion in section IV. I have mentioned that four kinds of measures should be taken in order to prevent organizational accidents: (a) ensuring the communication of factual premises, (b) the fostering of proper values, (c) the development and maintenance of programs, and (d) management of the switch from the application of a program to making a decision.

Effective regulations intended to prevent organizational accidents should encourage organizations to adopt these measures, whether by providing incentives or through the use of compulsory measures. More specifically, efficient regulations should encourage or force

organizations to (a) strengthen their communication network with their stakeholders, (b) establish a safety culture, (c) develop and maintain manuals and standard operating procedures, and (d) enhance peoples' ability to respond to diverse situations. Examples of regulations addressing (a) include the compulsory establishment of an independent panel, as well as obligations to secure communications within an organization and between the organization and its supplier, customers, or regulatory authorities. Regulations addressing (b) include the executives' obligation to foster a safety culture. Regulations addressing (c) refer to the obligation to develop manuals. However, regulations that address (d) are difficult to establish, since this usually means giving some discretion to organizations. The traditional style of "command and control" is compatible with the first three suggestions, but it often contradicts with (d).

Even so, this is not a big problem if (d) is not an important issue. In industries in which the occurrence and nature of accidents are predictable, such as food, drug, and cosmetics industries, switching from applying a program to decision making does not occur often. In other industries, especially those in which accidents are not predictable like the nuclear industry, addressing (d) is very important.

We must then consider whether or not actual regulations can encourage organizations to adopt all of those measures, especially in industries in which accidents are not predictable. Let me investigate the amendments to the nuclear safety regulations in recent years as an example of regulations in those industries[5]. Regarding the operation of a nuclear power plant, each power plant should make safety regulations and comply with them, according to Article 37 of the Law on the Regulations of Nuclear Source Material, Nuclear Fuel Material and Reactors [6] The Rules for the Installation, Operation, etc. of Commercial Power Reactors were established based on this law[7]. In recent years, the rule was amended in 2003 and again in 2007. In 2003, the amendment introduced a quality assurance standard, JEAC 4111-2003, which was based on ISO9001 (Nuclear and Industrial Safety Agency 2002; Government of Japan 2004). In 2007, after several instances of misconduct committed by employees of electric utilities, the Ministry of Economy, Trade, and Industry amended the rule again to strengthen those companies' ability to cope with misconduct (Ministry of Trade, Economy and Industry & Nuclear and Industry Safety Agency 2007).

In those amendments, reporting and disclosure,[8] compliance with laws and regulations,[9] establishing safety culture,[10] securing communications with suppliers,[11] and developing manuals and standard operating procedures were prescribed.[12] In other words, those amendments enhanced the regulations regarding (a), (b), and (c). Unfortunately, the regulations had a negative effect on (d). According to Article 7-4 of the rule introduced in 2007, each power plant must make standard operating procedures and adhere to them. This meant that any

violation of standard operating procedures would be regarded as a violation of the safety regulations of a plant, and thus a violation of the law.

If we take this article at its face value, we must comply with all standard operating procedures, and there is no room to switch from the application of a program (a standard operating procedure) to decision making. This article may create big problems if a standard operating procedure contains defects, is mistakenly applied, or cannot deal with the current situation.[13] Needless to say, this problem can be resolved by creating a special procedure for unusual, unexpected, and emergency situations.[14] Even so, formulating the act of switching from applying a program to decision making into a program itself is very difficult, so the conflict between the compliance with programs and proper switching cannot be eliminated completely.[15]

In summary, the obligation to comply with the standard operating procedures (programs) limits organizations' ability to cope with situations effectively. This problem should be distinguished from the problem of who makes the rules (a problem related to enforced self regulation; see Ayres and Braithwaite 1992). Essentially, the problem is to what extent discretion is given to organizations to cope with unexpected or emergent situations.[16] The latter problem is related to the outcome-based approach of regulation (see Parker 2000). In this sense, the utilization of in-house compliance programs and codes of conduct should be considered in nuclear industry and some other industries in which unexpected situations may occur, such as corporate law and environmental law.

VI. Conclusion

My investigation centered on methods for the prevention of organizational accidents and designing regulations for organizations that encourage them to prevent organizational accidents. My conclusion regarding organizational accidents is that they are caused by decision making errors (Type A) or errors in switching from applying programs to making decisions (Type B and Type C) in an organization's decision making process. An error in switching can be described as the deviation from a relevant program (Type B) or the misapplication of an improper program (Type C). The following measures are necessary to prevent these errors: (a) ensuring communication of factual premises, (b) fostering proper values, (c) development and maintenance of programs, and (d) management of the switch from applying a program to decision making. Thus, effective regulations should force organizations adopt these measures by providing sufficient incentives or through the use of compulsory measures. Measures (a), (b), and (c) can be included in regulations with relative ease, but (d) will be difficult to include in regulations. An investigation of the recent amendments to nuclear safety regulations shows us

that the new amendments could have a negative effect on the ability of switching in an organization's decision making process.

