Introduction

With the progress of information technology, the amount of software products has been increasing and the quality management of software products is essential. One of the means of establishing a quality management system is to provide guidance for software quality assurance.

The requirements for a generic quality system for two-party contractual situations have already been published: ISO 9001: 1987, Quality systems - Model for quality assurance in design/development, production, installation and servicing.

However, the process of development and maintenance of software is different from that of most other types of industrial products. In such a rapidly evolving technology field it is therefore necessary to provide additional guidance for quality systems where software products are involved, taking into account the present status of this technology.

The nature of software development is such that some activities are related to particular phases of the development process, while others may apply throughout the process. These guidelines have therefore been structured to reflect these differences. This document thus does not correspond directly in format with ISO 9001 and cross-reference indexes (annex A and annex B) are provided to give assistance when referring to that standard.
Contracts between two parties for software product development may occur in many variations. In certain cases of two-party contracts, these guidelines might not be applicable even if "tailored". It is therefore important to determine the adequacy of the application of this part of ISO 9000 to the contract.

This part of ISO 9000 deals primarily with situations where specific software is developed as part of a contract according to purchaser's specifications.

However, the concepts described may be equally of value in other situations.
Quality Management And Quality Assurance Standards

Part 3

Guidelines for the application of ISO 9001 to the development, supply and maintenance of software

1. Scope

This part of ISO 9000 sets out guidelines to facilitate the application of ISO 9001 to organisations developing, supplying and maintaining software.

It is intended to provide guidance where a contract between two parties requires the demonstration of a supplier's capability to develop, supply and maintain software products.

The guidelines in this part of ISO 9000 are intended to describe the suggested controls and methods for producing software which meet a purchaser's requirements. This is done primarily by preventing non-conformity at all stages from development through to maintenance.
The guidelines in this part of ISO 9000 are applicable in contractual situations for software products when

a) The contract specifically requires design effort and the product requirements are stated principally in performance terms, or they need to be established;

b) Confidence in the product can be attained by the adequate demonstration of a certain supplier's capabilities in development, supply and maintenance.

2. Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 9000. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 9000 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

Member of IEC and ISO maintain registers of currently valid International Standards.


ISO 8402 :1986, Quality - Vocabulary.

ISO 9001:1987, Quality systems-Model for quality assurance in design/development, production, installation and servicing.

3. Definitions

For the purposes of this part of ISO 9000, the definitions given in ISO 2382-1 and ISO 8402 apply, together with the following definitions.

3.1 Software: Intellectual creation comprising the program, procedures, rules, and associated documentation pertaining to the operation of a data processing system.

Note: Software is independent of the medium on which it is recorded.

3.2 Software product: Complete set of computer programs, procedures and associated documentation and data designed for delivery to a user.

3.3 Software item: Any identifiable part of a software at an intermediate step or at the final step of development.

3.4 Development: All activities to be carried out to create a software product.

3.5 Phase: Defined segment of work.

3.6 Verification (for software): The process of evaluating the products of a given phase to ensure correctness and consistency with respect to the products and standards provided as input to that phase.

3.7 Validation (for software): The process of evaluating software to ensure compliance with specified requirements.
4. Quality system - Framework

4.1. Management responsibility

4.1.1. Supplier's management responsibility

4.1.1.1. Quality policy

The supplier's management shall define and document its policy and objectives for, and commitment to quality. The supplier shall ensure that this policy is understood, implemented and maintained at all levels in the organization.

4.1.1.2. Organization

4.1.1.2.1. Responsibility and Authority

The responsibility, authority and the interrelation of all personnel who manage, perform and verify work affecting quality shall be defined; particularly for personnel who need the organisational freedom and authority to

a. Initiate action to prevent the occurrence of product nonconformity;

b. Identify and record any product quality problems;

c. Initiate, recommend or provide solutions through designed channels;

d. Verify the implementation of solution;

e. Control further processing, delivery or installation of non-conforming product until the deficiency or unsatisfactory condition has been corrected.

4.1.1.2.2. Verification resources and personnel

The supplier shall identify in-house verification requirements, provide adequate resources and assign trained personnel for verification activities.
Verification activities shall include inspection, test and monitoring of the design, production, installation and servicing processes and/or product; design reviews and audits of the quality system, processes and/or product shall be carried out by personnel independent of those having direct responsibility for the work being performed.

4.1.1.2.3. Management representative
The supplier shall appoint a management representative who, irrespective of other responsibilities, shall have defined authority and responsibility for ensuring that the requirements of ISO 9001 are implemented and maintained.

4.1.1.3 Management review
The quality system adopted to satisfy the requirements of ISO 9001 shall be reviewed at appropriate intervals by the supplier's management to ensure its continuing suitability and effectiveness. Records of such reviews shall be maintained.

Note: Management reviews normally include assessment of the results of internal quality system audits, but are carried out by, or on behalf of, the supplier's management viz management personnel having direct responsibility for the system.
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4.1.2. Purchaser's management responsibility

The purchaser should cooperate with the supplier to provide all necessary information in a timely manner and resolve pending items.

The purchaser should assign a representative with the responsibility for dealing with the supplier on contractual matters. This representative should have the authority commensurate with the need to deal with contractual matters which include, but are not limited to, the following:

a) Defining the purchaser's requirements to the supplier;

b) Answering questions from the supplier;

c) Approving the supplier's proposals;

d) Concluding agreements with the supplier;

e) Ensuring the purchaser's organisation observes the agreements made with the supplier;

f) Defining acceptance criteria and procedures;

g) Dealing with the purchaser - supplied software items that are found unsuitable for use.

4.1.3. Joint reviews

Regular joint reviews involving the supplier and purchaser should be scheduled to cover the following aspects, as appropriate:
a. conformance of the software to the purchaser's agreed requirements specification;

b. verification results;

c. acceptance test results;

The results of such reviews should be agreed and documented.

4.2. Quality system

4.2.1. General

The supplier should establish and maintain a documented quality system. The quality system should be an integrated process throughout the entire life cycle, thus ensuring that quality is being built in as development progresses, rather than being discovered at the end of process. Problem prevention should be emphasised rather than depending on correction after occurrence.

The supplier should ensure the effective implementation of the documented quality system.
4.2.2. Quality system documentation

All the quality system elements, requirements and provisions should be clearly documented in a systematic and orderly manner.

4.2.3. Quality plan

The supplier should prepare and document a quality plan to implement quality activities for each software development on the basis of the quality system, and ensure that it is understood and observed by the organizations concerned.

4.3. Internal quality system audits

Internal quality audits

The supplier shall carry out a comprehensive system of planned and documented internal quality system audits to verify whether quality activities comply with planned arrangements and to determine the effectiveness of the quality system.

Audits shall be scheduled on the basis of the status and importance of the activity.

The audits and follow up actions shall be carried out in accordance with documented procedures.

The results of the audits shall be documented and brought to the attention of personnel having responsibility in the area audited. The management personnel responsible for the area shall take timely corrective action on the deficiencies found by the audit.
4.4. Corrective action

The supplier shall establish, document and maintain procedures for

a. investigating the cause of nonconforming product and the corrective action needed to prevent recurrence;

b. Analysing all processes, work operations, concession, quality records, service reports and customer complaints to detect and eliminate potential causes of nonconforming product;

c. Initiating preventive actions to deal with problems to a level corresponding to the risks encountered;

d. Applying controls to ensure that corrective actions are taken and that they are effective;

e. Implementing and recording changes in procedures resulting from corrective action.

5. Quality system - Life cycle activities

5.1. General

A software development project should be organized according to a life cycle model. Quality related activities should be planned and implemented with respect to the nature of the life cycle model used.

This part of ISO 9000 is intended for application irrespective of the life cycle model used. Should any description, guidance, requirement or structure be read
differently, this unintended and should not be read as indicating that the requirement or guidance is restricted to a specific life cycle model only.

5.2. Contract Review

5.2.1. General

The supplier should establish and maintain procedures for contract review and for the coordination of these activities.

Each contract should be reviewed by the supplier to ensure that

a. The scope of the contract and requirements are defined and documented;

b. Possible contingencies or risks are identified;

c. Proprietary information is adequately protected;

d. Any requirements differing from those in the tender are resolved;

e. The supplier has the capability to meet contractual requirements;

f. The supplier's responsibility with regard to sub contracted work is defined

g. The terminology is agreed by both parties;

h. The purchaser has the capability to meet contractual obligations.

Records of such contract reviews should be maintained.

5.2.2. Contract item on quality

Among others, the following items are frequently found to be relevant in the contract:

a. acceptance criteria;

b. handling of the changes in purchaser's requirements during the development;
c. handling of problems detected after acceptance, including quality related claims and purchaser complaints;

d. activities carried out by the purchaser, especially the purchaser's role in requirements specification, installation and acceptance;

e. facilities, tools and software items to be provided by the purchaser;

f. standards and procedures to be used;

g. replication requirements.

5.3. Purchaser's requirements specification

5.3.1. General

In order to proceed with software development, the supplier should have a complete, unambiguous set of functional requirements. In addition, these requirements should include all aspects necessary to satisfy the purchaser's need. These may include, but are not limited to, the following: performance, safety, reliability, security and privacy. These requirements should be stated precisely enough so as to allow validation during product acceptance.

The purchaser's requirements specification records these requirements. In some cases, this document is provided by the purchaser. If not, the supplier should develop these requirements in close cooperation with the purchaser, and the supplier should obtain the purchaser's approval before entering the development stage. The purchaser's requirements specification should be subject to documentation control and configuration management as part of the development documentation.
All interfaces between the software product and other software or hardware products should be fully specified, either directly or by reference, in the purchaser's requirements specification.

5.3.2. Mutual Cooperation

During the development of purchaser's requirements specification, attention to the following issues is recommended:

a. Assignment of persons on both sides responsible for establishing the purchaser's requirements specification;

b. Methods for agreeing on requirements and approving changes;

c. Efforts to prevent misunderstandings such as definition of terms, explanations of background of requirements;

d. Recording and reviewing discussion result on both sides.

