TECHNICAL REPORT

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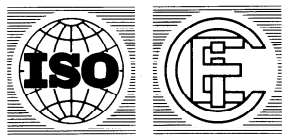
Information technology — Guidelines for the management of software documentation

Technologies de l'information — Lignes directrices pour la gestion de la documentation technique du logiciel



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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) together form a system for worldwide standardization as a whole. 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.

The main task of a technical committee is to prepare International Standards but in exceptional circumstances, the publication of a technical report of one of the following types may be proposed:

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

— type 2, when the subject is still under technical development requiring wider exposure;

— type 3, when a 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 Technical reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/IEC TR 9294, which is a technical report of type 3, was prepared by ISO/IEC JTC 1, *Information technology.*

Introduction

Documentation is required for all stages of the software lifecycle. As a result, the preparation and maintenance of documentation constitutes a necessary and continuous effort from the inception of the software through to its disposal. Documentation begins with the initiation of a software project and continues with the design, development, testing, installation, use, modification and enhancement of the software. The documentation process can only be regarded as having ended when the software comes to the end of its life.

Documentation is essential for the success of any software development project, and the production of documentation requires the commitment of time, effort and money. It is the responsibility of management to ensure the effective deployment of these resources, recognizing the importance of documentation to the quality and success of the software product.

Information technology — Guidelines for the management of software documentation

1 Scope

This Technical Report offers guidance on the management of software documentation to those managers responsible for the production of software or software-based products. The guidance is intended to assist managers in ensuring that effective documentation is produced in their organization.

The report addresses the policies, standards, procedures, resources and plans which managers must concern themselves with in order to manage software documentation effectively.

The guidance given is intended to be applicable to all types of software, from the simplest program to the most complex software suite or software system. All types of software documentation are covered, relating to all stages of the software lifecycle.

The principles of software documentation management are the same whatever the size of the project. For small projects, much of the detail given in this report may not apply, but the principles remain the same. Managers may tailor the recommendations to their particular needs.

It should be stressed that the guidance given is from the point of view of documentation management. Detailed advice on, for example, the content and layout of software documents is not provided.

2 References

ISO 2382 : 1984, *Data processing — Vocabulary — Part 1: Fundamental terms.*

ISO 6592 : 1985, *Information processing — Guidelines for the documentation of computer-based application systems.*

ISO 9127 : 1988, *Information processing systems — User documentation and cover information for consumer software packages.*

3 Definitions

For the purposes of this Technical Report, the following definitions apply.

3.1 document: A uniquely identified unit of information for human use, such as a report, specification, manual or book.

3.2 documentation: A collection of one or more related documents.

3.3 software product: The result of the software development process, i.e. software that has been released for use.

4 The role of managers

Managers commit their organization to documentation effort and give support to that effort in the policies, standards, procedures, resource allocations and plans that they establish.

Effective performance of the managerial role can be seen as resting on three elements:

1) Management commitment to documentation

This commitment requires recognition that software documentation is important and that it must be planned, written, reviewed, approved, produced, distributed and maintained.

2) Management support of staff commitment to documentation

This requires guidance and incentives for staff to produce the required documentation and the provision of resources to facilitate the work.

3) Evidence of managerial commitment and support

This requires the provision of

a) published documentation policy statements;

b) standards and guidelines identified for all aspects of software documentation;

c) published documentation procedures;

d) the allocation of adequate resources to documentation;

e) documentation planning undertaken as an integral part of the software development process;

f) continuous review undertaken to ensure compliance with documentation policy, standards, procedures and plans.

5 The functions of software documentation

To manage software documentation effectively it is important to be aware of the different functions performed by documentation.

Software documentation can be regarded as having six major functions:

1) Communication to management (see 5.1).
2) Task-to-task communication (see 5.2).
3) Quality assurance (see 5.3).
4) Instruction and reference (see 5.4).
5) Software support (see 5.5).
6) Historical reference (see 5.6).

5.1 Communication to management

During the development of software, management needs to be apprised of progress, problems and expectations. Periodic reports that track progress against schedules and lay out plans for the next period provide control mechanisms and visibility for the project.

5.2 Task-to-task communication

Most software development projects are divided into tasks, often carried out by different groups. Typically

* **subject area specialists** initiate the project
* **analysts** formulate system requirements
* **designers** develop system and program designs
* **publications specialists** produce user documentation in conformance with policy and standards for documentation
* **quality assurance specialists and auditors** assess overall software integrity and performance
* **maintenance programmers** improve the operational software and develop enhancements or extensions

These people need a means of communicating with one another which provides information that can be reproduced, distributed and referred to as needed.

Most software development methodologies establish formal documents for task-to-task communication. For example, analysts present formal requirements specifications to designers, and designers give formal design specifications to programmers.

