Quality Management and Improvement

Chapter 6
Standards and Models

2022/23

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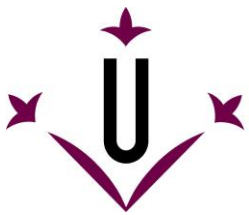

Universitat de Lleida
Departament d'Informàtica
i Enginyeria Industrial

Standards

- **What is a standard?**

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"Document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context *(ISO/IEC TR 29110-1:2016 Software engineering--Lifecycle profiles for Very Small Entities (VSEs)--Part 1: Overview, 2.33)*"

Software and Systems Engineering Vocabulary:
https://pascal.computer.org/sev_display/index.action

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"Document established by an authority, custom, or general consent as a model or example *(ISO/IEC/IEEE 24765h:2019)*"

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Standards

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The ability to apply software development and maintenance methodologies and procedures of the highest professional level.

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The ability to apply software development and maintenance methodologies and procedures of the highest professional level.

Better mutual understanding and coordination among development teams.

Greater cooperation with external participants in the project.

Better understanding and cooperation between suppliers and customers, based on the adoption of known development and maintenance standards as part of the contract.

Standards

- **Do you know some standard?**

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Environment management

Security

Information management

. . .

Standards

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ISO/IEC 15948

ISO 32000-1

Standards

- **Organizations involved in standards development**

IEEE (Institute of Electrical and Electronics Engineers) **Computer Society**

ISO (International Organization for Standardization)

DOD (US Department of Defense)

ANSI (American National Standards Institute)

IEC (International Electrotechnical Commission)

EIA (Electronic Industries Association)

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Ways to contribute

The provision of updated international standards.

SQA certification: external audits, independent professionals, until next audit.

Professional support: to provide tools for “self-assessment”; the detailed documentation provided by assessment programs serves as *manuals* for SQA system development.

SQA Standards

QUALITY MANAGEMENT STANDARDS

SQA Standards

QUALITY MANAGEMENT STANDARDS

PROJECT PROCESS STANDARDS

SQA Standards

QUALITY MANAGEMENT STANDARDS

- Focus on:
  - The organization's SQA system
  - Infrastructure.
  - Requirements.
- It **leaves** the choice of **methods** and **tools** to the organization.
- By **complying** with the quality management standards, organizations can steadily assure that their **sw products achieve an acceptable level of quality**.

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PROJECT PROCESS STANDARDS

- Focus on:
  - Methodologies for carrying out sw development and maintenance projects.

How the sw project is to be implemented

- These **defines** the **steps** to be taken, **design documentation requirements**, the **contents of design documents**, **design reviews** and **review issues**, **software testing**, etc.

SQA Standards

QUALITY MANAGEMENT STANDARDS	PROJECT PROCESS STANDARDS
- **What** to achieve	- **How** to perform

SQA Standards

QUALITY MANAGEMENT STANDARDS	PROJECT PROCESS STANDARDS
- **What** to achieve. - Management of sw development and/or maintenance.	- **How** to perform. - Software development and/or maintenance project team.

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QUALITY MANAGEMENT STANDARDS	PROJECT PROCESS STANDARDS
- **What** to achieve. - Management of sw development and/or maintenance. - Organizations of SQA systems, infrastructure and requirements.	- **How** to perform. - Software development and/or maintenance project team. - Methodologies for carrying out sw development and maintenance projects.

Standards

ISO 9000 [ISO 9000]

ISO 9000 – Quality management: https://www.iso.org/iso-9001-quality-management.html

Standards

ISO 9000 [ISO 9000]

- The ISO 9000 family addresses various aspects of quality management and contains some of ISO's best known standards.
- The standards provide guidance and tools for companies and organizations who want to ensure that their products and services consistently meet customer's requirements, and that quality is consistently improved.

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ISO 9001:2015

- This sets out the criteria for a quality management system.
- The only standard in the family that can be certified to (although this is not a requirement).
- It can be used by any organization. There are over one million companies and organizations in over 170 countries certified to ISO 9001

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ISO 9001: 2015 [ISO 9000]

This standard is based on a number of quality management principles

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ISO 9001: 2015 – *Quality Management Principles* [ISO 9000]

- *Quality Management Principles* are a set of fundamental beliefs, norms, rules and values that are accepted as true and can be used as a basis for quality management.

