Content

1. Background and Purpose
2. Outline of the Project
3. The Guide for Visualization, Security and Improvement of System and Software Quality
4. The Guide for Usage of Published Data for Quantitative Management
5. Future Schedule
1. Background and Purpose (1)

Background

- In Japan, benchmarking activities for evaluating software projects related to metrics are performed, and quality management methods of software are provided by multiple organizations.

- However, definitions, computation formulas, measurement methods and evaluation methods, etc. depend on such organizations. Consequently, not all of the persons such as users and vendors cannot readily use them at the Software Life Cycle.

<table>
<thead>
<tr>
<th>Software quality control methods based on measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO/IEC9126 Series, SQuaRE Series, JIS X0129 (SQuaRE), JISC</td>
</tr>
<tr>
<td>Guidelines for Non-functional requirements :User Vender Collaboration Project II (UVCII), JUAS</td>
</tr>
<tr>
<td>The Grades standards for Non-functional requirements (NFR-Grade) , NFR-Grade Study Group</td>
</tr>
<tr>
<td>System development common reference for the reliability improvement (Common reference), IPA/SEC</td>
</tr>
<tr>
<td>Practical use of SLA in software development (SLA in software development), JEITA</td>
</tr>
<tr>
<td>SLA guidelines for Private Sector IT Systems (SLA guidelines), JEITA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Benchmarking reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software metrics Reports, JUAS</td>
</tr>
<tr>
<td>IPA/SEC White Papers on Software Development Projects in Japan, IPA/SEC</td>
</tr>
<tr>
<td>Report of software development for supplier -Part II, ERA</td>
</tr>
</tbody>
</table>
1. **Background and Purpose (2)**

**Purposes**
- To improve the reliability at the Life Cycle of the information system and software, and form the social common recognition concerning the reliability.
- To develop/improve software metrics which people in every footing beyond the organization can commonly handle and the environment for usage thereof by using software process metrics of groups and organizations, and assets related to software process metrics.
- To create standards for having them widely known and used.
2. Outline of the Project (1)

Establish the Product Quality Metrics WG and Process Metrics WG

<Product Quality Metrics WG>

Scope of WG
- To establish the common recognition of the quality of the system and software fit for usage needs, and the metrics for achieving the quality

Activities for the first year
- To summarize domestic plural discussions on the quality guarantee of the system and software mainly in light of international standards, and assume the role of a guide for features of each content and mutual relations as well as the basis for the quality guarantee.

<Process Metrics WG>

Scope of WG
- To develop/improve the environment in which the system and software project can be analyzed and evaluated in an objective manner and with methods commonly applied.

Activities for the first year
- To summarize benchmarking data that you can currently use in Japan, and assume the role of a guide for their usage methods together with the basis for the quantitative management and points to note.
2. Outline of the Project (2) Structure for Implementation

Structure for Implementation of the Software Metrics Advancement Project

Product Quality Metrics WG

Process Metrics WG

<Secretariat>

METI

Mitsubishi Research

Japan Industrial Standards Committee

Non-Functional Requirement Grade Study Group

Japan Users Association of Information Systems

Japan Information Technology Service Industry Association

Japan Electronics and Information Technology Industries Association

Information Technology Promotion Agency

Economic Research Association

Universities

Ind.  Gov.  Acad.

NTT Data

NEC

OKI

HITACHI

FUJITSU

MDIS

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3. The Guide for Visualization, Security and Improvement of System and Software Quality

Product Quality Metrics WG
Software Metrics Advancement Project

(Japanese only)
Purpose of the Guide and its Summary

■ Purpose
  ■ To establish the common recognition about the quality of the system and software fit for usage needs and the metrics to realize the said quality.

■ Outline
  ■ Summarizing multiple methods relating the quality of software of Japan with international standards, and
  ■ Clarifying mutual relationships of such methods and features, and
  ■ Assume the role of a guide for respective usage methods and points to note.

<table>
<thead>
<tr>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1</td>
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<tr>
<td>Chapter 2</td>
</tr>
<tr>
<td>Chapter 3</td>
</tr>
<tr>
<td>Appendix</td>
</tr>
</tbody>
</table>
Chapter 1  Concept of the Quality Assurance of the System and Software

**Outline**
- To explain the concept of the quality assurance activities from quality requirement definitions to quality evaluation using metrics based on international standards

**Effect**
- Can learn the basic concept of the quality guarantee and improvement of the system and software

**Content**
- 1.1. Influence of the system and software quality and the quality assurance
- 1.2. Various standards related to the quality guarantee of the system and software
- 1.3. Viewpoints for improving the quality of the system and software
- 1.4. Concept of the Quality Life Cycle
- 1.5. Quality model
- 1.6. Concept of the quality measurement and quality gauging measure (metrics)
- 1.7. Quality Life Cycle and quality measurement of the system and software
- 1.8. Quality requirement
- 1.9. Quality evaluation
Chapter 2  Domestic Activities on the Quality Assurance of the System and Software

■ Outline
  ■ To summarize the activities of representative Japanese organizations that are discussing the quality assurance of the system and software relating metrics, and the features of such output reports.

■ Effect
  ■ Can collect the activity information on the quality guarantee of the system and software performed in Japan. By obtaining the features between the activities and output reports, can select reference materials necessary for performing quality assurance activities.

