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Software Quality Assurance

Planning and Tracking Software Quality

Telerik Software Academy
Learning & Development
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Table of Contents

- What Is Software Quality?
- Causes of Software Defects
- What is Quality Assurance?
- Improving the Software Quality

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What Is Software Quality?

Source: http://blog.qatestlab.com

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What is Software Quality?

- Pressman's definition of "Software Quality"

> Software quality measures how well software is designed (quality of design), and how well the software conforms to that design (quality of conformance)

  - Whereas quality of conformance is concerned with implementation, quality of design measures how valid the design and requirements are in creating a worthwhile product

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What is Software Quality? (2)

- IEEE Definition of "Software Quality"
  - The degree to which a system, component, or process meets specified requirements
  - The degree to which a system, component, or process meets customer or user needs or expectations

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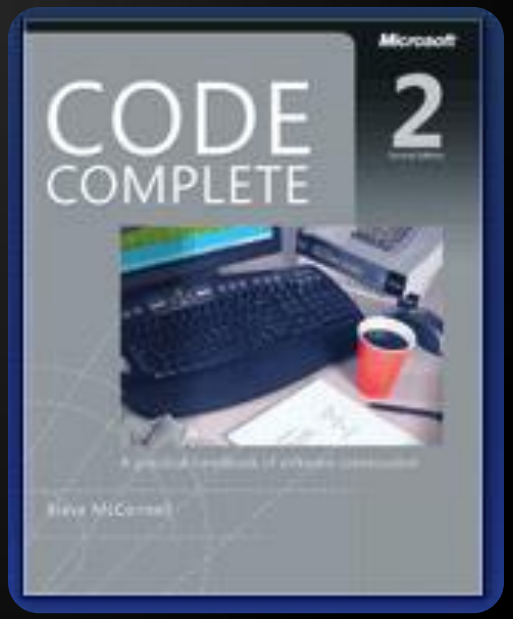
What is Software Quality? (3)

- Steve McConnell's Code Complete defines two types of quality characteristics:
  - External
    - Those parts of a product that face its users
  - Internal
    - Not apparent to the user



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External Characteristics

- Correctness
- Usability
- Efficiency
- Reliability
- Integrity
- Adaptability
- Accuracy
- Robustness

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Internal Characteristics

- Maintainability
- Flexibility
- Portability
- Reusability
- Readability
- Testability
- Understandability

Source: flickr.com

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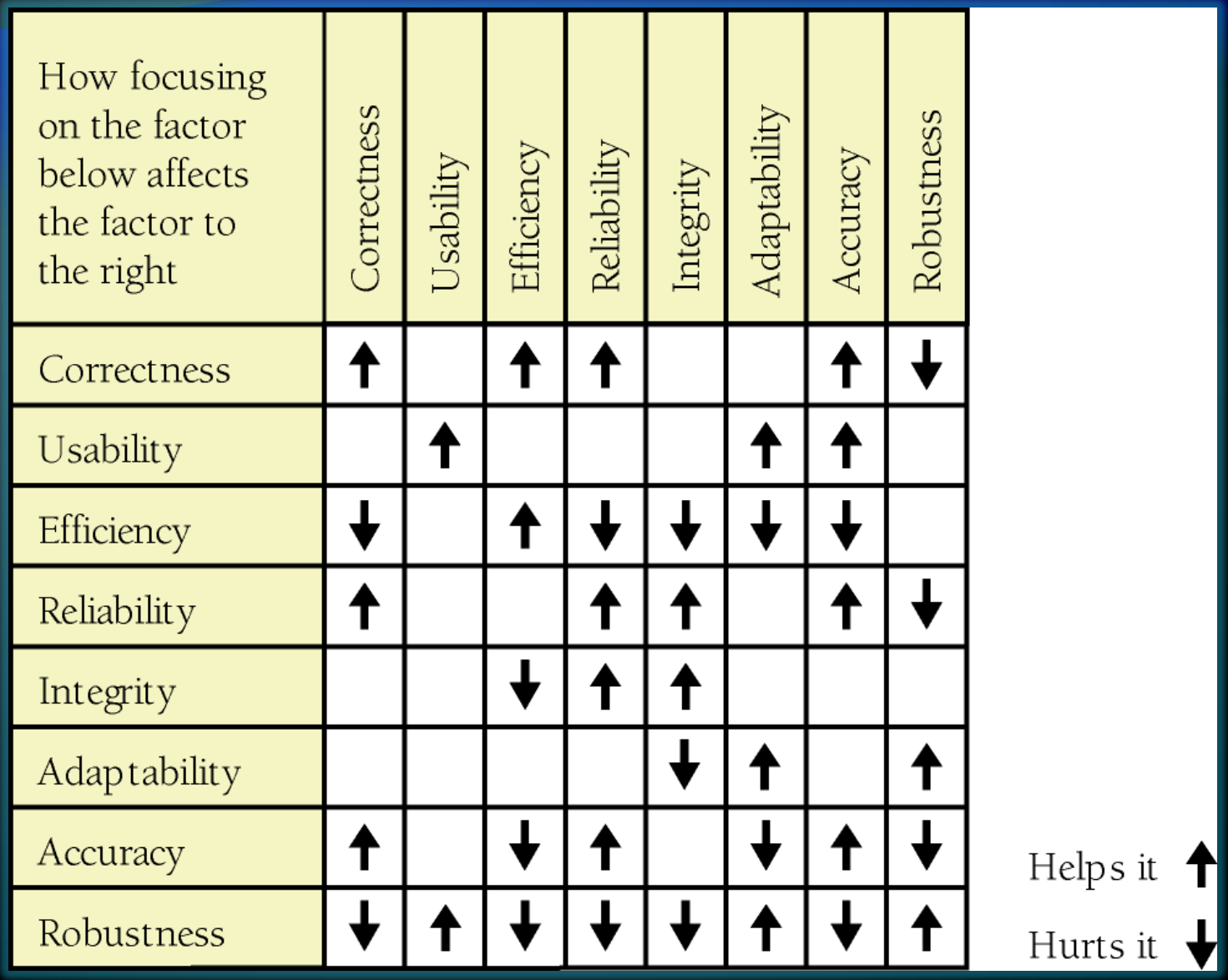
Dependencies



