



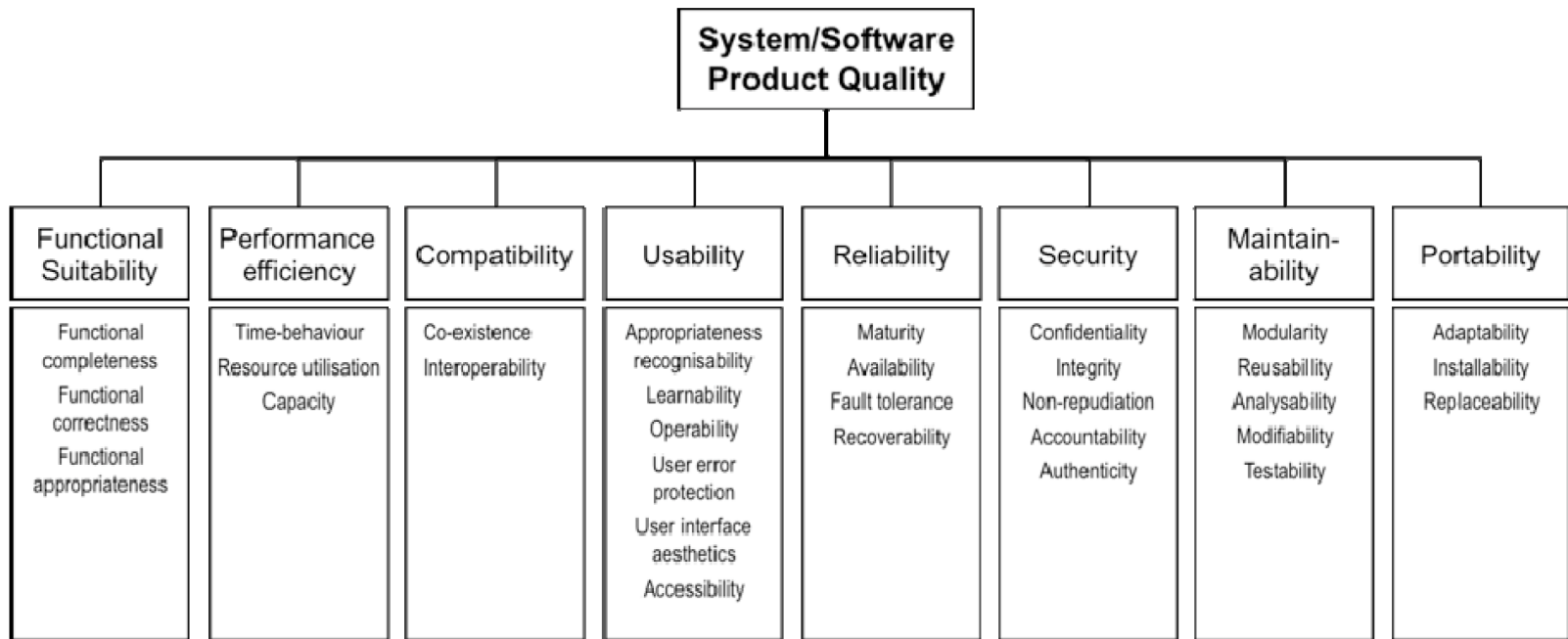
Quality Requirements Elicitation Based on Inquiry of Quality-Impact Relationships

Farnaz Fotrousi, Samuel A. Fricker,
Markus Fiedler

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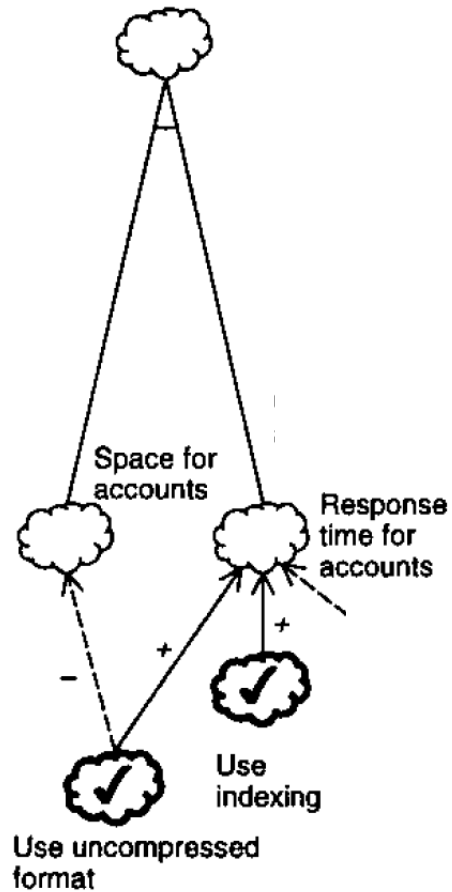
Quality Requirements



