

# **IEEE Standard 730-2014 Software Quality Assurance Processes**

**David I. Heimann**

**April 8, 2015**

**ASQ Software Quality Group of New England**

© 2015 by David I. Heimann

## **Learning objectives**

- 1. Benefits of SQA in general and IEEE 730 in particular.**
- 2. Integration of product and process requirements through SQA.**
- 3. The three key activity areas of SQA, and the specific tasks within each activity.**
- 4. SQA/IEEE 730 and various SDLC's including Agile**

## INTRODUCTION



3

## What is IEEE 730?

- **Gives guidance and establishes requirements for Software Quality Assurance in a software project.**
- **The very first published software engineering standard – 1979.**
- **Gives the details for the Software Quality Assurance tasks outlined in the IEEE 12207 Standard for Software Life Cycle Processes.**
- **IEEE 730-2014 greatly expands on the previous version of 2002; more like a whole new standard than a revision.**

4

## Why IEEE 730?

- **Easy to use, very informative**
  - Easy to follow, like a handbook
  - Gathers all the current SQA information in one place
  - Provides a clear checklist of what to do to organize the production of quality software
- **Fulfills important quality purposes for an organization**
  - Demonstrating conformance to the official standard for SQA
  - As a reference for developing an effective and consistent SQA process specifically pertinent to the organization
  - Obtaining information and guidance for specific questions

5

## Who benefits when an organization adopts IEEE 730?

- **Quality managers** who are looking for guidance and streamlined implementation for SQA.
- **Project managers** who do not want poor quality to damage their schedule, budget, and ability to deliver customer-acceptable software.
- **Product managers** who want to deliver software that fully satisfies their customer's requirements.
- **Senior managers** who want their company's quality to be a competitive advantage, and those having customers who require a demonstration of a commitment to quality.
- **Customers and end users** who want quality software with few or no bugs.
- In short – the entire organization!

## What is Software Quality Assurance?

- **SQA is a set of activities that →**
  1. **Defines and assesses the adequacy of software processes to →**
  2. **Provide evidence for a justified statement of confidence that →**
  3. **The software processes will produce software products that →**
  4. **Conform to their established requirements.**

7

## Why SQA?

- **Fewer defects in the**
  - Processes used to develop software.
  - Business rules and requirements.
  - Software products.
- **Defects are found much earlier in lifecycle**
  - Thereby costing far less in money and time address.
- **Reduction and elimination of waste.**
- **Generate confidence throughout the project that activities will go well.**

8

## SQA Is Not

- Testing
- Reviewing or Auditing
- Reactive
- A gate or "police"
- Done only at the end of development
- An organizational unit (though some units may be named "SQA")



9

## You Don't Want This



You are a lucky bug. I'm seeing that you'll be shipped with the next five releases.

copyright 2009 Kazem A. Andakmanan

Source: <http://www.amazingonly.com/cartoon/software-bugs-life/>  
To be used for professional communications only.

10

## **SQA ACTIVITY AREAS**



11

## **SQA Activity Areas**

- I. SQA Process Implementation**
- II. Product Assurance**
  - ✓ **Assures that software products conform to established requirements**
- III. Process Assurance**
  - ✓ **Assures that project and organizational processes are accurate and effective, and that project activities conform to these processes**

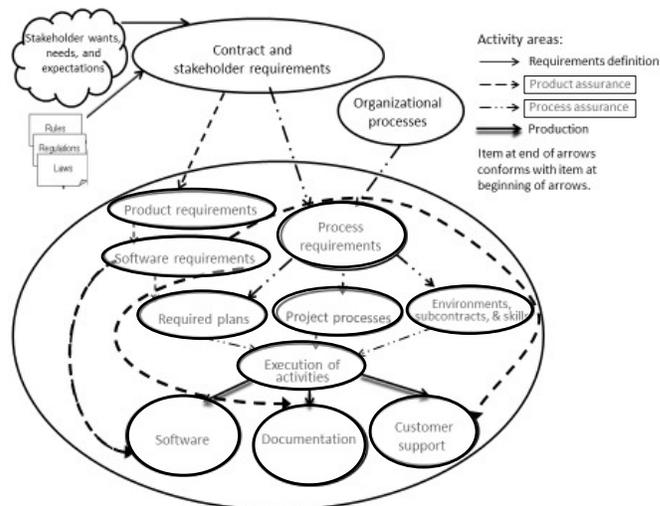
12

## Process flows through a project

- In a project, stakeholder and contract requirements merge with organizational processes to create product and process requirements for the project.
- These requirements lead to software product requirements and to project plans and processes, which are then used to develop the product for delivery to the customer.
- SQA assures that the product and the process flows are smooth and sure, with dependable handoffs from one element to the next.

