University of Stuttgart
BWI, Department VIII: Information Systems II
Prof. Dr. Georg Herzwurm

QFD-BP-Edition: QFD in der Lehre

Teaching QFD: Understand how to cause good quality!

Sixten Schockert, Felix Schönhofen

ISQFD'19, Boise, USA

QFD-Institut

W U S

Agenda

- Motivation
- Setting
- Approach
- Lessons learned
- Conclusion

Motivation

Motivation

- *“Quality”* and esp. *“Quality Function Deployment”* sounds old-school, boring and not attractive for todays students
- Past: teaching QFD as a tool the engineers have to use…
  …but – as we see today in various companies – many current engineers (i.e. former students) are not convinced to use it
  ➔ **Using QFD feels more like a duty than a pleasure!**
- “Modern” tools like “Design thinking” are hyped and sound more attractive
- In Software & IT – Development the formerly abandoned “trial & error” is common once again and widely accepted e.g. as “build, measure, learn” in the context of Lean Startup methods

Remember: „Copy the spirit, not the form“ (Yoji Akao)

- …QFD is more than a tool
- **…QFD is a mindset**
- …QFD is a certain way to meet challenges and tackle problems
- …we want students (and future workers) to “think QFD-like”
- …we want them to be convinced to use QFD

But how to teach QFD as a mindset?

Setting

Course setting

- QFD lessons are embedded in a course on Requirements and Quality Management with 6 ECTS (credit points)
- Mandatory course for BSc. Information Systems (4. term)
- Optional course for BSc. Business Administration (4. term)
- About 40 to 60 students
- QFD part takes about 8 weeks, each week consists of 2 lessons (4 hours): lecture (2 hours) and exercise (2 hours)
- Written examination at the end

Approach

Approach: ISO 16355

- Rather new norm with (possibly) more reputation, better standing, broader use, more widely recognition and acceptance than
  “stand-alone QFD as just another (and even old) method”
- Focus on part 1:
  General Principles and Perspectives of Quality Function Deployment (QFD), ISO 16355-1:2015, Genf 2015
- Supplemented by other parts, esp. part 2 (Non-quantitative Acquisition of Voice of Customer), part 4 (Analysis of Voice of Customer) and part 5 (Solution Strategy)

But: how to teach ISO 16355?

- ISO 16355-1, 2, 4 and 5: almost 300 pages
- ISO 16355-1: 131 references (i.e. over 1300 pages only in articles)
- Expensive and no favorable accessible electronic version

- And, even if teaching ISO 16355 as it is would be possible:

How to combine teaching QFD as a mindset with teaching ISO 16355?

The principles of QFD according to ISO 16355-1

Part 1: General principles and perspectives of QFD

"The **principles of QFD** are as follows:

a) prioritize information to focus; → **a) Focus**

b) understand how to cause good quality; → **b) Understand**

c) listen to the voice of the customer;

