Study on Organization Resilience to ensure Safety Climate based on Global Standard

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Abstract

Safety is the state of being “safe”, and can also refer to the control of recognized hazards in order to achieve an acceptable level of risk. Every organization has legal requirements for the health and safety of persons inside and around their workplace. Although the organization has to keep a workplace where complete safety is ensured, it might be difficult for paying whole efforts to remove every potential danger in the workplace. In order to ensure a safe working environment, the capability of responding (for any risks) to signals (i.e., information concerning events that could pose future problems that must be taken into account) that occur in and around corporations is necessary.

This study focuses on Occupational Health and Safety Assessment Series (especially OHSAS18001), an internationally applied standard for constructing and operating occupational health and safety management systems (OHSMS) in the adopted workplace. In this paper describe some problem and counterplan during adopting OHSMS standard.

Analyzing the OHSMS standard by using IDEF0 for function modeling, a PDCA cycles with required rules and resources are discussed to cultivate a safety climate by using OHSMS systematically.

Keywords: OHSMS, Safety-I, Safety-II.

1. Introduction

In recent production processes, since diversification, complication and internationalization of human workers have been advanced and new mechanical equipment and chemical substances have been introduced and the like, the resultant occupational accidents have been diversified, resulting in difficulty in determining their causes. This increases demand for countermeasures related to occupational health and safety concerns according to these actual causes and their features. On the basis of operation manuals and the like, employers should categorize appropriately operations so as to determine occupational risks and harmfulness for preparing countermeasures against them. OHSMS (Occupational Health and Safety Management Systems) defines statements of all potential risks and countermeasures related to the risks, and clarifies responsibility of personnel and organization.(1) In Japan, a policy related to OHSMS was announced and introduced by the Labor Ministry (now the Health, Labor and Welfare Ministry) in April 1994(2). Particularly at production sites, many production companies apply OHSMS as the international standard.

Yazdani(3) discussed implementations of OHSMS by comparing PE (participatory ergonomics) papers. Other studies also have seen OHSMS as a tool to give new perspectives (4, 5). However there are no detailed engineering for keeping PDCA cycle to continuously improve and maintain OHSMS activities in the bottom-up manner.

In this paper, the authors would like to propose an engineering method to install PDCA cycle of OHSMS based on resilience engineering concept.

2. Problem Statement

Resilience engineering is a concept which was proposed by Erik Hollnagel et al. Hollnagel presented views of Safety I and Safety II (6).

Safety-I: Avoiding that things go wrong

Safety II: Safety management for responding errors to be happened

The Safety I means a stated where things do not go wrong. The safety I tries only to prevent these things from

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Table1. Analysis of OHSMS standard.

Location	Sentence	Subject	Verb	Object	Knowledge, Rule, Skill
29-32 row from the top, page 90	Hazard identification, risk assessment and determining controls The organization shall establish, implement and maintain a procedure(s) for the ongoing hazard identification, risk assessment, and determination of necessary controls.	organization	planning	risk assessment	Rule
22 row from the top, page 92-16 row from the top, page 93	The procedure(s) for hazard identification and risk assessment shall take into account: a) routine and non-routine activities; b) activities of all persons having access to the workplace	organization	shall take into account	hazard risk assessment	Rule
21-26 row from the top, page 95	The organization's methodology for hazard identification and risk assessment shall: a) be defined with respect to its scope, nature and timing to ensure it is proactive rather than reactive; and b) Provide for the identification, prioritization and documentation of risks	organization	risk assessment shall	organization's methodology for hazard identification	Rule
24-27row from the top, page 97	For the management of change, the organization shall identify the OH&S hazards and OH&S risks associated with changes in the organization, the OH&S management system, or its activities, prior to the introduction of such changes.	organization	change	OH&S management system	Knowledge, Rule
1-2 row from the top, page 98	The organization shall ensure that the results of these assessments are considered when determining controls.	organization	shall ensure	determining control	Rule

going wrong. This approach assumes that it is possible to attain safety by eliminating all of contributory factors of adverse outcomes.

The safety II tries to ensure a state where the level of required performance is maintained to be as high as possible and to ensure that things go right under varying conditions. Attention is paid not to infrequent failure cases but to actual routine operational performances.

First, the OHSMS standard plans activities mainly on the basis of risk assessment, which can be considered as the countermeasures of Safety-I. Second, the OHSMS standard defines maintaining and improving of the safe environment, which can be considered as the countermeasures of Safety-II requiring continuous execution of improvement cycle.

Therefore, for the application of Safety-II framework, the following two problems should be solved.