The conceptual model I used in this paper is simple, and there are many things I will have to consider when examining effective regulations. At the same time, I should investigate the relationship between my model and other theories of organization, such as the theory proposed by Niklas Luhmann. Moreover, organizational decision making processes that produce intentional violations should be incorporated in my model.

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[1] Her new decision may become a new program. See March & Simon (1958: 173-174).

[2] Needless to say, there is an uncertainty about the consequences of an alternative. See March & Simon 1958: 114. Thus, the difference between organizational crimes and organizational accidents, that is, between "knowing" and "not knowing" is not clear.

[3] If the decision maker recognizes that their decision may cause an accident with a high probability, it may be regarded as willful negligence or willfulness. See Yamaguchi 2001: 179-181.

[4] One may think that the Chernobyl disaster is a tragic example of a Type B error. The conclusion of the first survey conducted by the International Nuclear Safety Advisory Group (INSAG) of IAEA in 1986 can be interpreted as identifying a Type B error. However, the follow up study conducted by INSAG in 1992 revealed that the disaster was brought about by both of Type B and C errors. See INSAG 1992.

[5] For an overview of the nuclear safety regulations in Japan, See Government of Japan 2007.

[6] Kaku Genryo Busshitsu, Kaku Nenryo Busshits Oyobi Genshiro no Kisei ni Kansuru Horitsu [the Law on the Regulations of Nuclear Source Material, Nuclear Fuel Material and Reactors], Law No. 166 of 1957 [hereinafter Genshiro-to Kisei Ho].

[7] Jitsuyo Hatsudenyo Genshiro no Secchi, Unten to ni Kansuru Kisoku [the Rules for the Installation, Operation, etc. of Commercial Power Reactors], Ministry of Trade and Industry Ordinance No. 77 of 1978 [hereinafter Jitsuyo-ro Kisoku].

[8] Jitsuyo-ro Kisoku art.12, para.1, no.9, art 16, para.1, nos.9 (no.16 at present), 21, 22; Nuclear Standard Comittee 2003: para.7.2.3.

[9] Jitsuyo-ro Kisoku arts.7-3-3, 7-3-5, 7-4, art.16, para.1, nos.1, 20 (no.3-ro at present); Nuclear Standard Committee 2003: paras.5.1(a), 7.2.1(a).

[10] Jitsuyo-ro Kisoku art.7-3-3, art.16, para.1, no.2, Nuclear Standard Committee 2003: paras.5.1(a), 5.2.

[11] Jitsuyo-ro Kisoku art. 7-3-4, para.1, no.3, art.7-3-5, Nuclear Standard Committee 2003: paras.4.1(5), 7.3.1(3), 7.4.2, 7.5.1.

[12] Jitsuyo-ro Kisoku art.7-3-2, art.7-3-4, para.1, no.5, art.7-3-5, Nuclear Standard Committee 2003: paras.4.1, 4.2.1, 4.2.2, 7.5.1, 8.3(1), 8.5.2, 8.5.3

[13] We can easily find several examples in which a standard operating procedure contained some defects or was mistakenly applied. See, for example, *Asahi Shinbun* (Ishikawa) Sep. 29, 2009 (A case of a leak of radiation-contaminated water caused by an erroneous manual at Shika Nuclear Power Plant, Hokuriku Electric Co. Ltd.)

[14] Electric power companies actually have this kind of special procedure. See, for example, *Asahi Shinbun* (Shizuoka) Dec. 27, 2008 (A case of noncompliance with the operating procedure for unexpected situations at the time of a fire accident at Hamaoka Nuclear Power Plan, Chubu Electric Power Co. Ltd.)

[15] In reality, electric power companies are hesitant to perform a scram (emergency shutdown) or to report extraordinary occurrences (As is seen in the concealment of a criticality accident at Shika Nuclear Power Plant. See *Asahi Shinbun*, Mar. 16, 2007. See also Nuclear and Industry

Safety Agancey, 2007). Because of this culture, cases have occurred where the staff of an electric power company (knowingly) violated the special procedure for emergency situations in order to hide the occurrence of an accident (*Asahi Shinbun* (Shizuoka) Dec. 27, 2008). Some may say that Article 7-4 of the Jitsuyo-ro Kisoku is necessary to deter this kind of behavior. It must be noted that the purpose of the article is not to make electric power companies obey their standard operating procedures, but to prevent organizational accidents. Compulsory compliance with standard operating procedures may impede voluntary preventive behavior of companies and thus degrade their ability to deal with extraordinary situations. Rather, it is desirable to provide enough incentive to deal with extraordinary situations voluntarily (including performing a scram) and report their response.

[16] Needles to say, those two are related with each other. It would be easier for organizations to comply with regulations and to cope with unexpected and emergency situations if they have the discretion to make and change regulations.

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