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Prof. Dr. Georg Herzworm

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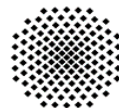
## Managing the challenges of product development in the Internet age using the new ISO 16355 standard for QFD

International Conference on INDUSTRY 4.0 Using Quality Function Deployment, Mladá Boleslav, Na Karmeli, 31.5.2016

Prof. Dr. Georg Herzworm



Speaker of the board



Universität Stuttgart

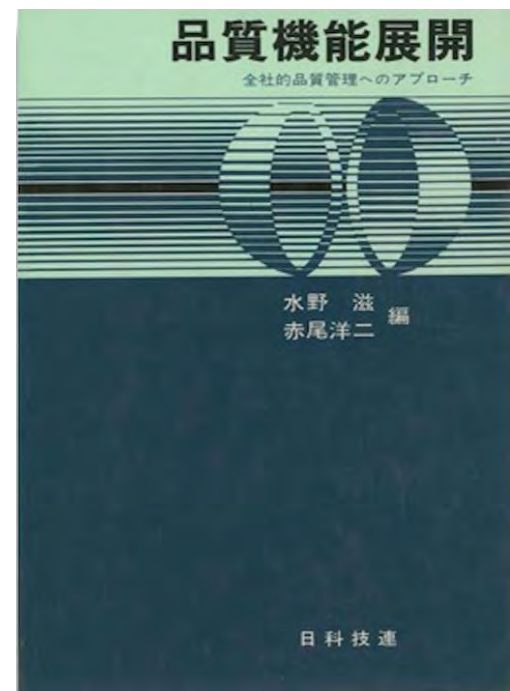
Chair for Information Systems



Member of the board

# QFD has to celebrate the following milestones

- 50 years since the first QFD publication by Bridgestone Tire (1966)
- 20<sup>th</sup> anniversary of the Akao Prize®
- 20<sup>th</sup> anniversary of the QFD Institut Deutschland e. V.
- Finalization of the ISO 16355 standard for QFD



# Agenda

	Nationale Ebene Bsp. Deutschland	Regionale Ebene Bsp. Europa	International
Allgemein			
Elektrotechnik			
Telekommunikation			

- Challenges of product development in the Internet age

Phase / Vorgang	Ziele	Zentrale Organisation	Interdisziplinäre Teams (Cross-Functional)	Formale Strukturen (Hierarchie)	Informations- und Kommunikationssysteme (IT)	Prozessmanagement
9.9 8.8	Ziele (z.B. Customer Satisfaction) für "WinWin"	○	○	○	○	○
9.9 8.8	Standardisierte IT-Infrastruktur an den Standorten (1)	○	○	○	○	○
8.6 7.0	Bessere Abstimmung von Anforderungen (zwischen IT & Fachbereichen (4))	○	○	○	○	○
7.4 6.0		○	○	○	○	○
7.4 6.0		○	○	○	○	○
7.4 6.0		○	○	○	○	○
7.4 6.0	Bindung von IT-Kompetenzen (14)	○	○	○	○	○
4.9 4.0		○	○	○	○	○

- History of QFD standardization

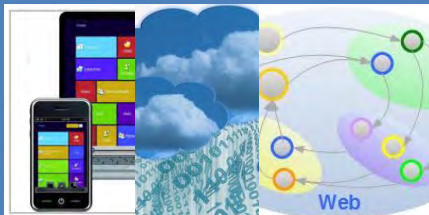
**ISO TC 69/SC 8**

Date: 2014-12-XX

**ISO/DIS 16355-1**

Secretariat: JISC

- Overview on ISO 16355



- Outlook and next steps

## Definition of QFD according to ISO 16355-1

- Quality Function Deployment (QFD) is a method to assure **customer or stakeholder satisfaction** and value with new and existing products by designing in, from different levels and different perspectives, the requirements that are most important to the customer or stakeholder.
- These requirements should be well understood through the use of quantitative and non-quantitative tools and methods to improve confidence of the design and development phases that they are **working on the right things**.