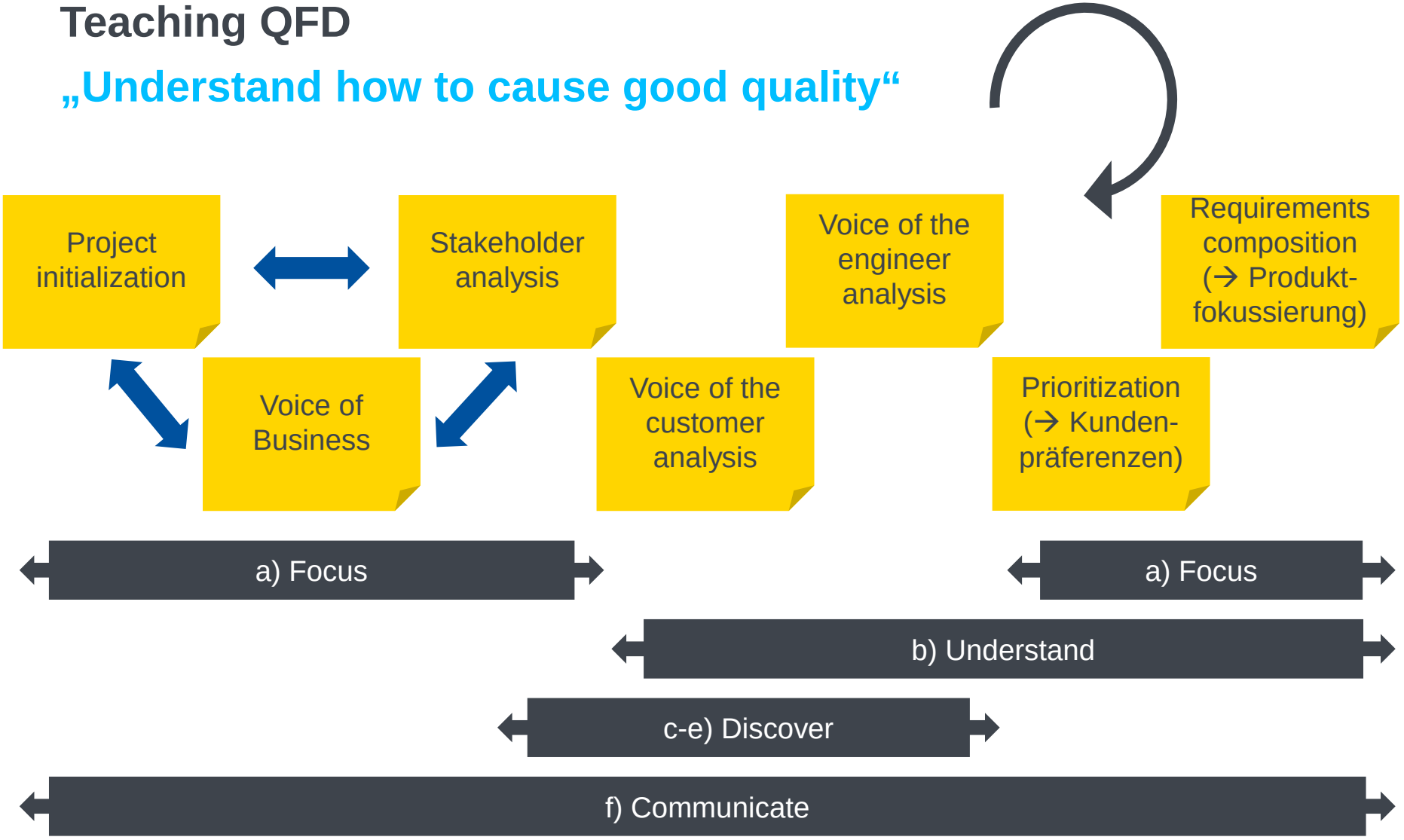
d) observe the customer's situation; → **c-e) Discover**

e) capture information from other sources;

f) improve internal communications through the transformation of information between perspectives." (Source: ISO 16355-1:2015, S. 11) → **f) Communicate**