ISO/IEC FDIS 25010

Goal Modeling

Good Performance for accounts



[Chung et al, 2000]

Research Problem

- How can we determine the appropriate quality levels for requirements that are specified with a scale, rather than with operationalized goals?
- Quality attributes such as
 - Performance such as response time
 - Reliability such as mean-time-to-failure
 - etc.
- Impact of the problem:
 - Too little quality disappoints users
 - Too much quality is costly and inefficient

Agenda

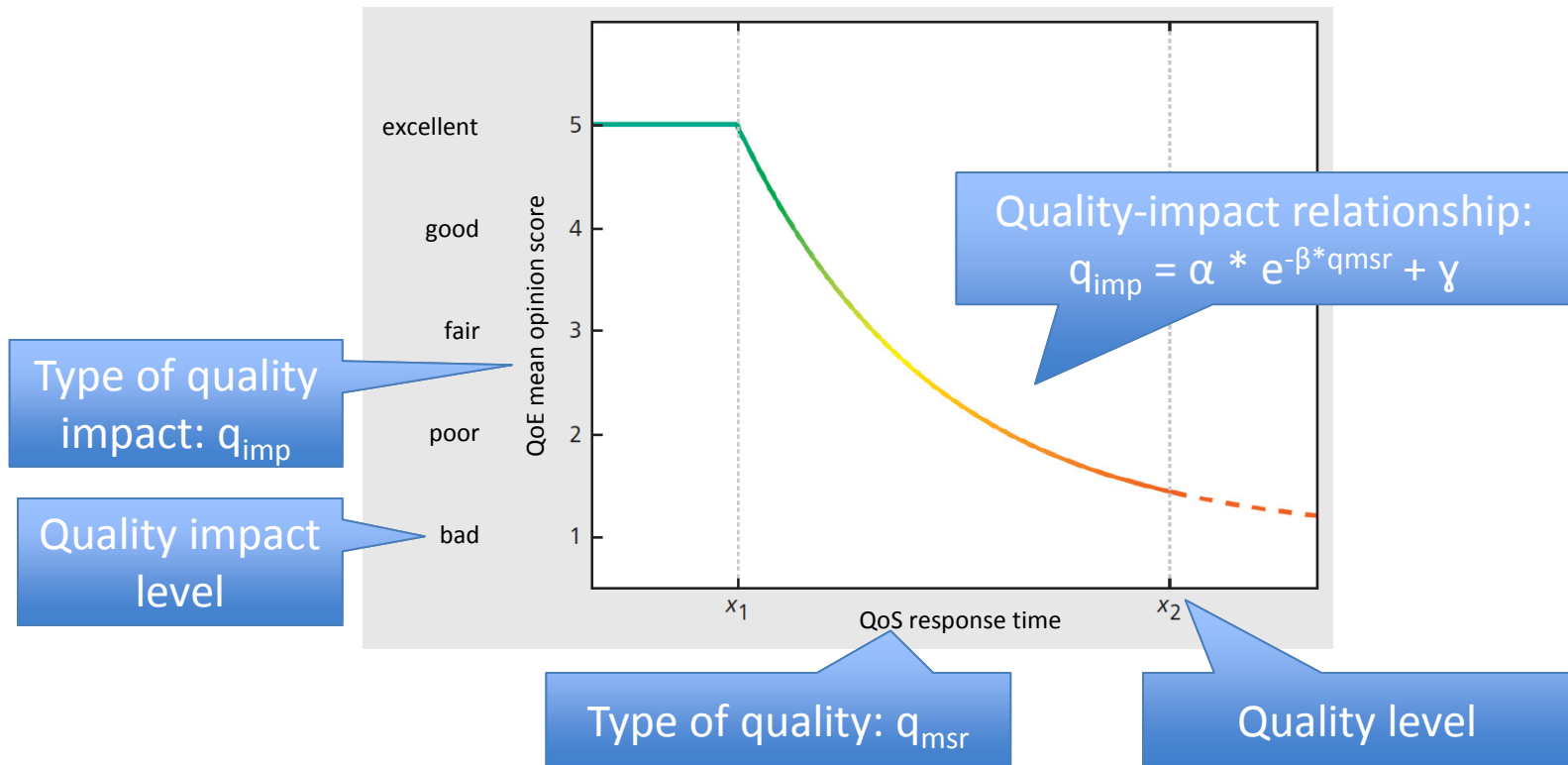
- Quality-Impact Relationships
- Requirements Elicitation Method
- Real-World Example of Method Application
- Discussion and Future Work
- Summary

