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Information technology — Software engineering — Guidelines for the adoption of CASE tools

Technologies de l'information — Ingénierie du logiciel — Lignes directrices pour l'adoption d'outils CASE

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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 Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.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 14471, 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 systems engineering*.

This second edition cancels and replaces the first edition (ISO/IEC TR 14471:1999), which has been technically revised.

Introduction

Historically, there have been problems experienced by organisations in adopting CASE (computer aided software engineering) tools. Because organisations have not gained the expected benefits of CASE technology, it is hoped that the use of a well-founded CASE adoption process will help achieve successful adoption of CASE tools.

A survey conducted by ISO/IEC JTC1/SC7/WG4 (See Annex A: Analysis of CASE adoption questionnaire) offers some hope that these problems may be improving. This survey suggests that CASE tools are performing new capabilities and getting easier to use, that users' expectations are getting more sophisticated, and that CASE tools are more likely to meet their goals. However, according to the survey, there remain a number of continuing problems. There has not been sufficient attention given to pilot trials of CASE technology before using it on actual projects, and users report a need for additional top management support, a total process for CASE adoption, and a preparation of the organisation for the introduction of the technology. This Technical Report addresses the continued needs reported by users.

The purpose of this Technical Report is to provide a recommended practice for CASE adoption. It provides guidance in establishing processes and activities that are to be applied for the successful adoption of CASE technology. The use of this Technical Report will help to maximise the return and minimise the risk of investing in CASE technology. However, this Technical Report does not establish compliance criteria.

Information technology — Software engineering — Guidelines for the adoption of CASE tools

1   Scope

Since CASE adoption is a subject of the broader technology transition problem, this Technical Report addresses the adoption practices appropriate for a wide range of computing organisations. This Technical Report neither dictates nor advocates particular development standards, software processes, design methods, methodologies, techniques, programming languages, or life-cycle paradigms.

This Technical Report will:

— identify critical success factors (CSF);

— propose a set of adoption processes;

— guide successful adoption in consideration of organisational and cultural environment.

The following groups are targeted as potential audiences:

— CASE users;

— information systems managers;

— chief information officers (CIO);

— CASE suppliers;

— software engineering consultants;

— those involved in the acquisition of CASE tools and technology.

Therefore this Technical Report addresses aspects of CASE tools adoption. It is best used with ISO/IEC 14102 for CASE tool evaluation and selection. It is complementary to related ISO/IEC documents which deal with the general aspects of these topics.

2   Terms, definitions and abbreviations

2.1 Terms and definitions

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

2.1.1
successful adoption
extent to which the use of CASE tools can measurably meet an organisation's uniquely defined adoption goals

2.1.2
adoption process
set of activities by which an organisation brings CASE tools into widespread use

2.1.3
CASE needs
organisational requirements which are met by CASE tool characteristics

NOTE   These characteristics are detailed in ISO/IEC 14102:1995. They include management process, development process, maintenance, documentation, configuration management, quality assurance, verification, validation, environment needs, CASE tool integrability, quality characteristics, acquisition needs, implementation needs, support indicators, and certification requirements.

2.2 Abbreviations

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CASE   computer aided software engineering

CSF   critical success factor

3   Critical success factors (CSF) for adoption

One of the primary goals of this Technical Report is to identify major factors which are critical to success in CASE adoption.   A comprehensive set of technical, managerial, organisational, and cultural factors should be considered in order to successfully introduce CASE technology into an organisation. These factors should be monitored through the adoption processes when applicable. A cross reference table for the processes and the factors is provided in Annex B.

The following critical success factors are to be considered and evaluated.

a)   Goal setting: The definition of a clear, measurable set of goals and expectations for CASE adoption, including both business and technical goals.

NOTE 1 Examples of measurable set of goals for CASE adoption might be "twenty percent increase of productivity in unit test activity", "sixteen percent improvement of quality in requirements specification activity", "fifty percent gain of reusability in object oriented design activity", "sixty percent of projects should use CASE tools", etc.

b)   Management support: The extent to which high level management actively encourages CASE adoption, including but not limited to the willingness to allocate the necessary resources.

c) Tool use strategy: The definition of a clear strategy for the scope of tool use.

    NOTE 2 Examples of strategy might include tool use on a specific set of application types, use by a specific business component or corporate-wide use.

d) Total adoption process plan: A plan and design for the total process of bringing the tool into the organisational component.

e) Engagement: The extent to which the people involved in the adoption effort become active, motivated participants.

f) Methodology adjustability: The willingness and technical feasibility of adjusting, as necessary, existing organisational methods and typical methods of using the CASE tool so as to arrive at a single consistent set of methods.

