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Software and systems engineering — Methods and tools for product line measurement

Ingénierie du logiciel et des systèmes — Méthodes et outils pour les mesures de gammes de produits

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Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Reference model for product line measurement **2**
4.1 Overview 2
4.2 Reference model for product line measurement 3
5 Product line measurement management **6**
5.1 General 6
5.2 Product line measurement planning 6
5.2.1 Principal constituents 6
5.2.2 Identify strategies for measurement operationalization 7
5.2.3 Assign responsibility for measurement operationalization 8
5.2.4 Define success measures for measurement operationalization 8
5.2.5 Estimate adequate resources needed for measurement operationalization 8
5.2.6 Document product line measurement plans 9
5.3 Product line measurement enabling 9
5.3.1 Principal constituents 9
5.3.2 Enable product line measurement environment 10
5.3.3 Define index, formula, and integration protocol for commonality and variability measurement 10
5.3.4 Provide guidance for measurement operationalization 11
5.3.5 Enable measurement environments for quantifying measurement operationalization 11
5.4 Product line measurement managing 12
5.4.1 Principal constituents 12
5.4.2 Review measurement operationalization status with success measures 12
5.4.3 Control issues on measurement operationalization 13
5.4.4 Make corrective actions on measurement operationalization 13
6 Product line measurement operationalization **13**
6.1 General 13
6.2 Product line measurement initiation 14
6.2.1 Principal constituents 14
6.2.2 Identify PL measurement participants 14
6.2.3 Mobilize resources for PL measurement operation 15
6.2.4 Initiate PL measurement operation 15
6.2.5 Perform preliminary PL measurement 15
6.3 Product line measurement for commonality 15
6.3.1 Principal constituents 15
6.3.2 Identify commonality for measurement 17
6.3.3 Apply commonality index and formula for PL measurement 18
6.3.4 Measure and determine the degree of PL commonality 18
6.3.5 Communicate and escalate commonality measurement issues to relevant roles and responsibilities (R&R) 18
6.4 Product line measurement for variability 19
6.4.1 Principal constituents 19
6.4.2 Identify variability for measurement 20
6.4.3 Apply variability index and formula for PL measurement 21
6.4.4 Measure and determine the degree of PL variability 21
6.4.5 Communicate and escalate variability measurement issues to relevant roles and responsibilities (R&R) 21

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6.5 Product line measurement result integration 22
6.5.1 Principal constituents 22
6.5.2 Identify gaps for integration among commonality and variability indices 23
6.5.3 Integrate commonality and variability indices 23
6.5.4 Communicate and escalate PL measurement issues to relevant roles and responsibilities (R&R) 23
6.6 Product line measurement result analysis and reporting 24
6.6.1 Principal constituents 24
6.6.2 Analyse PL measurement results with PL objectives 24
6.6.3 Report PL measurement results 25
6.6.4 Identify improvement opportunities for defined indices of PL measurement 25

7 Product line measurement support 26
7.1 General 26
7.2 Conformance to product line measurement 26
7.2.1 Principal constituents 26
7.2.2 Objectively assure the conformance to the measurement of relevant domain engineering assets 27
7.2.3 Objectively assure the conformance to the measurement of relevant application engineering assets 27
7.2.4 Communicate and resolve non-compliance issues 28
7.2.5 Establish records on conformity assurance activities 28
7.3 Decision support for product line measurement 28
7.3.1 Principal constituents 28
7.3.2 Establish decision support policy for PL measurement 29
7.3.3 Tailor decision procedure for PL measurement 29
7.3.4 Guide the decision execution for PL measurement 29
7.3.5 Document the rationale for decisions concerning PL measurement 30
7.4 Uncertainty analysis for product line measurement 30
7.4.1 Principal constituents 30
7.4.2 Quantify uncertainty in PL measurement 31
7.4.3 Assess the confidence level of commonality measurement results 31
7.4.4 Assess the confidence level of variability measurement results 32
7.4.5 Evaluate and improve uncertainty analysis in PL measurement 32

Annex A (informative) **Commonality/variability analysis matrix 33**

Annex B (informative) **Exemplary measurement for SSPL adoption 34**

Annex C (informative) **Capability maturity of SSPL measurement 36**

Bibliography 38

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Foreword

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Introduction

Software and systems product line (SSPL) engineering and management creates, exploits and manages a common platform to develop a family of products (e.g. software products, systems architectures) at a lower cost, with reduced time to market and better quality. As a result, it has gained increasing global attention since the 1990s.

For the successful adoption of the SSPL approach, quantitative management of a product line is essential. For quantitative management, the quality of product line processes and their work products should be measured. This is important because a product line deals with products as a portfolio, and its quality is not limited to a single product but multiple different products. Product line measurements deal with the quality of domain assets, the quality of individual products associated with the quality of a product line, and the quality of a product. Besides, for variability management, a product line should measure the number of variabilities and their impacts on the success of a product line. Methods and tools of product line measurements should consider these product line specific aspects.

This document can be used in the following modes:

— to provide guidance on how to perform product line measurement by organizations that want to adopt SSPL for producing their products;

— to provide guidance on the evaluation and selection for methods and tools for product line measurement by a product line organization;

— to provide guidance on implementing or developing methods and/or tools by specifying a comprehensive set of methods and tools capabilities for supporting product line measurement by either providers of methods or tools, or both.

