Technische Universität
Kaiserslautern

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software engineering dependability

Quality Management of Software and Systems:
DIN ISO 9000-Standards

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DIN ISO 9000-Standards

- Standards for quality assurance
  - DIN EN ISO 9000:2005 Quality management systems - Fundamentals and vocabulary
  - DIN EN ISO 9001:2008 Quality management systems - Requirements
  - DIN EN ISO 9004:2009 Managing for the sustained success of an organization - A quality management approach
  - DIN EN ISO 19011:2011 Guidelines for auditing management systems
- None of these standards is designed explicitly for the application to software or software-based systems
  - ISO 90003: Software engineering. Guidelines for the application of ISO 9001:2000 to computer software

Motivation

- Proof of an organization's capability to deliver quality results to their customers:
  - This proof is a precondition for companies to participate in public tenders (offers) of the Single European Market.
  - Product liability: in case of damages caused by the product, the question of liability can be clarified easier (Documentation of a suitable QA-System).
- Marketing (no longer: Made in Germany, but: ISO 9000 certified)
- The certificate is not given for unlimited time but can be deprived again. After the certification, checks are made regularly

➔ Permanent obligation to maintain the QA-system

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

Audi.

Erste Qualität im Modellbau: Teamarbeit bei der Prototypenentwicklung anhand des ersten Plastillinmodells.

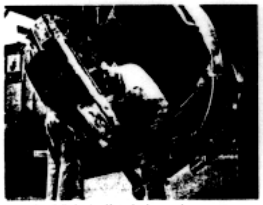
Erste Qualität in der Fahrzeuggeometrie: Entwicklung von CAD-Konstruktionsplänen nach Entwurfskizzen.

Erste Qualität im Design: Finish mit Oberflächenkontrolle am 1:1-Modell.

Erste Qualität in der Motorenfertigung: gruppenorientierte Montage des V8-Motors.

Erste Qualität in der Lackiervorbereitung: Kontrolle der vollverzinkten Karosserie.

Erste Qualität bei der Türmontage: Komplettierung mit Hilfe des Fahrerlosen Transportsystems (FTS).



Erste Qualität in der Unterbodenmontage: ergonomisch günstige Fertigung mittels Schwenkgehänge.

Erste Qualität beim Motoreneinbau: Verbindung der Antriebseinheit mit der Karosserie.

Erste Qualität bei der Dichtigkeitskontrolle: optische 100%-Prüfung der Innenraumisolation.

Erste Qualität bei der Fehleranalyse: Prüfung aus Kundensicht mit direkter Rückmeldung an die Fertigung.

Erste Qualität bei der Fahrzeugvorbereitung: letzte optische Überprüfung vor der Auslieferungsfreigabe.

Erste Qualität bei der Fahrzeugauslieferung: Übergabe des Automobils an den Audi Kundenberater.

Als erster deutscher Automobilhersteller erfüllt Audi die DIN ISO 9001. Und erhält damit die wichtigste Auszeichnung für erstklassige Qualität in Europa.

Das Zertifikat gilt für sämtliche Audi Unternehmensbereiche: Entwicklung und Planung, Logistik und Produktion, Marketing und Kundendienst.

Ausgestellt wird es vom TÜV-CERT, einem unabhängigen Prüf-Institut. Von 1996 an ist jeder Hersteller, der eine europaweite Zulassung beantragt, zur Zertifizierung verpflichtet. Solange wollten wir unsere Kunden allerdings nicht warten lassen. Daß wir die Auszeichnung auf Anhieb und als erster deutscher Automobilhersteller erhalten haben, ist das Ergebnis der Audi Qualitätsstrategie. Basierend auf dem Grundsatz: Vorsprung durch Technik.

Wie ernst unsere Mitarbeiter diesen Grundsatz nehmen, zeigt sich in jedem einzelnen Audi Automobil. Weil darin all die Werte stecken, die weit über den Standard hinausgehen.

Am besten lernen Sie die ausgezeichnete Audi Qualität bei einer Probefahrt kennen. Wozu Sie unsere Partner recht herzlich einladen.

Übrigens behalten wir unser Wissen, wie man mit erster Qualität höchste Anforderungen erfüllt, nicht für uns. Sondern geben es im Rahmen der Audi Akademie auch gern an andere Unternehmen weiter.

Nähere Auskünfte erhalten Sie unter der Telefonnummer 0841/9 66 02-0.

Audi.
Vorsprung durch Technik.

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 and tort laws
  - 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 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 placing the product on the market
  - Proof that the defect 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 ISO/IEC 90003

- It is certified according to DIN EN ISO 9001: the ISO/IEC 90003 standard is a reading aid
- QA-System - frame
  - Responsibility of the top management
  - Quality assurance system, internal quality audits, corrective actions
- QA-System – life cycle activities
  - Contract verification, determination of the requirements on the part of the client
  - Planning of the development, planning of the QA
  - Design and implementation, testing and validation
  - Acceptance, duplication, delivery and installation, maintenance
- QA-System – supporting activities
  - Configuration management, management of documents, quality records
  - Measurements, rules, methods and agreements, tools and techniques
  - Acquisition/provision, subcontractor management, training

Who Gives the Certificate?

- Certificates are given by external auditors of accredited certificate authorities, e.g.
  - Technical inspection authorities: RWTÜV systems engineering GmbH - institute for information technology, Essen; TÜV Süd, Munich; TÜV Cert e.V., Bonn
  - DEKRA AG certification center, Stuttgart; Landesgewerbeanstalt Bavaria, Nuremberg
  - Germanic Lloyd QA certification center, Hamburg; association of the property insurer (Verband der Sachversicherer) (VdS) e. V., Cologne
  - VDE inspection and certificate authority, Offenbach; German association of materials research and testing, 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

Procedure of a Certification

- Preparation
  - Classification of the material affected by DIN EN ISO 9001
  - Identification of problem areas
  - Implementation 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 EN 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 EN ISO 9001 has gained importance as verifiable qualification criterion in the quality assurance.
- The main focus of the DIN EN ISO 9001-certification is the proof of a QA-system according to the standard. The main focus of the CMM-assessment is on increasing the quality and productivity of the complete SW development process.
- There exists no conversion formula between the ISO-certification and CMM-levels.
- DIN EN ISO 9001-certification and assessments are no alternatives but approaches which complement each other
  - Economic reasons for certification: the client expects a certificate. Competitors are also certified
  - Technical reasons for assessment: productivity, quality, time saving

Literature

- ISO/IEC 90003:2004 Software engineering. Guidelines for the application of ISO 9001:2000 to computer software, Berlin: Beuth Verlag, 2004
- DIN EN ISO 9001 Quality management systems - Requirements, Berlin: Beuth Verlag, 2008.