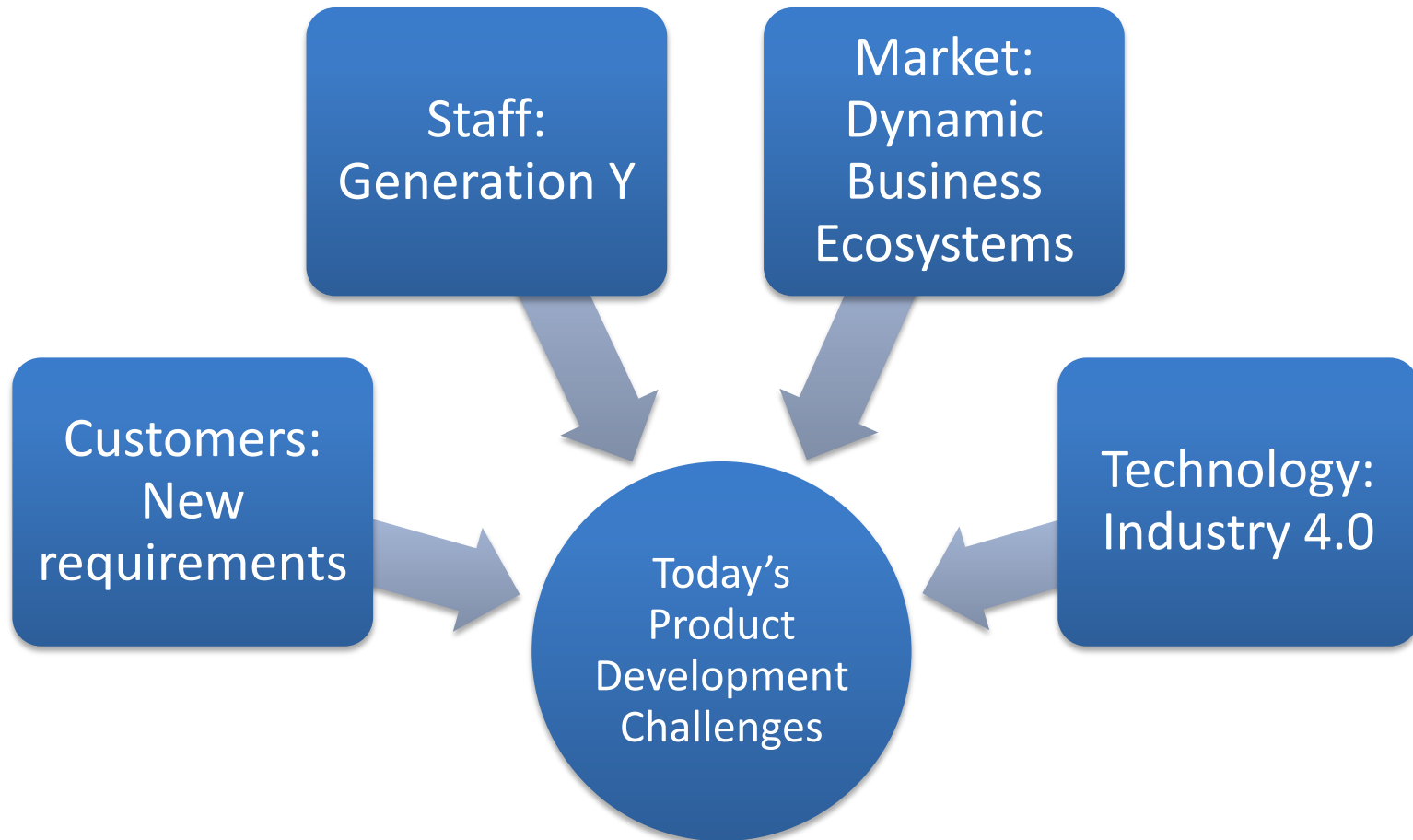
We should try to live as we teach

QFD is the solution!