■ Content
  ■ 2.1. Major activities in Japan
  ■ 2.2. Comparison of features of domestic activities
# Methods on Quality Assurance of System and Software, and IT Services in Japan

<table>
<thead>
<tr>
<th>Methods</th>
<th>Purpose</th>
<th>Output Overview</th>
</tr>
</thead>
</table>
| **UVC II (JUAS)**                            | To enable users properly define non-functional requirement in a requirement specification sheet | ■ 10 areas of non-functional requirements of information system, 230 indicators, definitions, measurement methods, measuring scales, computation formulas, interpretation methods  
■ How to handle indicators at the software process |
| **The Grades Standards for Non-Functional Requirement (NFR-Grade S.G.)** | To dissolve misunderstanding when users and vendors agree on non-functional requirements and enable both parties make a presentation/proposal | ■ Usage Guide (Usage Version, Comment Version) of “Non-Functional Requirement Grade”  
■ Grade Table on NFR of the system structure  
■ List of Items on NFR of the system structure  
■ Tree Diagram on NFR of the system structure  
■ Spread Sheet of NFR-Grade |
| **Critical Infrastructure Reliability (IPA/SEC)** | To prompt the introduction of the quantitative quality control mechanism of the software development, in particular, as one of the measures to improve the reliability of material infrastructure information system | ■ Profiling of the system and project  
■ Process evaluation metrics  
■ Product evaluation metrics  
■ Basic metrics |
| **SLA in Software Development (JEITA)**       | To directly feed back the quality issues at the “system management/operation” to the “system development” and improve the quality of IT services by working on the SLA/SLM as the PDCA cycle that runs through the entire life cycle of the IT system | ■ “Quality evaluation indicator”, “development/operation process coordination evaluation indicator” of product, process and resource at the software development |
| **SLA Guidelines (JEITA)**                    | To indicate evaluation indicators common to the SLA, enabling users and providers of IT services choose proper service level objectives. | ■ Service evaluation objectives  
■ IT process management evaluation objectives  
■ IT resource evaluation objectives  
■ SLO and SLA values of each of those put above |
## Features of the Methods from the Metrics Viewpoint

<table>
<thead>
<tr>
<th>Object</th>
<th>ISO / IEC 9126 Series</th>
<th>UVCII</th>
<th>NFR-Grade</th>
<th>Critical Infrastructure Reliability</th>
<th>SLA in Software Development</th>
<th>SLA Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software</td>
<td>✓ (covered)</td>
<td>✓</td>
<td>partially ✓</td>
<td>✓</td>
<td>✓</td>
<td>N/A</td>
</tr>
<tr>
<td>System</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>IT Service</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Ex.</td>
<td>N/A</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
<td>N/A</td>
<td>✓</td>
</tr>
</tbody>
</table>

### Deliverables on quality characteristics and metrics

- (Internal/External/ QIU) Quality Model, Measures
- NFR-measures
- NFR-measures, NFR-Grade chart, NFR-tree diagram, NFR-item list for system infrastructure
- Product Quality measures, In-process measures
- Quality assessment measures
- Connect assessment measures
- Level of (Service / IT process management / IT resource)

### Quality characteristics handled [target]

- **[Product]** Functionality, Reliability, Usability, Efficiency, Maintainability, Portability, [non-Product] Effectiveness, Restraint failure, Operationally, Maintainability, Security, System environment, Ecology
- **[Product/Process]** Dependability
- **[Product]** Functionality, Reliability, Usability, Efficiency, Maintainability, Portability
- **[Process]** Maintenance situation, Enforcement situation
- **[Resource]** (developer) Ability, Qualification, (supplier) Certification

### Definition of metrics

- ✓
- ✓
- ✓
- ✓
- ✓
- ✓

### Interpretation of measured value

- ✓
- ✓
- ✓
- ✓
- ✓
- ✓
- N/A

### Measurement of reference value

- N/A
- N/A
- ✓
- ✓
- N/A
- ✓

### Usage process, scene

- ISO/IEC25030 and 25040 provide usage methods
- When defining NFR
- When handling NFR at each process of planning, requirement definition and development of SLCP
- When managing at each period of before task, after the task and after completion of the project
- When determining service level objectives (SLO) on a development project
- When determining the content of SLA

### Usage guide

- ✓
- N/A
- ✓
- N/A
- ✓
- ✓
Chapter 3  Quality Assurance Activity and Usage at Software Life Cycle

Outline

- Summary of each method in light of the following perspectives:
  - Quality characteristics, metrics of the ISO/IEC9126 Series and the Quality Life Cycle
  - Usage scenes in the Software Life Cycle

Effect

- Can obtain reference information of the quality model, metrics handled in the quality requirement definitions in the quality assurance of the system and software based on the ISO/IEC9126 Series.
- Can obtain information on the usage of output reports per phase of the Software Life Cycle and that based on the evaluation results of the system reliability requirement level (system type).

Content

- 3.1. Summary in light of the quality guarantee activity of the system and software
  - Summary in light of quality characteristics, measures
  - Summary in light of the entire quality life cycle
- 3.2. Summary in light of the Software Life Cycle
  - Summary in light of the Software Life Cycle
  - Summary in a case where the system type is taken into account
# Summary of Quality Characteristics and Measures (1)

