Quality

What does quality mean?

What affects the quality of a product or company?

Book reading:
Chapters 19 and 20

Everything here will be covered by the course eventually, but not necessarily in the order given here. Beginning of Chapter 19 is most relevant to this section.

Quality – if time permits

Key quotes from DeMarco and Lister:

The Flight from Excellence – the market will often accept a level of quality which is so low that achieving only that demoralises the producers.

Quality, far beyond that required by the end user, is a means to higher productivity.

Quality is Free, but... Philip Crosby made essentially this point in his book *Quality is Free* (1979) but this is often misunderstood. In fact:

Quality is free, but only to those who are willing to pay heavily for it.

Power of veto.

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You brainstormed a large number of attributes of a product and/or a company that might contribute to it being considered "high quality", and some factors which affect quality (from technical things e.g. quality of the design and the testing procedure to mangagerial things e.g. deadlines.) In support of the idea that managerial factors are important I read out part of the chapter "Quality is Free" from Peopleware.

Quality assurance

(Section 20.4, mostly.)

Quality assurance

How can we go about ensuring that products and projects have the necessary quality attributes?

Two basic approaches:

- focus on the product itself (inspect, test, verify, ...)
- focus on the process of producing the product

Each focus has advantages and disadvantages: an effective quality policy needs aspects of both.

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Process focus

Advantages:

- potential to improve *all* products
- possibility of certifying a whole organisation
- some important things, especially planning (and thus time-to-market, cost etc.), are hard to approach in any other way.

Disadvantages:

- done badly, can easily prove very costly with low benefits: easy to spend time and money without improving *any* product

(more later)

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Centers of process-focused QA

Possibly directions of influence, each with own philosophy:

Organisation $\longleftrightarrow$ Project $\longleftrightarrow$ Individual

1. Organisation's management decrees, influencing projects whose managers direct individuals into desired behaviour.

   (Underlying philosphy: people try to get out of work and need to be controlled.)

2. Individuals introduce improvements which are rolled up and out to the rest of the project and the rest of the organisation.

   (Underlying philosophy: people want to do good work and need their efforts to be noticed and enabled.)

The DeMarco/Lister passage I read last week assumed the latter philosophy: most QA today seems to be based on the former.

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Controlling QA

We'll look at two examples with different aims:

- CMM, the Capability Maturity Model (from Carnegie Mellon's Software Engineering Institute).

  Crucial idea here is that maturity increases: quality planning, control and *improvement* framework.

- ISO9000

  Less emphasis on improvement: quality *control* framework.

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CMM

(I think this was mentioned in ProgMeth last year in the context of planning but you didn't discuss it more generally?)

CMM defines 5 levels of capability maturity, plus *key process areas* that have to be addressed to progress and *key practices* that organisations should be carrying out.

No certification as such, though respected consultants etc. may express opinions about the maturity level of an organisation they've audited.

More info from ricis.cl.uh.edu/process_maturity/CMM/TR24/tr24.html

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Quotations from that tech report (The Capability Maturity Model for Software):

1 Initial " ineffective planning and reaction-driven commitment systems";

"During a crisis, projects typically abandon planned procedures and revert to coding and testing. Success depends entirely on having an exceptional manager and a seasoned and effective software team.";

"Schedules, budgets, functionality, and product quality are generally unpredictable. Performance depends on the capabilities of individuals and varies with their innate skills, knowledge, and motivations."

2 Repeatable " An objective in achieving Level 2 is to institutionalize effective management processes for software projects, which allow organizations to repeat successful practices developed on earlier projects, although the specific processes implemented by the projects may differ."

"Realistic project commitments are based on the results observed on previous projects and on the requirements of the current project."

3 Defined "the standard process for developing and maintaining software across the organization is documented, including both software engineering and management processes, and these processes are integrated into a coherent whole."

"Projects tailor the organization's standard software process to develop their own defined software process, which accounts for the unique characteristics of the project."

"Because the software process is well defined, management has good insight into technical progress on all projects."

4 Managed "the organization sets quantitative quality goals for both software products and processes."

"Meaningful variations in process performance can be distinguished from random variation (noise), particularly within established product lines. The risks involved in moving up the learning curve of a new application domain are known and carefully managed."

5 Optimising "the entire organization is focused on continuous process improvement."

"Data on the effectiveness of the software process is used to perform cost benefit analyses of new technologies and proposed changes to the organization's software process."

"Software project teams in Level 5 organizations analyze defects to determine their causes. Software processes are evaluated to prevent known types of defects from recurring, and lessons learned are disseminated to other projects."

Brief definitions of CMM levels

Initial The software process is characterized as ad hoc, and occasionally even chaotic. Few processes are defined, and success depends on individual effort.

Repeatable Basic project management processes are established to track cost, schedule, and functionality. The necessary process discipline is in place to repeat earlier successes on projects with similar applications.

Defined The software process for both management and engineering activities is documented, standardized, and integrated into a standard software process for the organization. All projects use an approved, tailored version of the organization's standard software process for developing and maintaining software.

Managed Detailed measures of the software process and product quality are collected. Both the software process and products are quantitatively understood and controlled.

Optimizing Continuous process improvement is enabled by quantitative feedback from the process and from piloting innovative ideas and technologies.

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ISO9000

ISO9000 is a series of standards produced by the International Organisation for Standardisation. ISO9001, one of the series, is what you'll most often see cited for software quality. It covers quality assurance of design, development, production, installation and servicing.

Does not tell you exactly what your quality policy should be, e.g. what should be in your Quality Management System. Defines requirements for your own context-sensitive decisions.

It exists under other names too: BS5750 in the UK, AS/Q(?) 9000 in the US.

Certification/registration is done by 3rd party auditors, not by ISO: you choose.

More info: the Web, e.g. www.connect.ab.ca/~praxiom/9001.htm

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Next slide quoted from www.connect.ab.ca/ praxiom/9001.htm

E.g., to be ISO9001 registered management must:

- Define a quality policy. Your policy should describe your organisation's attitude towards quality.
- Define the organizational structure that you will need in order to manage your quality system.
  - Define quality system responsibilities, give quality system personnel the authority to carry out these responsibilities, and ensure that the interactions between these personnel are clearly specified. Also, make sure that all of this is well documented.
  - Identify and provide the resources that people will need to manage, perform, and verify quality system work.
  - Appoint a senior executive to manage your quality system and give him or her the necessary authority.
- Define a procedure that your senior managers can use to review the effectiveness of your quality system.

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Individual-based process management

Total Quality Management

TQM embodies the idea that improving quality is everyone's job – not just that of the QA department.

Quote from SQM article "TQM OK: BS5750 maybe" by Barry Faith:

TQM is a management philosophy which can be defined as: 'continuously meeting agreed customer requirements, at the lowest cost, by releasing the potential of everyone in your team'.

This definition highlights a little known fact: every member of your team comes, not only with two arms and two legs, but also a free brain! One of the primary tasks of executives and managers is to find ways of releasing the latent potential that everyone in their team has. We all have gold mines between our ears. TQM helps us dig!

TQM is enabled by two complementary actions [in] our organisation:

- a programme of culture change.
- implementing a QM System that specifies and records how your organisation goes about its business.

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Crucial ingredients

- Quality planning – how will you ensure that this project delivers a high quality product?
- Quality metrics – what measurements must you make in order to tell whether what you're doing is making the difference you intend?

You covered these in some detail in ProgMeth: good idea to revise that note.

Crucial extra ingredient:

- Quality improvement – what can you learn from this project to help you plan and run the next one better?

Even very simple techniques like routinely having a "post mortem" meeting can help a lot.

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