

Assignment 4: integration reports

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Content

The assignment is to critically assess the quality of the three modules you bought at the end of phase 1, and to report on your integration effort.

You should submit the following:

- 1) State which modules you bought, from which teams. Give a brief (1 paragraph each) description of why you chose each of these modules from among their competitors.
- 2) For each of the modules you bought at the end of phase 1, a description of the **quality** of the module. Include in your report a description of:
 - the quality factors that you used to make the assessment;
 - why those factors are important to you (ie. how do they relate to “*fitness for purpose*”);
 - the metrics you used to assess these quality factors, and
 - the actual data collected for each metric.Conclude by comparing your reasons for buying the module with your assessment of its quality – would you make the same purchasing decision again?
- 3) Provide a summary of the modifications you have made to the modules you bought at the end of phase 1. To do this you should define a small number of classes that characterize different types of modification you have made, based on both the original location of the problem (e.g. was it a problem in the original spec, a problem of interpreting the spec, a problem in the interface standards, a design error, a coding error, etc) and the type of the problem (e.g. missing function, extra function, wrongly implemented, misinterpretation, incorrect assumption, incorrect interface, etc). Provide summary data for numbers of modifications in each class. Then choose *one* modification from each class, and describe:
 - how you discovered the problem;
 - whether the problem could have been anticipated and avoided by improving the original specification;
 - whether the team that built the module could have predicted the need for the modification;
 - what the team that built the module could have done (if anything) to make the modification easier.
- 4) Briefly describe your integration testing strategy, and describe (in detail) four of the test cases you used for integration testing, indicating which tests passed and which failed. What other kinds of testing did you use? What are the strengths and weaknesses of your integration testing strategy?

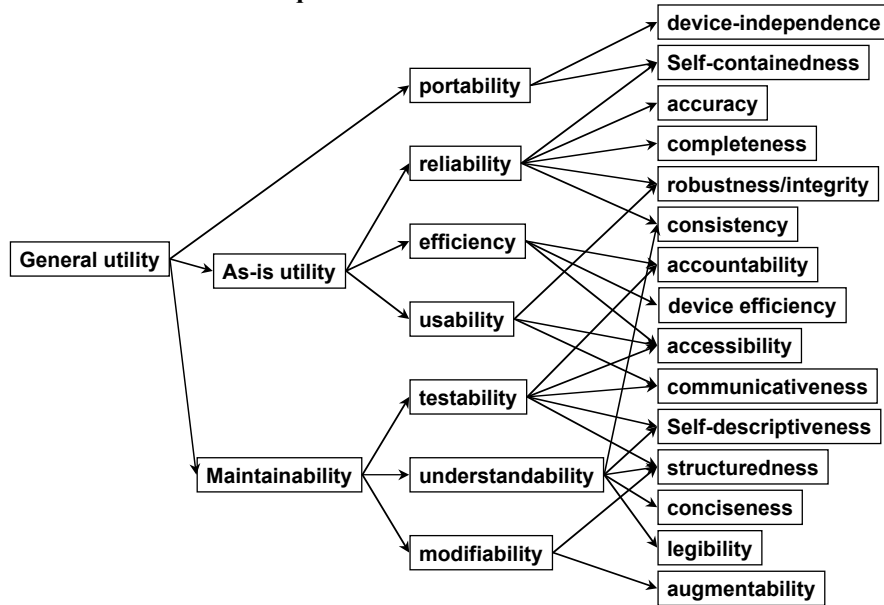
Background Information

The ultimate measure of design quality is fitness to purpose. This means that to measure software quality we have to understand what the purposes are for which it is intended. Note this also means that quality is not a measure of software in isolation; it is a measure of the relationship between software and its application domain. This means that an assessment of its quality depends on the context, and if you change the context, the assessment of quality may change – software that’s good for one purpose may not be so good for another purpose.