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1 - CUSTOMER FOCUS

2 - LEADERSHIP

3 – ENGAGEMENT OF PEOPLE

4 – PROCESS APPROACH

5 – IMPROVEMENT

6 – EVIDENCE-BASED DECISION MAKING

7 – RELATIONSHIP MANAGEMENT

ISO 9000 – Quality management: https://www.iso.org/iso-9001-quality-management.html

ISO 9001: 2015 – *Quality Management Principles* [ISO 9000]

1 - CUSTOMER FOCUS

- The primary focus of quality management is to meet customer requirements and to strive to exceed customer expectations.

- Benefits: increased customer satisfaction, enhanced reputation of the organization, increased customer loyalty, etc.

- Actions: recognize direct and indirect customers, understand their needs (current and future), measure and monitor customer satisfaction, etc.

ISO 9000 – Quality management: https://www.iso.org/iso-9001-quality-management.html

2 - LEADERSHIP

- Leaders at any level establish unity of purpose, directions and conditions in which people are engaged in achieving the organization's quality objectives.

- Benefits: Better coordination, improved communication, increased effectiveness and efficiency, etc..

- Actions: ensure that leaders are positive, establish a culture of trust and integrity, communicate strategy, policies, process, etc.

ISO 9000 – Quality management: https://www.iso.org/iso-9001-quality-management.html

ISO 9001: 2015 – *Quality Management Principles* [ISO 9000]

3 – ENGAGEMENT OF PEOPLE

- Competent, empowered and engaged people at all levels throughout the organization are essential to enhance its capability to create and deliver value.

- Benefits: improvement understanding of the organization's quality objectives, enhanced involvement of people, enhanced trust and collaboration throughout the organization, etc.

- Actions: communicate with people to promote understanding the importance of their individual contribution, facilitate open discussion and sharing of knowledge and experience, recognize and acknowledge people's contribution, etc.

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ISO 9001: 2015 – *Quality Management Principles* [ISO 9000]

4 – PROCESS APPROACH

- Consistent and predictable results are achieved more effectively and efficiently when activities are understood and managed as interrelated processes that function as a coherent system.

- Benefits: enhanced ability to focus effort on key processes and opportunities for improvement, optimized performance through effective process management, etc.

- Actions: define objectives of the system and processes necessary to achieve them, understand the organization's capabilities and determine resource constraints prior to action, etc.

ISO 9000 – Quality management: https://www.iso.org/iso-9001-quality-management.html

5 - IMPROVEMENT

- Successful organizations have an ongoing focus on improvement.
- Benefits: enhanced ability to anticipate and react to internal an external risks and opportunities, enhanced drive for innovation, etc.
- Actions: educate and train people on how to apply basic tools and methodologies to achieve improvement objectives, track, review and audit planning, etc.

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ISO 9001: 2015 – *Quality Management Principles* [ISO 9000]

6 – EVIDENCE-BASED DECISION MAKING

- Decision based on the analysis and evaluation of data and information are more likely to produce desired results.

- Benefits: improve decision-making processes, increased ability to review, challenge and change opinions, increased ability to demonstrate the effectiveness of past decisions, etc.

- Actions: determine, measure and monitor key indicator to demonstrate the organization's performance, analyse and evaluate data and information using suitable methods, make decisions and take actions based on evidence, balance with experience and intuition, etc.

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ISO 9001: 2015 – *Quality Management Principles* [ISO 9000]

7 – RELATIONSHIP MANAGEMENT

- For sustained success, an organization manages its relationships with interested parties, such as suppliers.

- Benefits: enhanced performance of the organization and its interested parties through responding to the opportunities and constraints related to each interested party, common understanding of goals and values among interested parties, etc.

- Actions: determine relevant interested parties (employees, investors, customer, partners, etc.), determine and prioritize interested party relationships that needed to be managed, etc.