Quality-Impact Relationships

- A *quality-impact relationship* is a function between software quality levels and their impacts for a given pair of quality attribute and impact.
- Example (positive)
 - Software quality level: 0.1 seconds response time
 - Impact: user thinks the software is excellent
- Example (negative)
 - Software quality level: 10 seconds response time
 - Impact: user thinks the software is bad

Prior Work

- In prior empirical work, we have explored one kind of quality-impact relationship: *Quality of Service (QoS)* and *Quality of Experience (QoE)* for telecommunication services [10]

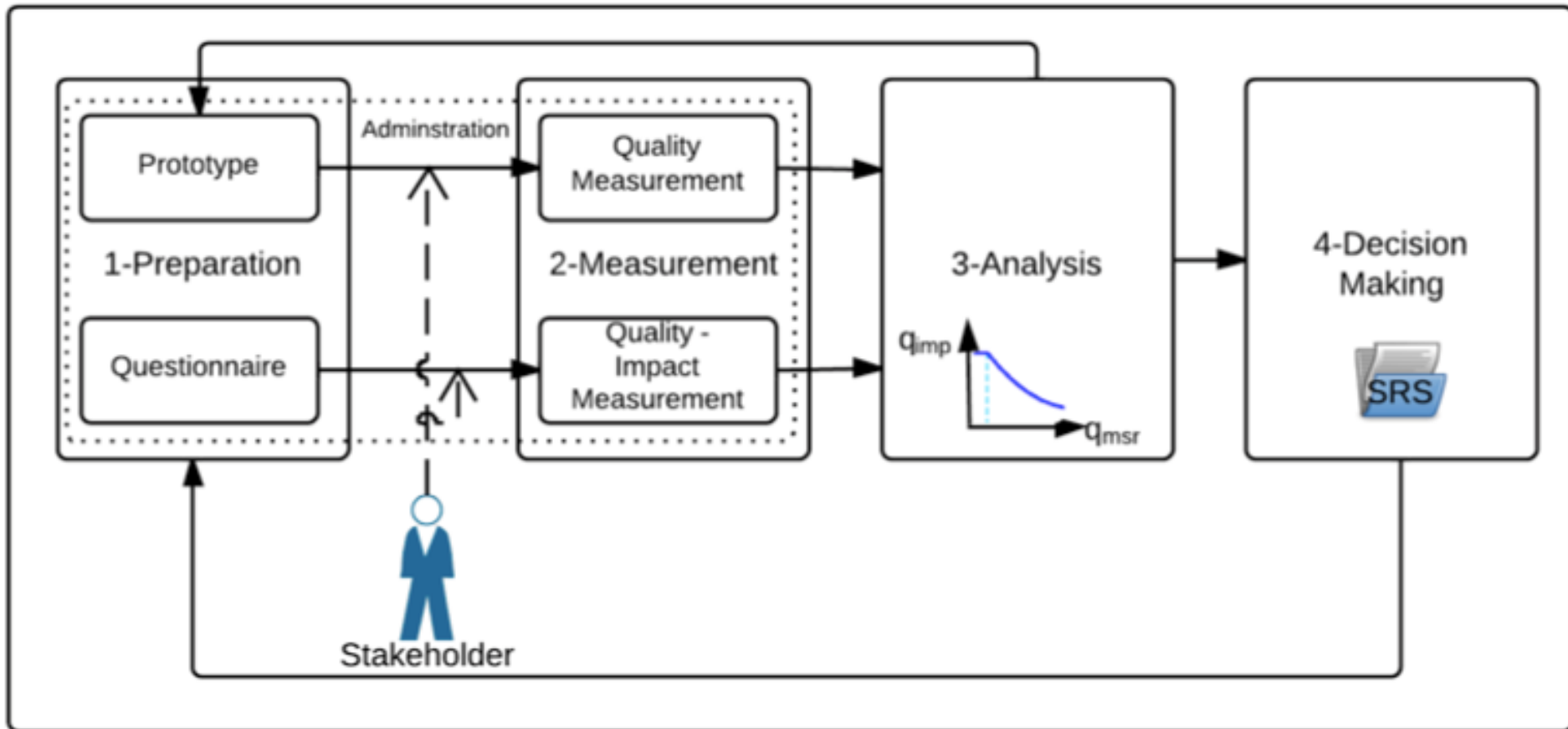


Key Ideas

- Quality-impact relationships make the pragmatic meaning of quality levels explicit.
 - instead of just saying we need 0.1 sec response time...
 - ...we know that the user will be happy with it
- Quality-impact inquiry method design:
 - Framework of inquiry-based requirements analysis
 - Supporting methods:
 - Prototype: enable the quality experience and measurement (q_{msr})
 - Questionnaire: collect user experience data (q_{imp})
 - Workshop: efficient, controlled setting