How focusing on the factor below affects the factor to the right	Correctness	Usability	Efficiency	Reliability	Integrity	Adaptability	Accuracy	Robustness
Correctness	↑		↑	↑			↑	↓
Usability		↑				↑	↑	
Efficiency	↓		↑	↓	↓	↓	↓	
Reliability	↑			↑	↑		↑	↓
Integrity			↓	↑	↑			
Adaptability					↓	↑		↑
Accuracy	↑		↓	↑		↓	↑	↓
Robustness	↓	↑	↓	↓	↓	↑	↓	↑

Helps it ↑

Hurts it ↓

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Causes of Software Defects

Source: http://codingcreativity.blogspot.com

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Causes of Software Defects

- A human being can make an error (mistake)
- Errors produce defects
  - Defects are faults / bugs in the program code, or in a document
- If a defect in code is executed, that might cause a failure:
  - Fail to do what it should do
  - Do something it shouldn't

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Causes of Software Defects (2)

- The human factor
  - Humans make mistakes
  - Poor training
  - Time pressure
  - Code complexity
  - Complexity of infrastructure
  - Changing technologies

Causes of Software Defects (3)

- Organizational factors
  - Inefficient team communication
  - Incomplete data specifications
  - Unclearly defined requirements
  - Incorrect project documentation

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Causes of Software Defects (4)

- Environmental conditions
  - Radiation
  - Magnetism
  - Electronic fields
  - Pollution
  - Etc.

These can change the hardware conditions

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What is Quality Assurance?

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What Is Software Quality Assurance?

- IEEE Definition of "Software Quality Assurance"
  - A planned and systematic pattern of all actions necessary to provide adequate confidence that an item or product conforms to established technical requirements
  - A set of activities designed to evaluate the process by which the products are developed or manufactured. Contrast with quality control

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What Is Software Quality Assurance? (2)

- Software quality assurance is a planned and systematic program of activities
  - Designed to ensure that a system has the desired characteristics

Source: http://www.askaboutvalidation.com/

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The Role of SQA

- What is the role of SQA in the software development process?
  - Monitoring the software engineering processes
  - Reducing the risk of problems
  - Ensuring the quality of the software
  - Providing information for decision-making
  - Help meeting standards:
    - Contractual or legal requirements
    - Industry-specific standards

