# Proposal of a Method to Support the Design and Evaluation of Rules that Take into Account the Mechanism of Functional Performance

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## Abstract

In this study, we propose a method to support rule design and evaluation that takes into account the mechanism of functional performance in order to prevent organizational accidents and scandals by defining the state in which a rule performs its function as "the rule is appropriate for purpose," "the established rule is followed," and "the rule is not becoming a dead letter. The proposed methodology consists of three steps. In Step 1, the user analyzes the regulatory regime of the subject rule. In Step 2, the user assesses the risk of the rule not being appropriate, not being followed, or becoming a dead letter. In Step 3, the user considers measures to address the risks. To evaluate the proposed method, we conducted user evaluations using questionnaires on the proposed method and the results of the proposed method, experiments to compare the proposed method with existing methods, and third-party evaluations of the results by the regulated parties to confirm the effectiveness and appropriateness of the proposed method. Finally, we explain conclusion and future research topics.

*Keywords:* rule design, rule management, prevention of rule becoming a dead letter, organizational rules, risk assessment

## 1  Introduction

According to Baldwin [1] , there are a large number of rules that are regularly ignored or disobeyed in virtually all fields of regulation and administration. And O'Dea & Flin [2] states that the failure to follow rules are the third most important perceived cause of accidents.

In response to organizational accidents and scandals caused by such rule violations, Taniguchi [3] states that in order to prevent organizational accidents and scandals, it is important to establish appropriate rules and ensure that the established rules are followed. Furthermore, Taniguchi [4] also discusses the usefulness of preventing rules from becoming a dead letter in order to prevent organizational accidents and scandals.

Thus, in the field of research on organizational accidents and scandals, there is a shared recognition of the importance of safety management through rules (hereafter, rule management) [5]. Yoshino & Saito [6] point out the challenges of this rule management, especially with regard to the methodology of rule design, which is a "feed-forward approach to design" in which all problems related to the rule are identified and designed in advance. He states that not only a "feed-forward design approach", in which all problems related to the rule are identified and designed in advance, but also a "practical approach", in which the regulator designs the rule sequentially

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whereas evaluating various practices in the field, is necessary. In other words, rule management to prevent organizational accidents and scandals requires a rule design method that takes into account "setting appropriate rules," "ensuring that the established rules are followed," and "evaluating field practices to prevent the rules from becoming a dead letter.

Based on the problem in the previous studies by Hale & Borys [7]. and Takahashi & Shimada & Sato, we propose a method to support rule design and evaluation that takes into account the mechanism of rule functional performance in order to prevent organizational accidents and scandals by defining the state in which a rule performs its function as "the rule is appropriate for purpose," "the established rule is followed," and "the rule is not becoming a dead letter.

This paper is organized as follows. We describe previous studies and novelty of this study in section 2. We mention the proposed method and its design in section 3. We show evaluation method in section 4, and evaluation results in section 5. We explain discussion in section 6, conclusion and future research topics in section 7 .

## 2    Previous Studies and Novelty of This Study

As a methodology for designing and evaluating rules that takes into account the mechanisms of functional performance of rules, Hale & Borys [7] propose a rule management framework, which has a cyclical structure, emphasizing the fact that rule management is a dynamic process of adapting rules to the changing realities of the activity and its environment. This framework has the structure of PDCA cycle in which rules are repeatedly evaluated and designed, with an emphasis on monitoring and learning part of the loop. While this is indeed a methodology for designing and evaluating rules that takes into account the mechanism of functional performance of rules, it does not describe a specific method for designing and evaluating rules.

A method that supports the design and evaluation of specific rules is Takahashi & Shimada & Sato's [8] risk assessment method for rules regarding intentional rule violations. They organized "direct causes of intentional rule violations" and "factors behind intentional rule violations" and developed a checklist for rule violation prevention based on these factors. However, they note that this method is only intended for chemical industry rules, and its application to rules in other industries and empirical studies are problems to be addressed. Furthermore, this method does not have a PDCA cycle structure like the framework of Hale & Borys [7], and it is difficult to say that it can take into account the mechanism of functional performance of rules.

Based on these problems of previous research, the novelty of this study is that we proposed specific methods to support the design and evaluation of rules that take into account the mechanism of the functional performance of rules, and that we empirically evaluated these methods.

## 3    Proposed Method and Its Design

In this section, we explain the proposed method and its design, considering previous studies.