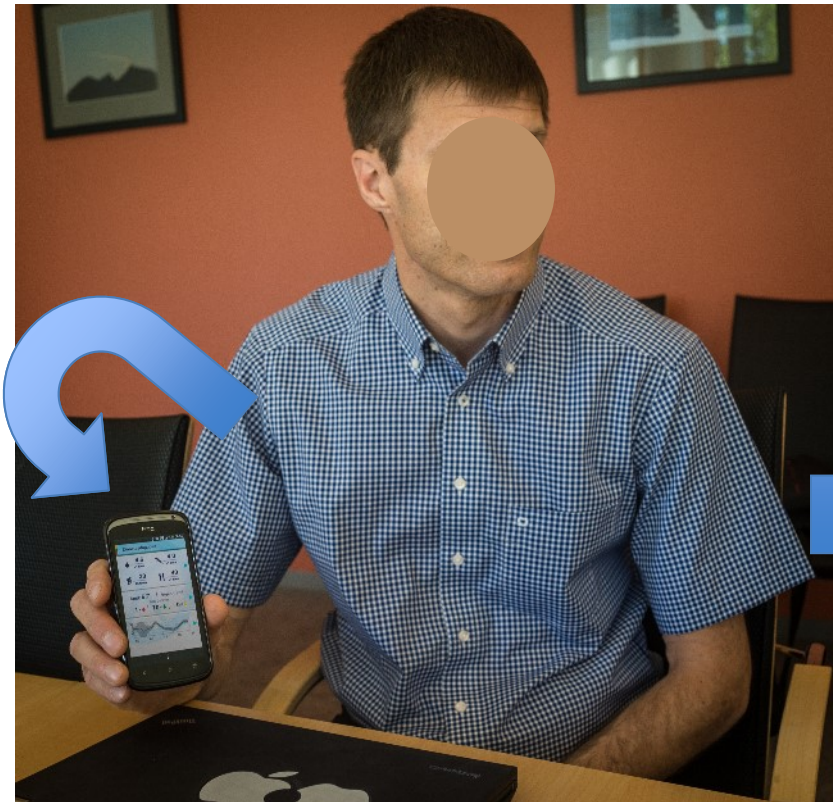
Quality-Impact Inquiry

Elicitation



Diabetes Self-Management App

Self-monitoring of glucose, stress, etc.



Data sharing
with consulting doctor

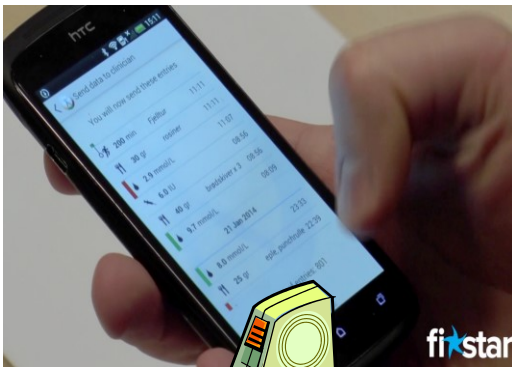
The Requirement Problem

What waiting time shall be acceptable for the user (patient) until data sharing is completed?

- Type of quality impact, q_{imp} : user acceptance
- Type of quality, q_{msr} : response time (waiting time)

1. Preparation

■ Prototype



measurement
facility



q_{msr} : response time

■ Questionnaire

Overall, how satisfied are you with the feature you just have experienced?

Excellent (5) Good (4) Fair (3) Poor (2) Bad (1)

Please tell us why you feel that way:



q_{imp} : user's acceptance

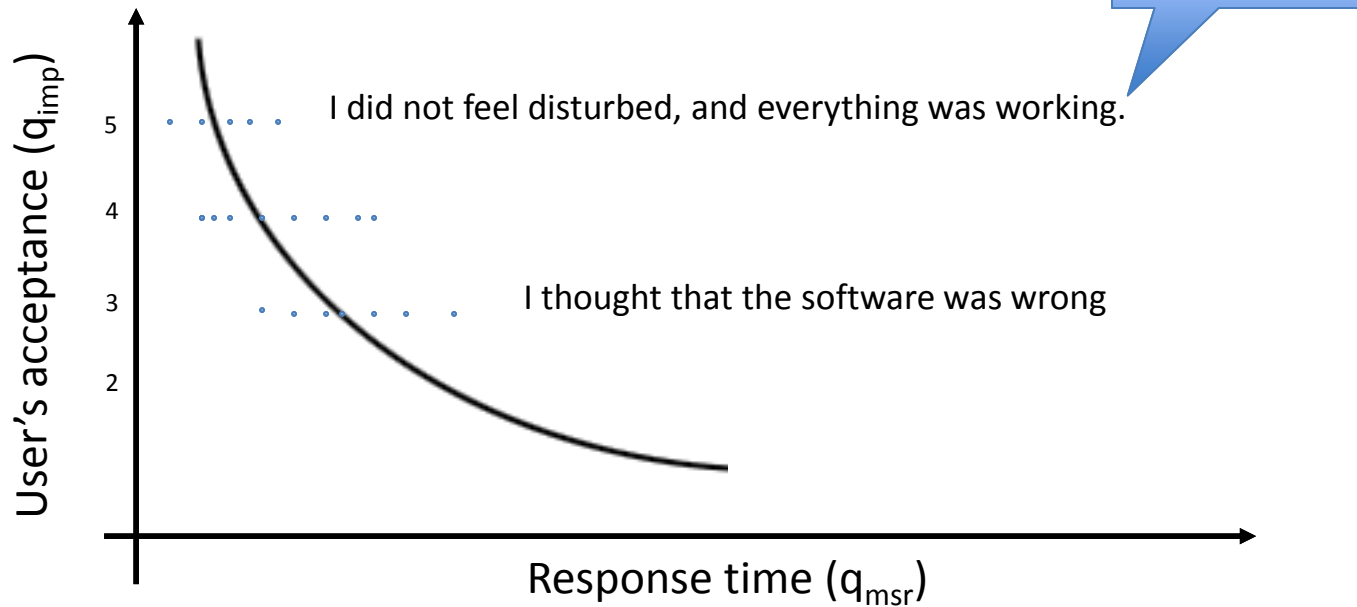
■ Call for Workshop

2. Measurement

Measurement	q_{msr} : response time	q_{imp} : user's acceptance	Rationale
Measurement 1	1.26 seconds	4	...because of...
Measurement 2	0.22 seconds	5	...because of...
Etc.			

3. Analysis

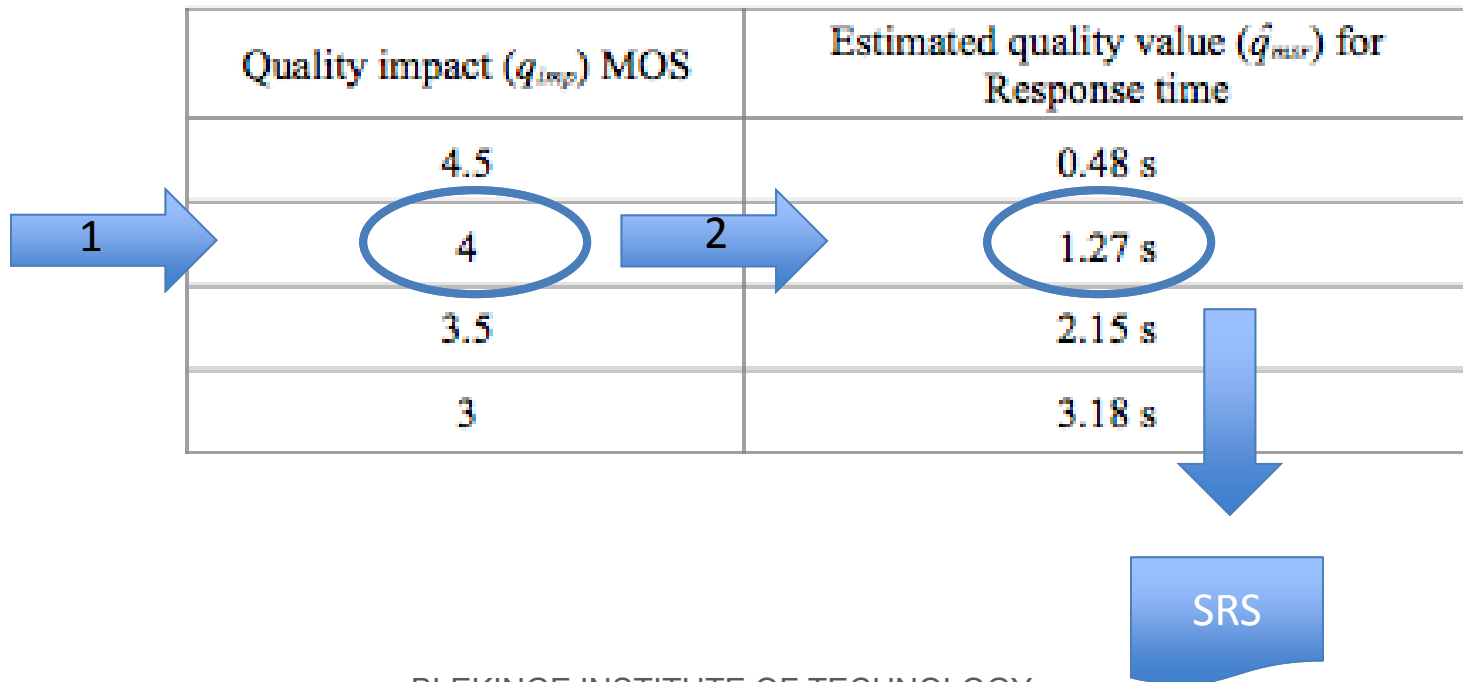
- Option A, use existing generic relationship



- Option B, develop new model

4. Decision-Making

- 1- Use industry standard, competitive analysis [5], or collected rationales to set the appropriate quality impact.
- 2- Then look up the desired quality.