5.3 Quality assurance

Those charged with the responsibility for quality assurance of software require development and product documentation to carry out their tasks.

5.4 Instruction and reference

Documentation is needed to enable operators, users, managers and other interested persons to understand and use the software product.

5.5 Software support

Maintenance programmers require detailed descriptions of the software so that they can locate and correct errors, and enhance or change the software as required.

5.6 Historical reference

Documentation is needed as a historical reference for the project. This documentation can also assist in the transfer and conversion of software to new environments.

6 Establishing documentation policy

Documentation policies that are prepared and supported by senior management provide guidance to decision-makers at all lower levels. Policy provides broad direction, but not detailed prescriptions on what to do or how to do it.

Because of the vital role documentation plays at all stages of the software lifecycle, a formal statement of policy should be prepared. Everyone affected by the policy should be informed of it and should understand it. Formal, written, well-publicized policy establishes the discipline required for effective software documentation.

Policy should support the basic elements of effective documentation:

1) Documentation requirements cover the whole software lifecycle

Documentation is required during the early stages of a project, and must be available and maintained throughout the software development process. After the development is completed, documentation is needed for the use, maintenance, enhancement, conversion or transfer of the software.

2) Documentation should be managed

Direction and control are required to obtain and maintain documentation. Managers and publications specialists should prepare detailed plans outlining documentation products, schedules, responsibilities, resources, and quality assurance and review procedures.

3) Documentation should be appropriate to its readership

Readers may be managers, analysts, professionals with no computer expertise, maintenance programmers, clerical personnel, etc. Depending on tasks performed, they require various degrees of detail and different presentations of material. A publications specialist should be charged with properly designing different types of documentation destined for different readers.

4) Documentation effort should be integrated into the overall software development process

The development process should be defined.

5) Documentation standards should be identified and used

Existing standards should be adopted wherever possible. Where no suitable standards exist, standards and guidelines should be developed as required.

6) Support tools should be specified

Tools which help to develop and maintain software products, including documentation, should be used wherever economically feasible.

7 Establishing documentation standards and guidelines

Within an organization, standards and guidelines should be adopted for

* the software lifecycle model
* document types and inter-relationships
* document content
* document quality
* document formats
* document identification

These standards and guidelines will determine how documentation tasks are carried out and will provide criteria for judging the completeness, usefulness and appropriateness of the software documentation produced within the organization.

Wherever possible, existing international and national standards should be adopted. Where no appropriate standards exist, the organization should develop its own.

Most standards and guidelines provide advice that is applicable at a general level. Managerial judgement will often be required to adapt the general advice to particular projects. Application of an organization's documentation standards will enable project managers to determine such things as

* which document types are required
* how much documentation is to be provided
* what the documents are to contain
* what level of quality is to be achieved
* when the documents are to be produced
* how the documentation is to be stored, maintained and communicated

If a contract for software is let, the contract should require the documentation to meet acceptable standards. It should specify the types of documents to be supplied, the level of quality for each, and the review and approval procedures.

7.1 Selecting a software lifecycle model

A number of models of the software lifecycle exist, with different terminology for the various stages. From the point of view of software documentation, it does not matter which model is adopted so long as the stages and their associated documentation are clearly defined, planned and scheduled for any particular software project. Managers should, therefore, select an appropriate software lifecycle model and ensure that it is applied in their organization.

Managers will find that having defined stages and associated tasks will help them to monitor the progress of any software project. The production of the documentation associated with a particular stage may, for example, be used as a checkpoint for the review, approval and completion of that stage prior to the beginning of the next.

7.2 Defining document types and content

An outline is given below of the major types of software document. This outline is not exhaustive or definitive, but will serve as a checklist of the major types of software documentation which managers should provide for when defining their standard document types.

Software documentation may be thought of as falling into three categories:

1) Development documentation (see 7.2.1).
2) Product documentation (see 7.2.2).
3) Project management documentation (see 7.2.3).

7.2.1 Development documentation

The documents that describe the software development process specify the requirements the software is to fulfil, the design of the software, how it should be tested and how its quality is to be assured. Development documentation also includes detailed technical descriptions of the software (program logic, program inter-relationships, data formats and storage, etc.)

Development documents serve five purposes:

1) They are the **vehicle of communication** between all those involved in the development process. They record details of the decisions made about software requirements, design, coding and testing.

2) They delineate the **responsibilities** of the development team. They define who does what and when by specifying the roles of software, subject matter, documentation, quality assurance personnel, and any one else involved in the development process.

3) They act as **checkpoints** that allow managers to assess the progress of the development. If development documents are missing, incomplete or outdated, managers lose an important tool for tracking and controlling the software project.

4) They form the basis of the **software support documentation** required by maintenance programmers as part of the product documentation.

5) They record the **history** of the software development.