The proposed method is intended for "persons in a position to design and operate rules in an organization (hereafter referred to as "regulators")," which are the entities that execute rule management, and is primarily to assist in the design and evaluation of rules when they are being designed or revised.

The requirements for the proposed method are to support the design of rules and to support the evaluation of rules. In order to embody these requirements, we have defined three steps based on Bax & Steijnet & De Witte's [9] point that "analysis of the regulatory regime is essential to

understand how workers assess the legitimacy of rules," and Amalberti & Vincent & Auroy, de Saint Maurice [10] that "risk should be managed rather than eliminated so that rules are not followed".

In Step 1, the user analyzes the regulatory regime of the subject rule. In Step 2, the user assesses the risk of the rule not being appropriate, not being followed, or becoming a dead letter. In Step 3, the user considers measures to address the risks.

In order to implement each step, we developed the following tools: "Confirmation Sheet for functional performance of rules," "Risk Assessment Sheet," and "Countermeasure Examination Sheet".

First, in Step 1, the user analyzes the mechanism by which the subject rule functions using the "Confirmation Sheet for Mechanism of Functioning of Rules" (Figure 1). This sheet defines the components and the relationships between the components for a rule to function. The components of the sheet are "A: Regulators", "B: Standard setting", "C: Sanctions", "D: Monitoring", "E: Enforcement", "F: Regulated Persons", "G: Environment for action", "H: Person in charge of disseminating", "I: Other rules", and "J: Monitoring Change".

First, component A is the regulator, which is the user of this method.

Components B, C, D, and E, enclosed by "Rule," indicate what is required for the rule to work, and are defined based on the three elements ("Standard Setting," "Monitoring and Enforcement," and "Sanctions") that Scott [11] has organized to make a regulation functional. Sanctions reduce the temptation to violate the regulated person, Monitoring ensures that the regulated person is following its rules, and Enforcement directs behavior to conform to the standards setting for the regulated person.

Component F is the regulated person, meaning the subject that the subject rules are intended to regulate. The regulated person acts as a constraint on the subject rules and other relevant rules [12].

Component G is the environment for action, which is the hardware used to act to follow the rules and the personnel involved in the action by the regulated person. The reason for the environment of action component is that, as Schulz [13] points out, an organization's rules become a dead letter over time, and this increases with the degree of change in the environment. As for what exactly the environment refers to, we set hardware, which is one of the factors for rule violations organized by Alper & Karsh [14], and those whom the rules do not directly require compliance with, but who are involved in the actions of the regulated party. The environment in which the action is to be taken affects the action because the content and methods of the action may change if the environment of the action changes. (For example, a change in the internal customer information management system will also change the action of how customer information is handled.)

Component H is who and how the rules are disseminated and has the role of informing the regulated persons of the function of the rules. The reason this component is necessary is that if the rules are not made known to the regulated, they will not be followed forever. Taniguchi [4] points out that disseminating the function of a rule to the field may be more important than tightening the regime of monitoring in order to prevent the rule becoming a dead letter, and for a rule to function, it must be made known, including education on why the rule is necessary and what value it has in being followed.

Component I is the rule which represents a rule of a higher or lower hierarchy of the subject rule or a rule which is incidental to the content that the rule prescribes, and these rules are closely related to the subject rule. This component is necessary because the research of Alper & Karsh [14] has revealed the problem of inconsistency among rules and lack of priority as a factor that

causes rules to be broken, and for rules to function, the related rules must be related without inconsistency and with clear prioritization.