1. Definition of a cycle for continuously improving, maintaining and acting the OHSMS standard in the bottom-up manner after the acquisition of identification of the OHSMS standard; and
    a. Describe input information for each safety activity.
    b. Describe output information for each safety activity.
    c. Describe control (limitation) information for each safety activity.
    d. Described human resource information for each safety activity.
2. Definition of an education method for executing the cycle for the OHSMS standard in the bottom-up manner

Particularly in the present paper, discussion for solving Problem 1 is presented as the bottom-up manner for continuously improving, maintaining and acting the OHSMS.

3. Problem Solving by using IDEF0

3.1 Analysis of OHSMS Specification

While OHSMS is being adopted in domestic manufacturing industries, OHSMS may not specify the personnel who ought to perform certain actions under particular circumstances. This paper discusses and analyzes Chapter 4 of the 2007 edition of OHSAS:18001, which contains directives on activities relating to health and safety.

The analysis of OHSMS was conducted by deconstructing and categorizing clauses of the standard from the following perspectives are showed in Table 1:

1) Chapter titles, subtitles
2) Number
3) Sentences location
4) Sentences (extracting only the sections on recommendations for actions relating to health and safety)
5) Subjects, objects, and verbs within sentences
6) Verb, objects, and verbs within sentences
7) Knowledge, skill, rule based on Rasmussen's[8] SRK model