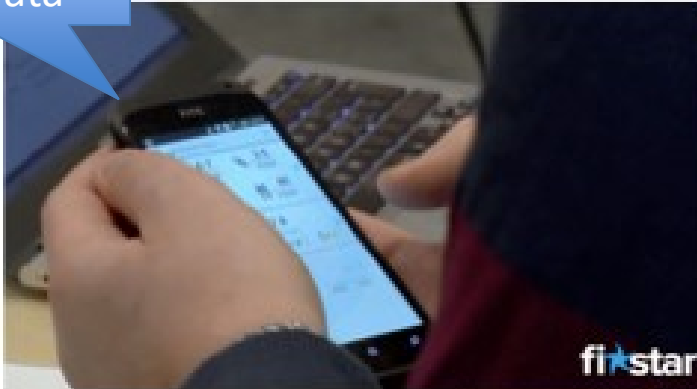


Example of Workshop

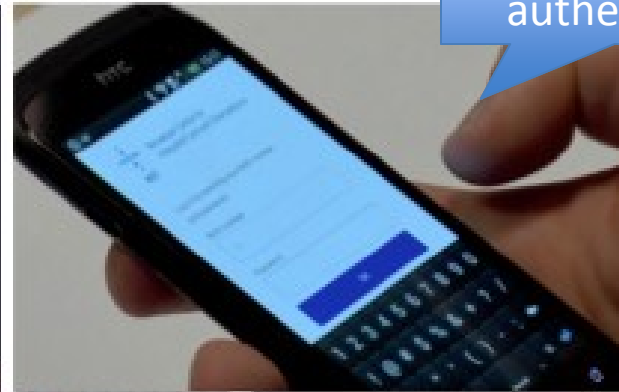


Example Scenario

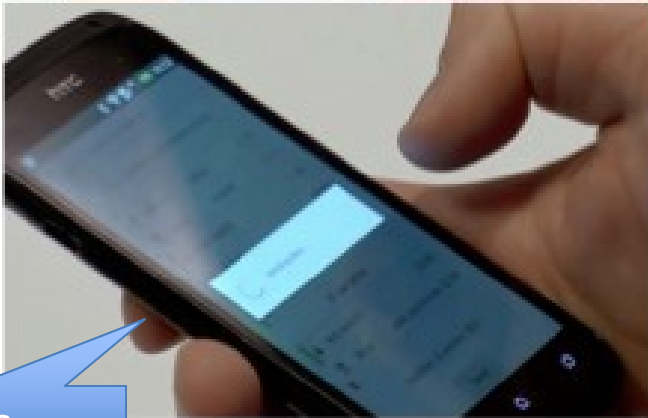
i) selection of patient data



ii) patient authentication



iii) data submission



iv) questionnaire



Example Measurement

- Log-file

...

2014-01-27 15:11:25.029000 fistar.observation_sharing.select_activity.click_button_start_send

2014-01-27 15:11:25.253000 fistar.observation_sharing.send_activity.start_activity

2014-01-27 15:11:25.611000 fistar.observation_sharing.select_activity.stop_activity

2014-01-27 15:11:33.694000 fistar.observation_sharing.send_activity.click_button_start_authorize

2014-01-27 15:11:33.921000 fistar.observation_sharing.send_activity.stop_activity

2014-01-27 15:12:39.978000 fistar.observation_sharing.send_activity.start_activity

2014-01-27 15:12:39.997000 fistar.observation_sharing.send_activity.show_sending_dialog

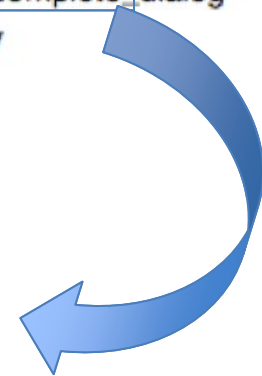
2014-01-27 15:12:41.787000 fistar.observation_sharing.send_activity.show_send_complete_dialog

2014-01-27 15:12:43.182000 fistar.observation_sharing.select_activity.start_activity