5.4. Development Planning

5.4.1. General

The development plan should cover the following:

a. The definition of the project, including a statement of its objectives and with reference to related purchaser of supplier projects;

b. The organisation of the project resources, including the team structure, responsibilities, use of sub-contractors and material resources to be used;

c. Development phases (as defined in 5.4.2.1);

d. The project schedule identifying the tasks to be performed, the resources and time required for each and any interrelationships between task;
e. Identification of related plans, such as

- Quality plan,
- Configuration management plan,
- Integration plan,
- Test plan.

The development plan should be updated as development progresses and each phase should be defined as in 5.4.2.1 before activities in that phase are started. It should be reviewed and approved before execution.

5.4.2. Development plan

5.4.2.1. Phases

The development plan should define a disciplined process or methodology for transforming the purchaser’s requirements specification into a software product. This may involve dividing the work into phases, and the identification of

a) Development phases to be carried out;

b) Required inputs for each phase;

c) Required outputs from each phase;

d) Verification procedures to be carried out at each phase;

e) Analysis of the potential problems associated with the development phases and with the achievement of the specified requirements.
5.4.2.2. Management

The development plan should define how the project is to be managed, including the identification of

a. schedule of development, implementation and associated deliveries;
b. progress control;
c. organisational responsibilities, resources and work assignment;
d. organizational and technical interfaces between different groups.

5.4.2.3 Development methods and tools

Development plan should identify methods for ensuring that all activities are carried out correctly. This may include

a. rules, practices and conventions for development;
b. tools and techniques for development;
c. configuration management;

5.4.3. Progress Control

Progress reviews should be planned, held and documented to ensure that outstanding resources issues are resolved and to ensure effective execution of development plans.

5.4.4. Input to development phases

The required input to each development phase should be defined and documented. Each requirement should be defined so that its achievement can be
verified. Incomplete, ambiguous or conflicting requirements should be resolved
with those responsible for drawing up the requirements.

5.4.5. Output from development phases

The required output from each development phase should be defined and
documented. The output from each development phase should be verified and
should

a. meet the relevant requirements;

b. contain or reference acceptance criteria for forwarding to subsequent phases;

c. conform to appropriate development practices and conventions, whether or
   not these have been stated in the input information;

d. identify those characteristics of the product that are crucial to its safe and
   proper functioning;

e. conform to applicable regulatory requirements.

5.4.6. Verification of each phase

The supplier should draw up a plan for verification of all development phase
outputs at the end of each phase.

Development verification should establish that development phase outputs meet
the corresponding input requirements by means of development control
measures such as

a. holding development reviews at appropriate points in the development
   phases;
b. comparing a new design with a proven similar design, if available;
c. undertaking tests and demonstrations.

The verification results and further actions required to ensure that the specified requirements are met should be recorded and checked when the actions are completed. Only verified development outputs should be submitted to configuration management and accepted for subsequent use.

5.5 Quality Planning

5.5.1. General

As part of the development planning, the supplier should prepare a quality plan. The quality plan should be updated along with the progress of the development and items concerned with each phase should be completely defined when starting that phase.

The quality plan should be formally reviewed and agreed by all organisations concerned in its implementation.

The document that describes the quality plan may be an independent document or part of another document, or composed of several documents including the development plan.

5.5.2. Quality plan content

The quality plan should specify or reference the following items:

a. Quality objectives, expressed in measurable terms whenever possible;
b. Defined input and output criteria for each development phase;
c. Identification of types of test, verification and validation activities to be carried out;

d. Detailed planning of test, verification and validation activities to be carried out, including schedules, resources and approval authorities;

e. Specific responsibilities for quality activities such as
   ♦ Reviews and tests
   ♦ Configuration management and change control
   ♦ Defect control and corrective action.

5.6. Design and Implementation

5.6.1. General

The design and implementation activities are those which transform the purchaser's requirements specification into a software product. Because of the complexity of software product, it is imperative that these activities be carried out in a disciplined manner, in order to produce a product according to specification rather than depending on the test and validation activities for assurance of quality.

Note 6 The level of information disclosure to be provided to the purchaser needs to be mutually agreed to by the parties, as design and implementation processes are frequently proprietary to the supplier.

5.6.2. Design

In addition to the requirements common to all the development phases, the following aspects inherent to the design activities should be taken into account.
a. Identification of design considerations: in addition to the input and output specifications, aspects such as design rules and internal interface definitions should be examined.

b. Design methodology: a systematic design methodology appropriate to the type of software product being developed should be used.

c. Use of past design experience: utilising lessons learned from past design experiences, the supplier should avoid recurrences of the same or similar problems.

d. Subsequent processes: the product should be designed to the extent practical to facilitate testing, maintenance and use.

5.6.3. Implementation

In addition to the requirements common to all the development activities, the following aspects should be considered in each implementation activity.

a. rules: rules such as programming languages, consistent naming conventions, coding and adequate commentary rules should be specified and observed.

b. Implementation methodologies: the supplier should use appropriate implementation methods and tools to satisfy purchaser requirements.

5.6.4. Reviews

The supplier should carry out reviews to ensure that the requirements are met and the above methods are correctly carried out. The design or implementation
process should not proceed until the consequences of all known deficiencies are satisfactorily resolved or the risk of proceeding otherwise is known.

Records of such reviews should be maintained.

5.7. Testing and Validation

5.7.1. General

Testing may be required at several levels from the individual software item to the complete software product. There are several different approaches to testing and integration.

In some instances, validation, field testing and acceptance testing may be one and the same activity.

The document that describes the test plan may be an independent document or a part of another document, or may be composed of several documents.

5.7.2. Test Planning

The supplier should establish and review the test plans, specifications and procedures before starting testing activities. Consideration should be given to

a. plans for software item, integration, system test and acceptance test;

b. test cases, test data and expected results;

c. types of tests to be performed, e.g. functional tests, boundary tests, performance tests, usability tests;

d. test environment, tools and test software;

e. the criteria on which the completion of the test will be judged;

f. user documentation;
g. personnel required and associated training requirements.

5.7.3. Testing

Special attention should be paid to the following aspect of testing:

a. the test results should be recorded as defined in the relevant specification;

b. any discovered problems and their possible impacts to any parts of the software should be noted and those responsible notified so the problems can be tracked until they are solved;

c. areas impacted by any modifications should be identified and retested;

d. test adequacy and relevancy should be evaluated;

e. the hardware and software configuration should be considered and documented.

5.7.4. Validation

Before offering the product for delivery and purchaser acceptance, the supplier should validate its operation as a complete product, when possible under conditions similar to the application environment as specified in the contract.

5.7.5. Field testing

Where testing under field conditions is required, the following concerns should be addressed:

a. the features to be tested in the field environment
b. the specific responsibilities of the supplier and purchaser for carrying out and evaluating the test;

c. restoration of the user environment (after test).

5.8. Acceptance

5.8.1. General

When the supplier is ready to deliver the validated product, the purchaser should judge whether or not the product is acceptable according to previously agreed criteria and in a manner specified in the contract.

The method of handling problems detected during the acceptance procedures and their disposal should be agreed between the purchaser and supplier and should be documented.

5.8.2. Acceptance test planning

Before carrying out acceptance activities, the supplier should assist the purchaser to identify the following:

a. time schedule;

b. procedures for evaluation;

c. software/hardware environments and resources;

d. acceptance criteria.

5.9. Replication, delivery and installation

5.9.1. Replication
replication is a step which should be conducted prior to delivery. In providing for replication, consideration should be given to the following:

a. the number of copies of each software item to be delivered;

b. the type of media for each software item, including format and version in human readable form;

c. the stipulation of required documentation such as manuals and user guides;

d. copyright and licensing concerns addressed and agreed to;

e. custody of master and back up copies where applicable, including disaster recovery plans;

f. the period of obligation of the supplier to supply copies.

5.9.2. Delivery

Provisions should be made for verifying the correctness and completeness of copies of the software product delivered.

5.9.3. Installation

The roles, responsibilities and obligations of the supplier and purchaser should be clearly established, taking into account the following:

a. schedule, including out of normal working hours and weekends;

b. access to purchaser's facilities

c. availability of skilled personnel;

d. availability and access to purchaser's systems and equipment;
e. the need for validation as part of each installation should be determined contractually;

f. a formal procedure for approval of each installation upon completion.

5.10. Maintenance

5.10.1 General

When maintenance of software product is required by purchaser, after initial delivery and installation, this should be stipulated in the contract. The supplier should establish and maintain procedures for performing maintenance activities and verifying that such activities meet the specified requirements for maintenance.

Maintenance activities for software products are typically classified into the following:

a. Problem resolution;

b. Interface modification;

c. Functional expansion or performance improvement.

The items to be maintained, and the period of time for which they should be maintained, should be specified in the contract. The following are examples of such items:

a) Programs;

b) Data and their structure;

c) Specifications;
d) Documents for purchaser and/or user;

e) Documents for supplier's use;

5.10.2 Maintenance plan

All maintenance activities should be carried out and managed in accordance with a maintenance plan defined and agreed beforehand by the supplier and purchaser. The plan should include the following:

a. scope maintenance;

b. identification of the initial status of the product;

c. support organisations;

d. maintenance activities;

e. maintenance records and reports.

5.10.3 Identification of the initial status of the product

The initial status of the product to be maintained should be defined, documented and agreed to by both supplier and purchaser.

5.10.4 Support organisation

It may be necessary to establish an organisation, with representatives from both supplier and purchaser, to support the maintenance activities. Since activities in the maintenance stage cannot always be carried out on a scheduled basis, this organisation should be flexible enough to cope with the unexpected occurrence of problems. It may also be necessary to identify facilities and resources to be used for the maintenance activities.
5.10.5. Types of maintenance activities

All changes to the software (for reason of problem resolution, interface modification, functional expansion or performance improvement) carried out during maintenance should be made in accordance with the same procedures, as far as possible, used for the development of the software product. All such changes should also be documented in accordance with the procedures for document control and configuration management.

a. Problem resolution: problem resolution involves the detection analysis and correction of software nonconformities causing operational problems. When resolving problems, temporary fixes may be used to minimise downtime and permanent modifications carried out later.

b. Interface modifications: interface modifications may be required when additions or changes are made to the hardware system, or components, controlled by the software.

c. Functional expansion or performance improvement: functional expansion or performance improvement of existing functions may be required by the purchaser in the maintenance stage.

