

## Development of Checklist based Operation Audit Quality Advancement Techniques

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**Abstract:** This study aimed at contributing to the improvement of objectivity and reliability of operating audit, quantitative audit result being able to comparing with best practice and past operating status, through providing quantitative operation check sheet. Quantitative operation check sheet is comprised of thirteen basic check sheet areas. The auditors evaluate the current operation status level with basis of basic check sheet area. It is hoped that this thesis on a quantitative operation check sheet for the Improvement of the operation audit will become the basis for the application and effectiveness of an operation audit that not only the improvement of the quality of information system audit but also usability of operation audit.

**Key words:** Operation audit, quantitative check sheet, check item, audit quality, improvement

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### INTRODUCTION

Planning and development of information systems and operation of efficient information systems are important for information technology to contribute to business. An information system that has been constructed can effectively achieve the goal set at the planning stage by efficiently operating at the operation stage. From these viewpoints, the importance of operating supervision is expected to increase more and more in the monitoring area.

The current management supervision is not a quantitative approach but deviation is large based on the discretion of supervision as to how to apply inspection items depending on supervisor's subjective judgment (MI, 2012). Such a point of view is also an opportunity for proper inspection according to circumstances according to the expertise of the supervisor. However, in reality it is not suitable for system operation rather than system construction (Kim, 2011; Lee, 2013).

Every time the operation system is operated and supervised by a system that requires continuous operation after construction, the reliability of the result of supervision cannot be secured when applying other inspection items and the utilization of the result of supervision is also limited. I have no choice but to. Therefore, in this study we try to improve the operation supervision and its utility by measuring the operation state of the information system with the quantified operating checklist.

### Literature review

#### **Operational consideration of information system:**

Operation of the information system means designing and constructing the information system, so that IT related work such as problem solving and security management is carried out. That is it refers to a task of collectively managing the system as general support activities for providing the service to the user via the information system and various support activities for smooth operation. The goal of the management is to provide reliable information resources so that the information system can achieve the business goals of the enterprise and use the information system service that is satisfactory so that the company can be competitive. We must focus on endeavoring to provide continuity to people. In addition, the operation of the information system may mean the task of comprehensively managing the system. The system operation related tasks are executed by the processing procedure of five steps leading to goal setting, plan setting, task execution, task evaluation, feedback back and its contents are as shown in Table 1. In ISO 2000 which is an international standard for evaluating and improving the operation of information systems each area of information system operation is composed of 5 process maps of service delivery processes, control process, release management, resolution process and relationship process (Kim, 2009, 2005; Cho, 2007; Han, 2001).

**Consideration on operation management of information system:** The operation management of the information

**Table 1: Operation process**

| Process                      | Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set operational goals        | A step of setting goals of the operation to be achieved in information system operation<br>It accurately grasps the list of equipment currently owned by the IT organization, analyzes the needs of users and displays the tasks of system operation tasks in the order of priority                                                                                                                                                                            |
| Set operational plan         | It is the stage of planning a substantial work processing method according to the goal of system operation<br>We must plan not only relocation of information systems and resources but also various artifacts that can measure the personnel utilization plan and the performance of the system operation                                                                                                                                                     |
| Execution of operations      | It is a step of executing substantial administrative work<br>Work must be proceeded so that the goal of system operation can be achieved based on the set plan. Operations being executed can be distinguished between system change management, performance management, fault management, security management and availability management                                                                                                                     |
| Evaluation of operation work | It is a stage of evaluating the degree of achievement of the operation target ratio operation task set in step 1<br>Evaluate the degree of attainment of the goal of the operation task based on various deliverables created at the stage of executing operations. As system administrators evaluate rational administrative tasks, they digitize various deliverables and determine cycle of business evaluation through consultation with other departments |
| Feedback                     | It is a step of analyzing the problem derived through stage-4 and finding the root cause of the problem. In order to solve the various problems, it is necessary to inform the department, based on the result of feedback, system operation task should be rebuilt                                                                                                                                                                                            |

system is to check the equipment organization, operation management of the operation, error countermeasure, etc., from the objective viewpoint of a third party as a supervisor at the operation stage of the information system during the life cycle of the information system and recommend it is intended to improve the efficiency of operation and is to be conducted periodically or non-periodically. In the case of domestic in 1987 the supervision started at the Korea Computer and Information System supervision started. The 1999 information system supervision standard (No. 1999-104, 1999.12.12) “was announced based on” Information system basic Law Article 15-2 (Information system supervision) “of Information Communication Department. In 2005, “act on the efficient introduction and operation, etc., of information systems (2015.12.30)”. This enactment and the obligation supervision was started in earnest. The information system supervision standard enacted in 1999 is based on the law it was revised in 2006 according to.