**How the ISO/IEC 9126 Series (JIS X 0129-1) respond to External/Internal Quality characteristics and measures**

<table>
<thead>
<tr>
<th>JIS X 0129-1</th>
<th>Quality Characteristics</th>
<th>Quality Sub-Characteristics</th>
<th>UVC Ⅱ</th>
<th>NFR-Grade</th>
<th>Critical Infrastructure Reliability</th>
<th>SLA in Software Development</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Appropriateness</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accuracy</td>
<td>✔</td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mutual operability</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Security</td>
<td>✔</td>
<td>◎</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Functionality compliance</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reliability</td>
<td>Maturity</td>
<td>✔</td>
<td>◎</td>
<td>(partially ◯)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fault tolerance</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recoverability</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reliability compliance</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Usability</td>
<td>Understandability</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Learnability</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operability</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Attractiveness</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Usability compliance</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Efficiency</td>
<td>Time behavior</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Resource utilization</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Efficiency compliance</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintainability</td>
<td>Analyzability</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changeability</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stability</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Testability</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maintainability compliance</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Portability</td>
<td>Adaptability</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Installability</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Co-Existence</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replaceability</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Portability compliance</td>
<td>✔</td>
<td>◯</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*To quality characteristics, ◎ provides metrics and reference values, ✔ provides metrics only, ◯ provides reference info on metrics*
Summary of Quality Characteristics and Measures (2)

How the ISO/IEC 9126 Series (JIS X 0129-1) in use responds to quality characteristics and measures

<table>
<thead>
<tr>
<th>JIS X 0129-1</th>
<th>Quality Characteristics</th>
<th>Quality Sub-Characteristics</th>
<th>UVC II</th>
<th>NFR</th>
<th>Critical Infrastructure Reliability</th>
<th>SLA in Software Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>When quality characteristics are used</td>
<td>Effectiveness</td>
<td>—</td>
<td>—</td>
<td>◎</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Productivity</td>
<td>—</td>
<td>—</td>
<td>△</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Safety</td>
<td>—</td>
<td>—</td>
<td>◎</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Satisfaction</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To quality characteristics, ◎ provides metrics and reference values, ✓ provides metrics only, △ provides reference info on metrics.
## Summary of Quality Characteristics and Measures (3)

### Quality Characteristics and Evaluation Indicators other than the ISO/IEC 9126 Series (JIS X 0129-1)

<table>
<thead>
<tr>
<th>Method</th>
<th>Quality [sub] Characteristics</th>
<th>Definition</th>
<th>Evaluation Indicator (Metrics, Others)</th>
</tr>
</thead>
</table>
| UVC II               | Restraint failure            | In particular, ability to prevent an occurrence of a failure at the development and management of highly reliable information system and contribute to the prevention of its expansion at the time when it occurred | Quality evaluation value  
Operational quality ratio  
ROI  
Claims from customers  
Satisfaction of users |
| Effectiveness        |                               | Ability to create the effect as planned and be able to evaluate it                                                                                                                                          |                                                                                                                                                    |
| Operability          |                               | Meaning the operability of not the product but the computer center                                                                                                                                         | Ratio of the time to provide services  
Ratio of an intervention operation  
Ratio of occurrences of operational errors in measures for failures  
Ratio of actual days to planned days until restoration in case of a local disaster |
| Technical requirement|                               | Pre-determined basic framework or mechanism of info system from the view of the organizational policy and maintenance of total consistency as a firm. Or, a requirement that is studied and decided within the project based on NFR. | System realization method  
Software configuration  
System development process  
User interface requirement  
Project management tool |
| SLA in Software Development | Maintainability               | [Easiness of maintainability]  
[Measures for failures]  
[Availability]                                                                                                                    | Clarity of operational conditions  
Trouble detection ratio  
Transfer procedures during the normal period |
## Summary of Quality Characteristics and Measures (4)

- Examples of Quality Characteristics and Evaluation Indicators for Service, Process and Resource

<table>
<thead>
<tr>
<th>Method</th>
<th>Quality Characteristics [quality sub-characteristics]</th>
<th>Definition</th>
<th>Examples of Evaluation Indicators (metrics, others)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLA Guidelines</td>
<td>Availability</td>
<td>Indicates whether a function or mechanism to continue and maintain operation so that services may not be provided due to various troubles is available or not</td>
<td>Operation ratio</td>
</tr>
<tr>
<td></td>
<td>Confidentiality</td>
<td>N/A</td>
<td>Time to detect by a firewall</td>
</tr>
<tr>
<td></td>
<td>Completeness</td>
<td>N/A</td>
<td>Number of packet loss among nodes</td>
</tr>
<tr>
<td></td>
<td>Reliability</td>
<td>Indicates how accurately a system can provide required processing under a certain time and conditions</td>
<td>Mean time between failures (MTBF)</td>
</tr>
<tr>
<td></td>
<td>Assuredness (Recoverability)</td>
<td>Refers to being able to restore to a normal condition if a system or an application suffers an unexpected failure of function</td>
<td>Restoration time</td>
</tr>
<tr>
<td></td>
<td>Capability (Respondence)</td>
<td>N/A</td>
<td>Adherence ratio of online responsive time</td>
</tr>
<tr>
<td></td>
<td>Expandability</td>
<td>Indicates whether a function or mechanism that can enhance the ability to provide services is available or not</td>
<td>Band capacity</td>
</tr>
<tr>
<td></td>
<td>Maintainability (Period)</td>
<td>N/A</td>
<td>Time to exchange parts</td>
</tr>
</tbody>
</table>
Summary of Quality Life Cycle

Positioning of Each Method at the Quality Life Cycle in the SQuaRE Series

Content that can serve as a reference excluding SQuaRE when examining requirements

Metrics that can be used excluding SQuaRE when evaluating quality

Non-Functional Grade

UVC II

SLA of Software Development

Critical Infrastructure Reliability

Coordination Evaluation Indicator

System Quality In Use Model

(System And Software) Product Quality Model

Quality In Use Requirement

Internal Quality Requirement

Computer System Quality Requirement

Quality In Use Needs

Requirements

Validation

Verification Validation

产品质量

Internal Quality

Verification Validation

Process Quality

Process Requirement

Implementation
Usage Scene of Each Method at Software Life Cycle (1)