2014-01-27 15:12:43.301000 fistar.observation_sharing.send_activity.stop_activity

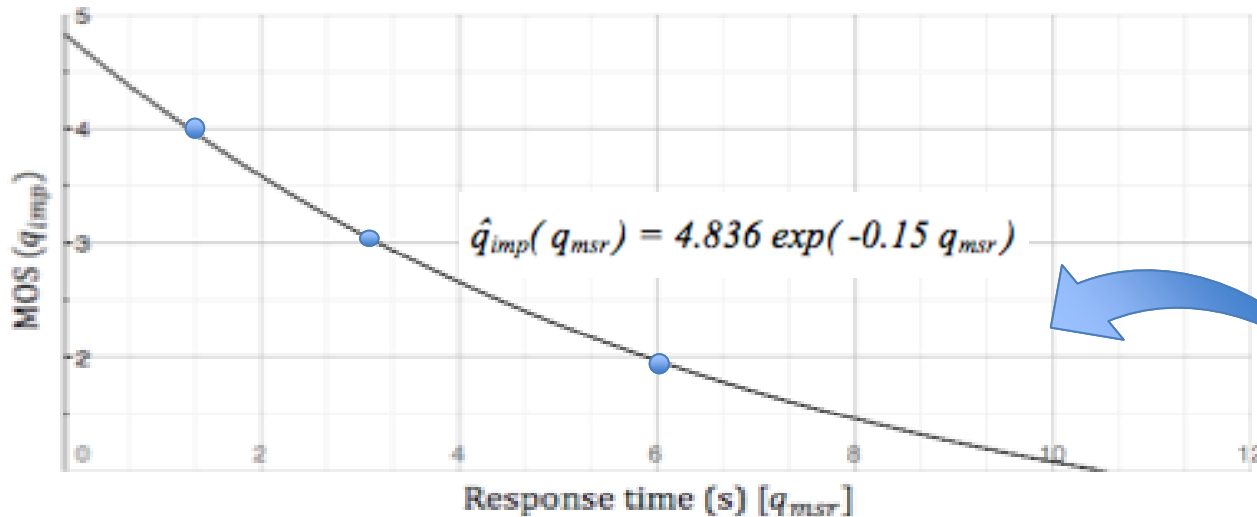
...

Measurement	q_{msr} : response time
Measurement 1	1.08 seconds



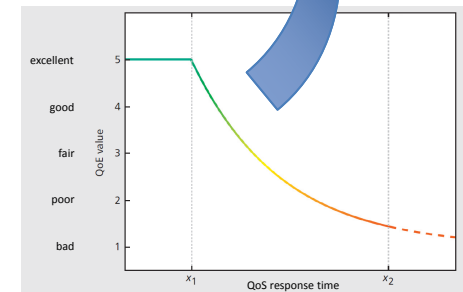
Example Analysis

- Blue dots: collected data



Curve matching

- Compensation of lack of extensive data by using existing generic model [10]



Example Decision

What waiting time shall be acceptable for the user (patient) until data sharing is completed?

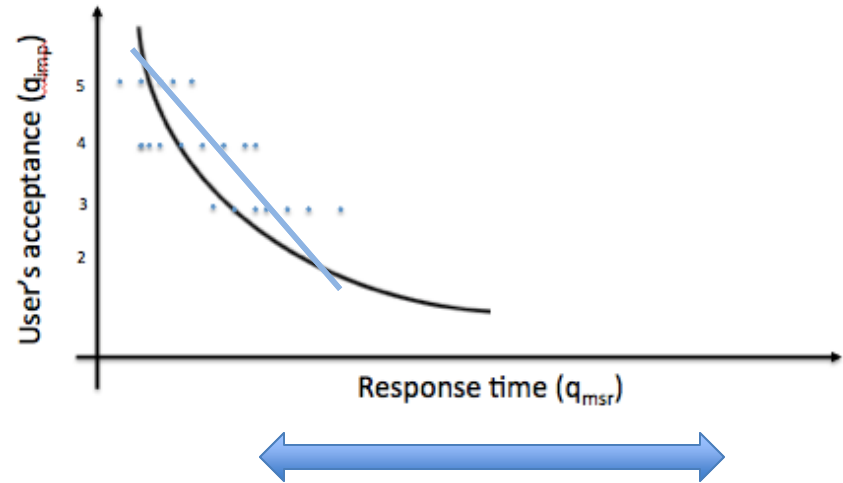
- Targeted quality impact, q_{imp} : user acceptance
 - MOS 4 “good” (based on stakeholder consensus)
- Type of quality, q_{msr} : response time (waiting time)
 - 1.26 s (based on specific quality-impact relationship)

Discussion

- Variations
- Feasibility in Practice
- Future Research

Variations (1)

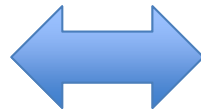
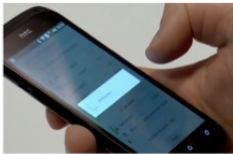
- Different generic relationships to describe the impact function
 - Linear
 - Exponential
 - ...
- Simulated quality levels (through prototype)



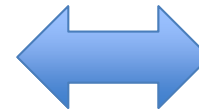
Variations (2)

- Software Features

data transfer



chatting



...