Component J is who and how the actions and the environment of the actions are monitored, and has the role of monitoring the actions and the environment for actions and reporting changes, if any, to the regulator. Alper & Karsh [14] point out that 'rules fail because the systems, both internal and external to an organization, are in a constant state of change,' and furthermore, according to Baldwin [15], the lack of a mechanism for detecting change is a major problem to regulate. Therefore, for regulations to work, they need to address changes in both the action (internal) and the action's environment (external).
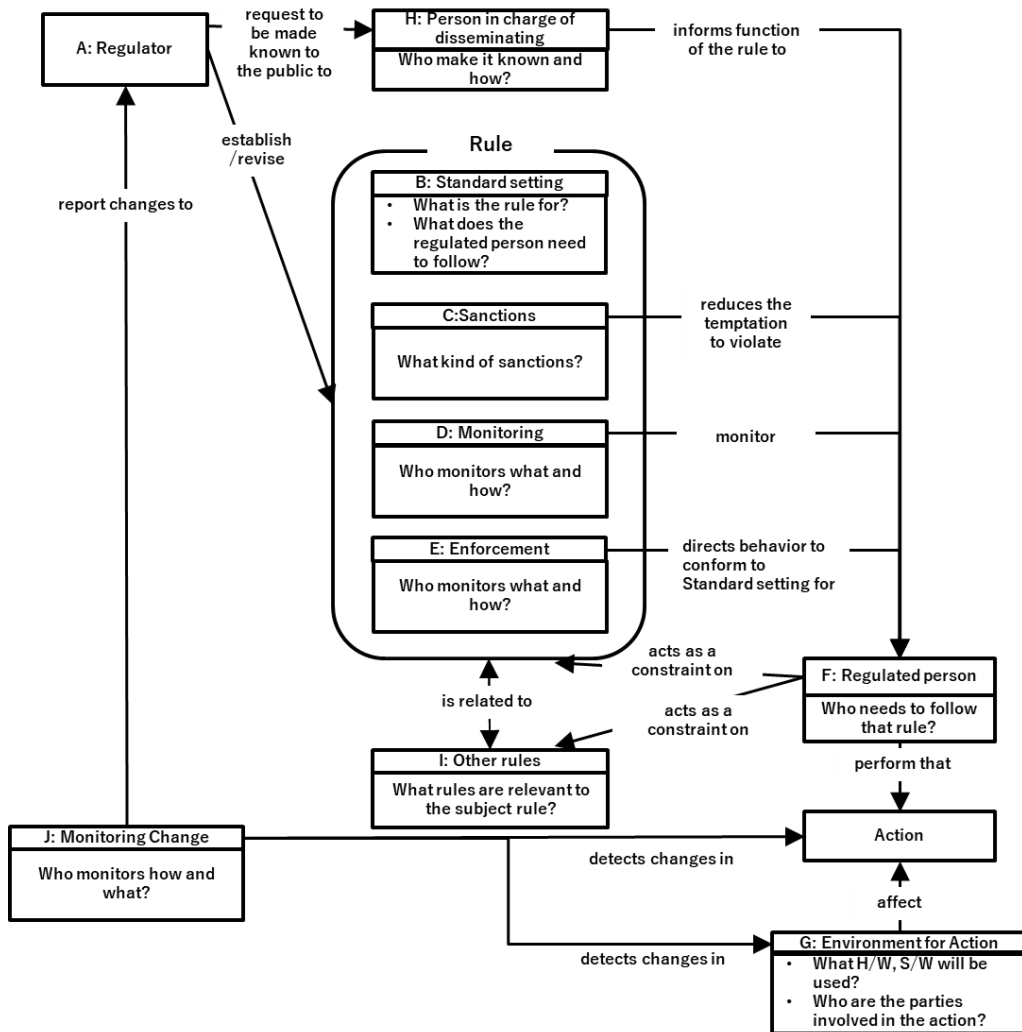


Figure 1: Confirmation Sheet for functional performance of rules

Next, in Step 2, the risk of the target rule not working is evaluated using the "Risk Assessment Sheet" with reference to the results of Step 1. The "Risk Assessment Sheet" lists the risks identified in previous studies by Schulz [13], Hale & Borys [7], Takagi & Fukui & Matsui [12], Alper & Karshet [14], Takahashi & Shimada & Sato [8], and others, as well as the risks identified by the author in analyzing the structure of the rules in this study. The risks of the rules not being

appropriate, the risks of the rules not being followed, and the risks of the rules becoming a dead letter are assessed.

Table 2 is an example of how to fill out the "Risk Assessment Sheet" on the subject of rule for appropriate reporting of entertainment expenses. The user should circle the risks listed that are or may be applicable and describe the rationale.

Table 1: Example of how to fill out the Risk Assessment Sheet (excerpt)

| No. | Risk Description | Assessment Results | Rationale for assessment |
|---|---|---|---|
| 1-1 | • The purpose of the rule is not appropriate. | | |
| 1-1 | • Compliance with the rules does not achieve the purpose. | | |
| 1-2 | • Sanction is not defined. | | |
| 1-3 | • Sanctions have not reduced the temptation to violate. | ○ | A caution is not enough, and the next time it's forgotten again, it may not be followed. |
| 1-4 | • Monitoring is not defined. | | |
| 1-5 | • Monitoring contents and methods are not appropriate. | ○ | We are not able to monitor all actions to ensure they are followed. |
| 1-6 | • The person charged with monitoring does not perform the monitoring as defined. | | |
| 1-7 | • Enforcement is not defined. | | |
| 1-8 | • Enforcement methods are not appropriate | | |
| ... | ... | ... | ... |

Finally, in Step 3, countermeasures for the applicable risks are examined using the Countermeasure Examination Sheet. Specifically, for those circled in the Step 2 assessment, countermeasures

are examined on the Countermeasure Examination Sheet. This sheet presents the response policy and items to be considered in advance, and the user examines the countermeasures in accordance with the policy and items. Table 2 shows an example of the "Response Plan Examination Sheet" based on the rule for appropriate reporting of entertainment expenses.