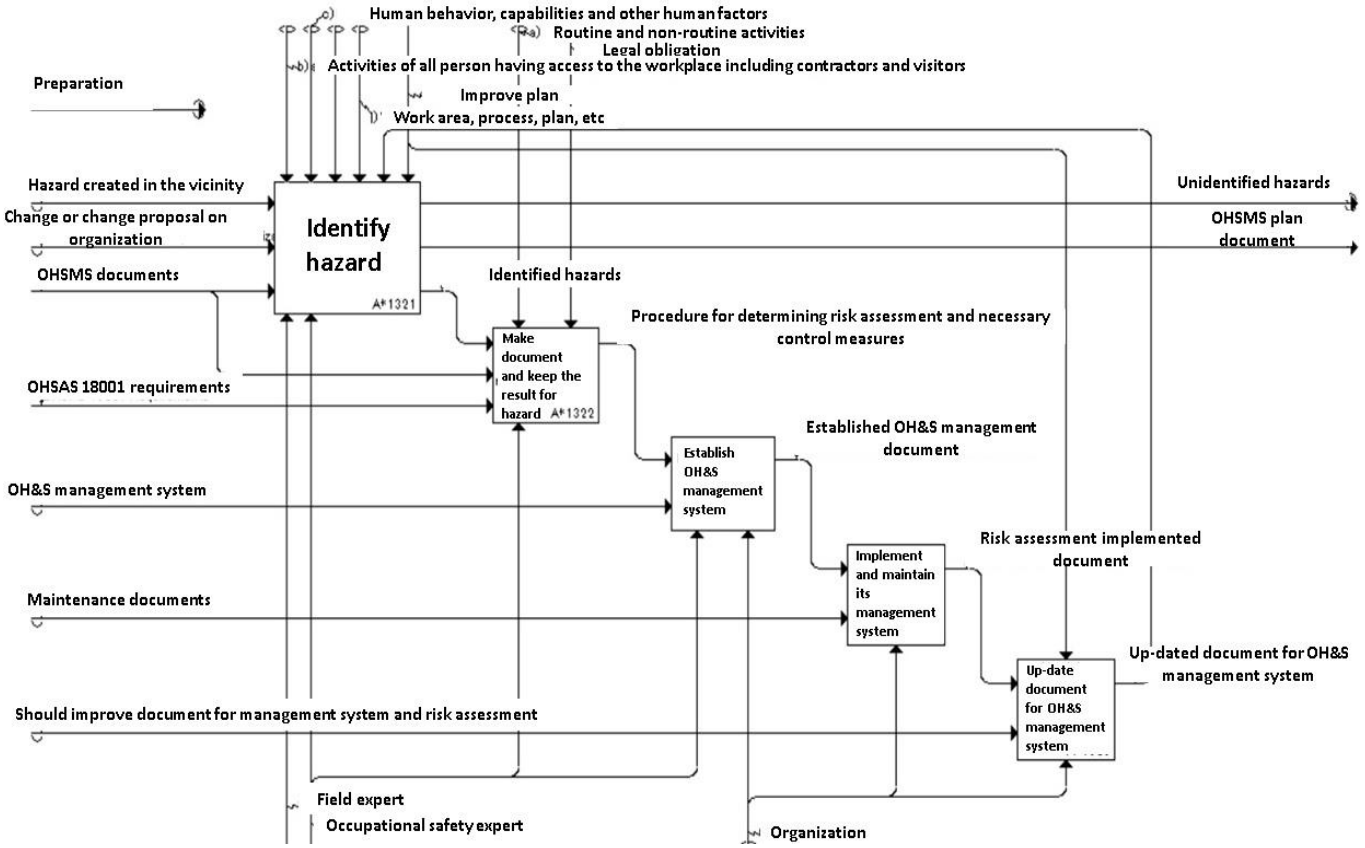

Fig1. OHSMS analysis by IDEF diagram.

The results showed that the entity in-charge of safety is primarily the "organization," and there is no mention in the standard of who should actually act. Furthermore, when the object was extracted during the analysis, hardly any details were mentioned, and it was hence not clear what action should be taken within the organization. Table 1 shows only top a few lines as the result of the analysis of the clauses of the OHSMS standard.

The OHSMS standard was written by the rule-base. There are many rules in the OHSMS standard. Then under the rules, method and knowledge of other skills are necessary. The OHSMS standard does not indicate how to meet the requirements and rules.

3.2 Development of IDEF0 Diagram for OHSMS Visualization

When a corporation implements OHSMS, it follows the relevant clauses in the OHSMS standard. The standard uses a PDCA [Plan, Do, Check (Evaluate), Act (review and implementation)] structure, which includes OH&S policy, goals, health and safety planning, its implementation and operation, daily inspections and improvements, system audits, and regular review of the system itself.

This system of business management is adopted by corporations due to its basic principle of continual improvement in each cycle caused by going through the PDCA motions. Research in revealed three areas where information is unclear in the implementation and operation of OHSMS:

i. The input and output of a given activity
ii. The main subject of a person who carries out the activity
iii. The conditions on the limitations and resources that must be taken into account in executing the activity

To identify these elements in the clauses of the OHSMS document, IDEF0, a function modeling methodology, is used.

The activity in IDEF0 can be identified as the verbs in the standard clauses of OHSMS. Concomitantly, whatever is fed in order to execute this activity is expressed as the input, and the results of executing the input through the activity can be expressed as the output. The control is done by limiting condition in executing the activity, and a mechanism is formed in a manner in which the execution of the activity is supported. This is expressed as the resource (especially the executor of the activity) to execute the activity.