13

## Process flows through a project (map)



14

## **SQA TASKS**

15

### **I. TASKS WITHIN SQA PROCESS IMPLEMENTATION**



16



Source: Dilbert, by Scott Adams, via <http://madhusudhan.info/Comics/Dilbert/>  
To be used for professional communications only.

17

## Task 1 – Establish the SQA Process

Define an effective SQA process that identifies what to do and how to:

1. Do it well
2. Confirm it is done right
3. Measure and track it
4. Manage and improve it
5. Encourage using it to improve quality

18

## **Task 2 – Coordinate with Related Software Processes**

**Enable SQA to integrate activities with other software processes, such as:**

- 1. Verification, Validation, Review, and Audit**
- 2. Project Planning**
- 3. Technical Processes**
- 4. Implementation Processes**
- 5. Reuse Processes**
- 6. Agreement**

19

## **Task 3 – Planning the SQA Activities**

- Adapt the generic SQA processes to the specific needs of the project.**
- Results are documented in the Software Quality Assurance Plan (SQAP).**
- This is where SQA is adapted to the specific nature of the project (e.g., Agile, CMMI, embedded, etc.)**

20

## **Outline for an SQA Plan**

- 1. Purpose and scope**
- 2. Definitions and acronyms**
- 3. Reference documents**
- 4. SQA plan overview**
- 5. Activities, outcomes, and tasks**
  - 5.1 Product assurance
  - 5.2 Process assurance
- 6. Additional considerations**
- 7. SQA records**

21

## **Task 4 – Execute the SQA Plan**

- **Execute the SQAP.**
- **Revise the SQAP as appropriate.**
- **Raise non-conformances when products or processes do not conform to their requirements.**
- **Create and use SQA records to improve quality.**

22

## **Task 5 – Manage SQA Records**

- **Records are created, maintained, and made available to project personnel and management.**
- **Records aim to document that project activities:**
  - Are performed in accordance with project plans.
  - Comply with the contract.
  - Support the identification and rectification of problems, causes, and improvements.
  - Enable information sharing.

23

## **Task 6 – Evaluate and Assure Organizational Objectivity**

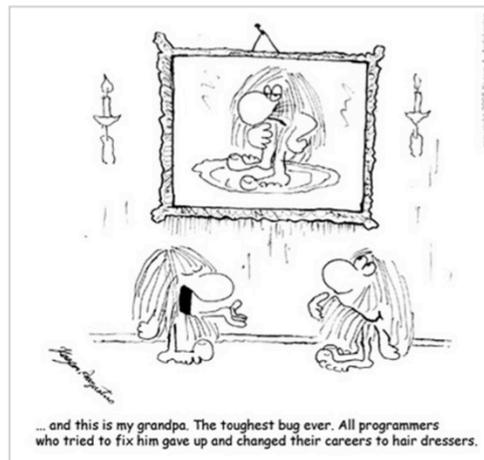
- **Those who perform SQA activities must have the organizational objectivity and authority to make objective evaluations and verify problem resolutions.**
- **Three important aspects of objectivity are:**
  - **Technical Independence:** Not involved in the development of the products being evaluated.
  - **Managerial Independence:** Not reporting to individuals responsible for product development/project management.
  - **Financial Independence:** Budget not controlled by individuals responsible for product development/project management.

24

## II. TASKS WITHIN PRODUCT ASSURANCE



25



Source: <http://www.amazingonly.com/cartoon/software-bugs-life/>  
To be used for professional communications only.