Table 2: Example of how to fill out the Countermeasure Examination Sheet (excerpt)

| Policy on Response Measures | Points for consideration | Risk No. | Countermeasure |
|---|---|---|---|
| Review the purpose of the rule | • What objectives should be set to prevent accidents and scandals in the organization? | 1 | |
| Review the content of the rule to ensure that it achieves the purpose. | • What modifications to the content would accomplish the purpose of the rule? | 2 | |
| Adapts to changes in the action environment | • What modifications can be made to the rule to adapt the changes in the environment for action that are already occurred? | 15,27 | |
| Define or review sanctions | • What rewards or penalties would reduce the temptation to violate? | 3,4,34,35 | Clarify penalties for violating rules and regulations, and reflect them in personnel evaluations. |
| Define or review monitoring | • What should we monitor to determine if rules are being followed?<br>• Who should monitor compliance with regulations?<br>• How should we monitor to determine if the rules are being followed? | 5,6,7 | All forms are monitored, not just those for which approval is requested. |
| Define or review enforcement | • Who should impose sanctions?<br>• Is it possible to move the regulated person's actions toward compliance through an architecture? | 8,9,10 | |
| . . . | . . . | . . . | . . . |

# 4    Evaluation Method

To evaluate the proposed method, we conducted user evaluations using questionnaires on the proposed method and the results of the proposed method, experiments to compare the proposed method with existing methods, and third-party evaluations of the results by the regulated parties to confirm the effectiveness and appropriateness of the proposed method. To ascertain whether the proposed method can be applied to more types of rules, We didn't limited to safety rules.

Table 3 shows the evaluation methods and perspectives of the evaluation. We conducted objective and subjective evaluations of the effectiveness of the proposed method and the deliverables of the proposed method, respectively, and for the subjective evaluation, we conducted a user evaluation using a questionnaire. For the objective evaluation, we conducted a comparison experiment with the existing method by Takahashi & Shimada & Sato [8] and an evaluation of the artifacts by the regulated parties based on the factors that contribute to making the rules a dead letter in the workplace by Takagi & Fukui & Matsui [12].

Table 3: Evaluation methods and perspectives of the evaluation

| Subjective evaluation | Objective evaluation |
|---|---|
| · Users evaluate the effectiveness of the proposed method. <br> · Users evaluate the understandability, usability, and effectiveness of the proposed method. | · Regulated persons evaluate the rules that reflect the subject rules and the improvements considered in each of the methods. <br> · Conduct experiments to compare the proposed method with existing methods. |

# 5    Evaluation Results

Twelve subjects from four organizations applied the proposed method to a total of seven rules. In this experiment, the scope was not limited to safety rules, but included "rules concerning behavior or conduct that require the regulated person to be obligated or prohibited," and the rule governing the company's approval of business activities and rule concerning secondary employment were included in the evaluation.

The subjects were then asked to evaluate the effectiveness of the proposed and existing methods and the artifacts of each method. In addition, several to several dozen regulated persons conducted third-party evaluations of the deliverables based on the rule formulation factors by Takagi & Fukui & Matsui [12]. Based on the results of these evaluations, we confirmed the validity of the proposed method for the purpose of this study and verified whether the content implemented with the proposed method was able to realize the requirements of the method.

First, we explain the results of the subjective evaluation, in which subjects rated the effectiveness of the proposed method on a five-point ranking scale ("not very much = 1," "not much = 2," "neither = 3," "much = 4," and " very much = 5"), which are shown in Table 4. The average point for all survey items was at least 3 points. ("*" mark indicates a reversed question)

