



# Software Project Management

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Software quality cont...

# ISO 9000

- ISO (international Standards Organization):
  - a consortium of 63 countries established to formulate and foster standardization.
- ISO published its 9000 series of standards in 1987.



# What is ISO 9000 Certification?

- ISO 9000 certification:
  - Serves as a reference for contract between independent parties.
- The ISO 9000 standard:
  - Specifies guidelines for maintaining a quality system.

# What is ISO 9000 Certification?

- ISO 9000 specifies:
  - Guidelines for repeatable and high quality product development.
  - Also addresses organizational aspects
    - Responsibilities, reporting, procedures, processes, and resources for implementing quality management.

# ISO 9000

- A set of guidelines for the production process.
  - Not directly concerned about the product it self.
  - A series of three standards:
    - ISO 9001, ISO 9002, and ISO 9003.

# ISO 9000

- Based on the premise:
  - If a proper process is followed for production:
    - Good quality products are bound to follow.

# ISO 9001

- Applies to:
  - Organizations engaged in design, development, production, and servicing of goods.
  - Applicable to most software development organizations.



# ISO 9002

- ISO 9002 applies to:
  - Organizations who do not design products:
    - but are only involved in production.
- Examples of this category of industries:
  - Steel or car manufacturing industries
  - Buy the product and plant designs from external sources:
    - only manufacture products.
  - Not applicable to software development organizations.

# ISO 9003

- ISO 9003 applies to:
  - Organizations involved only in installation and testing of the products.

# ISO 9000 for Software Industry

- ISO 9000 is a generic standard:
  - Applicable to many industries,
    - Starting from a steel manufacturing industry to a service rendering company.
- Many clauses of ISO 9000 documents:
  - Use generic terminologies
  - Very difficult to interpret them in the context of software organizations.



# Software vs. Other Industries

- Very difficult to interpret many clauses for software industry:
  - Software development is radically different from development of other products.

# Software vs. Other Industries

- Software is intangible:
  - Therefore difficult to control.
    - It is difficult to control anything that we cannot see and feel.
  - In contrast, in a car manufacturing unit:
    - We can see a product being developed through stages such as fitting engine, fitting doors, etc.
    - One can accurately tell about the status of the product at any time.
  - Software project management is an altogether different ball game.

# Software vs. Other Industries

- During software development:
  - The only raw material consumed is data.
- For any other product development:
  - Lot of raw materials consumed
    - e.g. Steel industry consumes large volumes of iron ore, coal, limestone, etc.
- ISO 9000 standards have many clauses corresponding to raw material control .
  - Not relevant to software organizations.



# Software vs. Other Industries

- Radical differences exist between software and other product development:
  - Difficult to interpret various clauses of the original ISO standard in the context of software industry.

# ISO 9000 Part-3

- ISO released a separate document called ISO 9000 part-3 in 1991:
  - To help interpret the ISO standard for software industry.
- At present:
  - Official guidance is inadequate.



# Why Get ISO 9000 Certification?

- Several benefits:
  - Confidence of customers in an organization increases.
    - If organization qualified for ISO 9001 certification.
    - This is especially true in the international market.



# Why Get ISO 9000 Certification?

- Many international software development contracts insist:
  - Development organization to have ISO 9000 certification.

# Why Get ISO 9000 Certification?

- Requires:
  - A well-documented software production process to be in place.
  - **Contributes to repeatable and higher quality software.**
- Makes development process:
  - Focussed, efficient, and cost-effective



# Why Get ISO 9000 Certification?

- Points out the weakness of an organizations:
  - Recommends remedial action.
- Sets the basic framework:
  - For development of an optimal process and TQM.



# How to Get ISO 9000 Certification?

- An organization intending to obtain ISO 9000 certification:
  - Applies to a ISO 9000 registrar for registration.
- ISO 9000 registration process consists of several stages.

# How to Get ISO 9000 Certification?

- Application stage:
  - Applies to a registrar for registration.
- Pre-assessment:
  - The registrar makes a rough assessment of the organization.

# How to Get ISO 9000 Certification?

- Document review and adequacy audit:
  - Process and quality-related documents.
  - The registrar reviews the documents.
  - Makes suggestions for improvements.

# How to Get ISO 9000 Certification?

- **Compliance audit:** The registrar checks:
  - Whether the suggestions made by it during review have been complied.





# How to Get ISO 9000 Certification?

- Registration:
  - The registrar awards ISO 9000 certificate after successful completions of all previous phases.
- Continued surveillance:
  - The registrar continues monitoring the organization periodically.

# ISO 9000 Certification

- An ISO certified organization :
  - Can use the certificate for corporate advertizements.
  - Cannot use the certificate to advertize its products.
    - ISO 9000 certifies organization's process
    - Not any product of the organization.
  - An organization using ISO certificate for product advertizements:
    - Risks withdrawal of the certificate.

# Summary of ISO 9001 Requirements

- **Management responsibility(4.1):**
  - Management must have an effective quality policy.
  - The responsibility and authority of all those whose work affects quality:
    - Must be defined and documented.



# Salient Features of ISO 9001 Requirements:

- All documents concerned with the development of a software product:
  - Should be properly managed, authorized, and controlled.
- Proper plans should be prepared:
  - Progress against these plans should be monitored.



# Salient Features of ISO 9001 Requirements

- Important documents independently checked and reviewed:
  - For effectiveness and correctness.
- The product should be tested :
  - Against specification.
- Several organizational aspects:
  - e.g., management reporting of the quality team.

# Shortcomings of ISO 9001 Certification

- ISO 9000 requires a production process to be adhered to:
  - But does not guarantee the process to be of high quality.
  - Does not give any guideline for defining an appropriate process.

# Shortcomings of ISO 9001 Certification cont...

- ISO 9000 certification process:
  - Not fool-proof
  - No international accreditation agency exists.
  - Likely variations in the norms of awarding certificates:
    - Among different accreditation agencies and among the registrars.

# Shortcomings of ISO 9001 Certification (3)

- Organizations qualifying for ISO 9001 certification:
  - Tend to downplay domain expertise.
  - Tend to believe that since a good process is in place,
    - Any engineer is as effective as any other engineer in doing any particular activity relating to software development.



# Shortcomings of ISO 9001 Certification (4)

- In manufacturing industry:
  - Clear link between process quality and product quality.
  - Once a process is calibrated:
    - Can be run again and again producing quality goods.
- Software development is a creative process:
  - Individual skills and experience is significant.

# Shortcomings of ISO 9001 Certification (5)

- Many areas of software development are very specialized:
  - Special expertise and experience (domain expertise) required.
- ISO 9001:
  - Does not automatically lead to continuous process improvement,
  - Does not automatically lead to TQM.

# Shortcomings of ISO 9001 Certification (6)

- ISO 9001 addresses mostly management aspects.
- Techniques specific to software development have been ignored:
  - Configuration management
  - Reviews
  - Release builds
  - Problem Notification system
  - Intranets

# Summary

- Discussed ISO 9000 standard.
- Discussed requirements for ISO.
- Discussed its limitations



# References :

1. B. Hughes, M. Cotterell, R. Mall, *Software Project Management*, Sixth Edition, McGraw Hill Education (India) Pvt. Ltd., 2018.
2. R. Mall, *Fundamentals of Software Engineering*, Fifth Edition, PHI Learning Pvt. Ltd., 2018.



Thank you