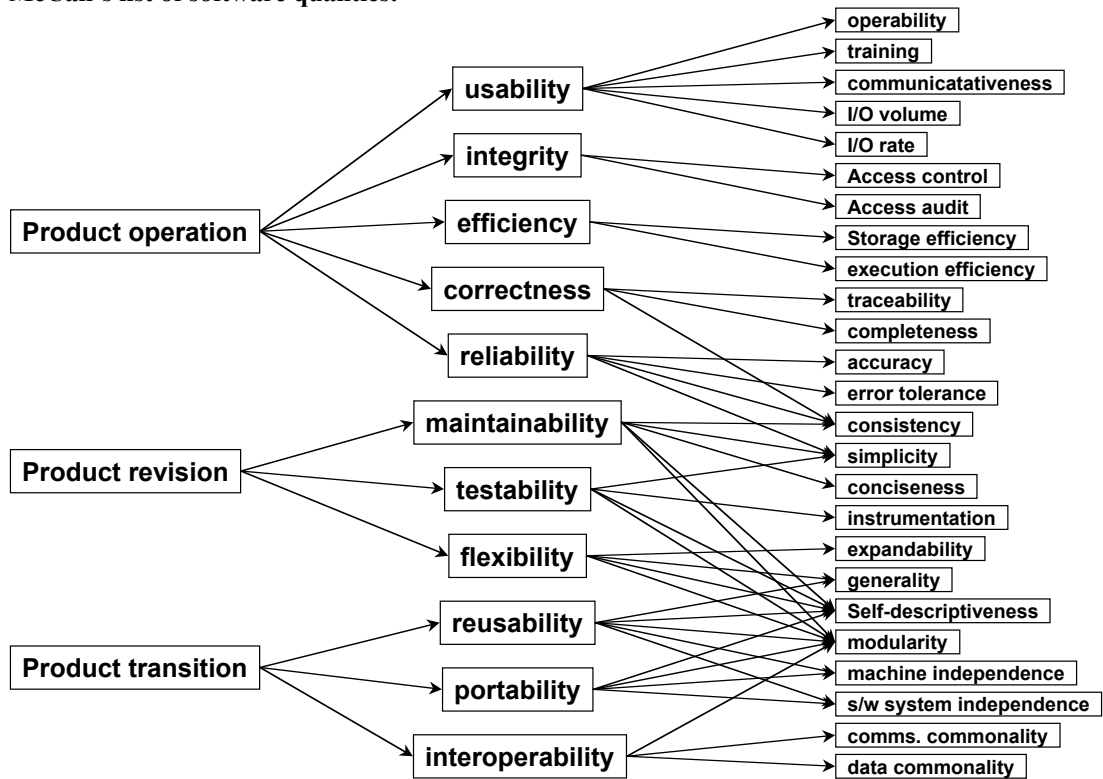
Measurement of quality generally starts by identifying a set of critical quality factors, and then refining these down to measurable attributes of the software. There is no agreed way of doing this. Different quality assessors disagree about what various measurable attributes of software actually tell you about its quality. Two well-known quality factor lists are those of Boehm and McCall. They differ, both on the factors they identify and on the mappings between higher level and lower level factors. Note that both stop before they get to measurable attributes – each of their bottom level factors still needs to be mapped onto *measurable* aspects of the software (i.e. things that you can actually count!).

See also lecture notes and the text on software quality.

Boehm's list of software qualities:



McCall's list of software qualities:



Marking scheme

Listed below are some of the things your TA will look for when marking this assignment. Use this list to check your work before you hand it in.

Note: It is assumed that this assignment describes a completed integration process. If the team claims that they couldn't complete (parts of) the assignment because they haven't finished the integration, they cannot get credit. Integration should have been complete by the due date of this assignment.

For submission 1. (These cover the decision making **before** the purchase.)