Typical development documents are

* feasibility studies and initiation requests
* requirements specifications
* functional specifications
* design specifications, including program and data specifications
* development plans
* software integration and test plans
* quality assurance plans, standards and schedules
* security and test information

7.2.2 Product documentation

Product documentation provides the information necessary for the use, maintenance, enhancement, conversion and transfer of a software product.

Product documentation serves three purposes:

1) It provides **training and reference information** for anyone using or operating the software product.

2) It enables programmers other than those who developed the software to **maintain or enhance it**.

3) It promotes the **marketing or acceptance** of the software product.

Product documentation should include material for the following types of reader:

* **users**, who enter data, retrieve information and solve problems with software
* **operators**, who run the software on a computer system
* **maintenance programmers**, who maintain, enhance or change the software

Product documentation may also include the following:

* **guides and materials for managers**, who supervise the use of the software
* **promotional materials**, announcing the availability of the software product and detailing its functions, operational environment, etc.
* **general information**, describing the software product for anyone interested in it

Typical product documents include

* training manuals
* reference manuals and user guides
* software support manuals
* product brochures and information leaflets

7.2.3 Project management documentation

Documents created on the basis of project management information such as

* schedules for each stage of the development process and records of schedule changes
* records of agreed changes to the software
* records of the decisions related to the development
* definitions of responsibilities

This documentation provides the information related to the life of a product from the management point of view.

7.3 Defining document quality

Managers should set standards for the level of quality appropriate to different types of document and different types of project, and should determine how that quality is to be achieved and maintained.

Considerations of quality apply to the content, structure and presentation of documentation:

1) **Quality of content** can be measured in terms of accuracy, completeness and clarity.

2) **Quality of structure** can be measured by the ease with which the reader is able to locate information.

3) **Quality of presentation** should be appropriate to the type of project. For example, a user guide might take the form of a set of typewritten pages stapled together, or it might be a typeset book with extensive illustrations designed by a graphics expert.

7.4 Defining document formats

Standardized document formats are important for the quality control of documents, for the readability of documents and for the ease of document maintenance.

Information can be presented in a variety of formats. Design specifications, for example, can be written on pre-defined forms. User training can be accomplished by means of on-line training programs, in classrooms or through workbooks and tutorials.

Document formats may vary from project to project. They will depend on factors such as the size of the project, the audiences to be addessed, the number of stages identified and the documentation budget.

In designing formats, thought should be given to whether documents will be translated for international distribution.

An organization's standards and guidelines for document formats should be defined in such a way as to leave flexibility for project managers in selecting the formats appropriate for their projects.

7.5 Defining a document identification system

A standard means of identifying documents is essential for effective control of documentation. Identifying information may include

* document title
* document reference number
* document version number
* date of issue and revision
* author
* approval authority
* protection/copyright identification
* issuing organization

Where documents are to be issued in loose-leaf form, every page should be uniquely identified (for example, with the document reference number, page number and issue number).

8 Establishing documentation procedures

Procedures should be established to implement the organization's documentation policies.

Procedures define sequences for documentation

* planning
* preparation
* configuration control
* review
* approval
* production
* storage
* backup
* distribution and updating
* disposal

Procedures should also identify quality assurance checkpoints and methods.

9 Allocating resources to documentation

Resources required for software documentation are primarily

* people (see 9.1)
* facilities (see 9.2)
* funding (see 9.3)

9.1 People

The process of software development has roles for people with knowledge of

* **software**, to develop the software
* **the subject matter**, to provide information about the application which the software is to address
* **documentation**, to develop the product documentation

It is important that staff are fully trained in documentation techniques, and that each group fully understands and fulfils its documentation role:

* **software designers and programmers** produce the development documentation that describes the products or their tasks; they also provide the software product support documentation
* **subject matter specialists** provide information for and may produce parts of feasibility studies, requirements specifications, testing and quality assurance plans, plans for integrating the software into its operational environment, and many types of schedules
* **publications specialists** usually produce user training, reference, product information and promotion documentation

9.2 Facilities

It is important to give consideration to the provision of adequate and appropriate facilities for documentation tasks.

Software tools are available for the preparation and control of documentation. They can be used to improve the efficiency of many of the documentation processes and the use of an organization's documentation standards.

9.3 Funding

It is important that documentation costs are identified as unique budget items since they often form a very significant part of the cost of software development.

10 Documentation planning

A documentation plan states what is to be done, how it is to be done, when it is to be done and who is to do it.

A documentation plan may be part of an overall project plan or a stand-alone document. For small, informal projects, the plan may be only one page long. For larger projects, it may be a comprehensive document that follows fixed standards and is subject to a formal review and approval procedure.

The documentation plan should be distributed to all development team members and to anyone else affected by it. It should clearly delineate responsibilities of all those involved in the documentation effort.