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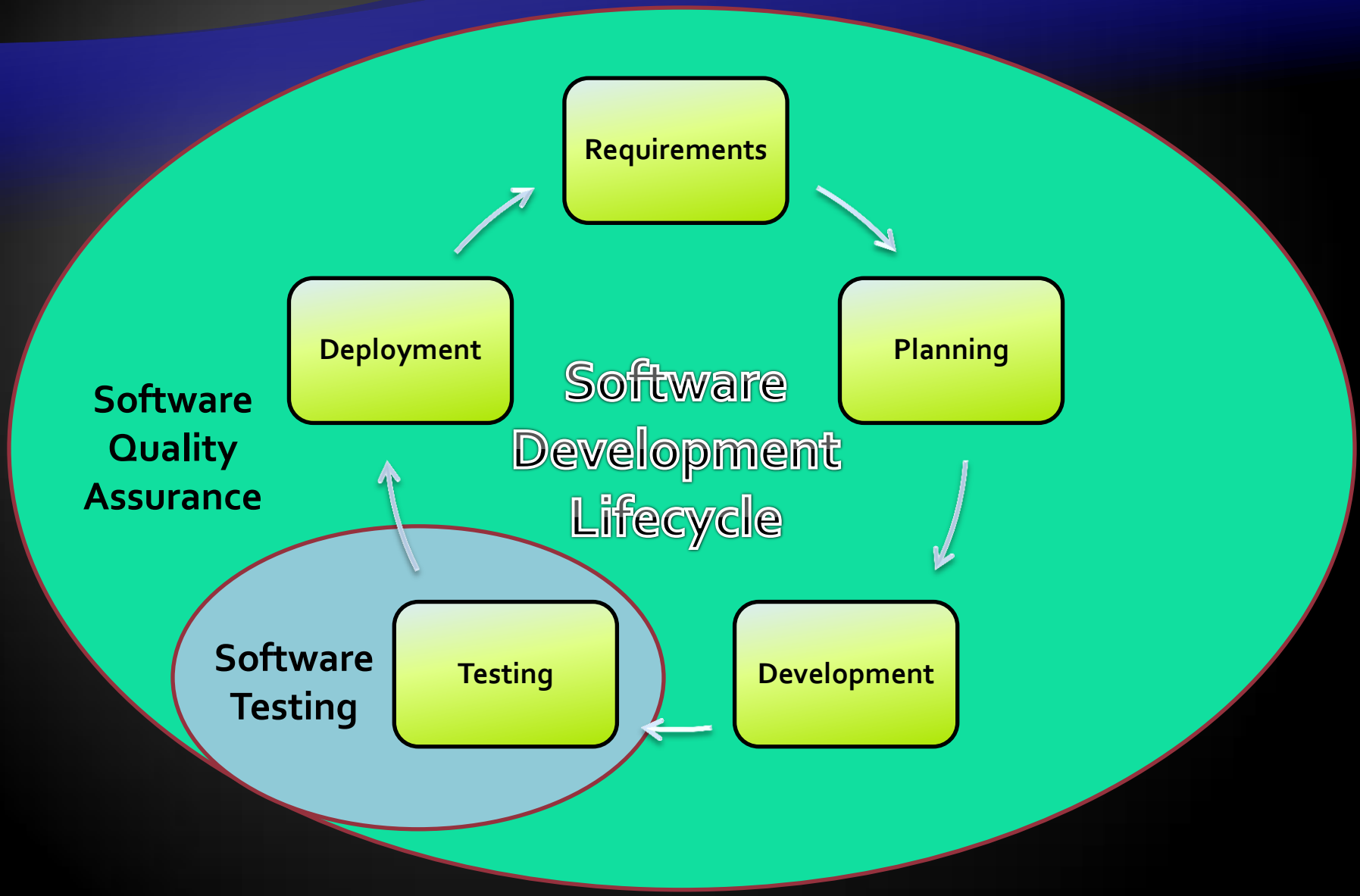
QA vs. Testing



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Improving the Software Quality

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Techniques for Improving Software Quality

- Software-quality objectives
- Explicit quality-assurance activity
- Testing strategy
- Software-engineering guidelines
- Informal technical reviews
- Formal technical reviews
- External audits

Source: http://www.enjoyhelpsmile.org/

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Relative Effectiveness

Removal Step	Lowest Rate	Modal Rate	Highest Rate
Informal design reviews	25%	35%	40%
Formal design inspections	45%	55%	65%
Informal code reviews	20%	25%	35%
Formal code inspections	45%	60%	70%
Modeling or prototyping	35%	65%	80%
Personal desk-checking of code	20%	40%	60%
Unit test	15%	30%	50%
New function (component) test	20%	30%	35%
Integration test	25%	35%	40%
Regression test	15%	25%	30%
System test	25%	40%	55%
Low-volume beta test (<10 sites)	25%	35%	40%
High-volume beta test (>1,000 sites)	60%	75%	85%

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Higher Defect Detection Rate

- Combination of Techniques
- Extreme programing Techniques

Removal Step	Lowest Rate	Modal Rate	Highest Rate
Informal design reviews (pair programming)	25%	35%	40%
Informal code reviews (pair programming)	20%	25%	35%
Personal desk-checking of code	20%	40%	60%
Unit test	15%	30%	50%
Integration test	25%	35%	40%
Regression test	15%	25%	30%
Expected cumulative defect-removal efficiency	~74%	~90%	~97%

