Software Engineering

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ISO 9000

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Outline

- Overview
- Structure
- Standards
- Registration
- Audits

Reference:

This is extra material abstracted from *ISO 9000 for Software Developers* by Charles H. Schmauch, ASQC Quality Press

Overview

History

EEC adopts quality management as a key strategic element to improve competetiveness.
ISO 9000 chosen as the model for quality assurance standards.

Premise

If the production and management system is right, the product or service that it produces will also be right.

Basic Approach

Say what you do; do what you say; demonstrate what you have done.

Model

The ISO 9000 standards specify *what*, at a minimum, must be accomplished in quality contol but they do not specify *how*.

Goal

Have written procedures that define how each significant activity is conducted in sufficient detail to allow you to continue making your product or providing your service at the same level of quality if all your personnel were replaced.

Registration and Audit

Third-party assessment via audit is used to confirm that your quality conforms to the model. You obtain registration after passing an audit. You keep registration by passing regular re-audit. Registration is granted to an organization, not to its products.

Structure/Documents

ISO 9000

Provides general descriptions and guidance on which standards group to choose for your quality system.
(ISO 9000-3: discusses software)

ISO 9001

Model for quality assurance in design, development, production, installation, and servicing
(The grand master model for quality systems that follow a product from initial design to final delivery; most appropriate for contract or end-product software development companies.)

ISO 9002

Model for quality assurance in production and installation
(The model for companies that manufacture or implement what others design or install, or that install and service products that others produce; most appropriate for software subcontractors or system/application service companies)

ISO 9003

Model for quality assurance in final inspection and test
(The model for companies that are purely test organizations; more common in the manufacturing sector, but a possible future niche for a specialty industry in the software industry)

ISO 9004

Guidance on the interpretation of ISO 9001 – ISO 9003

Why Be Interested?

- Provides guidance for establishing quality control practices
- Encourages consistency in practices
- Improves competetiveness
- Demanded by certain markets and contracts
- Corporate image
- Customers may demand it

Manufacturing

The models were set up with goods manufacturing and service provision in mind. The models have to be reinterpreted somewhat for the software industry.

Underlying Essence

Quality system must be

- Documented
- Controlled
- Auditable
- Monitored
- Improving
- Effective

20 Standard Elements

1. Management responsibility
2. Establised quality system
3. Contract review
4. Design control
5. Document control
6. Purchasing
7. Purchaser-supplied products
8. Product identification and traceability
9. Process control
10. Inspection and testing
11. Inspection, measuring, and test equipment
12. Inspection and test status
13. Control of nonconforming product
14. Corrective action
15. Handling, storage, packaging, and delivery
16. Quality records
17. Internal quality audits
18. Training
19. Servicing
20. Statistical techniques

Comments

Management responsibility

Quality policy must clearly define responsibilities, authority, and interrelations. Qualified personnel and resources must be provided. A manager must be responsible. Quality system must be periodically reviewed for effectiveness.

Quality system

Quality system must be established and conform to ISO 9000 models. A quality-system manual should be established.

Contract review

Procedures for ensuring that what is expected is adequately defined, verifiable, and that the capability exists to satisfy requirements.

Design control

Procedures for controlling and verifying design, planning each stage of development activity. Design reviews. Design verification by assigned and qualified personnel. Defined procedures for controlling design changes.

Document control

Defined procedures to ensure that the right level of information is available to the right people at the right time. Procedures to ensure that all documents are current. Master document list. Procedures for document control.

Comments

Purchasing

Components obtained elsewhere, used in the product or in its production, meet specified requirements

Purchaser-supplied products

Components obtained elsewhere must be correctly managed and used item[Product identification and traceability] Procedures for identifying and tracing the product at all stages of production, delivery, and installation.

Process control

Production must be carried out under controlled conditions (what is "production" for the software industry?)

Inspection and testing

Procedures for all levels of inspection and testing. Maintenance of test records. Established procedures for correcting faults in the *product*.

Test equipment

CASE tools must be of appropriate quality

Inspection and test status

Ability to identify and test the status of the product at all stages of the development process

Control of nonconforming products

Procedures to cover what happens when defects are discovered, both before and after delivery

Comments

Corrective action
Procedures for investigating and correcting faults in the quality assurance *process*.

Handling, storage, packaging, delivery
Controlled delivery to customer

Quality records
Identify and keep records to demonstrate achievement of product quality and effictive operation of quality system

Internal quality audits
Plan and carry out regular quality audits. Qualified individuals must be responsible.

Training
Identify the quality training needs of personnel. Provide the required training. Keep records of training.

Servicing
Procedures must be in place for servicing the product when servicing is part of the delivery.

Statistical techniques
All statistical techniques used must be correct. Metrics and measurements used to determine quality must be shown to be effective. Predictive algorithms and methods of collecting data must be valid and effective.

Summary

- Established responsibility and authority
- Assigned, competent individuals
- Adequate resources
- Complete records
- Clear and correct communications
- Documented procedures

Basic Elements

- Quality policy
- Quality manager
- Quality manual
- Quality records
- Library control system
- Documented processes and procedures
- Project plan
- Build plan
- Test plan
- Service and maintenance plan
- Training and training records
- Internal quality system audits

Auditor's Techniques

"Skilled auditors have subtle but effective ways to get the information they want using open-ended sequences of questions."

Is that procedure documented? May I see it?

Who provides that input? How do you validate it?

Who approved that? Can you show the evidence?

How do you measure that? Who defines the measurements? Who approves that? Can you show the evidence?

What document is that? Is it the latests version? How do you know? Who is responsible for making sure? How are previous versions removed?

By the way, do you keep records on this? For how long? May I see them?

Do you evaluate the organization that will do this work for you? What are the criteria of acceptance? Is any of this documented? May I see them?

What do you do in this department? What process do you follow to do that? May I see the process description documents? Who has oversight?

If there are questions about these procedures, whom do you ask? Let me speak to that person next.

etc. etc.