Quality Requirements: Trade-off Analysis of Benefit and Cost

Richard Berntsson Svensson
Department of Computer Science, Lund University, Sweden
richard.berntsson_svensson@cs.lth.se

1. Background

Would slightly better performance be significantly more valuable from a market perspective? Would significantly better performance be just slightly more expensive to implement? When dealing with quality requirements, we often end up in a difficult trade-off analysis. Aspects such as release targets, end-user experience, and business opportunities must be taken into consideration. But when is the quality level good enough? Berntsson Svensson et al. [1], pointed out that a major challenge by practitioners in industry is deciding when a certain quality level is good enough. Should the performance be two seconds, 1.5 seconds or even one second?

To support release planning and roadmapping of quality requirements, we have developed the quality performance (QUPER) model [2, 4, 5].

The development of QUPER was carried out at two case companies in the mobile handset domain with a supplier-integrator relationship [5]. To apply QUPER in practice, the generic guidelines in Regnell et al. [4] were developed in cooperation between industry and academia. Moreover, the tailoring and evaluation of QUPER [2] were carried out by the researchers together with practitioners at the case company using an action research [6] approach.

2. QUPER

A major objective of QUPER is to define a feature prioritisation model that includes a third dimension related to quality, in addition to cost and value that are used in prioritisation of functional requirements [3].

The QUPER model is based on the observations that quality is continuous and non-linear. The quality level is typically not viewed as either good or bad, but rather as something with different shades of goodness on a sliding scale.

The QUPER model has two main concepts: breakpoints and barriers. A breakpoint is an important aspect of the non-linear relation between quality and benefit, while barriers represent an interesting aspect of the non-linear relation between quality and cost. The two concepts of breakpoints and barriers form the basis of QUPER’s three views: (1) the benefit view, (2) the cost view, and (3) the roadmap view.

The benefit view (see Figure 1) includes three breakpoints. The utility breakpoint marks the border between useless and useful quality. Useless means that a product is not accepted on the market and does not recognize its value. The differentiation breakpoint marks the shift from useful to competitive quality, which makes them have a competitive market position. The saturation breakpoint imply a change in quality level from competitive to excessive quality, where higher quality levels have no practical impact on the benefit in the particular usage context considered.

![Figure 1. The QUPER benefit view](image)

The cost view (see Figure 2) includes foreseen cost barriers. For a specific quality aspect in a specific context, we approximate the quality-cost relation to have two different steepness ranges. A typical cost barrier may be the result of that a quality increases is not feasible without a large reconstruction of the product architecture, while a typical cost plateau is exemplified by the case where comparatively inexpensive software optimizations may result in high gains of performance.

The roadmap view (see Figure 3) combines the benefit and cost views by position the breakpoints and barrier together ordered on the same scale. This view enables visualization of benefit breakpoints and cost barriers in relation to the current quality level of a product and the qualities of competing products. This view also combines the notation of targets for coming releases with the aim of supporting roadmapping.
The QUPER model's benefit view is evaluated in Berntsson Svensson et al. [2]. The main lessons learnt by applying QUPER in an industrial context show that it was a good basis for decisions about introduction of new products to the market and it provided more informed decisions and a good overview of the current market. QUPER also was view as being easy to understand and learn.

The main identified challenge by using QUPER was difficulties to identify and specify the values for the differentiation and saturation breakpoints. In addition, different understanding of the breakpoints value among the involved stakeholders was raised as a challenge.

Ongoing research related to the QUPER model involves the development of practical guidelines for QUPER's cost view. We have started an interview study with professionals at the case company with the purpose to understand how software cost estimations are conducted in current processes, how the practitioners think we estimating software cost, and to get input about QUPER’s cost view. The gathered data will be used to create practical guidelines, which may be evaluated in several experiments, both with students and professionals as subjects. The initial results from the interviews indicate that the cost view is of great value for creating business cases. Several subjects have confirmed the importance to understand what different levels of quality cost, which is important for the decision-making process of roadmapping and scoping.

3. Conclusions

We have developed and evaluated QUPER in a case company by applying it in real projects, using real requirements, in cooperation with industry professionals. The overall lessons learnt are that QUPER is relevant in high-level decision-making for quality requirements in an activity such as release planning. The concepts of breakpoints, competitor analysis, and identification of own products' quality level provides a great understanding of current market segments and why a certain quality level is needed in a particular release. The main identified challenge is difficulties to identify the differentiation and saturation breakpoints.

Further research includes additional evaluations of QUPER involving case companies in other domains. In addition, evolution of the market needs to be investigated, how to use a snapshot of today’s market when predicting future quality levels.

4. References


Richard Berntsson Svensson © 2009. The authors assign to AWRE a non exclusive license to publish this paper in full in the AWRE'09 Proceedings. The paper may be published on the World Wide Web, CD ROM, in printed form, and on mirror sites on the World Wide Web. Any other usage is prohibited without the express permission of the authors.