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Recommended Combination

- Formal inspections of all requirements, all architecture, and designs for critical parts of a system
- Modeling or prototyping
- Code reading or inspections
- Execution testing

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The General Principle

- The General Principle of Software Quality is that improving quality reduces development costs
  - The industry-average productivity for a software product is about 10 to 50 of lines of delivered code per person per day
  - Debugging and associated refactoring and other rework consume about 50 percent of the time on a traditional, naive software-development cycle

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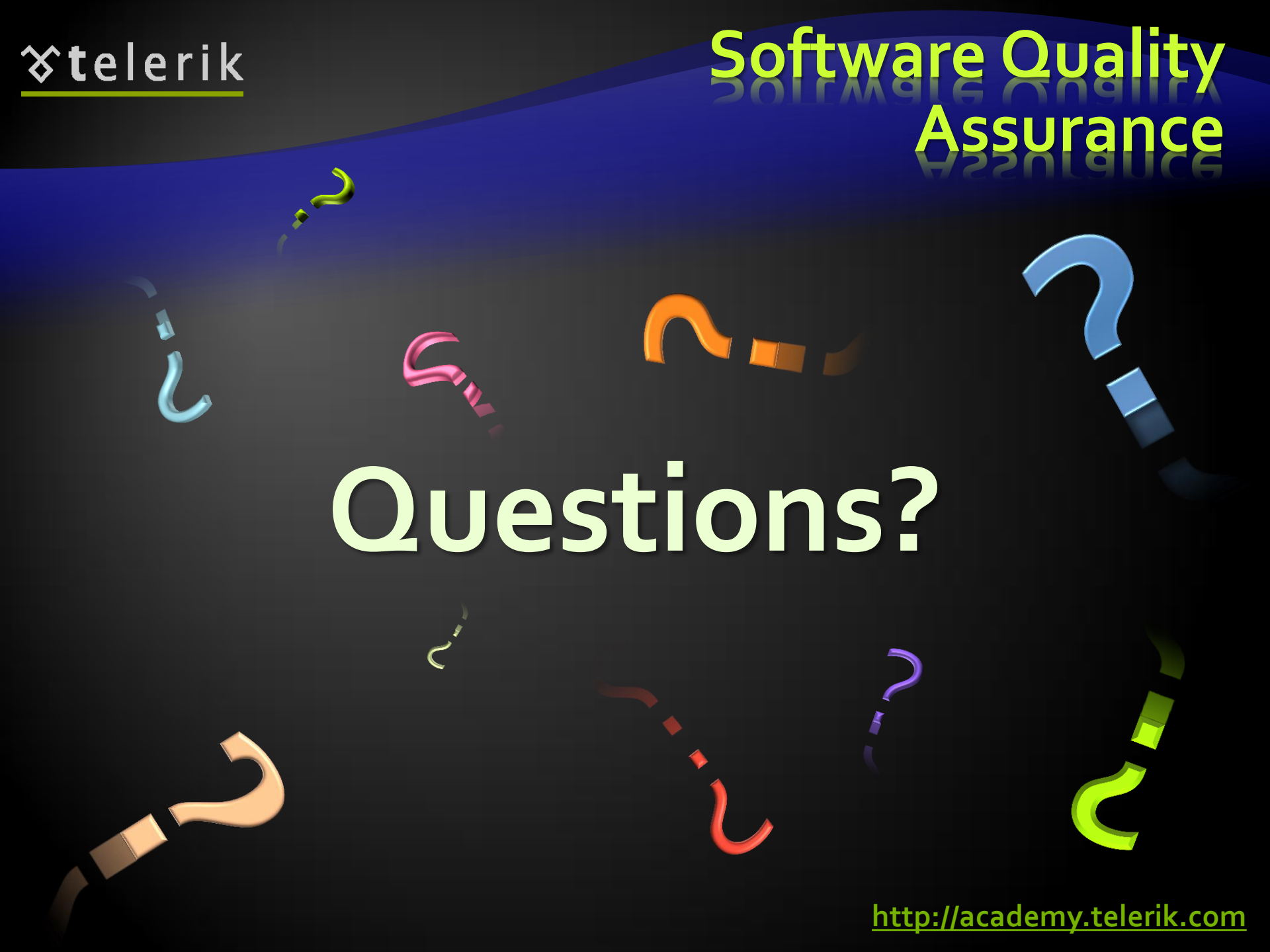
Software Quality Assurance



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