5.10.6. Maintenance records and reports

All maintenance activities should be recorded in pre-defined format and retained. Rules for the submission of maintenance reports should be established and agreed upon by the supplier and purchaser.
The maintenance records should include the following items for each software item being maintained:

a. List of requests for assistance or problem reports that have been received and the current status of each;

b. Organisation responsible for responding to requests for assistance or implementing the appropriate corrective action;

c. Priorities that have been assigned to the corrective action;

d. Results of the corrective actions;

e. Statistical data failure occurrences and maintenance activities.

The records of the maintenance activities may be utilised for evaluation and enhancement of the software product and for improvement of the quality system itself.

5.10.7 Release procedures

The supplier and purchaser should agree and document procedures for incorporating changes in a software product resulting from the need to maintain performance.

These procedures should include the following:

a. Ground rules to determine where localized "patches" may be incorporated or release of a complete updated copy of the software product is necessary;
b. Descriptions of the types (or classes) of releases depending on their frequency and / or impact on the purchaser's operations and ability to implement changes at any point in time;

c. Methods by which the purchaser will be advised of current or planned future changes;

d. Methods to confirm that changes implemented will not introduce other problems;

e. Requirements for records indicating which changes have been implemented and at what locations, for multiple products and sites.

6. Quality system-Supporting activities (not phase dependent)

6.1 Configuration Management

6.1.1 General

Configuration management provides a mechanism for identifying, controlling, and tracking the versions of each software item. In many cases earlier versions still in use must also be maintained and controlled.

The configuration management system should:

a. Identify uniquely the versions of each software items;

b. Identify the versions of each software item which together constitute a specific version of a complete product;

c. Identify the build status of software products in development or delivered and installed;
d. Control simultaneous updating of a given software item by more than one person;

e. Provide co-ordination for the updating of multiple products in one or more locations as required;

f. Identify and track all actions and changes resulting from a change request, from initiation through to release.

6.1.2. Configuration management plan

The supplier should develop and implement a configuration management plan which includes the following:

a. organisations involved in configuration management and responsibilities assigned to each of them;

b. configuration management activities to be carried out;

c. configuration management tools, techniques and methodologies to be used;

d. the stage at which items should be brought under configuration control.

6.1.3. Configuration management activities

6.1.3.1 Configuration identification and traceability

The supplier should establish and maintain procedures for identifying software items during all phases, starting from specification through development, replication and delivery. Where required by contract, these procedures may also
apply after delivery of the product. Each individual software items should have a unique identification.

Procedures should be applied to ensure that the following can be identified for each version of a software item:

a. The functional and technical specification;
b. All development tools which affect the functional and technical specifications;
c. All interfaces to other software items and to hardware;
d. All documents and computer files related to the software item.

The identification of a software item should be handled in such a way that relationship between the item and the contract requirements can be demonstrated.

For release products, there should be procedures to facilitate traceability of the software item or product.

6.1.3.2. Change control

The supplier should establish and maintain procedures to identify, document, review and authorise any changes to the software items under configuration management. All changes to software items should be carried out in accordance with these procedures.

Before a change is accepted, its validity should be confirmed and the effects on other items should be identified and examined.
Methods to notify the changes to those concerned and to show the traceability between changes and modified parts of software items should be provided.

6.1.3.3. Configuration status report

The supplier should establish and maintain procedures to record, manage and report on the status of software items, of change requests and of the implementation of approved changes.

6.2. Document control

6.2.1. General

The supplier should establish and maintain procedures to control all documents that relate to the contents of this part of ISO 9000. This covers

a. the determination of those documents which should be subject to the document control procedures;

b. the approval and issuing of procedures;

c. the change procedures including withdrawal and, as appropriate, release.

6.2.2 Types of documents

The document control procedures should be applied to relevant documents including the following:

a. procedural documents describing the quality system to be applied in the software life cycle;

b. planning documents describing the planning and progress of all activities of the supplier and his interaction with the purchaser;
c. product documents describing a particular software product, including
   - development phase inputs,
   - development phase outputs,
   - verification and validation plans and results,
   - documentation for purchaser and user,
   - maintenance documentation.

6.2.3. Document approval and issue

All documents should be reviewed and approved by authorised personnel prior to issue. Procedures should exist to ensure that

a. the pertinent issues of appropriate documents are available at appropriate locations where operations essential to the effective functioning of the quality system are performed;

b. obsolete documents are promptly removed from appropriate approval, access, distribution and archiving procedures.

6.2.4. Document changes

Changes to documents shall be reviewed and approved by the same functions/organisations that performed the original review and approval unless specifically designated otherwise. The designated organisations shall have access to pertinent background information upon which to base their review and approval.
Where practicable, the nature of change shall be identified in the document or the appropriate attachments.

A master list or equivalent document control procedure shall be established to identify the current version of documents in order to preclude the use of non applicable documents.

Documents shall be reissued after a practical number of changes have been made.

6.3. Quality records

The supplier shall establish and maintain procedures for identification, collection, indexing, filing, storage, maintenance and disposition of quality records.

Quality records shall be maintained to demonstrate achievement of the required quality and the effective operation of the quality system. Pertinent subcontractor quality records shall be an element of these data.

All quality records shall be legible and identifiable to the product involved. Quality records shall be stored and maintained in such a way that they are readily retrievable in facilities that provide a suitable environment to minimise deterioration or damage and prevent loss. Retention times of quality records shall be established and recorded. When agreed contractually, quality records shall be made available for evaluation by the purchaser or his representative for an agreed period.
6.4. Measurement

6.4.1. Product measurement

Metric should be reported and used to manage the development and delivery process and should be relevant to the particular software product.

There are currently no universally accepted measures of software quality.

However, at a minimum, some metric should be used which represent reported field failures and/or defects from the customer's view point. Selected metric should be described such that results are comparable.

The supplier of software products should collect and act on quantitative measures of the quality of these software products. These measures should be used for the following purposes:

a. To collect data and report metric values on a regular basis;

b. To identify the current level of performance on each metric;

c. To take remedial action if metric levels grow worse or exceed established target levels;

d. To establish specific improvement goals in terms of the metrics.

6.4.2. Process measurement

The supplier should have quantitative measures of the quality of the development and delivery process. These metric should reflect

a. how well the development process is being carried out in terms of milestone and in process quality objectives being met on schedule;
b. how effective the development process is at reducing the probability that faults are introduced or that any faults introduced go undetected.

6.5. Rules, practices and conventions

The supplier should provide rules, practices and conventions in order to make the quality system specified in this part of ISO 9000 effective. The supplier should review these rules, practices and conventions and revise them as required.

6.6. Tools and techniques

The supplier should use tools, facilities and techniques in order to make the quality system guidelines in this part of ISO 9000 effective for management purposes as well as for product development. The supplier should improve these tools and techniques as required.

6.7. Purchasing

6.7.1. General

The supplier should ensure that a purchased product or service conforms to specified requirements.

Purchasing documents should contain data clearly describing the product or service ordered. The supplier should review and approve purchasing documents for adequacy of specified requirements prior to release.
Note 7  a purchased product may be a software and / or hardware item intended for inclusion in the required end product or a tool intended to assist in the development of the required product.

6.7.2. Assessment of sub-contractors

The supplier shall select sub-contractors on the basis of their ability to meet sub-contract requirements, including quality requirements. The supplier shall establish and maintain records of acceptable sub-contractors. The selection of sub-contractors and the type and extent of control exercised by the supplier shall be dependent upon the type of product and where appropriate, on records of sub-contractors previously demonstrated capability and performance.

The supplier shall ensure that quality system controls are effective.

6.7.3. Validation of purchased product

The supplier is responsible for the validation of sub-contracted work. This may require the supplier to conduct design and other reviews in line with the supplier's own quality system and, if so, such requirements should be included in the sub-contract. Any requirements for acceptance testing of the sub-contracted work by the supplier should be similarly included.
Where specified in the contract, the purchaser or his representative should be afforded the right to determine at source, or upon receipt, that purchased product conforms to specified requirements. Validation by the purchaser may not absolve the supplier of the responsibility to provide acceptable product nor may it preclude subsequent rejection.

When the purchaser or his representative elects to carry out validation at the sub-contractors' premises, such validation should not be used by the supplier as evidence of effective control of quality by the sub-contractors.

6.8. Included software product

The supplier may be required to include or use software product supplied by the purchaser or by a third party. The supplier should establish and maintain procedures for validation, storage, protection and maintenance of such product. Consideration should be given to the support of such software product in any maintenance agreement related to the product to be delivered.

Purchaser supplied product that is found to be unsuitable for use should be recorded and reported to the purchaser. Validation by the supplier does not absolve the purchaser of the responsibility to provide acceptable product.

6.9. Training

The supplier should establish and maintain procedures for identifying the training needs and provide for the training of all personnel performing activities affecting quality. Personnel performing specific assigned tasks should be
qualified on the basis of appropriate education, training and /or experience, as required.

The subjects to be addressed should be determined considering the specific tools, techniques, methodologies and computer resources to be used in the development and management of the software product. It might also be required to include the training of skill and knowledge of the specific field with which the software is to deal.