The ISO/IEC 26550 family of standards addresses both engineering and management processes and capabilities of methods and tools in terms of the critical characteristics of product line development. This document provides processes and capabilities of methods and tools for variability modelling in product lines.

Other standards in the ISO/IEC 26550 family are as follows: ISO/IEC 26550, ISO/IEC 26551, ISO/IEC 26552, ISO/IEC 26553, ISO/IEC 26554, ISO/IEC 26555, ISO/IEC 26556, ISO/IEC 26557, ISO/IEC 26558, ISO/IEC 26559, ISO/IEC 26560, ISO/IEC 26561, ISO/IEC 26562 and ISO/IEC 26563.

— Processes and capabilities of methods and tools for domain requirements engineering and application requirements engineering are provided in ISO/IEC 26551.

— Processes and capabilities of methods and tools for domain design and application design are provided in ISO/IEC 26552.

— Processes and capabilities of methods and tools for domain realization and application realization are provided in ISO/IEC 26553.

— Processes and capabilities of methods and tools for domain testing and application testing are provided in ISO/IEC 26554.

— Processes and capabilities of methods and tools for technical management are provided in ISO/IEC 26555.

— Processes and capabilities of methods and tools for organizational management are provided in ISO/IEC 26556.

— Processes and capabilities of methods and tools for variability mechanisms are provided in ISO/IEC 26557.

— Processes and capabilities of methods and tools for variability modelling are provided in ISO/IEC 26558.

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— Processes and capabilities of methods and tools for variability traceability are provided in ISO/IEC 26559.

— Processes and capabilities of methods and tools for product management are provided in ISO/IEC 26560.

— Processes and capabilities of methods and tools for product line technical probe are provided in ISO/IEC 26561.

— Processes and capabilities of methods and tools for product line transition management are provided in ISO/IEC 26562.

— Processes and capabilities of methods and tools for product line configuration management are provided in ISO/IEC 26563.

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Software and systems engineering — Methods and tools for product line measurement

1 Scope

This document, within the context of methods and tools that support the product line measurement and management and that demonstrate the quality of the products and a product line:

— specifies processes for product line measurement (the processes are described in terms of purpose, inputs, tasks and outcomes);

— specifies method capabilities to support the defined tasks of each process;

— specifies tool capabilities that automate or semi-automate tasks and methods.

This document does not concern the processes and capabilities of tools and methods for a single system but rather deals with those for a family of products.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
application asset
output of a specific application engineering process (e.g. application realization) that may be exploited in other lifecycle processes of application engineering and may be adapted as a *domain asset* (3.3) based on a product management decision

[SOURCE: ISO/IEC 26550:2015, 3.2, modified — Notes to entry have been removed.]

3.2
commonality index
index that captures the level of commonality of a feature, subsystem, component or a product line

Note 1 to entry: Commonality index is calculated as a formula such as *measure* (3.4) or combination of measures (function). The formula for calculating the commonality index reflects the relative size, effort, complexity, or importance of features, subsystems, components, or a product line as weights.

Note 2 to entry: Function points is one of the candidate cost estimation methods used to calculate efforts required for establishing core assets or product line development. A commonality index is used in conjunction with a function point.

Note 3 to entry: Annex A elaborates on the meaning of commonality and commonality index of the product line.

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3.3
domain asset
output of domain engineering life cycle processes that can be reused in producing products during application engineering

[SOURCE: ISO/IEC 26550:2015, 3.11, modified — The alternative preferred term "core asset" and notes to entry have been removed.]

3.4
measure
variable to which a value is assigned as the result of *measurement* (3.5)

Note 1 to entry: The term "measures" is used to refer collectively to base measures, derived measures, and indicators.

[SOURCE: ISO/IEC 25000:2014, 4.18]

3.5
measurement
set of operations having the object of determining a value of a *measure* (3.4)

Note 1 to entry: Measurement can include assigning a qualitative category such as the language of a source program (ADA, C, Java, etc.).

[SOURCE: ISO/IEC 25000:2014, 4.20]

3.6
variability index
index that captures the level of variations across features, subsystems, components, products, or product lines

Note 1 to entry: Variability index is calculated as a formula such as *measure* (3.4) or combination of measures (function). The formula for calculating the variability index reflects the relative size, effort, complexity, or importance of features, subsystems, components, or product lines as weights.

Note 2 to entry: Function points is one of the candidate cost estimation methods used to calculate the additional efforts required for product development. A variability index is used in conjunction with a function point.

Note 3 to entry: Annex A elaborates on the meaning of variability and variability index of the product line.

4 Reference model for product line measurement

4.1 Overview

Measurements allow an organization to manage characteristics of software or systems quantifiably or countably. Measurements are necessary for measuring performance, estimating and planning work items, and measuring productivity. Software and systems product line (SSPL) engineering and management manage common platforms and variability and derive individual products based on the common platform and managed variability. These concepts are not necessary for the development of single systems and are not considered in single system measurement.

NOTE ISO/IEC/IEEE 15939 describes concepts of measurement for software and systems engineering projects.

In SSPL, different measures from single system measurement should be established to characterize the properties of SSPL. Product line (PL) measurements include commonality- and variability-aware measurement processes, tasks, and their supporting methods' and tools' capabilities. Product line measurement also includes measurements for the variability model because they are linked to all processes of product line lifecycles.

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