Recently, as businesses, businesses and processes are carried out through information systems, the risk of stoppage of information systems, obstacles and the like is greatly increased. The supervision of operations is based on compliance supervision and system operation costs that evaluate whether the deliverables that are the result of the activities are at an appropriate level by checking whether the detailed activities of the operation of the information system were executed faithfully and the system operation cost efficiency is assessed to evaluate the effectiveness of hardware and software. According to the management supervision standards there are “ISO 20000”, “COBIT”, “guidelines for the system operation business area” of the information system supervision standard (Chrissis *et al.*, 2011) (Table 2).

**Problems of management supervision and direction of improvement:** As shown in Table 3, problems in the operating supervision and supervision report were derived and the 3 improvement points are as follows (Jang, 2015; Yang and Koo, 2015; Nguyen and Oh, 2013).

**Table 2: ISO 20000 process map**

| Area                       | Process                                        |
|----------------------------|------------------------------------------------|
| Service delivery processes | Capacity planning                              |
|                            | Service level management                       |
|                            | Information security management                |
|                            | Service continuity and availability management |
|                            | Service reporting                              |
| Control process            | Budgeting and accounting for IT service        |
|                            | Configuration management                       |
|                            | Change management                              |
| Release management         | Release process                                |
| Resolution process         | Incident management                            |
|                            | Problem management                             |
| Relationship process       | Business relationship management               |
|                            | Supplier management                            |

First, it is necessary to subdivide the inspection items of the operation supervision, improve the measurement standard so that it can quantitatively determine the level by clearly defining the measurement standard in advance. System operation will not be done merely by solving problems and improvements to this. The level of system operation, necessary resources and cost are mutually complementary. Therefore, it is important to evaluate whether an appropriate operation level has been achieved. This is difficult with existing supervisory procedures that are only configured for problem improvement recommendations.

Secondly, procedures and methods are needed to directly check the status of the operating and information system. As a result, there are cases where items directly affecting the operation and utility of the information system such as service continuity, performance/availability and security management items are directly checked and the reliability of supervision can be enhanced.

Thirdly, if the object to be supervised is of the same system, it needs to work the same way all the time. Based on the information system supervision standards, existing supervision will formulate a supervisory plan in accordance with the object to be supervised. However, in this case each time supervision is carried out, supervision

Table 3: Problem of current operation audit

| Problem                                                     | Contents                                                                                                                                                                                                            |
|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operation supervision side</b>                           |                                                                                                                                                                                                                     |
| Mainly document-centered supervision                        | Due to the nature of the operating system there is difficulty in judging the actual operating state if you check only the document centrally without directly evaluating the actual state                           |
| Inspection items and methods differ for each supervisor     | The supervision guidelines are becoming inclusive and items to be supervised are supervised by the supervisor Shimada supervisor, so it is impossible to view the same items on the same basis for each supervision |
| <b>Supervision report side</b>                              |                                                                                                                                                                                                                     |
| I can not know the overall level of the operating system    | Unlike the method that can evaluate the operation level like the CMM, it is not possible to point out only the problem and specify the operation level                                                              |
| It is impossible to compare fundamental items by item level | It is not possible to evaluate basic operation level by item                                                                                                                                                        |
| Unfamiliarity of supervision                                | Because only the check of any number of items in the basic item is left to the discretion of the supervisor, the evaluation result will not be quantified                                                           |

is performed based on other standards and time. In the case of constructing an information system where the object is not the same for each supervisor this method has no problem. However, in the case of system operation, since it is the same as the object to be supervised, depending on the supervision timing and supervisor, if other criteria are applied whether or not the system operation is improved or determined.