Appropriate records of training/experience should be maintained.
## Cross-reference between ISO 9000-3 and ISO 9001

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</tr>
<tr>
<td>4.3 Internal quality system audits</td>
<td>4.17</td>
</tr>
<tr>
<td>4.4 Corrective action</td>
<td>4.14</td>
</tr>
<tr>
<td>5.2 Contract review</td>
<td>4.3</td>
</tr>
<tr>
<td>5.3 Purchaser’s requirements specification</td>
<td>4.3, 4.4</td>
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<tr>
<td>5.4 Development Planning</td>
<td>4.4</td>
</tr>
<tr>
<td>5.5 Quality Planning</td>
<td>4.2, 4.4</td>
</tr>
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<td>5.6 Design and implementation</td>
<td>4.4, 4.9, 4.13</td>
</tr>
<tr>
<td>5.7 Testing and validation</td>
<td>4.4, 4.10, 4.11, 4.13</td>
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<tr>
<td>5.8 Acceptance</td>
<td>4.10, 4.15</td>
</tr>
<tr>
<td>5.9 Replication, delivery and installation</td>
<td>4.10, 4.13, 4.15</td>
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<tr>
<td>5.10 Maintenance</td>
<td>4.13, 4.19</td>
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<tr>
<td>6.1 Configuration management</td>
<td>4.4, 4.5, 4.8, 4.12, 4.13</td>
</tr>
<tr>
<td>6.2 Document Control</td>
<td>4.5</td>
</tr>
<tr>
<td>6.3 Quality records</td>
<td>4.16</td>
</tr>
<tr>
<td>6.4 Measurement</td>
<td>4.20</td>
</tr>
<tr>
<td>6.5 Rules, practices and conventions</td>
<td>4.9, 4.11</td>
</tr>
<tr>
<td>6.6 Tools and techniques</td>
<td>4.9, 4.11</td>
</tr>
<tr>
<td>6.7 Purchasing</td>
<td>4.6</td>
</tr>
<tr>
<td>6.8 Included software product</td>
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<td>6.9 Training</td>
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Cross-reference between ISO 9001 and ISO 9000-3

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<td>4.2 Quality system</td>
<td>4.2, 5.5</td>
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<td>6.7</td>
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<td>5.7, 5.8, 5.9</td>
</tr>
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<td>5.8, 5.9</td>
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<td>4.18 Training</td>
<td>6.9</td>
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<td>4.19 Servicing</td>
<td>5.10</td>
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<td>4.20 Statistical techniques</td>
<td>6.4</td>
</tr>
</tbody>
</table>
4.1. Management Responsibility

ISO 9000-3 Self Assessment Tool

Seq. No. 01
Question
1. Is the quality policy, including objectives for, and commitment to quality documented?

Explanation of The Question

Company's management shows commitment to quality policy.

Save Your Choice

4.2. Quality System

ISO 9000-3 Self Assessment Tool

Seq. No. 01
Question
1. Has the supplier established, documented and maintained a quality system to ensure that product conforms to specified requirements?

Explanation of The Question

Company's system demonstrates all relevant clauses adequately.

Save Your Choice
4.1 Internal Quality System Audit

1. Are documented procedures established and maintained for planning and implementing internal quality audits?

Explanation of The Question
Auditors should verify that internal quality audits are carried out by personnel independent of the activities being audited.

Save Your Choice

4.4 Corrective Action

1. Are documented procedures established and maintained for implementing corrective and preventive action?

Explanation of The Question
Company's system demonstrates all relevant clauses adequately.

Save Your Choice
5.2. Contract Review

Question:
1. Are contract review procedures established, maintained and documented?

Explanation of The Question:
Company must ensure that all contractual requirements are adequately defined, differences are resolved, and the company capable of meeting these requirements.

Your Choice:
- First/Previous Assessment:
  - No
  - Yes

Save Your Choice:

5.3. Purchaser's Req. Specification

Question:
1. Has the supplier a complete, unambiguous set of functional requirements, include all necessary to satisfy the purchaser's need.

Explanation of The Question:

Save Your Choice:

First/Previous Assessment:
- No
- Yes

Current/Last Assessment: Yes
5.4. Development Planning

ISO 9000-3 Self Assessment Tool

Seq. No.: 01

Question:
1. Does management establish and maintain procedures for design control to ensure that the specified requirements are met?

Your Choice:

- First/Previous Assessment: No
- Current/Last Assessment: Yes

Explanation of The Question:
Company implements and maintains all design control procedures.

Save Your Choice:

Save

5.5. Quality Planning

ISO 9000-3 Self Assessment Tool

Seq. No.: 01

Question:
1. Is there a designated software project manager for each software project?

Your Choice:

- First/Previous Assessment: No
- Current/Last Assessment: Yes

Explanation of The Question:
The quality plan should specify or reference the following items:
- Quality objectives;
- Defined input and output criteria for each development phase;
- Identification of types of test, verification, and validation activities to be carried out;
- Detailed planning of test, verification and validation activities to be carried out, including schedules, resources, and approval authorities;

Save Your Choice:

Save
5.6. Design and Implementation

ISO 9000-3 Self Assessment Tool

Seq. No. 01

Question

1. Do management identify and plan production, testing, installation and servicing processes which affect quality to ensure that these processes are carried out under controlled conditions.

Explanation of The Question

Company shows processes that affect quality are adequately controlled and maintained. These processes may be qualified using processes capability studies.

Save Your Choice

5.7. Testing and Validation

ISO 9000-3 Self Assessment Tool

Seq. No. 01

Question

1. Does the quality plan or documented procedures for testing and validation define the records to be established?

Save Your Choice
1. Is there a formal procedure for testing or inspection of the completed software product before it is delivered to the customer?

5.9. Replication, Deliv. & Installation

1. Have documented procedures for the preservation of software product been established?
3.10. Maintenance

**Question:**

1. Does supplier establish and maintain procedures for performing maintenance activities and verifying that such activities meet the specified requirements for maintenance?

**Explanation of The Question:**

**Your Choice:**

- First/Previous Assessment: No
- Current/Last Assessment: Yes

Save Your Choice:

- Save

---

6.1. Configuration Management

**Question:**

1. Is there a mechanism used to manage the different versions of software tools used in the development process, e.g., Compiler, code generators, DBMS, etc?

**Explanation of The Question:**

**Your Choice:**

- First/Previous Assessment: No
- Current/Last Assessment: Yes

Save Your Choice:

- Save

---
6.2. Document Control

Question:

1. Does management establish and maintain documented procedures to control all appropriate documents and data.

Explanation of The Question:

Company shows an effective documentation system to control documents and data.

Your Choice:

First/Previous Assessment: No
Current/Last Assessment: Yes

Save Your Choice

First Record | Previous Record | Next Record | Last Record

6.3. Quality Records

Question:

1. Is there a records management function that takes care of the identification, filling, storage, maintenance and disposition of records?

Explanation of The Question:

Auditors should verify that quality records are legible and readily retrievable at the appropriate locations. Retention period of important records should also be checked. The storage and level of security in protecting the records should be consistent to the company's needs.

Your Choice:

First/Previous Assessment: No
Current/Last Assessment: Yes

Save Your Choice

First Record | Previous Record | Next Record | Last Record
6.4 Measurement

ISO 9000-3 Self Assessment Tool

Seq. No. 01

Question:
1. Are statistics collected for actual versus planned man-hours requirements?

Explanation of The Question:

Metric should be reported and used to manage the development and delivery process and should be relevant to the particular software product. The supplier of software product should collect and act on quantitative measures of the quality of software product.

6.5 Rules, Practices and Convention

ISO 9000-3 Self Assessment Tool

Seq. No. 07

Question:
1. Are naming standards used for objects such as data-sets, program modules, forms, tables?

Explanation of The Question:

Auditors should verify that rules, practices and conventions are provide by supplier in order to make the quality system effective.
Appendix B List of ISAT903's Screen

6.6 Tools, and Techniques

ISO 9000-3 Self Assessment Tool

Seq. No. 01 Question
1. Does the software development documentation describe the use of tools and techniques?

Explanation of The Question:
Auditors should verify that tools, facilities and techniques are used by supplier in order to make the quality system effective.

Save Your Choice:

Your Choice:
First/Previous Assessment: No
Current/Last Assessment: Yes

6.7. Purchasing

ISO 9000-3 Self Assessment Tool

Seq. No. 01 Question
1. Are documented procedures established and maintained to ensure that purchased product conforms to specified requirements

Explanation of The Question:
Company shows implementation of purchasing procedures.

Save Your Choice:

Your Choice:
First/Previous Assessment: No
Current/Last Assessment: Yes
Appendix B List of ISAT903's Screen

6.9. Training

1. Does management document appropriate procedures for the identification of training needs and to provide suitable training for all personnel performing activities affecting quality?

Explanation of The Question:

Auditors should verify whether the procedure for the identification of training needs is adequate to meet the needs of the company. Training records should be checked to verify that the training is being carried out by qualified instructors. Training records should normally provide sufficient information on the topic, duration, qualification of the instructor, and attendance of the participants. Records should be available to show the eligibility of the personnel.
Appendix B List of ISAT903's Screen

ISO 9000:3

Introduction

With the progress of information technology, the amount of software product has been increasing and the quality management of software products is essential. One of the means of establishing a quality management system is to provide guidance for software quality assurance.

The requirement for a generic quality system for two-party contractual situation have already been published: ISO 9001:1987, Quality System - Model for quality assurance in design / development, production, installation and servicing.

However, the process of development and maintenance of software is different that of most other type of industrial product. In such a rapidly evolving technology field it is therefore necessary to provide additional guidance for quality systems where software products are involved, taking into account the present status of this technology.

The nature of software development is such that some activities are related to particular phases of the development process, while others may apply throughout the process. These guidelines have therefore been structured to reflect these differences. This document thus does not correspond directly in format with ISO 9001 and reference indexes (annex A and annex B) are provided to give assistance when referring to that standard.

Contract between two parties for software product development may occur in many variations. In certain cases of two party contracts, these guidelines might not be applicable even if "tailored". It is therefore important to determine the adequacy of value in other situations.

ISO 9004:2

INTERNATIONAL STANDARD ISO 9004-2: 1991(E)

Quality and customer satisfaction are important subjects receiving increasing attention worldwide. This part of ISO 9004 provides a response to this awareness and seeks to encourage organizations and companies to manage the quality aspects of their service activities in a more effective manner.

This part of ISO 9004 builds on the quality management principles given in the ISO 9000 to ISO 9004 series. It recognizes that a failure to meet quality objectives can have consequences that may adversely affect the customer, the organization and society. It further recognizes that it is a management responsibility to ensure that such failures are prevented.

The creation and maintenance of quality in an organization is dependent upon a systematic approach to quality management aimed at ensuring that customer needs are understood and met. The achievement of quality necessitates a commitment to quality principles at all levels in the organization and a continual review and improvement of the established system of quality management based on feedback of the customer's perception of the service provided.

The successful application of quality management to a service provides significant opportunities for

- Improved service performance and customer satisfaction,
- Improved productivity, efficiency and cost reduction, and
- Improved market share.