Next, the results of the objective evaluation are described. In the comparison experiment, we confirmed the effectiveness of the proposed method and whether the contents implemented by the proposed method were able to realize the requirements of the method, and in the group comparison (t-test without assuming equal variance), the proposed method had higher average points

than the existing method in terms of "establishing appropriate rules," and significant differences were found. For "effectiveness in analyzing whether the purpose of the rule is appropriate," a statistically significant trend was confirmed for the mean, p = 0.003, as shown in Table 5. A statistically significant trend was also observed for "effectiveness in analyzing whether the content of the rule is appropriate in light of the purpose of the rule," a statistically significant trend was confirmed for the mean, p = 0.044, as shown in Table 5. On the other hand, no significant differences were found for the other items in the between-group and within-subject comparisons of the comparison experiments. In the comparison experiment, we also conducted a subjective comparison using a questionnaire, and a total of 9 responses were obtained. The results showed that the majority of the respondents agreed that the proposed method was effective in terms of " the rule does not become a dead letter," which was one of the aims of the proposed method. On the other hand, the existing method was more highly evaluated in terms of usability.

Table 4: Results of questionnaire to subjects on the effectiveness of the proposed method

| No. | Questionnaire items | 1 | 2 | 3 | 4 | 5 | Average point |
|---|---|---|---|---|---|---|---|
| 1 | Do you feel that this method is effective in analyzing and examining whether the purpose of the rule is appropriate? | 0 | 3 | 3 | 2 | 3 | 3.45 |
| 2 | Do you feel that this method is effective in analyzing and examining whether the content of the rule is appropriate for the purpose of the rule? | 2 | 1 | 2 | 4 | 2 | 3.27 |
| 3 | Do you feel that this method is effective in making the rules to function? | 1 | 3 | 3 | 2 | 2 | 3.09 |
| 4 | Do you feel that this method is effective in modifying the rules as the action changes or as the environment for the action changes? | 1 | 1 | 4 | 2 | 3 | 3.45 |
| 5 | Do you feel that this method is effective in examining the regime that the regulations have in place to deal with changes in actions and in the environment in which actions take place? | 1 | 2 | 5 | 2 | 1 | 3.00 |

Table 5: Results of paired t-tests in comparative experiments

| | T | df | p value (two-tailed test) |
|---|---|---|---|
| Effectiveness in analyzing whether the purpose of the rule is appropriate | 3.993 | 10 | 0.003 |
| Effectiveness in analyzing whether the content of the rule is appropriate in light of the purpose of the rule | 2.301 | 10 | 0.044 |

Next, we explain the results of the third-party evaluation. The results of the comparison of the evaluation of the rules reflecting the results of the proposed method with the evaluation of the current rules (t-test without assuming equal variances) are shown in Table 6.

There is a positive statistically significant difference for the proposed method with p = 0.022 for the item "I feel that if you break this rule, someone will notice right away" as a "mechanism to prevent rules from being broken". On the other hand, there is a negative statistically significant difference for the proposed method with p = 0.007 and p = 0.030 for the items "I feel that the rule is changed frequently" and "I feel that the rule is complicated and has many exceptions and examples" as "reliability of the rule".

The reason why the degree of freedom in Table 6 varies from item to item is that the number of third-party evaluators differs for each rule, and the statistical analysis was conducted separately for each rule in this evaluation.

Table 6: Results of paired t-tests in third-party evaluations

| | T | df | p value (two-tailed test) |
|---|---|---|---|
| A mechanism to prevent rules from being broken (I feel that if you break this rule, someone will notice right away) | -3.91 | 31 | 0.022 |
| Reliability of the rule (I feel they change the rules too often) | -2.880 | 36 | 0.007 |
| Reliability of the rule (I feel that the rule is complex, with many exceptions and case divisions) | -2.260 | 36 | 0.030 |

## 6   Discussion

Based on the evaluation results, we will explain the effectiveness of the proposed method and its comparative advantage over existing methods in terms of whether the rules are designed and evaluated in consideration of the three aspects of the purpose of this study: the rule is appropriate for the purpose, the established rule is followed, and the rule does not become a dead letter.

In terms of "the rule is appropriate for the purpose," the subjective ratings were as shown in Table 4, No. 1 and No. 2, with No. 1 and No. 2 receiving 3.45 and 3.27 points, respectively, indicating a positive opinion. On the other hand, one respondent commented, "I could consider whether the rules were appropriate for the purpose, but I felt I could not determine whether the purpose was appropriate." This comment suggests that one of the limitations of this method is that it may not be able to assist in judging whether the purpose of rules is correct or not. In addition, the results of the third-party evaluation differed depending on the rule. This suggests that the results of this method may vary depending on the type and characteristics of the rule.