Software Life Cycle

<table>
<thead>
<tr>
<th>Planning</th>
<th>Requirement Analysis</th>
<th>Design</th>
<th>Construction Unit Test</th>
<th>Test</th>
<th>Installation</th>
<th>Operation Maintenance</th>
</tr>
</thead>
</table>

SQuaRE

Software System

UVCII

Software System Service

SLA in Software Development

Software Service

SLA Guidelines

Service

Critical Infrastructure Reliability (Common Reference)

Software System Service

NFR Grade

System Service

Method Target

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Reference: System Profiling

- Critical Infrastructure Reliability…Classifies the information system related to business applications into four-tier profiles from the less social impact during a failure
- NFR Grade…Defines model systems corresponding to Type I to Type III

<table>
<thead>
<tr>
<th>Category</th>
<th>Impact on human lives</th>
<th>Estimated amount of damage</th>
<th>Social impact</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type IV</td>
<td>System that affects human lives and gives a huge economic loss</td>
<td>Fatal accident</td>
<td>¥1 billion or more</td>
<td>Gives a serious impact on society</td>
</tr>
<tr>
<td>Type III</td>
<td>System with a serious social influence</td>
<td>Serious disaster</td>
<td>Less than ¥1 billion</td>
<td>Causes inconvenience to a lot of people, or gives large psychological impact to certain individuals</td>
</tr>
<tr>
<td>Type II</td>
<td>System with a limited social influence</td>
<td>Marginal</td>
<td>Less than ¥100 million</td>
<td>Marginal</td>
</tr>
<tr>
<td>Type I</td>
<td>System with almost no social influence</td>
<td>Almost none</td>
<td>Less than ¥10 million</td>
<td>Almost none</td>
</tr>
</tbody>
</table>
Usage Scene in Software Life Cycle (2) Taking System Profile into Account

Software Life Cycle

Planning | Requirement Analysis | Design | Construction Unit Test | Test | Installation | Operation Maintenance

Entire Software System Services

SQuaRE

Software System

UVCII

Software System Service

Critical Infrastructure Reliability (Common Reference)

Software System Service

NFR Grade

System Service

* Some NFR Grades can be used regardless of its type.
4. The Guide for Usage of Published Data for Quantitative Management

Process Metrics WG
Software Metrics Advancement Project

(Japanese only)
Intention and Summary of the Guide

- **Intention**
  - Aiming to develop/improve the environment in which you can analyze and evaluate the system and software projects from the viewpoints commonly available.

- **Summary**
  - To explain the expectation effect of the quantitative management and the usage of published data for the quantitative management.
  - To introduce the published data which you can use in Japan at present.
  - To explain the usage methods of these as well as points to note

<table>
<thead>
<tr>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1</td>
</tr>
<tr>
<td>Basis of Quantitative Management</td>
</tr>
<tr>
<td>Chapter 2</td>
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<tr>
<td>Outline of Published Data</td>
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<td>Chapter 3</td>
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<tr>
<td>Usage Methods of Published Data</td>
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<tr>
<td>Appendix</td>
</tr>
<tr>
<td>Metrics Relationship Diagram of Published Data</td>
</tr>
<tr>
<td>Outline of Activities of Organizations in Japan</td>
</tr>
</tbody>
</table>
Chapter 1 Basis of Quantitative Management

■ Outline
  ■ To explain the methods of the basic quantitative management, usage of published data.

■ Effect
  ■ Can learn the basic of the quantitative management using published data.

■ Content
  ■ 1.1. Expectation effect of the quantitative management
  ■ 1.2. Points to note of the quantitative management
  ■ 1.3. Promotion of the quantitative management using published data
  ■ 1.4. Points to note for using published data
Expectation Effect and Points to Note of the Quantitative Management

Matters that you can do with the quantitative management (expectation effect)

- **Visualization** of the quality of the product, project and process
- **Estimate** of man-hours of the project, its progress, the scale and quality of the product
- **Planning** of activities, its required man-hours, an implementation period and the quality included in the project
- **Proposals of measures for improvement** with high relevancy, promotion of the development of such measures in the organization

Points to note when performing the quantitative management

1. Metrics has theories and technique.
2. Use metrics that are in harmony with the purposes.
3. Information which metrics express is part of the concept that you want to measure.
4. Metrics is means, not a purpose.
5. Perform the quantitative management based on the spontaneous intention of the organization.
6. Strive for the establishment as an organization with conviction
7. Kick-off from the easy-to-handle part.
Promotion of the Quantitative Management on Usage of Published Data and Points to Note

Promotion of the quantitative management using published data

Matters that you can do by using published data

(Organization with few experience of the quantitative management)
- To estimate development man-hour, form a quality plan.
- To select data items that should be stored in the organization.
- To understand usage purposes and methods of metrics.

(Organization that practices the quantitative management)
- To grasp and compare the performance of own organization in the industry.
- To grasp strong and weak points of own organization and fix the priority targets to be improved.

Points to note

- Published data is reference information, and to continue relying on published data is not ideal.
- Try to store data within own organization so that you can use the data within own organization.

Notes for handling published data

(1) Purposes or processes for compiling published data differ depending on those who provide published data
- It is necessary to understand purposes of published data providers or such providers themselves.