To achieve this benefits, a quality system for services should also respond to the human aspects involved in the provision of a service by
International Standard ISO 9004-4

Introduction

When implementing a quality system (e.g., as described in ISO 9004), the management of an organization should ensure that the system will facilitate and promote continuous quality improvement. A constant goal of management at all levels of an organization should be to strive for customer satisfaction and continuous quality improvement.

The quality of products and services is important for competitiveness. Continuous quality improvement is necessary to enhance an organization's competitive position. It should be emphasized that innovative strategies for the introduction of new product, service, or process technologies and continuous quality improvement all need to be considered.

The motivation for quality improvement comes from the need to provide increased value and satisfaction to customers. Every member of an organization should develop a conscious awareness that each process can be performed more effectively and more efficiently with less waste and resources consumption.

Increases in effectiveness and efficiency benefit customers, the organization and its members, and society in general. Continuous quality improvement enhances the ability of an organization to compete and the opportunity for its members to contribute, grow, and excel.

Quality management and quality system elements

part 4
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<td>69. Training</td>
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Assessment Summary Report:

Score of The Quality System: 0
The Maximum Score: 140
The Quality Rating: Poor

Currently/Lastly: 140

Excellent
Welcome to ISAT903

- Introduction
- Getting Started
- Exploring ISAT903
- Glossary of Terms
- The List of ISO Institutions

Introduction to ISAT903

Software Engineering Research Laboratory, University of Malaya, Kuala Lumpur Malaysia has produced an Interactive Self Assessment Tool called ISAT903.

The software is designed to help organization to attain and maintain compliance with the International Standard Quality system for Software development and Maintenance ISO 9000 - 3.

This Manual describes the use and functionality of the Software.

System Contents

The software package itself contains:

- three 3 1/2 inch diskettes
- user manual
Appendix B List of ISAT903’s Screen

Getting Started

- System Overview

The purpose of the ISAT903 is to help your company implement the ISO 9000-3 and Total Quality Management. There are many aspects of instituting ISO 9000-3, each requiring understanding and commitment. The following outlines the general approach of this software, depending on how much your company has already progressed; this overview may help to clarify the purpose, goal and benefits of the ISAT903.

ISAT903 uses a four part to compliance. First is the Assessment Section which helps you to assess your company’s current level of compliance and highlight the areas you need to work on. Second is the Reference Section which houses various reference material related to ISO 9000-3. Third is Report Section which produces various reports for management. Fourth is the Help Section which provides guidance to understand the use of ISAT903.

- The Assessment Section

The Assessment Section is designed as a multipurpose questionnaire and information gathering process. As you answer the assessment questions, explanations are provided in order to help you frame your responses. Click on the Assessment Section located in the Menu Bar to get the Assessment Status Screen.

Exploring ISAT903

- The System bar

The system bar at the top of the screen consists of four main buttons, allowing quick access to the different section within ISAT903.

- Assessment Section

The assessment section button gives you access to the various questions within ISAT903. There are 140 questions provided by ISAT903. If it is the first time for you in assessing the system, you should fill up the answer on the column First / previous assessment. You should fill up the current / last assessment if you have been assessed before and you want to know the improvement between the period.

- Reference Section

Reference section button will allow you to select from a specific library of information.

- Report Section

Report section provides a selection of summary reports for your use. These reports will give useful feedback regarding the status of your Management Quality System.

- Help
Glossary of Terms

International Standard
ISO 8402 : 1994 (E/F/R)

Quality management and quality assurance - Vocabulary

Scope

This International Standard defines the fundamental terms relating to quality concepts. As they apply to all areas, for the preparation and use of quality related standards and for mutual understanding in international communications.

Term and Definitions

In the following definitions, the terms appearing in the alphabetical index are in semi-bold type. Within each definition, reference is made to the number where they are defined.

The numbered terms and definitions are classified under the following main headings:

- general terms;
- terms related to the quality;
- terms related to the quality system;
- terms related to tools and techniques.

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MAIDENHEAD
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Tel: +44 628 37 512
Faks: +44 628 77 33 67
1. Organisation and Resource Management
   1.1. Organisation Structure

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<td>1.1.2</td>
<td>Does the project software manager report directly to the project manager.</td>
<td>Organisation Chart/Project Management</td>
<td>Organisational and Technical Interfaces 4.4.2.2</td>
<td>Development Plan-Management 5.3.2.2.d</td>
<td>2</td>
</tr>
<tr>
<td>1.1.3</td>
<td>Does the software Quality Assurance (SQA) function have a management reporting channel separate from the software development project management?</td>
<td>Organisation Chart</td>
<td>Organisation- Verification Resources and Personnel 4.1.2.2</td>
<td>Organisation- Verification Resources and Personnel 4.1.1.2.2</td>
<td>2</td>
</tr>
<tr>
<td>1.1.4</td>
<td>Is there a designated individual or team responsible for the control of software interfaces?</td>
<td>Project Management/ Project Plan/Quality Plan</td>
<td>Design Control-Design Changes 4.4.6</td>
<td>Quality Plan Content 5.4.2.e</td>
<td>3</td>
</tr>
<tr>
<td>1.1.5</td>
<td>Is software system engineering represented on the system design team?</td>
<td>Project Management/ Project Plan</td>
<td>Design and Development Planning Activity Assignment 4.4.2.1</td>
<td>Development Plan Management 5.3.2.2.c</td>
<td>3</td>
</tr>
<tr>
<td>1.1.6</td>
<td>Is there a software configuration control function for each project that involves software development.</td>
<td>Quality Plan / Configuration Management</td>
<td>Design and Development Planning Activity assignment 4.4.2.1</td>
<td>Quality Plan Content 5.4.2.e</td>
<td>2</td>
</tr>
<tr>
<td>1.1.7</td>
<td>Is there a software engineering process group function.</td>
<td>Organisation Chart/ Management Review</td>
<td>Quality System 4.2</td>
<td>Quality System 4.2.1</td>
<td>3</td>
</tr>
</tbody>
</table>
1.2 Resources, Personnel, and Training (Continued)

<table>
<thead>
<tr>
<th>No.</th>
<th>SEI-CMM Question</th>
<th>Typical Guideline/ Document Name</th>
<th>ISO 9001 Clause</th>
<th>ISO 9000-3 Clause</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2.1</td>
<td>Does each software developer have a private computer-supported work station / terminal.</td>
<td>Project Management / Project Plan</td>
<td>Design and Development Planning Activity Assignment 4.4.2.1</td>
<td>Development Plan-Management 5.3.2.2.c</td>
<td>3</td>
</tr>
<tr>
<td>1.2.2</td>
<td>Is there a required training program for all newly appointed development managers designed to familiarise them with software project management?</td>
<td>Training Policy</td>
<td>Training 4.18</td>
<td>Training 6.9</td>
<td>2</td>
</tr>
<tr>
<td>1.2.3</td>
<td>Is there a required software engineering training program for software developer?</td>
<td>Training Policy</td>
<td>Training 4.18</td>
<td>Training 6.9</td>
<td>3</td>
</tr>
<tr>
<td>1.2.4</td>
<td>Is there a required software engineering training program for first line supervisors of software development?</td>
<td>Training Policy</td>
<td>Training 4.18</td>
<td>Training 6.9</td>
<td>3</td>
</tr>
<tr>
<td>1.2.5</td>
<td>Is a formal training program required for design and code review leaders?</td>
<td>Training Policy</td>
<td>Training 4.18</td>
<td>Training 6.9</td>
<td>3</td>
</tr>
</tbody>
</table>
### 1.3 Technology Management (Continued)

<table>
<thead>
<tr>
<th>No.</th>
<th>SEI-CMM Question</th>
<th>Typical Guideline/ Document Name</th>
<th>ISO 9001 Clause</th>
<th>ISO 9000-3 Clause</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3.1</td>
<td>Is a mechanism used for maintaining awareness of the state of the art in software engineering technology.</td>
<td>Training Policy</td>
<td>Training 4.18</td>
<td>Training 6.9</td>
<td>2</td>
</tr>
<tr>
<td>1.3.2</td>
<td>Is a mechanism used for evaluating technologies used by the organisation versus those externally available.</td>
<td>Technology Acquisition Plan/ Annual Budget/ Work Plan</td>
<td>Design and Development Planning Activity Assignment 4.4.2.1</td>
<td>-</td>
<td>3</td>
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<tr>
<td>1.3.3</td>
<td>Is a mechanism used for deciding when to insert new technology into the development process?</td>
<td>Technology Acquisition Plan/ Annual Budget/ Work Plan</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>1.3.4</td>
<td>Is a mechanism used for managing and supporting the introduction of new technology?</td>
<td>Technology Acquisition Plan/ Annual Budget/ Work Plan</td>
<td>-</td>
<td>-</td>
<td>4</td>
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<tr>
<td>1.3.5</td>
<td>Is a mechanism used for identifying and replacing obsolete technologies?</td>
<td>Technology Acquisition Plan/ Annual Budget/ Work Plan</td>
<td>-</td>
<td>-</td>
<td>5</td>
</tr>
</tbody>
</table>

### 2. Software Engineering Process and Its Management

#### 2.1 Documented Standard and Procedures

<table>
<thead>
<tr>
<th>No.</th>
<th>SEI-CMM Question</th>
<th>Typical Guideline/ Document Name</th>
<th>ISO 9001 Clause</th>
<th>ISO 9000-3 Clause</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.1</td>
<td>Does the software organisation use a standardised and documented software development process on each project?</td>
<td>SDLC</td>
<td>Process Control 4.9.1</td>
<td>Development Plan Phase 5.3.2.1</td>
<td>3</td>
</tr>
<tr>
<td>2.1.2</td>
<td>Does the standard software development process documentation describe the use of tools and techniques?</td>
<td>SDLC</td>
<td>Process Control 4.9.1</td>
<td>Rules, Practices, and Conventions/ Tools and Techniques 6.5 / 6.6</td>
<td>3</td>
</tr>
<tr>
<td>2.1.3</td>
<td>Is a formal procedure used in the management review of each software development prior to making contractual commitments?</td>
<td>Contract Review</td>
<td>Contract Review 4.3</td>
<td>Contract Review 5.1</td>
<td>2</td>
</tr>
<tr>
<td>2.1.4</td>
<td>Is a formal procedure used to assure periodic management review of the status of each software development project?</td>
<td>Progress Reports/Time Sheets/ Weekly Reports</td>
<td>Design Control 4.4</td>
<td>Development Planning- Progress Control 5.3.3</td>
<td>2</td>
</tr>
</tbody>
</table>
### 2.1 Documented Standard and Procedures (Continued)