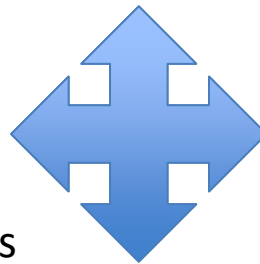
- Stakeholder Sampling

patient

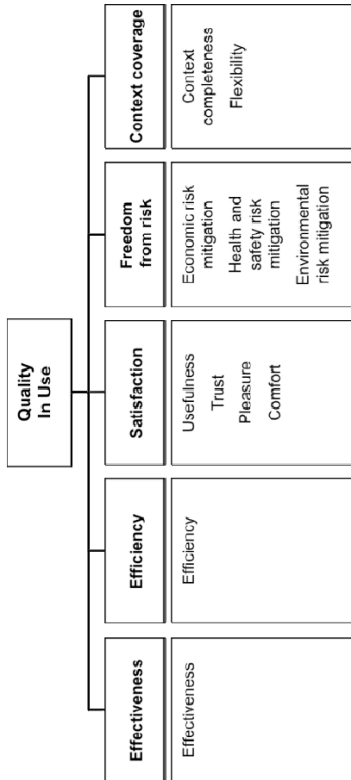
doctor

Many patients

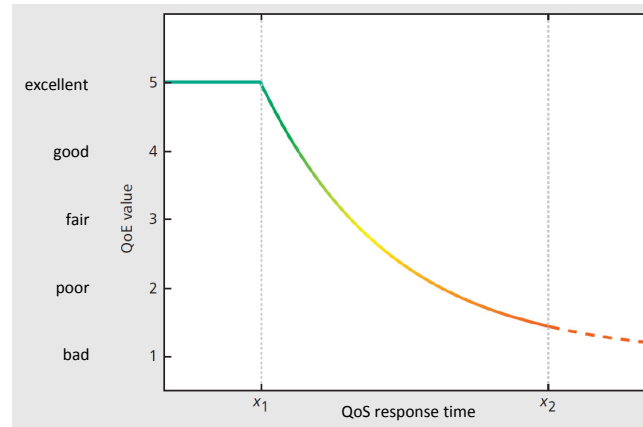
Many doctors



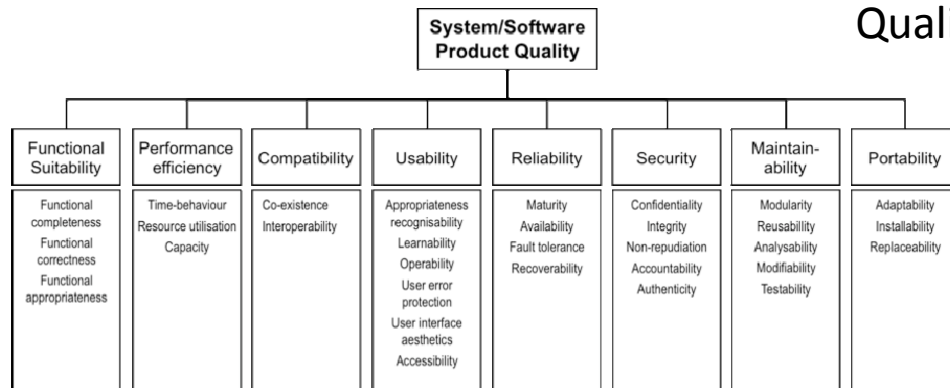
Variations (3)



Impact Attributes



Quality Attributes



ISO/IEC FDIS 25010

Feasibility in Practice

- Experienced requirements engineers vs. junior requirements engineers
- Construction of Service Level Agreements
- Extension of the requirements engineering toolset
- Complementing competitive analysis of product quality

Future Research

- Validating and evaluating the method in large-scale requirement engineering situations
- Expanding the understanding of the generic relationships between combinations of software quality attributes and their impacts as well quality attributes relationship.
- Scaling: how to get a sufficient number of data points

Summary

- Problem: How to determine the appropriate level of quality?
- Approach: Quality-Impact inquiry method
- Example
- Key insights



Thank you

samuel.fricker@bth.se

Twitter [@samuelfricker](https://twitter.com/samuelfricker)

www.bth.se

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