## MATERIALS AND METHODS

### Improvement of management supervision

#### Derivation of basic items of checklist for operation:

In this research, referring to the information system supervision standards and IS 20000 process map which is the international standard, basic items (13 items) of the operating checklist are derived as shown in Table 4.

Comparing the system operation information system supervision standard with the IS 20000 process map, it is already possible to know that the supervision standard has been created considering almost all the standards. Therefore, since the purpose of the basic items of the operating checklist is not to replace the supervision standard but to supplement it, unless there is a special reason, its name is applied as it is to the operational information system supervision standard of the system. "Communication management" was excluded from basic confirmation items. Since, the communication level is indirectly measured at the level of other basic confirmation items basic inspection items are excluded. Also, budget management (budgeting and accounting for IT service) was not included in the basic item. This is because there are no supervisory standards and in reality the budget items are not provided to supervisors in many cases.

**Evaluation item derivation:** Evaluation items (75) for each basic item in the operational checklist were supplemented with additional evaluation items based on the examination items of details of system operation and information system supervision standards. For example, the basic confirmation item "operation management plan" has a

detailed study item of the operation information system supervision standard of the system '01. Confirm whether the system operation policy has been established. Do you reflect this as it is and established "(evaluation items) system operation policy?)". However, the operation information system supervision standards of the system are focused on documents and there are no evaluation items for actual confirmation. In such a case we directly added the evaluation items to check the state of the system.

**Measurement method derivation:** As shown in Table 5, the type of measurement method by 75 detailed evaluation items was checked and derived by five methods of operator interview, manager interview, outsourcing company interview, live-action confirmation.

**Derivation of scores:** For each evaluation item, scores of up to 5 points are given at one point according to the state. As shown in Fig. 1 this is the evaluation model of construction supervision, CMM, SPICE process applied. In order to avoid ambiguity of evaluation, concrete evaluation criteria indicating the respective states from 1-5 points were specified for each evaluation item. However, if it is difficult to change the state of the evaluation item to 5 points at one point, it may be divided into in this case the score gives 1, 3 and 5 points for each level.

**Measurement by evaluation item:** For each of the 75 evaluation items, a score is given based on the evaluation method (5 points) in Table 4 and then based on the evaluation standard (5 points full score). For example, if you evaluate the evaluation item "CPU performance is satisfactory" in the performance/availability management of the basic items of Table 6 operation checklist this item is the confirmation of the document and confirmation of live-action wool It is an item if both have to go through. Therefore, CPU utilization should be confirmed in the document or system log and actual CPU utilization should be measured. Even if the actual measurement can not be done on all servers for some specimens, run you have to

Table 4: Basic item of operation check sheet

| Area                      | System operation<br>information system<br>supervision standard | Informatization KISA<br>management  | IS20000 process                                   | Operation checklist<br>default item    |
|---------------------------|----------------------------------------------------------------|-------------------------------------|---------------------------------------------------|----------------------------------------|
| Service provision<br>area | Operational management plan                                    |                                     |                                                   | Operational management plan            |
|                           | Service level management                                       |                                     | Service level management                          |                                        |
|                           | Performance management                                         |                                     |                                                   | Service level management               |
|                           | Capacity management                                            | Backup management                   | Capacity planning                                 | Performance management                 |
|                           | Service continuity<br>management                               | Computer room<br>management         | Service continuity and<br>availability management | Capacity management                    |
|                           | Performance/availability<br>management                         | Performance management              |                                                   | Service continuity<br>management       |
|                           | Security management                                            | Operational state management        |                                                   | Performance/availability<br>management |
| Service support<br>area   |                                                                | Security management                 | Information security<br>management                | Security management                    |
|                           | Outsourcing management                                         | Outsourcing management              |                                                   | Outsourcing management                 |
|                           | Build a service desk                                           | Manage user support                 | Business relationship<br>management               | Build a service desk                   |
|                           | Disability and problem<br>management                           | Fault management                    | Incident management<br>problem management         | Disability and<br>problem management   |
|                           | Configuration management                                       | Configuration and change management | configuration management                          | Configuration management               |
|                           | Change management                                              |                                     | Change management                                 | Change management                      |
|                           | Release management                                             |                                     | Release process                                   | Release management                     |
|                           | Communication management                                       |                                     |                                                   |                                        |
|                           |                                                                | Budget management                   | Budgeting and accounting<br>for IT service        |                                        |
|                           |                                                                |                                     | Service reporting                                 |                                        |
|                           |                                                                |                                     | Supplier management                               |                                        |