26

## **Task 1 – Evaluate Plans for Conformance**

- 1. Identify plans required by the contract.**
- 2. Raise non-conformances when plans do not conform to the contract (or when the contractual requirements are inadequate).**
- 3. Raise non-conformances when plans are not mutually consistent.**

27

## **Task 2 – Evaluate Products for Conformance**

- 1. Identify products and documentation required by the contract.**
- 2. Identify allocated requirements and ensure adequacy.**
- 3. Ensure that evaluations of software products/ documentation for conformance against the requirements are performed.**

28

### **Task 3 – Evaluate Product for Acceptability**

- **Determine project's understanding of conditions for product acceptance.**
- **Prior to delivery, evaluate the level of confidence that the software products and related documentation will be acceptable to the acquirer.**

**Note -- Depending on the development lifecycle (e.g., Agile environments), the customers themselves may be involved in prior-to-delivery acceptability determinations.**

29

### **Task 4 – Evaluate Product Support**

- **Have acquirer's expectations for product support and cooperation been established and documented?**
- **Have they been met?**
- **If the SQA process ends at delivery, how is suitable support ensured?**

30

## **Task 5 – Measure Products**

- **Do the project measures accurately and objectively represent the quality of the software products?**
- **Are improvements done as a result of the product measurements effective in improving product quality?**
- **Do the measurements of software products satisfy the measurement requirements and conform to the measurement plans?**

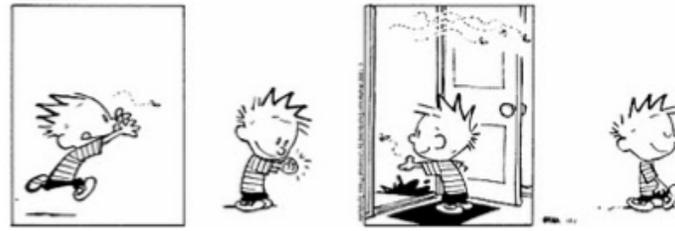
31

## **III. TASKS WITHIN PROCESS ASSURANCE**



32

Regression:  
"when you fix one bug, you  
introduce several newer bugs."



Source: <http://softwaretestingandqa.blogspot.com/> (and Calvin & Hobbes)  
To be used for professional communications only.

33

## Task 1 – Evaluate Life Cycle Processes

- Does the software development life cycle conform to project plans and fit with contractual requirements?
- Does the execution of project activities conform to the project plans?
- Does the execution of project activities yield products that conform to requirements?

34

## **Task 2 – Evaluate Environments**

- **Do the software development and test environments conform to project plans?**

35

## **Task 3 – Evaluate Subcontractor Processes**

- **Have project acquisition needs, goals, product, and service criteria been identified? Have they been met?**
- **Do subcontractor processes conform to project's requirements and subcontractor's own quality standards?**

36

## **Task 4 – Measure Processes**

- **Do the project measures support effective management of the software processes?**
- **Do the project measures meet the information needs necessary for managing effective processes?**
- **Does the executed measurement process satisfy the measurement requirements and conform to the measurement plans?**

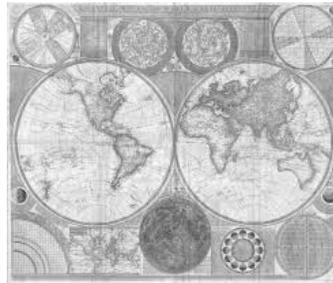
37

## **Task 5 – Assess Staff Skill & Knowledge**

- **Do the staff, including SQA staff, assigned to the project have the knowledge, skills, and abilities to perform their assigned roles?**
- **Have education and training plans been developed? Are they effective?**

38

## IEEE 730 ANNEXES



39

## Annexes to IEEE 730

- A. Mapping between IEEE 12207 and IEEE 730
- B. Mapping between SQA Plan outlines in IEEE 730-2002 and IEEE 730-2014
- C. **Guidance for Creating Software Quality Assurance Plans** (the aim of prior IEEE 730 versions, which this version includes)
- D. Mapping between IEEE 730 and SPICE
- E. Industry-Specific Guidance for IEEE 730
- F. IEEE 730 and the Agile Development Process

40

## **Annexes to IEEE 730**

- G. IEEE 730 and Very Small Entities (Std 29110)**
- H. Software Tool Validation**
- I. Assessing Product Risk: Software Integrity Levels and Assurance Cases**
- J. Corrective and Preventive Action Processes and Root Cause Analysis Process**
- K. Cross-reference**
- L. Bibliography**