Teaching QFD

„Understand how to cause good quality“



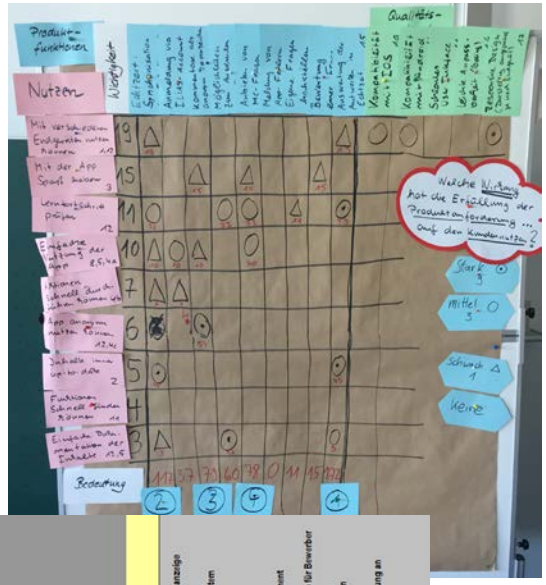
Course outline

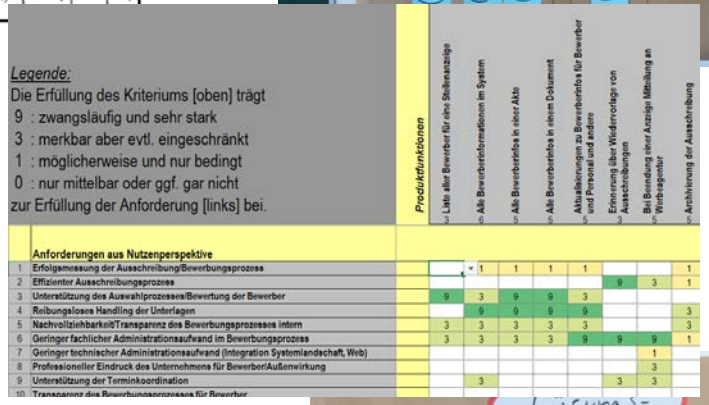
1. **Project initialization** with customer identification, Voice of Business, Scoping, Team and Process outline (ISO 16355-1, Sec. 6, 7, 8.1, 8.2.1-6, parts of ISO 16355-2)
2. **Voice of customer analysis** to elicit and describe customer needs (ISO 16355-1, Sec. 3.3, 8.2.7-11, parts of ISO 16355-2, 4 & 5, 5W1H-Table)
3. **Voice of engineer analysis** to get new ideas, transform needs into requirements and structuring of requirements (ISO 16355-1, Sec. 9, 12, 13.5, creativity techniques, ISO 16355-4, Sec. 10)
4. **Prioritization** of customer needs including AHP (ISO 16355-1, Sec. 10, 11, ISO 16355-4, Sec. 11)
5. **Requirements composition** by linking requirements to needs including House of Quality & Maximum Value Table, analysis of this linkage, assessment of requirements, precise requirements specification (ISO 16355-1, Sec. 13.1-4, ISO 16355-4, Sec. 12, Kano, Pareto, Templates)
6. **In-depth QFD**, supplements, QFD models and deployment (ISO 16355-1, Sec 12.1, 13.1, 13.5-6, parts of ISO 16355-5)

Course activities

- **Lectures:**
  - Same general example (interactive education app for students and lecturers to use live in courses) used throughout all lectures
  - Supplemented by examples from ISO 16355
  - Precedes the exercises
- **Exercises:**
  - Working groups of up to five students
  - Students decide by themselves on an example (e.g. drone to deliver medicine, project management gamification, navigation for motorcyclists) used throughout all their exercises
  - Excel template as a supporting tool
  - Presentation of the procedures and outcomes at the end

QFD Live



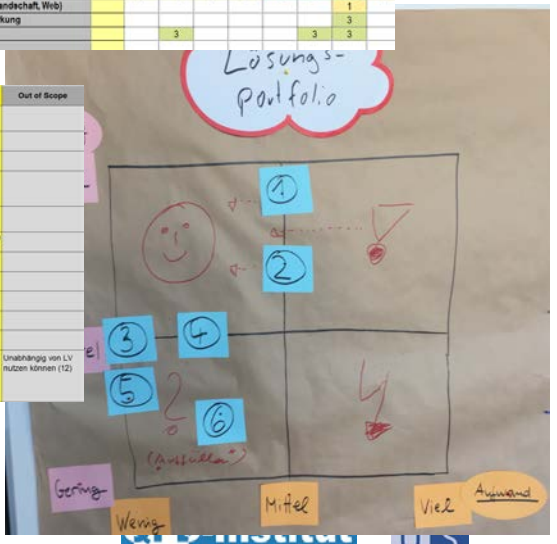


Nutzen / Nutzeneffekte	Dozent	Rang	Student	Rang	Summe	Rang
Mit verschiedenen Endgeräten nutzen können (1)	9	2	10	1	19	1
Einfache Nutzung der App (4a)	11	1	4	4	15	2
Lernfortschritt prüfen (12)	4	4	7	3	11	3
Mit der App Spaß haben (3)	1	9	9	2	10	4
Aktionen schnell durchführen können (4b)	6	3	1	8	7	5
App anonym nutzen können (4c)	2	6	4	4	6	6
Inhalte immer up-to-date (2)	2	6	3	6	5	7
Funktionen schnell finden können (11)	2	6	2	7	4	8
Einfache Dokumentation der Inhalte (5)	3	5	0	9	3	9

Vergleichende Bewertung der Wichtigkeit

Legende:
Stakeholder [Zeile] ist mir im Vergleich zu Stakeholder [Spalte]
1/9 : viel weniger wichtig
1/3 : weniger wichtig
1 : genauso wichtig
3 : wichtiger
9 : viel wichtiger

	Studierende	Dozent	Datenschutz	Uni-Leitung	Rechenzentrum	ω
Studierende	1	1	9	3	3	39,6%
Dozent	1	1	3	1	1	21,1%
Datenschutz	1/9	1/3	1	1	3	13,3%
Uni-Leitung	1/3	1	1	1	1	13,5%
Rechenzentrum	1/3	1	1/3	1	1	12,6%
Σ	2 7/9	4 1/3	14 1/3	7	9	37 4/9



Learning targets

- **Die Studierenden verstehen, wie Produkte hoher Qualität gestaltet werden.**

Mindset

- Die Studierenden lernen Quality Function Deployment (QFD) gemäß ISO 16355-1:2015 zur Gestaltung von Kundenutzen generierenden, wettbewerbsüberlegenen und profitablen Produkten kennen.