Table 5: Check method

| Measuring method              | Contents                                                                                                                      |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Document confirmation         | Check and measure the deliverables of the item                                                                                |
| Operator interview            | Measure the score of the evaluation item through an interview with the operator who operates the system                       |
| Administrator interview       | Measure through interviews with administrator                                                                                 |
| Outsourcing company interview | In the case of outsourcing, measure in an interview with the person in charge of the company that performs actual outsourcing |
| Live-shoot confirmation       | Check the system and facilities directly, measure and score the score of the evaluation item                                  |

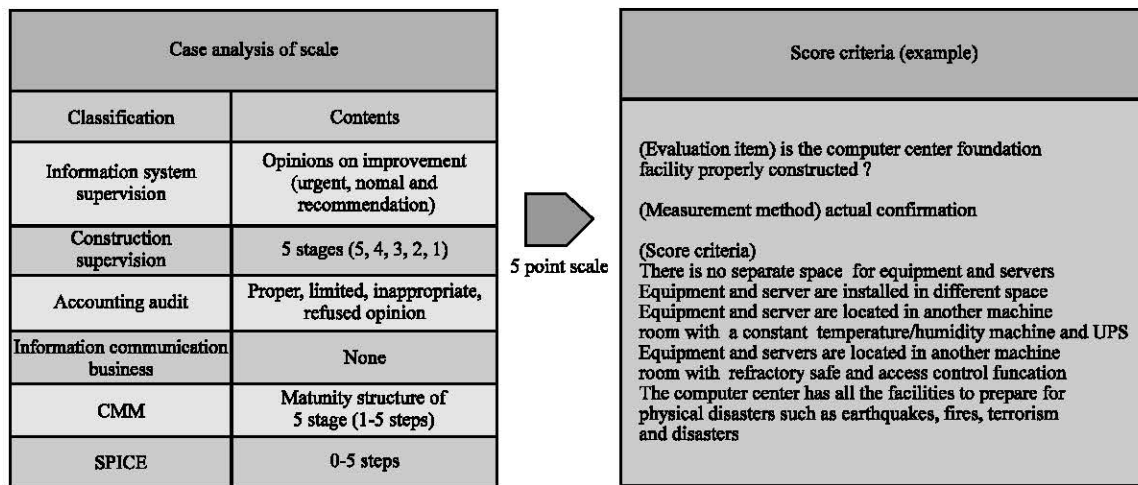


Fig. 1: Point standard example

make sure that the document is consistent with the actual state. As a result, some CPUs have usage rates of <70%, judging from the trend of increase in past usage rate, if predicted if the usage rate is <70% even after one year, the score of the evaluation item is 5 points.

**Evaluation score aggregation:** After aggregating the evaluation scores by basic items (13 items) of the operation checklist, arithmetic mean processing is performed. The average method divides the number of evaluation items by the sum of evaluation scores and

Table 6: Operation check sheet (part example)

|                                            |                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Evaluation item                            | CPU performance is sufficient                                                                                                                                                                                                                                                                                                                          |
| <b>Performance/availability management</b> |                                                                                                                                                                                                                                                                                                                                                        |
| Measuring method                           | Actual confirmation, confirm document                                                                                                                                                                                                                                                                                                                  |
| Score based                                | There are systems where the average cpu average usage rate is over 90%<br>Considering the current increase and the increase in usage up to 1 year later there are systems with cpu average usage rate of 70% or more, peaks 90% or more<br>The CPU average utilization rate is >70% in consideration of the increase in use up to now and 1 year later |

processes them. The number of evaluation items differs for each basic item. In order to analyze the basic items on the same basis, the score scale is the same. Therefore, after summing up the score of the evaluation item by default item we will make the number of evaluation items of the basic item. This means that all basic items are located between 5 points in one point. Depending on the status and conditions of the supervisory object, the basic items themselves are indispensable. For example, if you do not do outsourcing at all, “outsourcing management” excludes because there is no reason to evaluate. For organizations that do not perform performance management, “performance management” can be excluded. However, detailed evaluation items of basic items are not added or deleted. This is because it is necessary for the evaluation items to be consistent with each other in order to compare with evaluation cases of other companies and past evaluation cases. If the detailed evaluation items are adjusted, the evaluation criteria have changed, so there is a problem that it can not be compared with other evaluations.

