

# Software Engineering

## Architecture, Design and Patterns

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# CHAPTER 04

## SOFTWARE QUALITY



## SOFTWARE QUALITY ASSURANCE (SQA)

“Quality is the entire set of attributes that gives a software product the ability to satisfy expressed or implied stakeholder requirements. These stakeholder requirements become refined into software requirements, including functional requirements and performance attributes that specify how well the software performs the functional requirements”

IEEE, 2014

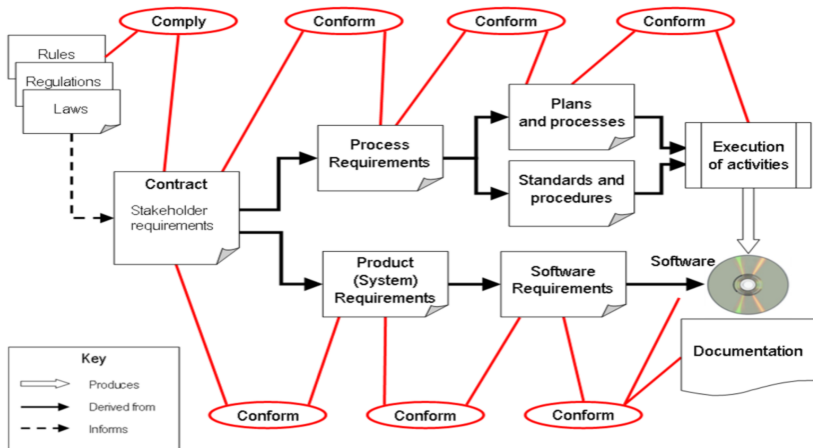


# THE CLIENT IS THE KING

- ▶ Client satisfaction → clients must have their needs and demands satisfied
- ▶ Avoid rework → the needs must be satisfied within the budget and deadline
- ▶ Credibility → software engineers have reputation to uphold
- ▶ Profit → software engineers must keep feeding the family



## PROCESS ASSURANCE → IEEE STANDARD





### KEY FACTORS

- ▶ Functionality → ability to provide functions which meet stated or implied needs of the client (correctness, useful)
- ▶ Efficiency → ability to provide appropriate performance in relation to the amount of resources used (how well a software works)
- ▶ Usability → ability to be *easy to learn and use* (documentation and interface)



## KEY FACTORS

- ▶ Reliability → ability to maintain a specified level of performance within the specified usage conditions
- ▶ Maintainability → ability to be analyzed, changed and tested, and to avoid unexpected effects from modifications
- ▶ Portability → ability to be moved to another computing platform



# GQM → GOAL-QUESTION-METRIC

- ▶ Proposed by Basili and Weiss to identify meaningful metrics for the measurement process
- ▶ Questions are formulated based on a more abstract goal
- ▶ Metrics are chosen to answer each question





# GQM → GOAL-QUESTION-METRIC

1. Develop a set of corporate, division and project business goals and associated measurement goals for productivity and quality
2. Generate questions (based on models) that define those goals as completely as possible in a quantifiable way



# GQM → GOAL-QUESTION-METRIC

3. Specify the measures needed to be collected to answer those questions and track process and product conformance to the goals
4. Develop mechanisms for data collection
5. Collect, validate and analyze the data in real time to provide feedback to projects for corrective action



# GQM → GOAL-QUESTION-METRIC

6. Analyze the data in a post mortem fashion to assess conformance to the goals and to make recommendations for future improvements



## EXAMPLE 1

- ▶ Goal → Increase productivity
- ▶ Questions:
  - ▶ Which are productivity bottlenecks?
  - ▶ How can we increase the amount of code we produce?
- ▶ Metrics:
  - ▶ Current lines of code (LOC) per developer



## EXAMPLE 2

- ▶ Goal → Decrease development time
- ▶ Questions:
  - ▶ Which are the bottlenecks?
  - ▶ How to decrease specification time?
- ▶ Metrics:
  - ▶ Time required for requirements
  - ▶ Time required for modeling



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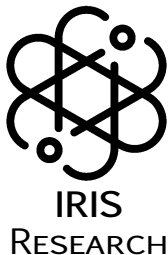


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# THANK YOU



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*"Science is more than a body of knowledge. It is a way of thinking."*

Carl Sagan