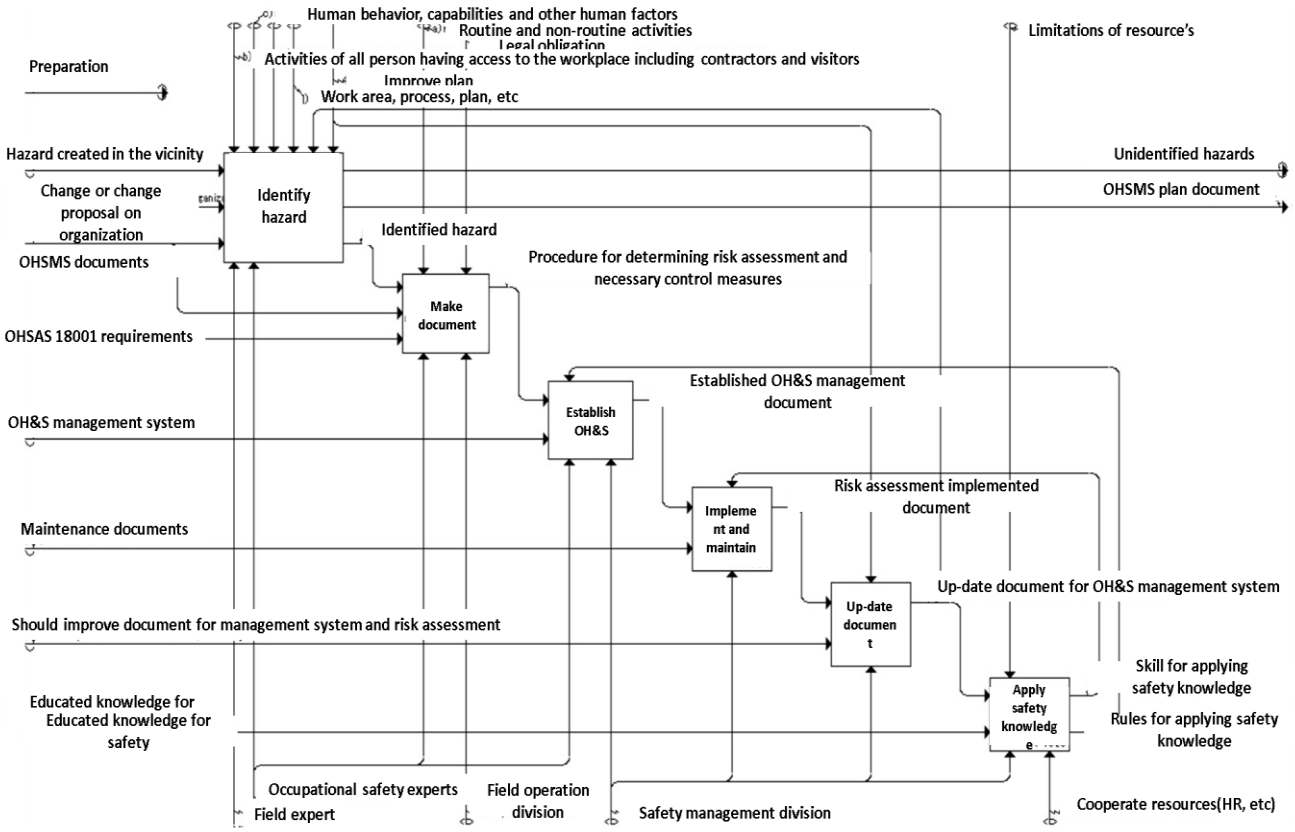

Fig2. Identification of actual constraints and necessary resources and mechanism for implementing OHSMS.

Fig 1 shows the determination of the source of a hazard, a risk assessment, and decision making on the management method based on clauses in 4.3.1 of the OHSMS standard document. Existing activities are a determination of the source of the hazard, the risk assessment, and the establishment of steps to determine how to manage, implement, maintain, and disseminate those steps.

Four steps—"Identify hazard" and "Make document and keep the result for hazard" and "Establish OHSMS management system" and "implementation and maintain of the steps," "Up-date document for OHSMS management system the steps," the dissemination of the steps"—form the basic structure of activities in all the OHSMS clauses. But there some control and mechanism is no detail on the standard. Need to describe to control and mechanism.

3.3 Expectation of Possible Constrains and Required Resources for Activity Execution

Fig. 1 shows a cycle supplying a new operational procedure to be followed by the site human workers so that the feedback is provided by a team, a whole organization or the like for maintaining this cycle. There need to describe some control and mechanism. In addition, Fig. 1 shows also all activities among those for supplying, executing and maintaining.

However, the OHSMS rules do not mention constrained conditions to be considered for executing the activities and personnel in charge of this case. Accordingly, in Fig. 1, for such activities with unclarified constrained conditions, "control" is noted as NA (not applicable) in Fig1. IDEFO. When "control" is noted as NA, the following two reasons may be assumed:

Case 1:

a. Control is not actually required; and
b. "Activity for defining previously constrained conditions" is not presented.

In this case, "possible activity for defining previously constrained conditions" should be added.

Additionally, when the personnel who execute the activities is not clarified, "mechanism" is noted as NA. When "mechanism" is noted as NA, the following two reasons may be also assumed:

Case 2:

c. Mechanism is not actually required; and
d. "Activity for defining previously personnel in charge of this case" is not presented.

In this case, "possible activity for defining previously

the personnel in charge of this case" should be added.

Fig2 describes followings;

1. Some control is not actually required on the standard. Added new activity "Apply safety knowledge". Activity for "Establish OHSMS management system" control is rules for applying safety knowledge. Establishing management system need to rule for applying safety knowledge. Activity for "Implement and maintain OSHMS management system" control is skill for applying safety knowledge.
2. Mechanism is not actually required. Safety management division is send to operation each activity steps.

The above mentioned possible activities differ each other depending on departments or sections even in a company. Since such differences can be visualized in this study, "differences in viewpoints for safety and countermeasures (Localized safety culture)" depending on the departments or section are also visualized. Thus, it is possible for a general manager for safety of the company to form a general safety culture of the company by taking what is necessary and leaving what is unnecessary from the localized safety culture for each department or section.

4. Concluding Remarks

In this paper, based on the Occupational Health and Safety Management standard, a technical procedure is proposed by which an organization can improve the safety through formulation and operation of the standard. Industry safety is not only Physical safety. We need to approaches factory operator and the IT administrator. And an education method for executing the PDCA cycle in each part will be studied from now on.

Acknowledgment

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