## RESULTS AND DISCUSSION

### Efficiency verification

**Expert interview:** Expert interview (25 people) the object is a senior supervisor who is a national certified information system supervisor, a senior supervisor who acquired the qualification of an information processing engineer but has sufficient experience (5 years or more) on supervision and information system operation and evaluation) was selected as an objective object. The results of the interview are as follows.

First of all, it said that all experts are applicable to the applicability of the operation check list of the operation supervision. However, there were opinions that the operating checklist should not be differentiated according to the size of the operating system and that it was necessary to adjust detailed evaluation items for each operating system. The interview targets are in charge of the operation management of the current information system and answered that excluding the use of the check list, the performance management items are indications of customer’s difficulty in application.

Secondly, all experts say that objectivity is improved and it will be useful for quantification even for the question of whether it is useful for securing and quantifying supervisory objectivity. Thirdly, when using the presented operating checklist, the question that similar results are drawn even when the supervisor is changed will be supervised through continuous supervised education and internal results review I answered that it is necessary to reduce the deviation due to some.

**Apply the checklist thread of operation:** In order to verify the effectiveness of the operational checklist we conducted four field assessments (Table 7) using the checklist of the management for the actual operating system.

Case “A” was applied to the entire IT operation system as a medium-sized commercial private distribution company with sales of >5 trillion. Without IT outsourcing, it is done through all our own personnel. However, the hardware is outsourced to an external data center for management. Since, IT outsourcing is not carried out, “outsourcing management” is excluded from the evaluation from the basic confirmation items. Also we did not do “performance management” at all and we excluded it from evaluation which customers did not want (Fig. 2). The level of each basic check item of the case “A” is the highest in 2.6 for “performance/availability management”, the lowest “service level management” and “failure/problem management” is 1.2. Even if all the evaluation items are averaged, it is low level to 1.6. IT is primarily at the level that supports business; IT investment was insufficient to improve the overall operation level. “Performance/availability management” is somewhat higher because the hardware is outsourced to the data center. However, monitoring and management of how to manage in an outsourced data center was insufficient and did not have high level. Also, most of the items were not documented there were no company-wide procedures or standards and it was operated at the discretion of the person in charge. In case “A” we confirm that the level of IT operation system is low through evaluation and we have prepared measures for this.

Table 7: Practice

| Case | Industry       | Scale  | Target area                           | Apply to basic items | Result (average) |
|------|----------------|--------|---------------------------------------|----------------------|------------------|
| A    | Distribution   | Medium | The entire organization IT system     | 10                   | 1.6              |
| B    | Infrastructure | Large  | Data center                           | 10                   | 3.2              |
| C    | Infrastructure | Large  | Important business area Target system | 10                   | 2.7              |
| D    | Finance        | Large  | The entire organization IT system     | 11                   | 2.7              |

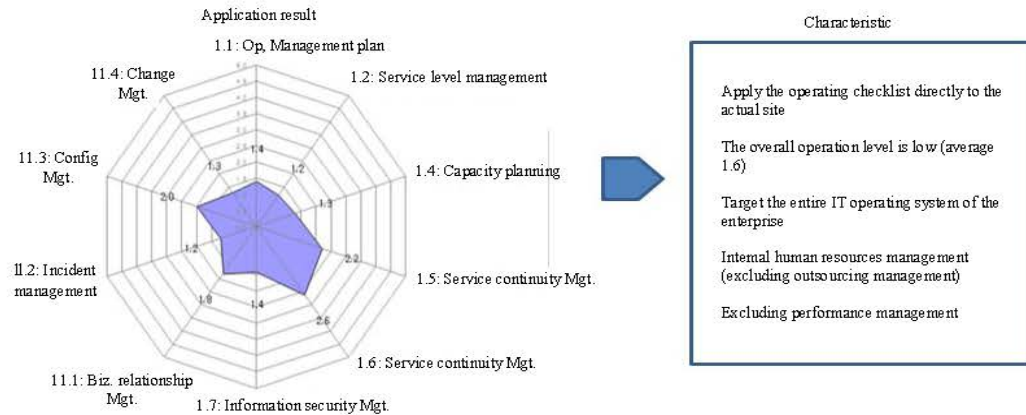


Fig. 2: Practice “A”

