Quality Management of Software and Systems:
Terminology

Contents

- System, technical system
- Quality, quality requirement, quality characteristic, quality measure
- Safety, technical safety
- Correctness, completeness
- Robustness
- Reliability, availability
- Failure, fault, error

- ## System

    - Technical and organizational means for the autonomous fulfillment of a task (based on Birolini, ETH)

    - Generally, a system can consist of hardware, software, people (service and maintenance personnel) and logistic assistance

- ## Technical System

    - System where influences by people and logistics are ignored

- **Quality**
  - Property of an entity concerning its qualification to fulfill defined and derived requirements (quality requirements) /DIN 55350-11/
  - Degree in which the inherent attributes of an entity fulfill quality requirements /DIN EN ISO 9000 05/

- **Quality Requirement**
  - Total of single requirements of an entity which concern the property of this entity   /DIN 55350-11/
  - Expectation or demand defined (by a customer) that is generally assumed or mandatory /DIN EN ISO 9000 05/

- **Quality Characteristic**
  - Property of an entity on the basis of which its quality is described and estimated, but which makes no statement about the degree of fulfillment of the characteristic
  - A quality characteristic can be refined incrementally into partial characteristics
  - Inherent attribute of a process, product or a system that relates to a quality requirement /DIN EN ISO 9000 05/.

- **Quality Measure**
  - Measure which allows to draw conclusions on the fulfillment of specific quality characteristics. For instance, MTTF (Mean Time To Failure) is a quality measure of the quality characteristic Reliability.

4

- ## Safety
  - State where the danger of a personal or property damage is reduced to an acceptable value (DIN EN ISO 8402)
  - Birolini defines safety as a measure for the ability of an item to endanger neither persons, property nor the environment
  - A distinction is drawn between the safety of a failure-free system (accident prevention) and the technical safety of the failure afflicted system

- ## Technical Safety
  - Measure for the ability of a failure afflicted item to endanger neither persons, property nor the environment

- Correctness
    - Correctness has a binary character, i.e., an item is either correct or incorrect
    - An fault-free realization is correct
    - An artifact is correct if it is consistent to its specification
    - If no specification exists for an artifact, correctness is not defined

- Completeness
    - A system is functional complete, if all functions required in the specification are implemented. This concerns the treatment of normal cases as well as the interception of failure situations

- Robustness

  - Property to deliver an acceptable behavior also in exceptional situations (e.g. ability of a software to detect hardware failures)

  - A correct system – as measured by the specification – can have a low robustness, actually

  - Accordingly, robustness is rather a property of the specification than of the implementation

  - A robust program is the result of the correct implementation of a good and complete specification

  - Robustness has a gradual character

- Reliability
  - Part of the quality with regard to the behavior of an entity during or after given time periods with given working conditions (DIN 40041)
  - Collective term for the description of the power concerning availability and its influencing factors: power concerning functionality, maintainability and maintainability support (DIN EN ISO 8402)
  - Property of an entity regarding its qualification to fulfill the reliability requirements during or after given time periods with given application requirements (DIN ISO 9000)
  - Measure for the ability of an item to remain functional, expressed by the probability that the required function is executed failure-free under given working conditions during a given time period (based on Birolini, ETH)

- Availability
  - Measure for the ability of an item to be functional at a given time

TECHNISCHE UNIVERSITÄT
KAISERSLAUTERN

- Failure, Fault, Error
    - Failure: Inconsistent behavior w.r.t. specified behavior while running a system (happens dynamically during the execution) ➔ Each failure has a time-stamp
    - Fault, defect: Statically existent cause of a failure, (i.e., a „bug"). Usually the consequence of an error made by the programmer
    - Error: Basic cause for the fault (e.g., misunderstanding of a particular statement of the programming language)

0101seda010100
software engineering dependability