Did they state which modules they bought and give some justification for each purchase? (This can be an informal justifications – a few sentences should be sufficient)

- must be (at least) three modules purchased, one of each type.
- Any justification is acceptable, as long as it relates to the purchase (e.g. being impressed with the team's marketing literature; knowing members of the other team, the other team being easy to get hold of, etc)

Do their justifications for each purchase should say how the modules that they bought compared to the ones they didn't buy? (This can be an informal comparison – a few sentences should be sufficient)

- should refer to some qualities that relate to their goals for the project.
- should say something about which factors they regarded as important in the trading
- should say how the competing selling teams compared according to these factors, including the modules/teams that they rejected.

For submission 2. (These cover the quality assessments **after** acquiring the modules, given that they could then examine what they bought in detail.)

Did they pick out a set of quality factors to use for the quality assessment, and give some rationale as to why those factors were important?

- Is it clear which quality factors they used?
- Do they clearly say why they selected these factors?
- Does their chosen set of quality factors make sense for their stated goals?
- Did they say *why* other quality factors were rejected for use in the assessment? (They must have rejected some, otherwise they are doing too much analysis!!)
- Is the set of factors well-balanced (i.e. covers several different aspects of software quality)?

Did they identify actual metrics (countable measures) that relate to each of the quality factors that they chose to use, and did they apply the metrics to the modules? Subjective nominal categories (e.g. using "poor, average, good, excellent" for a metric) are fine for *some* of the metrics, as long as this wasn't the only approach used for every factor!

- Do they show evidence that they understand how to break down a high-level quality factor into a number of specific measurable quantities?
- Are the metrics they selected appropriate for the quality factors they identified?
- Did they use a range of different metrics (i.e. not just subjective nominal categories everywhere!)?
- Do they give some data from applying the metrics?
- Is the data believable (i.e. have they applied the metric correctly?)

Did they provide a clear summary and visualization of how the modules compare according to the metrics & qualities? (E.g. a table, some graphs, etc)

- Is the summary clear and readable?
- Does the summary give a coherent picture of the quality of the three modules?
- Did they use their assessment to provide some insight into how effective their purchasing strategy was now that they've had a chance to assess the modules they purchased in detail?

These refer to submission 3. (If there are no modifications to report because the modules they bought were "perfect", then they can only get these points if they give an absolutely convincing argument for how this could be, including evidence that they have done sufficient integration testing.)

Have they defined a classification scheme for the modifications made during integration?

- Does the scheme refer to both original source of the problem and type of the problem?

- Did they give a justification of their choice of classification scheme?
- Did they use the scheme to classify the modifications?
- Did they provide summary data for all their modifications?
- Does the classification scheme give a useful overview of the kinds of changes that were necessary?

Have they described a sampling of the integration problems they encountered?

- Did they cover a modification from each of the (populated) classes in their classification scheme?
- Did they clearly describe what the problem was?
- Did they clearly describe how they discovered it?
- Did they justify why the change was necessary? (E.g. for bug fixes, what impact does the bug have on the overall system operation; for design modifications, is there a cost/benefit analysis?)

Have they shown that they understand whether and how the integration problem(s) could have been prevented?

- Did they say whether they thought each problem could have been prevented prior to integration?
- Did they make suggestions about whether (or not) any improvements to the specification could have made integration easier? (If not, they need to say why not!)
- Did they make suggestions about whether (or not) the teams writing the individual modules could have made integration easier? (If not, they need to say why not!)
- Are the suggestions sensible and plausible?

These refer to submission 4.

Did they clearly explain their integration testing strategy?

- Is the strategy clearly different from just testing each module in isolation?
- Does their strategy show evidence that they thought about *coverage* for integration tests?
- Do they understand the strengths of their strategy?
- Do they understand the weaknesses of their strategy?
- Overall, is their testing strategy likely to be effective?

Did they clearly describe a sampling of their test cases? (The assignment asked for four!).

- Would you be able to follow the descriptions, as a tester, to carry out each test?
- Did they give a clear rationale for each test case (what aspect of the system is it testing?)
- Is each of the test cases clearly part of integration testing (i.e. not just a unit test!)
- Do they include some tests beyond basic functional correctness (e.g. stress testing, endurance testing, etc)?
- Did they say which tests passed and which failed?