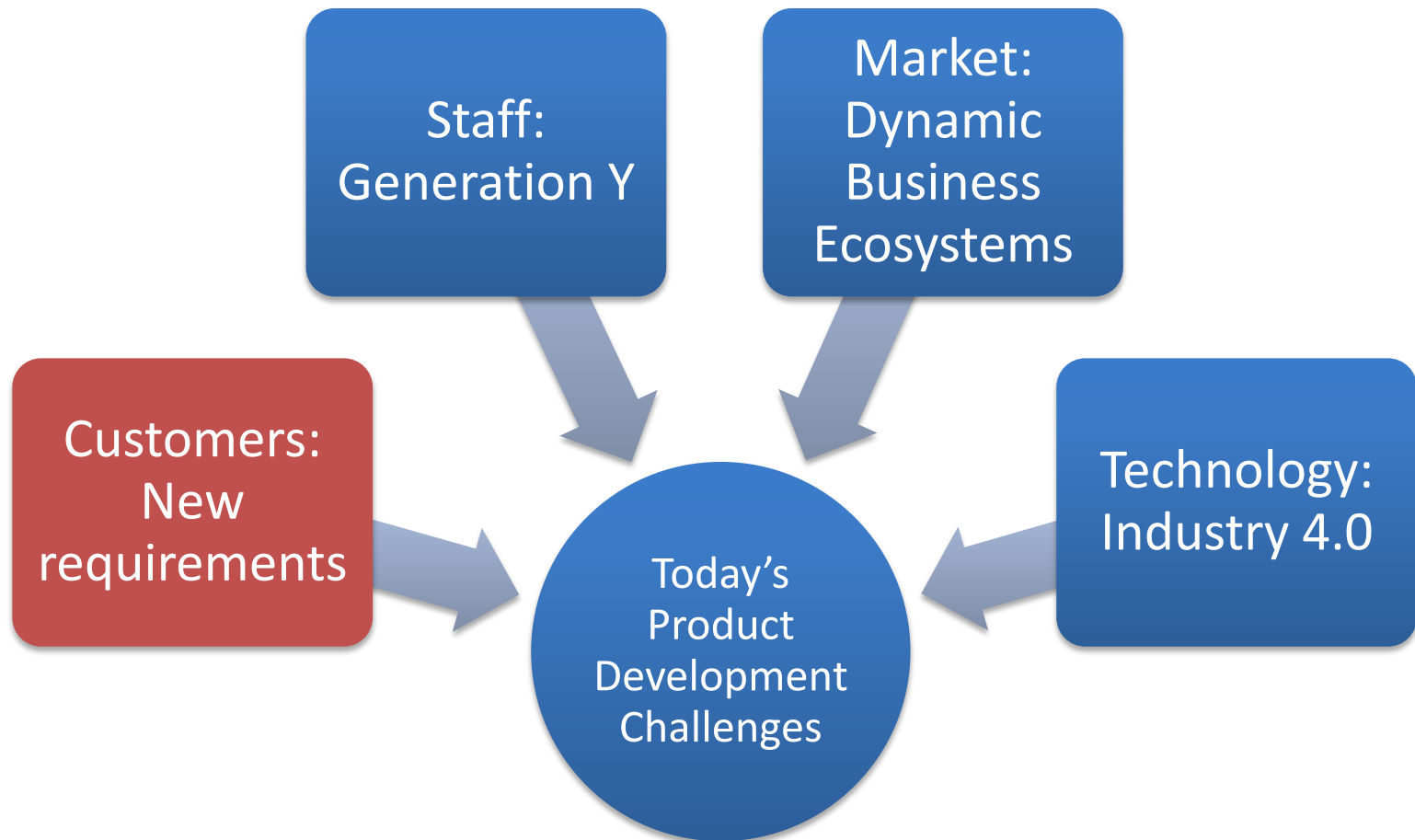


What is the problem?