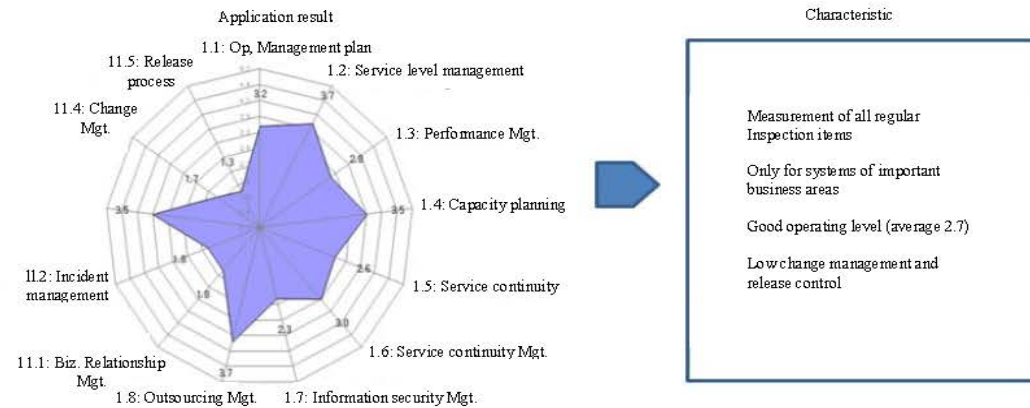


Fig. 3: Practice “C”

Case “C” is a public enterprise and it is a large-scale organization with >5 trillion in sales as an infrastructure providing base infrastructure. We limited the spirit to be applied to the core business system, not the transfer IT operating system as a whole. Normally, core business systems are managed and managed more thoroughly. As a result, levels targeted for the entire IT operating system sometimes appeared somewhat lower. Public institutions also applied “performance management”. In other words, in the case “C”, all the basic check items of the basic operation check list were evaluated. The level by case for each basic check item of case “C” was the highest at “outsourcing management” at 3.7 and “release management” at the lowest at 1.3. When all the evaluation items were averaged, 2.7 came out. Figure 3 the level difference between basic confirmation items is large as

shown in Fig. 3. Overall, the level of “service provision area” is high but the level of “service support area” is low. In particular, the levels of “release management” and “change management” are low. We were able to measure the results of operational supervision more objectively and quantitatively using the operating checklist quantified as shown by the cases “A” and “C” and concretely lacking I was able to derive directionality to improve parts.

## CONCLUSION

In this study, we tried to improve the utility by improving the objective and quantitative derivation of the result of the operation supervision using the quantified operating checklist. The quantified operation checklist

specifies the basic measurement method for each item, specifically specifies the score criterion on a 5-point scale for each score and displays the deviation of the result based on the supervisor and the supervisory case. In order to reduce, it to the utmost. In addition, the inspection result is not a qualitative report but is derived to a quantified numerical value so as to improve the objectivity of supervision.

The checklist for operation was quantified with 5 points in 1 point for each of 13 basic confirmation items in total. As a result, it is possible to compare the operation level with other operation examples and it is also possible to analyze the time series of the current operation level with the past operation level. In addition, since the operation level is derived for each basic inspection item, it is possible to know what item level improvement is necessary.

Whether the operational checklist is actually available is verified through two methods, effectiveness. First of all we confirmed the applicability of management checklist through expert interview and confirmed some improvement points. We reaffirmed that the operating level explicitly appears by applying the operating checklist to the four actual operating systems. Through the verification of these effectiveness, it is judged that the operation checklist can contribute to efficient operation supervision and operation supervision utility. However, the operation style, scale, system to operate, customer's needs, etc. of the information system are very diverse.

Therefore, in order to effectively supervise operation in accordance with these various conditions we also need to improve in the future. First, it is necessary to subdivide it so that the operation checklist can be applied to various operating environments. Secondly, research is needed to apply to the time series of operation checklists. We hope that continuous research and development of operational checklists will contribute to the development of comprehensive management supervision system.

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