    NOTE 3 For example, existing process-oriented methods and candidate object-oriented programming tools might not be adjusted as a single consistent set of methods.

g) Training: Provision of the training and information necessary and appropriate at each step for each person involved in the adoption process.

h) Expert support: Provision of enthusiastic, expert tool use support during the pilot project and continuing as the tool moves into routine use throughout the organisational component.

    NOTE 4 The experts (or champions) assigned to the pilot project, as a group, should have a combination of skills, including capability of being proponents for the new technology, experience in the tool use, experience in the process and procedures of the organisation, and influence within the organisation.

i) Pilot project: The performance of a controlled pilot project prior to the final adoption decision.

j) Tool capability: The technical capability of the tool, in its hardware and software environment, to satisfy the defined goals in the context of the intended scope.

k) Smooth changeover: Due consideration paid to ensuring the ability of the organisation to simultaneously operate in both the old and new methods until the entire organisational component has fully changed over to the new methods.

4 Overview of CASE adoption

This Technical Report will describe a set of adoption processes that can be used in a broad range of environments, where the definition of success can be tailored to the organisation. Successful CASE adoption requires more than casual adoption activities. This clause shows the major processes for adoption and the overview of the processes as shown in Figure 1. Adoption of CASE tools includes four major processes:

a)   preparation process,

b)   evaluation and selection process,

c)   pilot project process,

d)   transition process.

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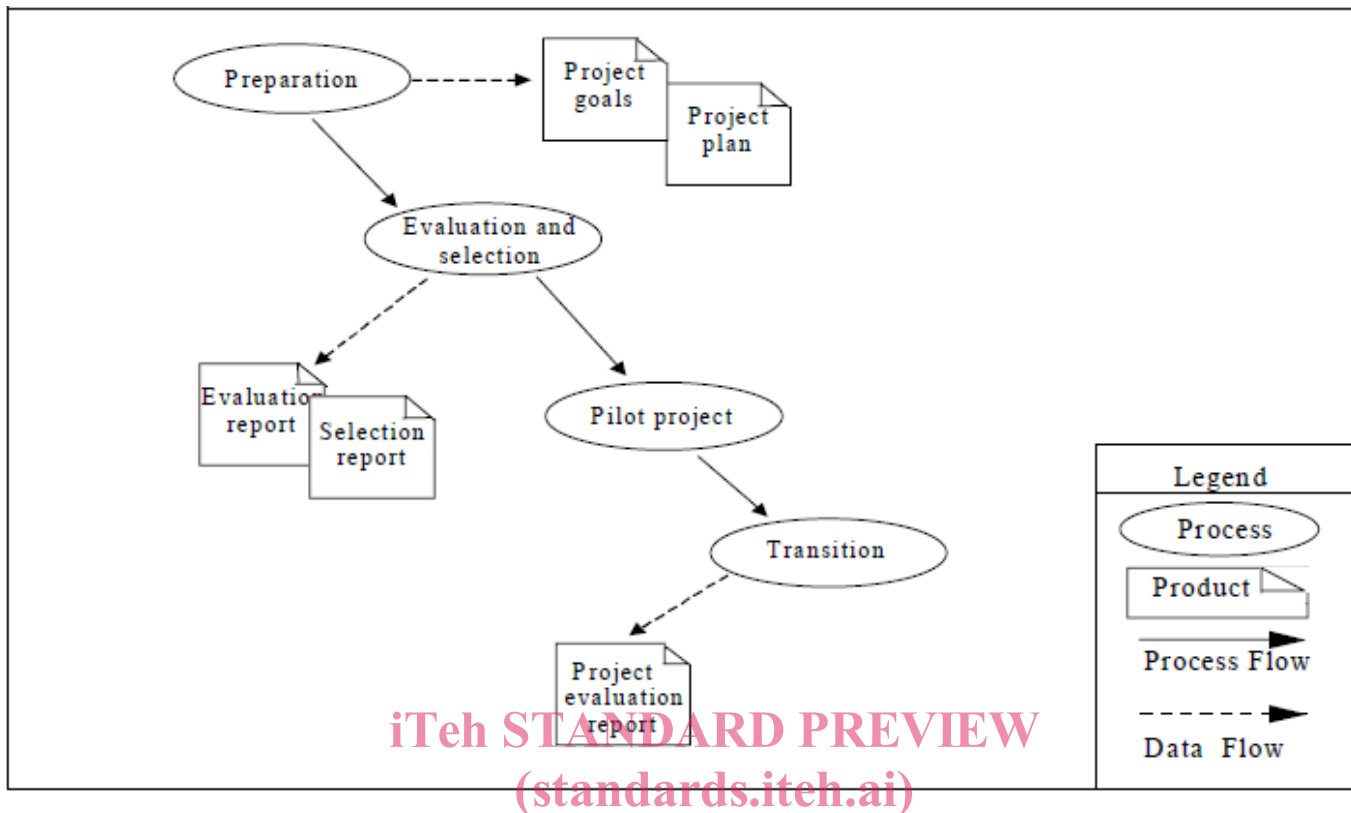
Figure 1 — The adoption process