Method

Zusätzlich für die gesamte Veranstaltung (nicht nur den QFD-Teil):

- Die Studierenden lernen einen Werkzeugkasten zur Ermittlung, Beschreibung und Abstimmung von Anforderungen kennen und können diesen situationsadäquat einsetzen.

Toolbox

Lessons learned

Lessons learned (and possible implications) (1)

Observations

- When starting with Voice of Business (VoB) it is difficult for novice students to separate it from the Voice of Customer
  → Maybe starting after a short scoping with customer identification instead of VoB? But for prioritization of customers one could need the VoB, so perhaps providing Example-VoBs to students?
- First guess of students regarding VoB is always “reduce costs”…
- Voice of Stakeholder and Voice of Customer are mixed up, esp. the developers view often already included
  → clear separation of customer and stakeholder needed
- Customer needs often get too general when asking why, why, why…
  → needs should be independent of the product and its implementation, but within the Scope of the Project

Lessons learned (and possible implications) (2)

Observations

- If needs are too general it is also difficult to find concrete requirements to fulfill the needs, the cases become somewhat “arbitrary”
- Kano-Model seems for students – also because of its broad dissemination – as an alternative approach to requirements composition and customer orientation → introduction with care and not too early & only for requirements assessment, not for needs prioritization

Oder: Kano als Ausgangspunkt?

- Pareto-Diagrams, Portfolios and other compact presentations of the QFD outcomes could be misleading, esp. if the analysis of the linkage of needs and requirements has not been done thoroughly
  → very important to learn how to “read a matrix”

Betonung, das Matrix ANALYSIERT werden muss!

- Excel template to support the QFD process important as motivation and documentation, but also misleading because it deviates the focus of QFD to “filling out the template” (like often in todays companies)

Student feedback

Overall satisfaction level of 1.87 (when 1 is best, 5 lowest)

- More presentations of intermediate solutions of the working groups (not only one at the end) to get more compact and earlier feedback and to prohibit “Garbage-in, Garbage-out” through early checking/correcting results
- Difficult for students to get a clue of possible questions in the exam, because the written exam doesn’t match easily with the interactive exercises

Klausur, trotz vergleichbarem Schwierigkeitsgrad, deutlich besser ausgefallen

- Longer exercises…ratio of lecture to exercises better 1:2 than 1:1
- Promise of additional QFD certification motivating
- Difficult to establish different perspectives (customer, developer etc.) in exercises; and, difficult to train moderation in working group settings (but: is it a pure QFD competence?)
- Distinction of different customers groups important insight

Conclusion

Concluding thoughts

- “Learning takes place through the active behavior of the student: it is what he does that he learns, not what the teacher does.”

  (Tyler, R.W. (1949): Basic principles of curriculum and instruction. University of Chicago Press.)

  ➔ Coordinated procedure of lectures and exercises with several feedback points beneficial

- Customer needs are essential! And the analysis of the linkage of needs and requirements – the “reading of the matrix” – is the central insight to get for the students! ➔ **Mindset!**

- Future: incorporate lessons learned and try to apply the constructive alignment framework of John Biggs (e.g. Biggs, J. and Tang, C. (2011): Teaching For Quality Learning At University. 4th Edition. Open University Press, McGraw-Hill)

+ Akao (= QFD) ist die Vertiefung und Detaillierung von Kano
+ Fokussierung (z.B. Synthese in Matrix) ist DAS „Arbeitsmittel“ zur Gestaltung
+ Flexible und ausgewogene Produktentwicklung

?!

University of Stuttgart
BWI, Department VIII: Information Systems II
Prof. Dr. Georg Herzwurm

Thank you!

Questions?
Remarks?
Discussion?

Dr. Sixten Schockert

e-mail sixten.schockert@bwi.uni-stuttgart.de, schockert@qfd-id.de
phone +49 (0) 711 685-82387
fax +49 (0) 711 685-82388

University of Stuttgart
BWI, Department VIII: Information Systems II
Prof. Dr. Georg Herzwurm