(2) Definitions of terminologies or metrics differ depending on published data
- It is necessary to understand how published data providers define terminologies or metrics.
Chapter 2 Outline of Published Data

Outline

- Major organizations of Japan that provide benchmarking data, and their activities
- Basic information (definitions of metrics, etc.) of provided benchmarking data
  (published data)

Effect

- Can select published data that is fit for own organization by obtaining domestic
  published data information

Content

- Basic information
  - Activity information of organizations that provide benchmarking data
- Terminologies/definitions of published data
  - Terminologies, definitions which are different per published data
  - Relationship diagram of basic metrics, derived metrics per published data
## Major Organizations that Provide Benchmarking Data in Japan

<table>
<thead>
<tr>
<th>Provider</th>
<th>JUAS</th>
<th>IPA/SEC</th>
<th>Economic Research Association (ERA)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benchmark Report</strong></td>
<td>2009 Software Metrics Reports (user companies)</td>
<td>2009 White Papers on Software Development Projects in Japan</td>
<td>Report of Software Development for Supplier – Part II</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>Once a year</td>
<td>Almost once a year</td>
<td>Once a year</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>(1) By collecting and analyzing exhaustively data that can be used through the entire software life cycle from the view of system users, to present control indicators in order to realize high quality software. (2) To present viewpoints or values of analyses for indicating with data targets or the current conditions in the software field.</td>
<td>(1) By collecting newly various project data from companies every year, to continue stylized statistical analyses every year and improve the accuracy as a scale. (2) By expanding targets of analyses depending on a certain issue or theme, to propose a new scale or a new approach to selecting issues.</td>
<td>(1) To provide a person who place an order of a software development project with information that plays the role of a yardstick for estimating software development man-hour or cost. (2) To provide a person who receive an order for a software development project with information that plays the role of a yardstick for evaluating the project data of own company.</td>
</tr>
<tr>
<td><strong>Target users</strong></td>
<td>A person responsible for a company system (together with users/vendors) A project manager of a company system Staff at the quality management div. of a company system, and staff of the organization that performs such functions</td>
<td>Top executives of a company (user companies, vendor companies) Persons responsible for the operation div., info system div. Project manager, project leader Project management office, quality guarantee div.</td>
<td>Each project manager, etc. for persons who place/receive an order for a software development project</td>
</tr>
</tbody>
</table>
# Outline of Published Data

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of collected data (Latest Version)</td>
<td>435 Project (Development/management/maintenance) Data</td>
<td>2,327 Project Data</td>
<td>173 Company Data</td>
</tr>
<tr>
<td>Outline</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ Analytical result of profile of questionnaire data</td>
<td>■ Collected data, analysis</td>
<td>■ Relation between man-hour and construction period, analysis per process (new development, renovation development)</td>
<td></td>
</tr>
<tr>
<td>■ Analytical result of development survey (man-hour, construction period, total cost, system size, quality evaluation, productivity, etc.)</td>
<td>■ Profile of collected data</td>
<td>■ Analysis of relation between scale and man-hour</td>
<td></td>
</tr>
<tr>
<td>■ Analytical result of maintenance survey (maintenance organization, staff, quality, construction period, estimate, satisfaction)</td>
<td>■ Statistics of major elements of a project (FP scale, SLOC scale, construction period, man-hour, number of staff)</td>
<td>■ Analysis of relation between scale and productivity (FP scale and FP productivity, FP scale per industry and FP productivity, etc.)</td>
<td></td>
</tr>
<tr>
<td>■ Analytical result of operation survey (management level, organization, use of ITIL, personnel development, outsourcing, content of various kinds of management)</td>
<td>■ Analysis of relations of man-hour, construction period and scale (man-hour and construction period, scale and man-hour, productivity)</td>
<td>■ Analysis of reliability (FP scale and No. of failures (density), SLOC scale and No. of failures (density))</td>
<td></td>
</tr>
<tr>
<td>■ Summary of survey results of development, maintenance and operation</td>
<td>■ Analysis of reliability (FP scale and No. of bugs, density of bugs, etc.)</td>
<td>■ Analysis of estimate and performance (size/man-hour/construction period)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>■ Analysis per process (construction period per process, man-hour, No. of cases where reviews are pointed out, No. of test cases, etc.)</td>
<td>■ Analysis of effect by contract form (estimates/actual values of FP/man-hour/construction period and contract forms)</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 3 Usage Methods of Published Data

Outline

- To develop/improve the environment for using major published data of Japan
  - Scenes where persons who place orders and users can use published data at the Software Life Cycle (usage scenes)
  - To summarize metrics of published data that serves as a reference per usage scene
  - To present usage methods of published data for the quantitative management and points to note

Effect

- Can know usage methods of published data
- Can obtain usable published data per Software Life Cycle

Content

- Usage scenes of published data
- Published data reference
- Published data metrics table
- Usage process of published data and points to note
Development/Improvement of Usage Environment of Published Data

- To provide contents that clarify when, how and which published data should be used in the quantitative management of a project.
- To summarize scenes where published data can be used at the quantitative management per SLCP… Usage Scene
- To provide reference information of published data per usage scene… Published Data Reference
- To summarize metrics of 3 published data per usage scene… Usage Method List (Benchmarking Metrics Table)
- To present points to note for using published data at the quantitative management … Usage Method for Published Data (usage process, points to note for use, metrics relationship diagram)

Environment toward Practical Use of Published Data for Quantitative Management
# Published Data Usage Scenes (1) Persons Placing Orders