<table>
<thead>
<tr>
<th>No.</th>
<th>SEI-CMM Question</th>
<th>Typical Guideline/Document Name</th>
<th>ISO 9001 Clause</th>
<th>ISO 9000-3 Clause</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.5</td>
<td>Is there a mechanism for assuring that software subcontractors, if any, follow a disciplined software development process?</td>
<td>Vendor Selection</td>
<td>Purchasing Assessment of Sub contractors 4.6.2</td>
<td>Purchasing Assessment of Sub contractors 6.7.2</td>
<td>2</td>
</tr>
<tr>
<td>2.1.6</td>
<td>Are standards used for the content of software development files / folders?</td>
<td>SDLC</td>
<td>Process Control 4.9</td>
<td>Design and Implementation 5.5.3</td>
<td>3</td>
</tr>
<tr>
<td>2.1.7</td>
<td>For each project, are independent audits conducted for each step of the software development process?</td>
<td>Internal Audit</td>
<td>Internal Quality Audits 4.17</td>
<td>Internal Quality System Audits 4.3</td>
<td>2</td>
</tr>
<tr>
<td>2.1.8</td>
<td>Is a mechanism used for assessing existing designs and code for reuse in new application</td>
<td>Reuse/Design</td>
<td>Design Control 4.4</td>
<td>Development Methods and Tools 5.3.2.3</td>
<td>3</td>
</tr>
<tr>
<td>2.1.9</td>
<td>Are coding standards applied to each software development project.</td>
<td>Coding Standard</td>
<td>Process Control 4.9.1</td>
<td>Rules, Practices, and Conventions 6.5</td>
<td>2</td>
</tr>
<tr>
<td>2.1.10</td>
<td>Are standards applied to the preparation of unit test cases?</td>
<td>Unit Testing</td>
<td>Process Control 4.9.1</td>
<td>Rules, Practices, and Conventions 6.5</td>
<td>3</td>
</tr>
<tr>
<td>2.1.11</td>
<td>Are code maintainability standard applied?</td>
<td>Unit Testing / Maintainability</td>
<td>Process Control 4.9.1</td>
<td>Rules, Practices, and Conventions 6.5</td>
<td>3</td>
</tr>
<tr>
<td>2.1.12</td>
<td>Are internal design review standards applied?</td>
<td>Design Review</td>
<td>Design Verification 4.4.5</td>
<td>Rules, Practices, and Conventions 6.5</td>
<td>4</td>
</tr>
<tr>
<td>2.1.13</td>
<td>Are code review standards applied?</td>
<td>Code Review</td>
<td>Process Control 4.9.1</td>
<td>Rules, Practices, and Conventions 6.5</td>
<td>4</td>
</tr>
<tr>
<td>2.1.14</td>
<td>Is a formal procedure used to make estimate of software size?</td>
<td>Estimation Procedure</td>
<td>Process Control 4.9.1</td>
<td>Rules, Practices, and Conventions 6.5</td>
<td>2</td>
</tr>
</tbody>
</table>
### 2.1 Documented Standard and Procedures (Continued)

<table>
<thead>
<tr>
<th>No.</th>
<th>SEI-CMM Question</th>
<th>Typical Guideline/Document Name</th>
<th>ISO 9001 Clause</th>
<th>ISO 9000-3 Clause</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.15</td>
<td>Is a formal procedure used to produce software development schedules?</td>
<td>Project/Planning/Estimation Procedure</td>
<td>Process Control 4.9.1</td>
<td>Rules, Practices, and Conventions 6.5</td>
<td>2</td>
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<tr>
<td>2.1.16</td>
<td>Are a formal procedures applied to estimating software development cost?</td>
<td>Contract review/Estimation Procedure</td>
<td>Contract Review 4.3</td>
<td>Contract Review-General 5.1.1</td>
<td>2</td>
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<tr>
<td>2.1.17</td>
<td>Is a mechanism used for ensuring that the software design teams understand each software requirement?</td>
<td>Requirements Review/SDLC</td>
<td>Organisational and Technical Interfaces 4.4.2.2</td>
<td>Purchaser's Requirement Specification 5.2</td>
<td>2</td>
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<tr>
<td>2.1.18</td>
<td>Are man machine interface standards applied to each appropriate software development project?</td>
<td>User Interface Guideline</td>
<td>Process Control 4.9.1</td>
<td>Rules, Practices, and Conventions 6.5</td>
<td>3</td>
</tr>
</tbody>
</table>

### 2.2 Process Metrics

<table>
<thead>
<tr>
<th>No.</th>
<th>SEI-CMM Question</th>
<th>Typical Guideline/Document Name</th>
<th>ISO 9001 Clause</th>
<th>ISO 9000-3 Clause</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.1</td>
<td>Are software staffing profiles maintained of actual staffing versus planned staffing?</td>
<td>Software Metrics</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4.2</td>
<td>2</td>
</tr>
<tr>
<td>2.2.2</td>
<td>Are profiles of software size maintained for each software configuration item over time?</td>
<td>Software Metrics</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4.2</td>
<td>2</td>
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<tr>
<td>2.2.3</td>
<td>Are statistics on software design errors gathered?</td>
<td>Software Metrics</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4.2</td>
<td>3</td>
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<tr>
<td>2.2.4</td>
<td>Are statistics on software code and test errors gathered?</td>
<td>Software Metrics</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4.2</td>
<td>2</td>
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<tr>
<td>2.2.5</td>
<td>Are design error projected and compared to actual?</td>
<td>Software Metrics</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4.2</td>
<td>4</td>
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<td>2.2.6</td>
<td>Are code and test errors projected and compared to actual?</td>
<td>Software Metrics</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4.2</td>
<td>4</td>
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<tr>
<td>2.2.7</td>
<td>Are profiles maintained of actual versus planned software units designed over time?</td>
<td>Software Metrics</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4.2</td>
<td>2</td>
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</table>
## 2.2 Process Metrics (Continued)

<table>
<thead>
<tr>
<th>No.</th>
<th>SEI-CMM Question</th>
<th>Typical Guideline/Document Name</th>
<th>ISO 9001 Clause</th>
<th>ISO 9000-3 Clause</th>
<th>Level</th>
</tr>
</thead>
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<tr>
<td>2.2.8</td>
<td>Are profiles maintained of actual versus planned software units completing unit testing over time?</td>
<td>Software Metrics</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4.2</td>
<td>2</td>
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<td>2.2.9</td>
<td>Are profiles maintained of actual versus planned software units integrated unit testing over time?</td>
<td>Software Metrics</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4.2</td>
<td>2</td>
</tr>
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<td>2.2.10</td>
<td>Are target computer memory utilisation estimates and actual tracked?</td>
<td>Software Metrics</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4.2</td>
<td>2</td>
</tr>
<tr>
<td>2.2.11</td>
<td>Are target computer throughput utilisation estimates and actual tracked?</td>
<td>Software Metrics</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4.2</td>
<td>2</td>
</tr>
<tr>
<td>2.2.12</td>
<td>Are target computer I/O channel utilisation tracked?</td>
<td>Software Metrics</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4.2</td>
<td>2</td>
</tr>
<tr>
<td>2.2.13</td>
<td>Are design and code review coverage measured and recorded?</td>
<td>Software Metrics</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4.2</td>
<td>4</td>
</tr>
<tr>
<td>2.2.14</td>
<td>Is test coverage measured and recorded for each phase of functional testing?</td>
<td>Software Metrics</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4.2</td>
<td>4</td>
</tr>
<tr>
<td>2.2.15</td>
<td>Are the action items resulting from design reviews tracked to closure?</td>
<td>Defect tracking</td>
<td>Corrective Action 4.14</td>
<td>Design and Implementation reviews 5.5.4</td>
<td>3</td>
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<tr>
<td>2.2.16</td>
<td>Are software trouble reports resulting from testing tracked to closure?</td>
<td>Defect tracking</td>
<td>Corrective Action 4.14</td>
<td>Testing 5.6.3.b</td>
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<td>Are the action items resulting from code reviews tracked to closure?</td>
<td>Defect tracking</td>
<td>Corrective Action 4.14</td>
<td>Design and Implementation Reviews 5.5.4</td>
<td>3</td>
</tr>
<tr>
<td>2.2.18</td>
<td>Is test progress tracked by deliverable software component and compared to the plan?</td>
<td>Test Planning</td>
<td>Corrective Action 4.14</td>
<td>Quality Plan Content 5.4.2</td>
<td>2</td>
</tr>
<tr>
<td>2.2.19</td>
<td>Are profiles maintained of software build/release content versus time?</td>
<td>Test Planning</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4.2</td>
<td>2</td>
</tr>
</tbody>
</table>
2.3 Data Management and Analysis (Continued)