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ISO 9001: 2015 [ISO 9000]

It replaces the ISO 9001:2008.

One of the key improvements of this new version was to make it more applicable and accessible to all types of enterprises.

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- Purpose: to establish requirements for initiating, planning, controlling and executing the SQA processes of software development or maintenance project.

IEEE 730-2014, IEEE Computer Society: "IEEE Standard for Software Quality Assurance Processes (Revision of IEEE Std 730-2002)", IEEE, NY, USA. DOI:10.1109/IEEESTD.2014.6835311, ISBN:978-0-7381-9168-3.

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- The standard is organized into clauses and annexes.

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IEEE 730-2014 [IEEE 730-2014]

- **Clause 5**
  - **This clause specifies the SQA processes, activities and tasks.**
  - **Sixteen activities are identified in this clause and are grouped into three major areas: process implementation, product assurance, and process assurance.**

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SQA PROCESS
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- Establish the SQA process
- Coordinate with related processes
- Document SQA planning
- Execute the SQA Plan
- Manage SQA records
- Evaluate organizational independence and objectivity

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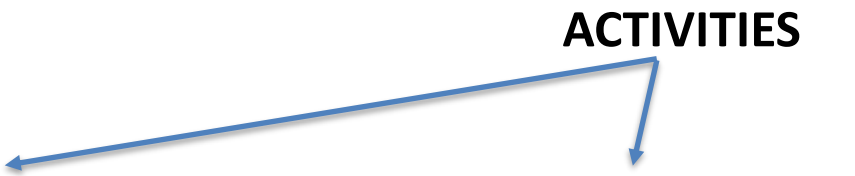

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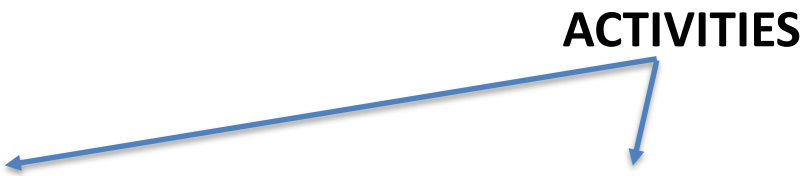

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PRODUCT ASSURANCE ACTIVITIES

- Evaluate plans for conformance to contracts, standards, and regulations
- Evaluate product for conformance to established requirements
- Evaluate product for acceptability
- Evaluate product life cycle support for conformance
- Measure products

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SQA PROCESS IMPLEMENTATION ACTIVITIES	PRODUCT ASSURANCE ACTIVITIES	PROCESS ASSURANCE ACTIVITIES
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IEEE 730-2014, IEEE Computer Society: "IEEE Standard for Software Quality Assurance Processes (Revision of IEEE Std 730-2002)", IEEE, NY, USA. DOI:10.1109/IEEESTD.2014.6835311, ISBN:978-0-7381-9168-3.

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Certifications y Accreditations (ISO 9000)

- The ISO 9000 **certification process** verifies that an organization's software development and maintenance process fully comply with the standard's requirements.

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- As ISO 9000 standards have been adopted as national standards in many countries, there is a growing worldwide interest in certification according to ISO 9000 by organizations un many industries, including the software industry.

- The certification service is organized by the International Organization for Standardization (ISO) through a worldwide network of certification services that are authorized by means of *accreditation bodies and certification bodies*.

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- AENOR (Asociación Española de Normalización y Certificación).

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The certification audits are carried out in two stages:

- To verify the compliance of the organization's SQA system with the requirements (standard).
- To certificate the compliance.

Periodic re-certifications audits (approx. once or twice a year) are performed to verify continued compliance with the standard requirements.

Bibliography

References

- Daniel Galin. Software Quality Assurance. From theory to implementation. Pearson Education Limited, 2004.

- Stephen Kan. Metrics and Models in Software Quality Engineering. 2nd Edition. Addison-Wesley, 2002.

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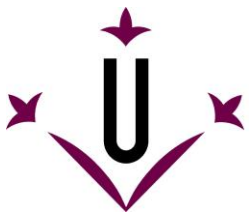

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