<table>
<thead>
<tr>
<th>Phase</th>
<th>Process</th>
<th>Activity</th>
<th>Examples of Purposes of Quantitative Management by Persons Placing Orders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entire</td>
<td>Acquisition</td>
<td>Preparation for contract and update</td>
<td>● Want to prepare for contract and negotiate with the supplier (person who receives the order)</td>
</tr>
<tr>
<td></td>
<td>Management of changes in contracts</td>
<td>Survey analysis of effect</td>
<td>● Want to control changes of the contract and require a change if needed</td>
</tr>
<tr>
<td></td>
<td>Planning</td>
<td>Planning of systematization vision/scheme</td>
<td>● Want to define requirements that should be realized on business (content of business, property, terminology and information given and received) and those related to schedule</td>
</tr>
</tbody>
</table>
| Planning | Planning | Monitoring of suppliers | ● Want to compile a systematization vision, plan  
● Want to make a proper estimate for internal explanation  
● Want to review selections for acquisition  
● Want to review a feasibility of the project |
| System/software requirement definition, basic/detail design, construction/unit test, test | Acquisition | Monitoring of suppliers | ● Want to evaluate the quality of the deliverables  
● Want to control the deviation of the contract content/planned values and actual figures (want to control budget and performance) |
| Transition/operation preparation (acceptance/completion) | Acquisition | Monitoring of suppliers | ● Want to evaluate the quality of the deliverables |
|       | Improvement | Process evaluation | ● Want to evaluate the contract content and the performance, and evaluate the vendor |
| Operation/maintenance | Operation | Evaluation of system operation | ● Want to better it by monitoring and identifying problems of the system and improve convenience |
|       | Maintenance | Grasping issues and analysis of revisions Implementation of revisions | ● Want to understand problems and review making revisions, and examine appropriateness of the maintenance  
● Want to analyze before making revisions, and decide the portions to be revised  
● Want to evaluate the portions to be revised |
## Published Data Usage Scenes (2) Persons Receiving Orders

<table>
<thead>
<tr>
<th>Phase</th>
<th>Process</th>
<th>Activity</th>
<th>Examples of Purposes of the Quantitative Management by Persons Receiving Orders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entire</td>
<td>Supply</td>
<td>Planning</td>
<td>● Want to confirm requirements for various plans and examine selections to supply before concluding a contract</td>
</tr>
<tr>
<td></td>
<td>Management of changes in contracts</td>
<td>Survey analysis of influence</td>
<td>● Want to conduct management of changes in contracts and require changes if needed</td>
</tr>
<tr>
<td>Planning</td>
<td>Planning</td>
<td>Planning of systematization vision/plan</td>
<td>● Want to confirm requirements of systematization plan (development, maintenance, operation, test, transition, environmental improvement, quality), and policies for purposes, means, staff, period, delivery date, equipment, cost, etc. which are subject to the systematization, and examine the feasibility</td>
</tr>
</tbody>
</table>
| Requirement definition | Requirement definition | Definition of stakeholder requirements | ● Want to clarify system requirements of function/non-function, etc.  
● Want to confirm various target values in developing and set such values |
| System/software requirement definition, basic/detail design, construction/unit test | Confirmation of development/appropriateness | Method design/software code preparation and test/appropriateness confirmation | ● Want to control the deviation between the contract content/planned values and actual values (want to control budget and performance) |
| Preparation for transition/management (acceptance/completion) | Development | Introduction of software Support for accepting software | ● Want to evaluate the quality of the deliverables |
|       | Improvement | Evaluation of process | ● Want to confirm the deviation between the contract content/planned values and actual values and evaluate whether the project is successful or not (want to manage budget and performance) |
| Operation/maintenance | Maintenance | Compilation of revision procedures | ● Want to compile a maintenance plan |
|       | Maintenance | Grasping problems and analysis of revisions Implementation of revisions | ● Want to grasp problems in maintaining and examine conducting revisions  
● Want to analyze in making revisions and determine the portions to be revised  
● Want to evaluate the revised the portions |
| Regular | Control | Measurement | ● Want to evaluate strong/weak points of the organization |
| None | Improvement | Process improvement | ● Want to improve the process for the next project |
## Published Data Reference (Excerpt)

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Entire</td>
<td>Acquisition</td>
<td>Preparation for contract and update</td>
<td>Want to prepare for contract and negotiate with a supplier</td>
<td>• Unit price (man month) JUAS-u1 Soft P44~ P109~</td>
<td>• Scale, man-hour with confidence belt SEC-u1 Chapter 6.4, 6.6</td>
<td>• Ratio of actual man-hour per process SEC-u2 Chapter 8.1</td>
<td>• Standard man-hour ERA-u1 3-(2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Unit price (KLOC) JUAS-u2 Soft P120</td>
<td>• Standard construction period man-hour and construction period ERA-u2,3 1-(1), 2-(1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td></td>
<td></td>
<td>• Unit price (FP) JUAS-u3 Soft P123, 124</td>
<td>• FP Productivity ERA-u4 4-(1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>of</td>
<td></td>
<td></td>
<td></td>
<td>• Standard construction period JUAS-u4 Soft P52</td>
<td>• Standard FP Productivity ERA-u5 4-(6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>changes</td>
<td></td>
<td></td>
<td></td>
<td>• Deviation of construction period JUAS-u5 Soft P53, 54</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>in</td>
<td></td>
<td></td>
<td></td>
<td>• Target/defect ratio JUAS-u6 Soft P64~</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>contracts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Want to control changes in contract content and require changes as necessary</td>
<td>• Man-hour and construction period with confidence belt SEC-u3 Chapter 6.3, 6.4, 6.6</td>
<td>• Man-hour – construction period, man-hour – scale with confidence belt SEC-u4 Chapter 6.3, 6.4, 6.6</td>
<td>• Man-hour ratio per process ERA-u6 1-(5), 2-(5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Want to define requirements that should be realized on business (business content, properties, terminologies, information that you give or receive) and those related to schedule</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SLCP**
Scenes that use published data in a project

**Target**
Metrics responding to usage scenes, reference codes in the Usage Method List and reference sources for published data