<table>
<thead>
<tr>
<th>No.</th>
<th>SEI-CMM Question</th>
<th>Typical Guideline/Document Name</th>
<th>ISO 9001 Clause</th>
<th>ISO 9000-3 Clause</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3.1</td>
<td>Has a managed and controlled process data base been established for process metrics data across all project?</td>
<td>Software Metrics</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4.2</td>
<td>4</td>
</tr>
<tr>
<td>2.3.2</td>
<td>Is the review data gathered during design reviews analysed?</td>
<td>Software Metrics</td>
<td>Corrective Action 4.14</td>
<td>Corrective Action 4.4</td>
<td>4</td>
</tr>
<tr>
<td>2.3.3</td>
<td>Is the error data from code reviews and tests analysed to determine the likely distribution and characteristics of the error remaining in the product?</td>
<td>Software Metrics</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4</td>
<td>4</td>
</tr>
<tr>
<td>2.3.4</td>
<td>Are analyses of error conducted to determine their process related causes?</td>
<td>Error Analysis</td>
<td>Corrective Action 4.14</td>
<td>Corrective Action 4.4</td>
<td>4</td>
</tr>
<tr>
<td>2.3.5</td>
<td>Is a mechanism used for error cause analysis?</td>
<td>Error Analysis</td>
<td>Corrective Action 4.14</td>
<td>Corrective Action 4.4</td>
<td>5</td>
</tr>
<tr>
<td>2.3.6</td>
<td>Are the error causes reviewed to determine the process changes required to prevent them?</td>
<td>Error Analysis</td>
<td>Corrective Action 4.14</td>
<td>Corrective Action 4.4</td>
<td>5</td>
</tr>
<tr>
<td>2.3.7</td>
<td>Is a mechanism used for initiating error prevention actions?</td>
<td>Error Prevention</td>
<td>Corrective Action 4.14</td>
<td>Corrective Action 4.4</td>
<td>5</td>
</tr>
<tr>
<td>2.3.8</td>
<td>Is review efficiency analysed for each project?</td>
<td>Review Efficiency</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4</td>
<td>4</td>
</tr>
<tr>
<td>2.3.9</td>
<td>Is software productivity analyzed for major process steps?</td>
<td>Software Productivity</td>
<td>Statistical Techniques 4.20</td>
<td>Process Measurement 6.4</td>
<td>4</td>
</tr>
<tr>
<td>No.</td>
<td>SEI-CMM Question</td>
<td>Typical Guideline/Document Name</td>
<td>ISO 9001 Clause</td>
<td>ISO 9000-3 Clause</td>
<td>Level</td>
</tr>
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<td>----------------------------</td>
<td>-------</td>
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<tr>
<td>2.4.1</td>
<td>Does senior management have a mechanism for the regular review of the status of software development projects?</td>
<td>Quarterly / Monthly Management Review</td>
<td>Design Control</td>
<td>Development Planning Progress Control 5.3.3</td>
<td>2</td>
</tr>
<tr>
<td>2.4.2</td>
<td>Is a mechanism used for periodically assessing the software engineering process and implementing indicated improvements?</td>
<td>Quality Assurance / Internal Audit</td>
<td>Quality System 4.2</td>
<td>Quality System 4.2</td>
<td>4</td>
</tr>
<tr>
<td>2.4.3</td>
<td>Is a mechanism used for identifying and resolving system engineering issues that affect software?</td>
<td>Requirements / Design Review/System Engineering Coordination Group</td>
<td>Organisational and Technical Interfaces 4.4.2.2</td>
<td>Development Plan-Management 5.3.2.2.d</td>
<td>3</td>
</tr>
<tr>
<td>2.4.4</td>
<td>Is a mechanism used for independently calling integration and test issues to the attention of the project manager?</td>
<td>Test Planning / Integration and Test Review</td>
<td>Organisation Responsibility and Authority 4.1.2.1</td>
<td>Testing 5.6.3.b</td>
<td>3</td>
</tr>
<tr>
<td>2.4.5</td>
<td>Is a mechanism used for regular technical interchanges with the customer?</td>
<td>Customer Interaction Group/ User Group</td>
<td>-</td>
<td>Joint Reviews 4.1.3</td>
<td>2</td>
</tr>
<tr>
<td>2.4.6</td>
<td>Is a mechanism used for ensuring compliance with the software engineering standards?</td>
<td>Final inspection / Technical Reviews</td>
<td>Internal Quality Audits 4.17</td>
<td>Internal Quality System Audits 4.3</td>
<td>3</td>
</tr>
<tr>
<td>2.4.7</td>
<td>Do software development first line managers sign off on their schedules and cost estimates?</td>
<td>Project Planning</td>
<td>Design and Development Planning Activity Assignment 4.4.2.1</td>
<td>Development Plan Management 5.3.2.2</td>
<td>2</td>
</tr>
<tr>
<td>2.4.8</td>
<td>Is a mechanism used for ensuring trace-ability between the software requirements and top level design?</td>
<td>Configuration Management</td>
<td>Product Identification and Trace-ability 4.8</td>
<td>Configuration Identification and Trace-ability 6.1.3.1</td>
<td>3</td>
</tr>
<tr>
<td>2.4.9</td>
<td>Is a mechanism used for controlling changes to the software requirements?</td>
<td>Change Control / Configuration Management</td>
<td>Document Control 4.5</td>
<td>Mutual Co-operation 5.2.2</td>
<td>2</td>
</tr>
<tr>
<td>2.4.10</td>
<td>Is there a formal management process for determining if the prototyping of software functions is an appropriate part of detailed designs?</td>
<td>Project Plan / Design Standards</td>
<td>Design Verification 4.4.5</td>
<td>Development Plan 5.3.2</td>
<td>4</td>
</tr>
</tbody>
</table>
### 2.5 Process Control (Continued)

<table>
<thead>
<tr>
<th>No.</th>
<th>SEI-CMM Question</th>
<th>Typical Guideline/Document Name</th>
<th>ISO 9001 Clause</th>
<th>ISO 9000-3 Clause</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4.11</td>
<td>Is a mechanism used for ensuring trace-ability between the software top level and detailed designs?</td>
<td>Configuration Management</td>
<td>Product Identification and Trace-ability 4.8</td>
<td>Configuration Identification and Trace-ability 6.1.3.1</td>
<td>3</td>
</tr>
<tr>
<td>2.4.12</td>
<td>Are internal software design reviews conducted.</td>
<td>Design Review</td>
<td>Design Control 4.4</td>
<td>Design and Implementation Reviews 5.5.4</td>
<td>3</td>
</tr>
<tr>
<td>2.4.13</td>
<td>Is a mechanism used for controlling changes to the software design?</td>
<td>Change Control / Design Control</td>
<td>Design Changes 4.4.6</td>
<td>Change Control 6.1.3.2</td>
<td>3</td>
</tr>
<tr>
<td>2.4.14</td>
<td>Is a mechanism used for ensuring trace-ability between the software detailed design and the code?</td>
<td>Coding Standard</td>
<td>Product Identification and Trace-ability 4.8</td>
<td>Configuration Identification and Trace-ability 6.1.3.1</td>
<td>3</td>
</tr>
<tr>
<td>2.4.15</td>
<td>Are formal records maintained of unit(module) development progress?</td>
<td>Unit Development Folders</td>
<td>Process Control 4.9</td>
<td>Rules, Practices and Conventions 6.5</td>
<td>3</td>
</tr>
<tr>
<td>2.4.16</td>
<td>Are software code reviews conducted?</td>
<td>Project Plan</td>
<td>In Process Inspection and Testing 4.10.2</td>
<td>Design and Implementation Reviews 5.5.4</td>
<td>3</td>
</tr>
<tr>
<td>2.4.17</td>
<td>Is a mechanism used for controlling changes to the code?</td>
<td>Configuration management / Change Control</td>
<td>Corrective Action 4.14</td>
<td>Change Control 6.1.3.2</td>
<td>2</td>
</tr>
<tr>
<td>2.4.18</td>
<td>Is a mechanism used for configuration management of software tools?</td>
<td>Configuration management / Change Control</td>
<td>Process Control 4.9.1.c</td>
<td>Configuration Identification and Trace-ability 6.1.3.1</td>
<td>3</td>
</tr>
<tr>
<td>2.4.19</td>
<td>Is a mechanism used for verifying that the samples examined by software quality assurance are truly representative of work performed?</td>
<td>Quality Assurance / Internal Audit</td>
<td>Internal Quality Audits 4.17</td>
<td>Internal Quality System Audits 4.3</td>
<td>3</td>
</tr>
<tr>
<td>2.4.20</td>
<td>Is there a mechanism for assuring that regression testing is routinely performed?</td>
<td>Test Planning</td>
<td>Final Inspection and Testing 4.10.3</td>
<td>Rules, Practices, and Conventions 6.5</td>
<td>2</td>
</tr>
<tr>
<td>2.4.21</td>
<td>Is there a mechanism for assuring the adequacy of regression testing?</td>
<td>Test Planning / Regression Testing</td>
<td>Final inspection and Testing 4.10.3</td>
<td>Rules, Practices, and Conventions 6.5</td>
<td>3</td>
</tr>
<tr>
<td>2.4.22</td>
<td>Are formal test case reviews conducted?</td>
<td>Test Planning</td>
<td>Inspection, Measurement, and Test Equipment 4.11</td>
<td>Test Planning 5.6.2</td>
<td>3</td>
</tr>
</tbody>
</table>
ISAT903

User
Manual

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1. Introduction

Introduction to ISAT903

Software Engineering Research Laboratory, Faculty of Computer Science University of Malaya, Kuala Lumpur, has produced a Software tool called ISAT903. The software is designed to help software organization to attain and maintain compliance with the International Standard ISO 9000-3. This manual describes the use and functionality of the software.

This manual assumes that the reader is familiar with ISO 9000-3. It is not the purpose of this manual to explain the ISO 9000-3 standard itself. Only the use of ISAT903 software tool is explained.

System Contents

The software package itself contains:

- Three 3 1/2 Inch diskettes
- User manual

The manual contains the following chapters:

Chapter 1, Introduction, gives a general overview of the entire manual.

Chapter 2, Getting Started provides you with an overview of the system outlining how ISAT903 can help you to comply with standard. This chapter also outlines the system requirements, how to install and start the software, etc.

Chapter 3, exploring ISAT903, provides a quick summary of how to move within the system.
2. Getting Started

System Overview

The purpose of the ISAT903 is to help your company implement the ISO 9000-3 and Total Quality Management. There are many aspects of instituting ISO 9000-3, each requiring understanding and commitment. The following outlines the general approach of this software depending on how much your company has already progressed, this overview may help to clarify the purpose, goal and benefits of the ISAT903.

ISAT903 uses a four sections of menu. First is the Assessment Section which helps you to assess your company's current level of compliance and highlight the areas you need to work on. Second is the Reference Section which houses various reference related material to ISO 9000-3. Third is Report Section which produces various reports for management. Fourth is the Help Section which provides guidance to understand the use of ISAT903.

The Assessment Section

The Assessment Section is designed as a multipurpose questionnaire and information gathering process. As you answer the assessment questions, explanations are provided in order to help you to frame your responses. Click on the Assessment Section located in the Menu Bar to get the Assessment Status Screen. The major elements of the Assessment Status Screen are:
A question is answered by selecting one of the responses provided besides the question. For the first assessment the user just click on the answer below the label the first / previous Assessment. After one period of Assessment, in order to know the progress of improvement during the period, the user just click on the Current / last assessment. To move to the next question, click the Next button on the navigator. You may use the previous button to return to the previous question. You may also use the first button and the last button to return to the first question and the last question.