41

## **IEEE 730 & Selected Software Development Lifecycles**



42

## IEEE 730 and Agile

- **SQA Process Implementation activity area**
  - In Agile, the product backlog plays a role of the "contract".
  - The SQA Plan is a tailored and evolving document, aiming to implement the 12 Agile principles.
  - SQA is integrated within each development team, with independence preserved through dotted-line relationships to the corporate quality management function.
  - Non-conformance issues are inserted into the product backlog and addressed in the appropriate sprints.
  - "Evaluation of product for acceptance" is a continual process in Agile, not just carried out at end of the project.

43

## IEEE 730 and Agile

- **Product Assurance activity area**
  - Product assurance works through the Agile "done" criteria.
  - Non-conformance issues are inserted into the product backlog and addressed in the appropriate sprints.
  - "Evaluation of product for acceptance" is a continual process in Agile, not just carried out at end of the project.
  - Measures are of two classes
    - Development team measures focus on progress in the sprint
    - Project management measures focus on progress in the product backlog, interactions among backlog items, and overall customer satisfaction.

44

## IEEE 730 and Agile

- **Process Assurance activity area**
  - SQA elements are integrated into the development teams, including test-driven development, tester and customer inclusion in development teams, continual integration, automated builds, and regression testing.
  - Strong emphasis on retrospectives after each sprint and at project completion.
  - Much stronger involvement with subcontractors, since organization is acting as an involved customer of the subcontractor.
  - Evaluation of processes, plans and environments are continuous

**IEEE 730 has an annex on Agile (Annex F) containing further details.**

45

## IEEE 730 and ISO 9001

- **ISO 9001 calls for answers to the following questions:**
  - Tell me what you do
  - Show me where it says that
  - Will these processes help you achieve your stated objectives?
  - Prove that this is what happened
- **Section 5 of IEEE 730 supplies material you can use to answer the above questions and thereby provide answers for Sections 1-8 of the ISO 9001 requirements.**

## IEEE 730 and CMMI

- CMMI has 16 core process areas. The ones that relate to quality are PPQA (Product and Process Quality Assurance), VAL (Validation), and VER (Verification).
- Since CMMI does not specify a particular process flow, CMMI-conforming organizations need to design their own PPQA process.
- IEEE 730 provides details for how to design this process.
- The VAL and VER process areas implement product assurance according to the plan in PPQA.

## SUMMARY



## **Learning objectives**

- 1. Benefits of SQA in general and IEEE 730 in particular.**
- 2. Integration of product and process requirements through SQA.**
- 3. The three key activity areas of SQA, and the specific tasks within each activity.**
- 4. SQA/IEEE 730 and various SDLC's including Agile**

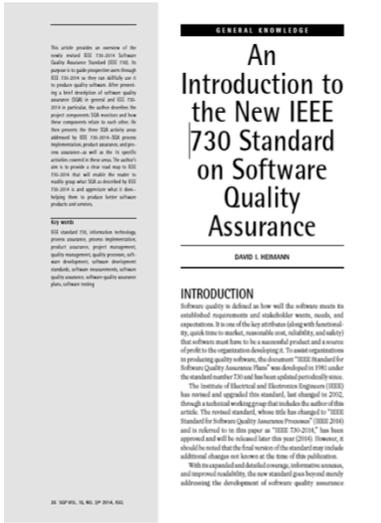
49

## **Summary of Presentation**

- IEEE 730 provides a foundation for Software Quality Assurance, which in turns provides confidence that software products will conform to their established requirements and satisfy the customer.**
- IEEE 730 addresses the three areas of SQA: Process Implementation, Product Assurance, and Process Assurance.**
- IEEE 730 can be used to prove conformance where SQA conformance is required, and to provide guidance where SQA conformance is desired.**

50

## My Software Quality Professional paper (e-mail me for a copy)



51

## My contact information:

**David I. Heimann**

**E-mail: [heimann.david@gmail.com](mailto:heimann.david@gmail.com)**

**Phone: 617-524-4531**

**[www.linkedin.com/in/dheimann](http://www.linkedin.com/in/dheimann)**

**[www.davidiheimann.com](http://www.davidiheimann.com)**

52