**JUAS**

**IPA/SEC**

**ERA**
Usage Method List (1) Item

- Summarize metrics of 3 published data per usage scene in SLCP
  - Compile the list for each person who place an order or receive an order
  - Provide it with an excel sheet

- Items on the Usage Method List

<table>
<thead>
<tr>
<th>Item</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usage scene</td>
<td>Indicates the content which published data can use as a usage purpose per Software Life Cycle Process.</td>
</tr>
<tr>
<td>Name of metrics of published data</td>
<td>Presents names of metrics which the provider of the published data has defined.</td>
</tr>
<tr>
<td>Provider of published data</td>
<td>Organization that provides relevant metrics as published data.</td>
</tr>
<tr>
<td>Code No.</td>
<td>Code No. of the published data reference. Names of the providers of the published data (JUAS/SEC/ERA) – Viewpoint (u: person who place an order/v: person who receives an order) No. (a number given to each provider of the published data) (Ex.) JUAS-u1: metrics No.1 of the published data provided by JUAS to those who place orders</td>
</tr>
<tr>
<td>Purpose of application</td>
<td>Shows with a question form where a reply is obtained by using metrics</td>
</tr>
<tr>
<td>Method of application</td>
<td>Shows the outline when an application is made</td>
</tr>
<tr>
<td>Formula to measure metrics of published data and definitions of data elements</td>
<td>Indicates formulas of metrics defined in the published data, and explains data to be used.</td>
</tr>
<tr>
<td>Information on provided published data</td>
<td>Indicates the content of the published data that is provided</td>
</tr>
<tr>
<td>Interpretation of metrics of the published data</td>
<td>Indicates the scope of allowable values of metrics of published data, standards for judgment or way of thinking</td>
</tr>
<tr>
<td>Input source, measurement method of metrics of the published data</td>
<td>Indicates major sources and measurement methods of data (base measure) that is prepared for using the published data</td>
</tr>
<tr>
<td>Usage method of published data</td>
<td>Indicates usage methods of the published data and points to note in use.</td>
</tr>
<tr>
<td>Reference information</td>
<td>Indicates reference sources of the published data</td>
</tr>
</tbody>
</table>
## Usage Method List (2) (Example)

<table>
<thead>
<tr>
<th>Phase</th>
<th>Process</th>
<th>Activity</th>
<th>Purpose (outline)</th>
<th>Purpose (detail)</th>
<th>Name of Metrics of Published Data</th>
<th>Provider of Published data</th>
<th>Code No.</th>
<th>Application Purpose</th>
<th>Application Method</th>
<th>Formula to measure metrics of published data and definitions of data elements</th>
<th>Definition of data elements that a person who places orders measures (prepares)</th>
<th>Definition of data elements that a person who receives orders measures (prepares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entire</td>
<td>Acquisition</td>
<td>Contract preparation and update</td>
<td>Want to prepare for contract and negotiate with a provider</td>
<td>Man-hour plan</td>
<td>Both sides agree on the deviation between the assumed FP and estimated man-hour</td>
<td>Scale – man-hour</td>
<td>SEC</td>
<td>Where does the assumed man-hour stand in the confidence belt toward the assumed FP size?</td>
<td>Describe the outline of the application</td>
<td>Formula to measure metrics (x) of the published data</td>
<td>Confidence belt 0%+ Scope where Element B can take at 0% probability to Element A. X=(A,B) Plotted point</td>
<td>Man-hour - construction period distribution chart of a project by own company data with confidence belt A=Assumed FP size</td>
</tr>
</tbody>
</table>

### Info that published data provides (metrics, charts, tables)

| Interpretation of metrics of published data | Input sources, measurement methods of data elements (Basic Measure) | Usage methods of published data | Reference info of published data |
|---------------------------------------------|-----------------------------------------------------------------|---------------------------------|---------------------------------
| allowable metrics value | Excellent value/status | Measurement methods | 2009 White Papers on the Quantitative Data Chapter 6.4, 6.6 |
| Man-hour – CP distribution chart with confidence belt | But, if own entity’s data is available, it is prioritized. | Coordinate X is between confidence belt. | ✔ ✔ ✔ | In a case of comparing in the same scale, if the presented estimated man-hour is off the reliability line (estimate of 0% probability), examine reasons for the deviation. If it can be explained by project properties, explanations of its properness considering the properties are given, and agree on it. If you cannot explain: (1) if the FP scale is the basis of the estimate and its accuracy has a problem, you need to pay attention due to possible effect to others (2) it may be reflected in man-hour as a buffer to risks. Clarify and share the risk, review how to handle risk and man-hour, and agree on them. Confidence belt is not fixed, and so set it according to the status or performance of the company. Evaluation on own company data is ideal, but use SEC data instead if own data is not enough. However, stick to use it as reference values in this case. There are other reasons for deviation, so carefully examine it. Unit of man-hour is man-hour. Man-hour excludes that of a user. | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ ✔ | ✔ ✔ °
**Usage of Published Data at Quantitative Management**

**PDCA Cycle of Quantitative Management**

1. **Implementation Plan**
   - (Scope) Quality estimate of product
   - (Selection of metrics) No. of bugs
   - (Confirmation of usage data) Past data, published data (*)

2. **Acquisition of Metrics values**
   - (Establishment of evaluation standards) Prior actual values, analytical values Values in published data (*)
   - (Acquisition of metrics values) Counting, summary counting of bugs

3. **Analysis/Evaluation**
   - (Evaluation of metrics values) Target (Past actual values)

