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Software engineering — Product quality —

Part 2: External metrics

Génie du logiciel — Qualité des produits —

Partie 2: Métrologie externe

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

In exceptional circumstances, the joint technical committee may propose the publication of a Technical Report of one of the following types:

— type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;

— type 3, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC TR 9126-2:2003, which is a Technical Report of type 2, was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and system engineering*.

This document is being issued in the Technical Report (type 2) series of publications (according to the Procedures for the technical work of ISO/IEC JTC 1) as a "prospective standard for provisional application" in the field of external metrics for quantitatively measuring external software because there is an urgent need for guidance on how standards in this field should be used to meet an identified need.

This document is not to be regarded as an "International Standard". It is proposed for provisional application so that information and experience of its use in practice may be gathered. Comments on the content of this document should be sent to the ISO Central Secretariat.

A review of this Technical Report (type 2) will be carried out not later than three years after its publication with the options of: extension for another three years; conversion into an International Standard; or withdrawal.

ISO/IEC 9126 consists of the following parts, under the general title *Software engineering — Product quality*:

— *Part 1: Quality model*

— *Part 2: External metrics*

— *Part 3: Internal metrics*

— *Part 4: Quality in use metrics*

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Introduction

This Technical Report provides external metrics for measuring attributes of six external quality characteristics defined in ISO/IEC 9126-1. The metrics listed in this Technical Report are not intended to be an exhaustive set. Developers, evaluators, quality managers and acquirers may select metrics from this Technical Report for defining requirements, evaluating software products, measuring quality aspects and other purposes. They may also modify the metrics or use metrics which are not included here. This Technical Report is applicable to any kind of software product, although each of the metrics is not always applicable to every kind of software product.

ISO/IEC 9126-1 defines terms for the software quality characteristics and how these characteristics are decomposed into subcharacteristics. ISO/IEC 9126-1, however, does not describe how any of these subcharacteristics could be measured. ISO/IEC TR 9126-2 defines external metrics, ISO/IEC TR 9126-3 defines internal metrics and ISO/IEC 9126-4 defines quality in use metrics, for measurement of the characteristics or the subcharacteristics. Internal metrics measure the software itself, external metrics measure the behaviour of the computer-based system that includes the software, and quality in use metrics measure the effects of using the software in a specific context of use.

This Technical Report is intended to be used together with ISO/IEC 9126-1. It is strongly recommended to read ISO/IEC 14598-1 and ISO/IEC 9126-1, prior to using this Technical Report, particularly if the reader is not familiar with the use of software metrics for product specification and evaluation.

Clauses 1 to 7 and Annexes A to D are common to ISO/IEC TR 9126-2, ISO/IEC TR 9126-3, and ISO/IEC 9126-4.

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Software engineering — Product quality —

Part 2: External metrics

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1 Scope

This Technical Report defines external metrics for quantitatively measuring external software quality in terms of characteristics and subcharacteristics defined in ISO/IEC 9126-1, and is intended to be used together with ISO/IEC 9126-1.

This Technical Report contains:

I. an explanation of how to apply software quality metrics

II. a basic set of metrics for each subcharacteristic

III. an example of how to apply metrics during the software product life cycle

This Technical Report does not assign ranges of values of these metrics to rated levels or to grades of compliance, because these values are defined for each software product or a part of the software product, by its nature, depending on such factors as category of the software, integrity level and users' needs. Some attributes may have a desirable range of values, which does not depend on specific user needs but depends on generic factors; for example, human cognitive factors.

This Technical Report can be applied to any kind of software for any application. Users of this Technical Report can select or modify and apply metrics and measures from this Technical Report or may define application-specific metrics for their individual application domain. For example, the specific measurement of quality characteristics such as safety or security may be found in International Standards or Technical Reports provided by IEC 65 and ISO/IEC JTC 1/SC 27.

Intended users of this Technical Report include:

— Acquirer (an individual or organization that acquires or procures a system, software product or software service from a supplier);

— Evaluator (an individual or organization that performs an evaluation. An evaluator may, for example, be a testing laboratory, the quality department of a software development organization, a government organization or a user);

— Developer (an individual or organization that performs development activities, including requirements analysis, design, and testing through acceptance during the software life cycle process);

— Maintainer (an individual or organization that performs maintenance activities);

— Supplier (an individual or organization that enters into a contract with the acquirer for the supply of a system, software product or software service under the terms of the contract) when validating software quality at qualification test;

— User (an individual or organization that uses the software product to perform a specific function) when evaluating quality of software product at acceptance test;

— Quality manager (an individual or organization that performs a systematic examination of the software product or software services) when evaluating software quality as part of quality assurance and quality control.

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2 Conformance

There are no conformance requirements in this Technical Report.

NOTE General conformance requirements for metrics are in ISO/IEC 9126-1 Quality model.

3 Normative references

ISO/IEC 9126-1:2001, *Software engineering — Product quality — Part 1: Quality model*

ISO/IEC TR 9126-3[1)], *Software engineering — Product quality — Part 3: Internal metrics*

ISO/IEC 9126-4[1)], *Software engineering — Product quality — Part 4: Quality in use metrics*

ISO/IEC 14598-1:1999, *Information technology — Software product evaluation — Part 1: General overview*

ISO/IEC 14598-2:2000, *Software engineering — Product evaluation — Part 2: Planning and management*

ISO/IEC 14598-3:2000, *Software engineering — Product evaluation — Part 3: Process for developers*

ISO/IEC 14598-4:1999, *Software engineering — Product evaluation — Part 4: Process for acquirers*

ISO/IEC 14598-5:1998, *Information technology — Software product evaluation — Part 5: Process for evaluators*

ISO/IEC 14598-6:2001, *Software engineering — Product evaluation — Part 6: Documentation of evaluation modules*

ISO/IEC 12207:1995, *Information technology — Software life cycle processes*

ISO/IEC 14143-1:1998, *Information technology — Software measurement — Functional size measurement — Part 1: Definition of concepts*

ISO/IEC 2382-20:1990, *Information technology — Vocabulary — Part 20: System development*

ISO 9241-10:1996, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 10: Dialogue principles*

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 14598-1:1999 and ISO/IEC 9126-1:2001 apply. They are also listed in Annex D.

5 Abbreviated terms

The following abbreviations are used in this Technical Report:

SQA — Software Quality Assurance (Group)

SLCP — Software Life Cycle Processes

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