ESPA Seminar – Understanding Software Quality
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Quality goal setting method
Experiences from four software product companies

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Quality goals – why?

- Quality is in the eye of the beholder
  - Vague concept, different meanings, varying viewpoints
- Without goals, no matter which road do you take
- Quality goals help understanding and concretizing the desired quality characteristics and their level
  - Selecting and improving quality practices based on the quality goals
  - Improving the communication of the quality goals
  - Following the achievement of the quality goals
Software quality goal

A goal related to an external or internal quality attribute of final or intermediate software product.

- Characterizes the product from some quality viewpoint
- There are two types of goals
  - success factors, i.e. goals that are already reasonably well achieved
  - challenges, i.e. goals for which clear improvements are needed
How are quality goals handled in practice?  
A sample from ESPA survey

We have identified/prioritized/document the most important quality attributes  
(%, N=31)

Some companies have not identified their quality attributes, i.e., have no quality goals to strive for

Many companies have not prioritized or documented their quality goals

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Quality Goal Setting Method

- Objective is to *identify*, *prioritize* and *elaborate* quality goals in a *certain context*
- Collaborative approach
  - Workshop
  - Many roles and viewpoints represented
  - Genuine discussion on the goals
- Context specific
  - Specific goals for a selected product
  - Concrete goals in a project context
- Subjective goal identification
  - Experience based
  - Supported by a quality model (e.g. ISO 9126)
- Focusing to the most important qualities
- Sustainable effort
The context where the method was created and applied

- Software product development organizations
  - Different sizes, mainly SME (all < 500 persons)
  - Existing, mature products
    - Incremental product development
  - Products with long development life-cycle
    - Several past and forthcoming releases

- Method was applied
  - to a specific software product
    - in the context of a certain project type
    - in the context of a specific release project
QGS method: Overview of the phases

✓ Step 1: Preparation and pre-assignment
✓ Step 2: Brainstorming
✓ Step 3: Prioritization by voting
✓ Step 4: Goal elaboration
✓ Step 5: Post-workshop finalizing activities

**Individual assignment**
- 3-8 participants from different roles
- ½ hours / participant

**Workshop**
- 3-8 participants from different roles
- 4 hours / participant

**Individual/pair assignment**
- Few hours
QGS method: Step 1 (individual assignment)

Preparation

- Selecting the context and participants
  - Roles of the participants
    - Management
    - Business / Sales
    - Marketing
    - Development
    - Quality assurance
    - Representative of customer and end-user
    - ...

- Scheduling a workshop meeting

- Pre-assignment to participants
  - “prepare by using 10-30 minutes to list the most important quality goals for <the product/project> from your own viewpoint”
QGS method: Step 2 (workshop)

**Brainstorming**

- Brainstorming important quality goals for the product
  - Post-it notes on the wall
  - Ideas form the pre-assignment and new ideas

- Both success factors and challenges
  - Both types explicitly collected

- Briefly described
  - Can only state the quality attribute, not the actual goal
  - Elaborated later

- Similar and related ideas grouped to form goals
Additional brainstorming using a checklist

Checklist based on ISO 9126 and McCall Quality Models

Qualities

- Functionality
  - accuracy
  - configurability
  - correctness
  - customizability
  - repeatability
  - reproducibility
  - suitability
  - timeliness

- Reliability
  - accessibility
  - availability
  - dependability
  - fault tolerance
  - predictability
  - recoverability
  - stability
  - survivability
  - sustainability

- Performance efficiency
  - efficiency
  - performance
  - resource utilization
  - robustness
  - scalability

- Usability
  - administrability
  - demonstrability
  - learnability
  - manageability
  - operability
  - responsiveness
  - simplicity
  - understandability

- Maintainability
  - accountability
  - co-existence
  - composable
  - evolvability
  - extensibility
  - flexiblity
  - modularity
  - reusability
  - testability

- Security
  - accountability
  - credibility
  - integrity
  - safety

- Compatibility
  - adaptability
  - deployability
  - distributability
  - installability
  - mobility
  - portability

- Transferability
  - co-existence
  - compliance
  - interchangeability
  - interoperability

- Other
  - affordability
  - attractiveness
  - auditability
  - durability
  - relevance
  - serviceability
QGS method: Step 3 (workshop)

Prioritizing

- Everyone has as many votes as there are goals
- Everyone can give any number of their votes to any goal
- Success factors and challenges should be treated equally
  - voting based on the importance of the goal
  - not on the fact that some goals have already been achieved better than others
QGS method: Step 4 (workshop)

Elaborating

- Top-5 goals are chosen for elaboration
- Goals described in more detail by following a given template
  - In groups of 2-3 people
  - 20-30 minutes per goal
- Discussion and refining the goals if needed
Goal template

- **Name**
  - short name for the goal

- **Description**
  - Description that documents the goal on higher level than a single measure.

- **Rationale**
  - Motivates why the goal is important. Gains and risks; E.g., costs, business benefits, customer viewpoint.

