Quality Management of Software and Systems

DIN ISO 9000-Standards

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DIN ISO 9000-Standards

- Standards for quality assurance
  - ISO 9000: general goals of a QS-system
  - ISO 9001: criteria for the QS-system of a manufacturing enterprise with development/construction, assembly and marketing service
  - ISO 9002: criteria for the QS-system in production and assembly (no development, no marketing)
  - ISO 9003: criteria for the QS-system in the final assembly
  - ISO 9004: quality management and elements of a QS-system – manual/guide
- None of these standards is designed explicitly for the application to software or software-based systems
  - ISO 9000-3: manual/guide for the application of ISO 9001 to development, delivery and maintenance of software

Motivation

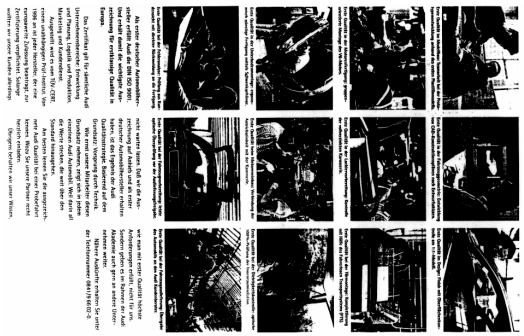
- Proof of qualification for the generation of quality-compatible results for clients, e.g.
  - Intended as precondition/requirement to participate in public tenders in the European single market
  - Product liability: in the event of damage the question of liability can be cleared easier. Documentation of an appropriate QS-system
- Marketing (no longer: Made in Germany, but: ISO 9000 certified)
- The certificate is not given for unlimited time but can be denied/deprived again. After the certification checks/tests are made regularly

➔ Permanent obligation to maintain the QS-system

Motivation

Der erste deutsche Automobil-hersteller, dem der TÜV in allen Bereichen erste Qualität bescheinigt:

Motivation



Product Liability and ISO 900X

- Product liability is the obligation to make up for a damage caused by a defective product
- In Germany regulated since 1990 by the product liability law
  - Adds to the contract law and tort law
  - The terms product, fault/defect, producer can be interpreted differently (e.g. dealer or seller can be regarded as producer ➔ liable to the full extent)
- Producer is liable for consequential damages
  - To persons in the private and industrial sector
  - To property in the private sector
- An effective liability exclusion is not possible
- Faults/defects and damages to the product itself do not come under the product liability law

Product Liability and ISO 900X

- Claimant only has to show/prove a resulting damage
- The fault of the producer concerning the defect does not have to be proven
- The producer has to acquit himself of the fault presumption
  - Proof that the defect did not exist at the time of the placing on the market
  - Proof that it was not avoidable according to the state of the scientific and technical knowledge. Existence of a quality management system (e.g. ISO 900X) can possibly facilitate this

Contents of DIN ISO 9000-3

- It is certified according to DIN ISO 9001: the DIN ISO 9000-3 standard is a reading aid/facility
- QS-System - frame
  - Liability/responsibility of the top management
  - Quality assurance system, internal quality audits, corrective actions
- QS-System – live cycle activities
  - Contract check/verification, determination of the demands/requirements on the part of the client
  - Planning of the development, planning of the QS
  - Design and implementation, testing and validation
  - Acceptance, duplication, delivery and installation, maintenance
- QS-System – supporting activities
  - Configuration management, management of documents, quality records
  - Measurements, rules, methods and agreements, tools and techniques
  - Acquisition/provision, software product provided, training

Who Gives the Certificate?

- Certificates are given by external auditors of accredited certificate authorities, e.g.
  - Technical inspection authorities: RWTÜV systems engineering (Anlagentechnik) GmbH - institute for information technology, Essen; TÜV Bavaria-Saxony, Munich; TÜV Cert e.V., Bonn
  - DEKRA AG certification center, Stuttgart; Landesgewerbeanstalt Bavaria, Nuremberg
  - Germanic Lloyd QS certification center, Hamburg; association of the property insurer (Verband der Sachversicherer) (VdS) e. V., Cologne
  - VDE inspection and certificate authority (Prüf- und Zertifizierungsinstitut), Offenbach; german association of materials research and testing (Staatl. Materialprüfungsamt) NRW, Dortmund; association of the railway vehicle construction for the certification ..., Berlin

  This list is not complete
- Not each of the listed certificate authorities certifies every branch/sector

What can be certified?

- Business companies
- Parts of business companies (e.g. business areas)
- Process for individual products

Course/Procedure of a Certification

- Preparation
  - Triage of the material affected by DIN ISO 9001
  - Identification of problem areas
  - Introduction of required modifications
  - Modification of problem areas (e.g. closing of gaps in the guidelines)
  - Training of staff members, training of internal auditors
  - Execution of internal preparation audits
- Execution of the certification
  - Information of the concerned persons
  - Monitoring of the external certifiers
- After the certificate is granted (continuously)
  - Internal Q-audits, management reviews, monitoring and re-audits, training

Comparison: DIN ISO 9001 and Software Process Assessments

	DIN ISO 9001	Software Process Assessment
subject	multitude of industrial organizations, products and procedures	at the moment intended for pure software development processes
goal	proof of qualification for the generation of quality-compatible results	detailed objectives and priority specifications for the improvement of the process
status	fixed de facto standard	useful means for problem analysis and process improvement
basis	fixed standard text	flexible Capability Maturity Model
requirements	minimal requirements (have to be met without exception)	hierarchy of demands/requirements depending on the level
result	accepted certificate	actual state, strengths and weaknesses profile
costs vs. benefit	benefit is founded by the given certificate	savings due to process improvements vs. costs for the assessments and the improvement activities

Summary

- The certification according to DIN ISO 9001 in future will gain increasing importance as verifiable qualification criterion in the quality assurance
- The main focus of the ISO 9001-certification is the proof of a QS-system according to the standard. The main focus of the CMM-assessment is the quality and productivity increase for the entire SW development process
- There exists no conversion formula between the ISO-certification and CMM-levels.
- DIN ISO 9001-certification and assessments are no alternatives but approaches which complement each other
  - Economic reasons for certification: the client expects a certificate. The concurrence is also certified
  - Technical reasons for assessment: productivity, quality, time saving

Literature

- DIN EN ISO 9000-3, Normen zum Qualitätsmanagement und zur Qualitätssicherung / QM-Darlegung - Teil 3: Leitfaden für die Anwendung von ISO 9001:1994 auf Entwicklung, Lieferung, Installation und Wartung von Computer-Software (ISO 9000-3:1997); Zweisprachige Fassung EN ISO 9000-3:1997, Berlin: Beuth Verlag, August 1998
- DIN EN ISO 9001, Qualitätsmanagementsysteme - Modell zur Qualitätssicherung / QM-Darlegung in Design / Entwicklung, Produktion, Montage und Wartung (ISO 9001:1994); Dreisprachige Fassung EN ISO 9001:1994, Berlin: Beuth Verlag, August 1994