The Reference Section

The Reference Section button will allow you to select a reference.

The Report Section

The Report Section will allow you to produce three reports. They include the Management Report, Management Compliance Summary, and The Assessment Result Summary.

The Help

The Help Section button provides access to on line assistance for you. It is designed for quick look-ups of concepts.

Exit

The Exit button will allow you to close the program and exit from the system.
Appendix D

System Requirements

ISAT903 runs under Windows95, and requires approximately 5 megabytes of space on your hard drive.

We recommended the following as a minimum system requirements to run the program:

- 486 processor
- 66 Megahertz clock speed
- 8 Megabytes of RAM
- 16-color VGA (SVGA preferred)
- Laser or dot matrix printer

Installing Your Program

To install ISAT903:

1. Place disk 1 (ISAT903 setup) into the floppy drive.
2. Double click My computer, select Setup and double click Setup.exe
3. When the dialog box appears, click Next button or press Enter.

Set up will ask you to type your name and the company's name into the areas provided.

Click Next button to continue.

When it is prompted, choose the destination location where ISAT903 will be installed. You can accept Setup's choice (Default C:\ISAT903DIR).

Setup will then prompt you to type a new folder name or select an existing folder to which the program icons will be added. You can type ISAT903.
When Setup has finished copying files, it will create the program manager file and icon.

Setup will prompt you for the next disk once the files have been copied.

You now successfully completed the installation of ISAT903 and will be taken back to the start screen or program manager.

**Opening ISAT903**

To open ISAT903, simply click **Start Menu, Program** and select ISAT903 icon or by **double Click ISAT903 icon** in ISAT903DIR's directory.

---

### 3. Exploring ISAT903

- **The System bar**

  The system bar at the top of the screen consists of four main buttons, allowing quick access to the different sections within ISAT903.

- **Assessment Section**

  The assessment section button gives you access to the various questions within ISAT903. There are 140 questions provided by ISAT903. If it is the first time for you in assessing the system, you should fill up the answer on the first column / previous assessment. You should fill up the current/last assessment if you have been assessed before and you want to know the improvement between the two period.
- Reference Section

Reference section button will allow you to select a reference.

- Report Section

Report section provides a selection of summary reports for your use. These reports will give useful feedback regarding the status of your Management Quality System.

- Help

The Help section button provides access to online assistance for you. It is designed for quick look up of concepts and terms. A hypertext approach allows great flexibility in accessing the information available.

- Exit

The Exit button allows you to exit the entire system.
To: The Director
«Company»
«Address1»
«Address2»
«City» «PostalCode»
«State»,
«Country»

25th June, 1999

Dear Sir / Madam

Let me introduce myself as a postgraduate student at University of Malaya in Kuala Lumpur, Malaysia.


In line with the above, herewith I enclose:

- 3 (three) diskettes of setup ISAT903’s tool. These are free for you, please install and operate it, and give us your evaluations into Customer Evaluation;
- 1 (one) set of Customer Evaluation to be filled up by person or department in your company of who/which is responsible for software development and maintenance.

Hopefully, I could have the answer of this Customer Evaluation questionnaire within 1-2 weeks.

With best wishes that I am waiting forward to having your kind response at your convenience.

Thank you for kind attention and cooperation.

Yours Sincerely,

MS. Zarina Mohd Kasirun
Supervisor / Senior Lecturer

Burhani Amirudin
Post Graduate Student
Appendix F Customer Evaluation

CUSTOMER EVALUATION ON ISAT903
(Interactive Self Assessment Tool by ISO 9000-3)

It is possible to feel that there are too many questions asked in this self assessment. There are consequences in order to achieve a good evaluation. A feedback is important to us in improving this self assessment tool if you have no objection in answering the questions below. Your answers will be of useful for evaluation and improvement of this tool. Hopefully, it will come to be profitable contribution to Software Industry, especially the Software Quality System.

How is the level of ease in setting up this tool?

a. Very easy
b. Easy
c. Difficult
d. Other reasons:

How is the level of ease in operating this tool?

a. Very easy
b. Easy
c. Difficult
d. Other reasons:

Extent to which the questionnaires can be understood?

a. Easy to understand
b. Difficult to understand, because:
   - We have not implemented the software engineering
   - We have not implemented the ISO 9000-3
   - We have not implemented the TQM
   - We have not implemented the combination of the those things.

By selecting answer with "Yes", "No" or "Unknown", how is the level of ease in answering the questions on this self assessment tool?

a. Very easy
b. Easy
c. Difficult
d. Other reasons

What do you think about the presentation of menu?

a. Very attractive
b. Attractive
c. Less attractive
d. Other reasons:

How far is the role of Help menu on this self assessment tool in giving the sources of information?

a. Very good
b. Good
c. Poor
d. Other reasons:

How far is the role of Reference Section on this self assessment tool in giving the sources of references?

a. Very good
b. Good
c. Poor
d. Other reasons:
8. After filling up suitable answer, then the user should know the rating or the score of current software quality system directly, do you think this response:
   a. Highly interactive
   b. Interactive
   c. Less interactive
   d. Other reasons:

9. On the report produced by this tool, How is the level of clarity of the strength and the weakness of the current software quality system?
   a. Very clear
   b. Clear
   c. Less clear
   d. Other reasons:

10. When you have already known about the strength and the weakness of the software quality system, How is the level of clarity about the steps in implementing the improvement actions that should be done for increasing the current software quality system?
    a. Very clear
    b. Clear
    c. Less clear
    d. Other reasons:

Overall: Good product!
It possible to feel that there are to many questions asked in this self assessment. There are consequences in order to achieve a good evaluation. A feedback is important to us in improving this self assessment tool if you have no objection in answering the questions below. Your answers will be of useful for evaluation and improvement of this tool. Hopefully, it will come to be profitable contribution to Software Industry, especially in the Software Quality System.

1. How is the level of ease in setting up this tool?
   a. Very easy
   b. Easy
   c. Difficult
   d. Other reasons:

2. How is the level of ease in operating this tool?
   a. Very easy
   b. Easy
   c. Difficult
   d. Other reasons:

3. Extent to which the questionnaires can be understood?
   a. Easy to understand
   b. Difficult to understand, because:
      • We have not implemented the software engineering
      • We have not implemented the ISO 9000-3
      • We have not implemented the TQM
      • We have not implemented the combination of the those things.

4. By selecting answer with "Yes", "No" or "Unknown", how is the level of ease in answering the questions on this self assessment tool?
   a. Very easy
   b. Easy
   c. Difficult
   d. Other reasons

5. What do you think about the presentation of menu?
   a. Very attractive
   b. Attractive
   c. Less attractive
   d. Other reasons:

6. How far is the role of Help menu on this self assessment tool in giving the sources of information?
   a. Very good
   b. Good
   c. Poor
   d. Other reasons:

7. How far is the role of Reference Section on this self assessment tool in giving the sources of references?
   a. Very good
   b. Good
   c. Poor
   d. Other reasons:
8. After filling up suitable answer, then the user should know the rating or the score of current software quality system directly, do you think this response:
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   c. Less interactive
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    a. Very clear
    b. Clear
    c. Less clear
    d. Other reasons:
CUSTOMER EVALUATION ON ISAT903
(Interactive Self Assessment Tool By ISO 9000-3)

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1. How is the level of ease in setting up this tool?
   a. Very easy  
   b. Easy
   c. Difficult
   d. Other reasons:

2. How is the level of ease in operating this tool?
   a. Very ease
   b. Easy
   c. Difficult
   d. Other reasons: problem with the scrolling bar (does not appear)

3. Extent to which the questionnaires can be understood?
   a. Very easy to understand
   b. Easy to understand
   c. Difficult to understand, because:
      - We have not implemented the software engineering
      - We have not implemented the ISO 9000-3
      - We have not implemented the TQM
      - We have not implemented the combination of the those things.
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   b. Clear
   c. Less clear
   d. Other reasons:

10. When you have already known about the strength and the weakness of the software quality system, How is the level of clarity about the steps in implementing the improvement actions that should be done for increasing the current software quality system?
    a. Very clear
    b. Clear
    c. Less clear
    d. Other reasons: Clear, but at least some options/suggestions must be offered.

Bahagian Sistem Maklumat,
Kementerian Pendidikan Malaysia;
Peras 3, Block J,
Pusat Bandar Damansara,
50604 KUALA LUMPUR,

Company's Name: ____________________________

Date: 6/7/99
CUSTOMER EVALUATION ON ISAT\textsuperscript{903}
(Interactive Self Assessment Tool By ISO 9000-3)

It is possible to feel that there are too many questions asked in this self assessment. There are consequences in order to achieve a good evaluation. A feedback is important to us in improving this self assessment tool if you have no objection in answering the questions below. Your answers will be of useful for evaluation and improvement of this tool. Hopefully, it will come to be profitable contribution to Software Organization Industry, especially in the Software Quality System.

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   b) Easy
   c) Difficult
   d) Other reasons:

2. How is the level of ease in operating this tool?
   a) Very easy
   b) Easy
   c) Difficult
   d) Other reasons:

3. Extent to which the questionnaires can be understood?
   a) Very easy to understand
   b) Easy to understand
   c) Difficult to understand, because:
      - We have not implemented the software engineering
      - We have not implemented the ISO 9000-3
      - We have not implemented the TQM
      - We have not implemented the combination of the above things.
   d) Other reasons:

4. By selecting answer with "Yes", "No" or "Unknown", how is the level of ease in answering the questions on this self assessment tool?
   a) Very easy
   b) Easy
   c) Difficult
   d) Other reasons

5. What do you think about the presentation of menu?
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6. How far is the role of Help menu on this self assessment tool in giving the sources of information?
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   b. Clear
c. Less clear
d. Other reasons:

10. When you have already known about the strength and the weakness of the software quality system, How is the level of clarity about the steps in implementing the improvement actions that should be done for increasing the current software quality system?
a. Very clear
   b. Clear
c. Less clear
d. Other reasons:

Company's Name: PT Semen Padang

Date: 08/05/1999