- **Related factors**
  - Tentative ideas of what contributes, or prevents achieving this goal

- **Votes**
  - Number of votes in prioritization

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**One or more quality indicators**

- Measures that can be used indicate if this goal is achieved

- **For each quality indicator:**
  - **Description**
    - To understand exactly what is the indicator and a measure for it
  - **Current level**
    - Current value of the measure
  - **Target level**
    - Target for this indicator to achieve the goal
  - **Breakpoints**
    - Utility, differentiation, saturation
  - **Cost barriers**
    - If can be identified

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*concepts from QUPER

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Example of an elaborated goal

- **Name:** Easy updateability

- **Description:**
  - Updating the software should be quick and easy, ideally possible without deep technical or product knowledge

- **Rationale:**
  - Direct cost savings related to updates. Reduced risk of errors during updates.

- **Related factors:**
  - Robustness of the software, configurability, quality of installer software

- **Votes:** 6

- **QI 1:** Updating effort

  - Amount of average working hours consumed by making an update for a single customer installation.
    - Current level: 3 h
    - Target level: 15 min

  - **Breakpoints:**
    - Utility: 4h
    - Differentiation: 1h
    - Saturation: 10 min

  - **Cost barriers**
    - Automated installers have to be developed to reach better values than 1 h.
QGS method: Step 5 (individual/pair assignment)

Finalising documentation

- Finalize the description with the goal owner if needed
- Dig out the existing data on current level  
  - for the quality indicators
- Communicate the goals
- List current practices that contribute achieving the goals
Results of applying the method

- Brainstorming -> around 40-50 individual ideas
- Combined -> 8-14 quality goals
- Detailed elaboration -> 2-5 goals

- Common goals
  - Usability
  - Installability & updateability
  - Functional correctness
  - Functional suitability
  - Performance efficiency
Utilizing the quality goals

- Selecting and improving practices
- Guiding work and tracking progress
- Communicating the goals

... to achieve the goals
Utilizing quality goals on project level
QGP for Features

- Bringing goals and practices down to project plan level
  - Use product level goals and practices to create a project level quality assurance plan

- Project specific goals are specified
  - In the context of a certain feature in a certain project

- Quality practices are designed to match the project specific goals

- Quality goals and practices are communicated for designers, developers, testers, ...
  - What goals do we aim at
  - What exactly must be done to achieve the goals
QGP for Features

1. Identifying goals for selected features
   - For each selected feature define ~1-3 goals
   - Elaborate each goal
     - What does e.g. “efficient to use” mean in the context of this feature in this project

2. Designing practices for achieving goals
   - Select at least one good practice for each goal
     - What practices has to be performed?
     - How the practices help to achieve the goal?

3. Planning tasks based on the selected practices
   - Results are included into the project plan
   - Plan tasks for each selected practice and feature
     - What needs to be done
     - How much effort
     - When
     - Who is responsible
Example:
How to bring product quality goal on feature level

- **Product Quality goal**: Easy to use – The product is easy to use for normal users. A deep "guru“-level knowledge is not required in normal use.

- **Feature**: A new sketching tool for an engineering application

- **Detailed quality goal for the feature**:
  - Tool use can be learned in a few minute demo
  - An existing user who knows the principles of modeling can use the tool correctly without referring to manuals

- **Practices**:
  - Manual testing by independent tester
  - Creating a 1-2 min how-to video
  - Beta testing with real users
  - Using beta version at training sessions

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Lessons Learned
Lessons Learned:
Workshop based method seems to work

- Defining useful quality goals is possible
  - By little guidance and mentoring
  - Even easier than expected
  - Resulting quality goals were perceived good and useful

- Measures clarify the sometimes vague quality goals
  - Example: Installability - The software must be easy to install, update and configure.
    - Throughput time per update (including fixes) < 5h
    - Average number of reported defects from updates < 2

- Quality model was partly useful
  - provided a good structure to organize the goals
  - only few additional goal propositions raised, if any
Lessons Learned:
Effects of the Context

- A context of a specific project tends to be challenging
  - Focusing on specific details of a project context first
  - A lot of generic goals and practices emerge

- Method worked smoothly in the context of one product
  - Easier to maintain focus
    - Wide and generic goals avoided
      - generic or company-policy level
  - Drilling down to the project level was easy based on product level goals and practice list
Lessons Learned:
Perceived challenges

- Separating different types of goals and practices essential
  - Success factors and challenges
  - Current practices and improvement ideas

- People have a tendency to think solutions first
  - Before analysing or even identifying properly the goals

- Multiple viewpoints in prioritization
  - Focusing to goals that need improvement
  - Important success factors were easily neglected
  - People in different roles see different priorities
  - Effect of the dependencies between the goals

- Workshops with a large group take a lot of effort
  - Trade-off between spent effort and wide involvement
  - Easy to slip into inefficient chit-chat around the quality topics
Lessons Learned: Practical tips

- Ensure that participants have enough authority to represent their group
- Four-hour workshop is a heavy exercise – split it into 2 two-hour workshops
  - Gives time to think and recharge
- Cut down the effort by focusing
  - Do the initial brainstorming by smaller group
  - Pre-assignment can be collected from larger group
  - Do elaboration individually or in pairs
  - Use large workshop for communicating and prioritization
- List first the success factors and after that the goals that need improvement
- Chair should ensure goal names reflect goals, not solutions
  - E.g., “testability”, not “efficient test automation”
Questions and more discussion

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