4. **Update/revision**
   - (Upgrade/revision while project is in execution) Addition of the test items
   - (Upgrade/revision when project is finished) <Project>
     Improve future methods to execute a project based on the project evaluation
     <Quantitative management>
     Revise application scope, target values

(*) **Usage of Published Data at Quantitative Management**

- It is used as alternative data when actual data of the past has not been accumulated (as evaluation target).
- Confirm the positioning viewed from the industry in general by using values gained from multiple organizations within the industry.
## Usage Process of Published Data at Quantitative Management

<table>
<thead>
<tr>
<th>Activity</th>
<th>Process</th>
<th>Input</th>
<th>Content of Process</th>
<th>Output</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Implementation plan</td>
<td>Definition of scopes, roles</td>
<td>● Necessity, policy of explicit/implicit management</td>
<td>➢ Define management purposes, requirements and the scope for management targets necessary for the success of the project. ➢ Define roles for management.</td>
<td>● Purposes, requirements ● Target scopes ● Roles</td>
<td>Usage scenes of public data by persons who place/receive orders</td>
</tr>
<tr>
<td>Selection of metrics</td>
<td></td>
<td>● Purposes, requirements ● Target scope</td>
<td>➢ Select metrics that can be used for purposes, requirements and target scopes.</td>
<td>● Metrics</td>
<td>[3.1] Published Data Reference [3.2] Usage Method List</td>
</tr>
<tr>
<td>Confirmation and acquisition of usable data (selection of published data)</td>
<td></td>
<td>● Purposes ● Metrics ● Published data groups</td>
<td>➢ Confirm whether there is past actual data accumulated in the organization to metrics. ➢ Select and acquire published data that can be used from plural published data for the purpose including cases where past actual data is not available.</td>
<td>● Actual data of the past ● Published data (metrics, data element definition)</td>
<td>[2.1] Basic information of published data [3.1] Published Data Reference [3.2] Usage Method List</td>
</tr>
<tr>
<td>Establishment of evaluation standards</td>
<td></td>
<td>● Metrics ● Actual data of the past ● Published data</td>
<td>➢ Establish evaluation standards in order to evaluate the results of metrics.</td>
<td>● Evaluation standards</td>
<td>[3.2] Usage Method List (interpretation of metrics/usage methods of published data)</td>
</tr>
<tr>
<td>2. Acquisition of metrics</td>
<td>Acquisition of metrics</td>
<td>● Definition of metrics of published data ● Scope of target</td>
<td>➢ Measure the basic measure in accordance with fixed methods ➢ Obtain metrics from the result of the measurement</td>
<td>● Result of the measurement ● Metrics values</td>
<td>[3.2] Usage Method List (input source of metrics/measurement method)</td>
</tr>
<tr>
<td>3. Analysis /evaluation</td>
<td>Evaluation of metrics values, usage process</td>
<td>● Evaluation standards ● Result of the measurement, metrics values ● Published data</td>
<td>➢ Evaluate what kind of evaluation level metrics values are located in compared with published data and evaluation standards. ➢ Evaluate whether metrics or management process was competent for achieving the purposes.</td>
<td>● Result of the evaluation of metrics ● Result of the evaluation of process</td>
<td>[3.2] Usage Method List (usage methods of published data)</td>
</tr>
<tr>
<td>4. Updating /revision</td>
<td>Updating/revision</td>
<td>● Result of the evaluation of metrics ● Result of the evaluation of process</td>
<td>➢ Review points that should be improved from the result of the evaluation of metrics. ➢ Study new usage of metrics from the result of the evaluation of process. ➢ Accumulate the obtained results and prepare for future usages.</td>
<td>● Improvement plan of project ● Process improvement plan</td>
<td></td>
</tr>
</tbody>
</table>
Points to Note in Usage Process of Published Data

1. Implementation Plan
   - Define measurable metrics that are fit for purposes, requirements and control targets of the quantitative management of own organization.
   - In case metrics and evaluation standards are gained from published data, obtain from published data that is suitable for own organization.
   <Reference information> Usage scenes of published data of those who place/receive orders, published data reference, metrics relation diagram

2. Acquisition of metrics values
   - Consider measurement methods defined in published data.
   <Reference information> Usage Method List of Published Data

3. Analysis/Evaluation
   - When using values of published data as an evaluation target, evaluate metrics values after correctly understanding the content of the values.
   <Reference information> Usage Method List of Published Data

4. Update/Revision
   - Review on how to respond in future based on the result of the evaluation.
   - Improve and review the quantitative management.
   - Store as benchmarking data of own organization metrics values and the results of analyses/evaluation.
5. Future Schedule

<Product Quality Metrics W.G.>

- **W.G. Scope:**
  - To establish the common recognition of the quality of the system and software responding to usage needs, and metrics for realizing the quality.

- **Activities for the second year:**
  - To conduct a survey research on product quality metrics that is management indicators for the product quality of the information system in a bid to establish system development methods that improve the system reliability and the efficiency of its development.
  - Specifically, to produce product quality metrics sets per field of the system and software that can evaluate the realization as required of the product qualities such as reliability and security (ex. material infrastructure system, enterprise core system).
  - To input to the ISO/IEC 25000 Series(25022,23,24).

<Process Metrics W.G.>

- **W.G Scope:**
  - To develop/improve the environment where the system and software project can be analyzed and evaluated objectively and from the common viewpoints.

- **Activities for the second year:**
  - To produce process metrics sets that can evaluate the degree of realization of the requirements on reliability, security, etc. and compile usage methods as the guides.
  - To put together drafts of operational rules of benchmarking data so that users can use the data based on the understanding of its compilation process.
  - To perform activities toward international standardization.