4.1 Preparation process

The purpose of the preparation process is to establish the general objectives and goals of the CASE adoption effort, to establish the high level direction, and to define the management aspects of the effort (e.g., schedule, resources, cost).

The preparation process is composed of four activities:

a)   Setting goals: identifies CASE adoption goals where CASE can help meet business objectives.

b)   Verifying feasibility and measurability: develops and verifies technically and economically feasible and measurable subgoals for a CASE adoption project.

c)   Setting policy: provides the rationale and general policy for adoption of CASE tools incorporating the critical success factors.

d)   Developing a plan: produces a plan for the entire adoption project.

4.2 Evaluation and selection process

The purpose of the evaluation and selection process is to identify the most suitable CASE tool(s) among the candidate tools, and to ensure that the recommended tool(s) meets the original goals.

The evaluation and selection process is fully defined in ISO/IEC 14102:1995, and is composed of following sub processes (activities):

a) Preparation: defines the objectives and requirements of the intended evaluation and selection of CASE tools.

b) Structuring: elaborates a set of structured requirements based upon the CASE tool characteristics in ISO/IEC 14102:1995.

c) Evaluation: produces technical evaluation reports that will be the major input for the selection sub process.

d) Selection: identifies the most suitable CASE tool(s) among the candidate tools.

4.3 Pilot project process

The purpose of the Pilot project process is to aid in validating the work performed in the earlier processes of CASE adoption process and to determine if the actual capability of the tool meets the organisational needs.

The Pilot project process is composed of four activities:

a) Pilot initiation: defines plans, procedures, resources, and training to perform a pilot project.

b) Pilot performance: executes a controlled project in which the newly acquired CASE tools can be tried out.

c) Pilot evaluation: provides the evaluation results of the performance of the pilot project.

d) Decision for a next step: decides whether to go ahead with the adoption process, abandon the tool or perform a second pilot project, and identify organisational learning experience for the transition process.

4.4 Transition process

The purpose of the transition process is to minimise disruptions during the changeover from the current processes to new technology based on the maximum use of the pilot project experiences.

The transition process is composed of five activities:

a) Initiation for transition: defines plans, procedures, and resources to perform transition and outlines, use of the tool.

b) Training: trains new CASE tool users.

c) Institutionalisation: progressively applies the tool to larger segments of the target environment until its use becomes part of normal organisational practice.

d) Monitoring and continuous support: identifies whether the adoption is in fact working, and ensures on-going training and other resources as needed during the transition period.

e)   Evaluation of adoption project and completion: measures the success of CASE adoption, and provides organisational learning experience for future adoption projects.

5   Preparation process

The first process in a CASE adoption effort is the preparation of CASE adoption goals and the project plan.   Four major activities in the preparation process are:

a)   setting goals,

b)   verifying feasibility and measurability,

c)   setting policy,

d)   developing a plan.

Starting with the review of business objectives, CASE adoption goals will be defined and validated. A business objective is a higher level objective (e.g., improve competitive position of the organisation, increase productivity), which is not tied to any specific software engineering life-cycle objective. However, business objectives should be used to derive core (possibly alternate) sets of CASE adoption goals (e.g., improve process, improve design quality). These goals are related to software engineering life-cycle processes to ensure the effectiveness of the organisational functions and performances.

The activity of verifying feasibility and measurability examines the conformance of the business and CASE adoption objectives and it assesses technical and economic validity.

The activity of setting policy develops the direction for the remainder of the adoption process. In this activity, the critical success factors defined in Clause 5 should be tailored for a specific CASE adoption effort. Finally, the last activity in the preparation process is to organise a plan for the total process of bringing the tool into the organisational component. The overview of the preparation process in shown in Figure 2.