In terms of "the established rule is followed," the subjective ratings were as shown in Table 4, No. 3, receiving 3.09 points, indicating a slight but positive result. Based on the comments from users, it was suggested that the proposed method has various perspectives to make the rule be followed and that it is now possible to examine it from multiple perspectives. On the other hand, it was suggested that the amount of work and complexity of the work is an problem. In addition,

considering the result of the decline in "reliability of regulations" in the objective evaluation, the proposed method asked respondents to consider and evaluate countermeasures for all applicable risks one at a time, but since not all countermeasures will be adopted when regulations are actually enacted or revised, the proposed method allows the selection of several countermeasures. Therefore, it is suggested that this method does not take into account the step of determining a well-balanced response by selecting several response measures and considering the impact of the regulation.

In terms of "the rule does not become a dead letter," In terms of "the rule does not become a dead letter," the subjective ratings were as shown in Table 4, No. 4 and No. 5, with No. 4 and No. 5 receiving 3.45 and 3.00 points, respectively, indicating a positive opinion. Users commented that the monitoring of changes was easy to understand because it was set up in a positive manner, and that they felt that the background behind the formality of the rules was not taken into account. This suggests that the proposed method is effective in modifying the rules in accordance with changes in operations and the business environment, but does not cover modifying the rules based on past background.

The objective evaluation did not reveal any significant differences from existing methods. However, in a comparison of subjective evaluations by users, most of them commented that the proposed method was more effective, suggesting its comparative advantage over previous studies.

In addition, this study did not confirm whether the proposed measures would really prevent the rules from becoming obsolete. Therefore, one of the limitations of this study is that it does not support whether or not the proposed measures can deal with the subsequent deformity and whether or not the occurrence of deformity can be noticed.

As a result, the limitations of this study are as follows. First, it is necessary to add an item to assist in determining whether the purpose of the rule is correct. This is because if the regulated person is not convinced of the purpose of the rule, the rule may not be followed. Second, since the results of this approach may differ depending on the type and characteristics of the rule, it is necessary to have the proposed method used by regulators in various organizations and industries to confirm its effectiveness as a widely used method. On the other hand, since the evaluation results changed depending on the rules, it is necessary to consider whether there is merit in developing design and evaluation methods for each type of industry, such as agriculture, industry, information technology industry, and service industry, based on the characteristics of the rules. It is also necessary to examine what kind of regulatory method would be appropriate, since the results were likely to change depending on the regulatory method, such as mandatory versus prohibited rules.

Next, since it was pointed out that the amount of work and complexity involved in this method needs to be improved to increase the usability of this methodology depending on user's purpose by reducing the amount of work involved in this methodology and making the operation of this methodology more efficient. In addition, in order not to reduce the reliability of the rule, it is considered necessary to add a step to assist in determining a balanced response strategy, taking into account the impact of the regulation after the response strategy has been considered. Also, since rules may be broken by human will in the first place, proposals for regulatory methods combined with other forms of regulation, such as regulation by architecture that regulates without notice, may be considered. And since this study has not confirmed whether the proposed measures can detect changes, it is necessary to confirm whether the measures considered in the proposed method can really detect changes in the behavioral environment and changes in behavior. Finally, this study has not confirmed whether the proposed method can maintain the state in

which rule becoming a dead letter does not occur. Therefore, it is necessary to confirm whether or not the proposed method can maintain the state where rule becoming a dead letter does not occur by means of empirical experiments.

# 7    Conclusion and Future Research Topics

This study proposed a method to support rule design and evaluation that takes into account the mechanism of functional performance in order to prevent organizational accidents and scandals by defining the state in which a rule performs its function as "the rule is appropriate for purpose," "the established rule is followed," and "the rule is not becoming a dead letter, and empirically evaluated these methods. The evaluation results suggest that the proposed methods may be more effective than methods based on previous studies in terms of "establishing appropriate rules," "ensuring follow with rules," and "preventing rules becoming a dead letter.

Future research topics include:

- Add an item to assist in determining whether the purpose of the rule is correct.
- Have the proposed method used by regulators in various organizations and industries to confirm its effectiveness as a widely used method.
- Examine that methods appropriate to the type and characteristics of the rule are effective.
- Improve to increase the usability of this method by reducing the amount of work involved in this method and making the operation of this method more efficient.
- Add a step to assist in determining a balanced response strategy, taking into account the impact of the regulation after the response strategy.
- Propose for regulatory methods combined with other forms of regulation, such as regulation by architecture that regulates without notice.
- Confirm through empirical experiments whether the measures considered in the proposed method can really detect changes in the action environment and changes in actions and help prevent rules becoming a dead letter.

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