# Changing problems since QFD was introduced



# Changing problems since QFD was introduced



# Quality requirements 1966: zero-defects



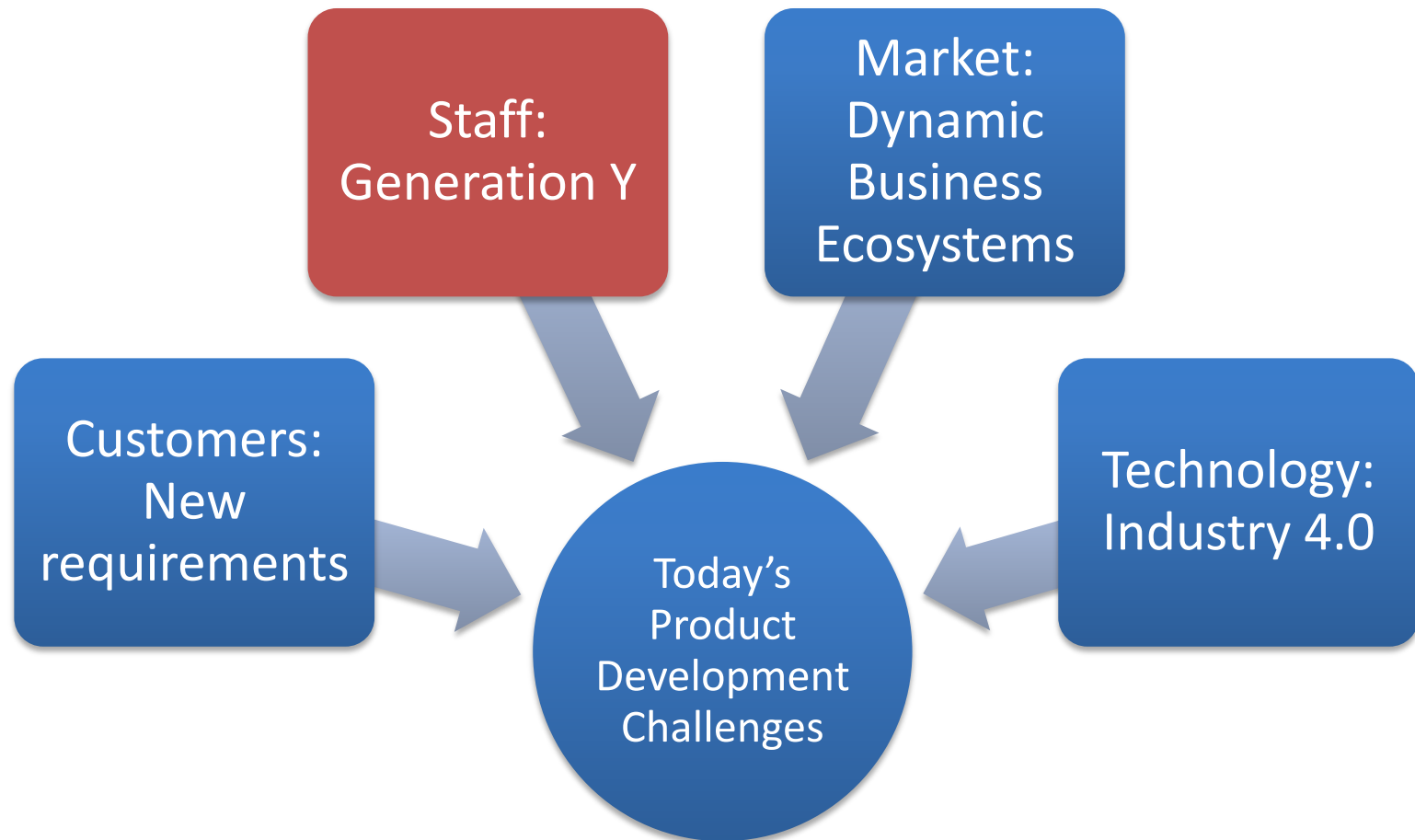




# Quality requirements 2015: innovation/coolness

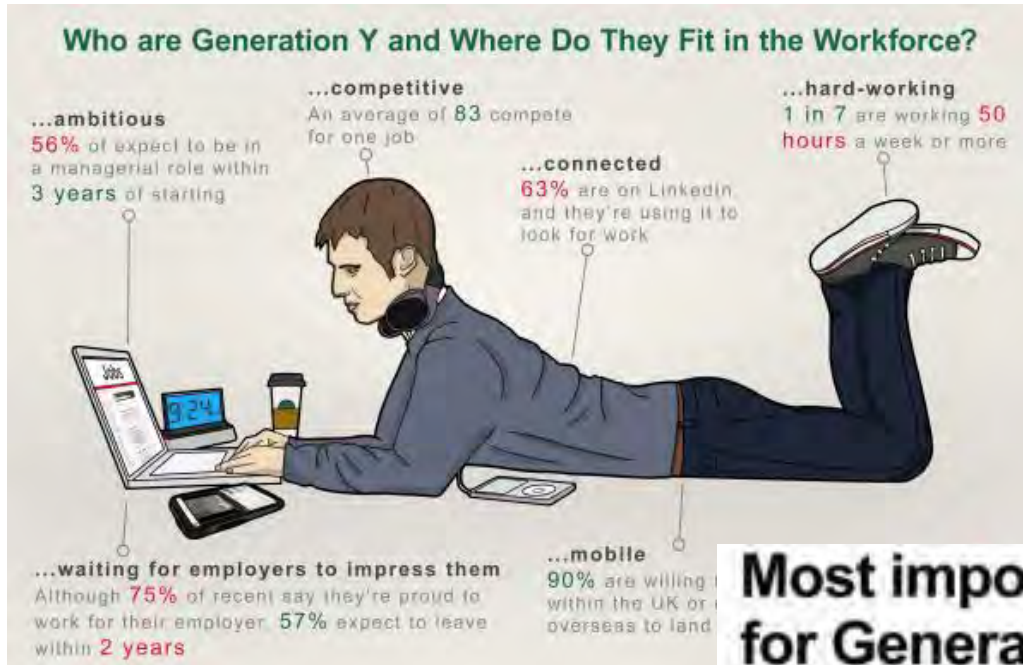


# Changing problems since QFD was introduced





# Generation Y is coming up ..



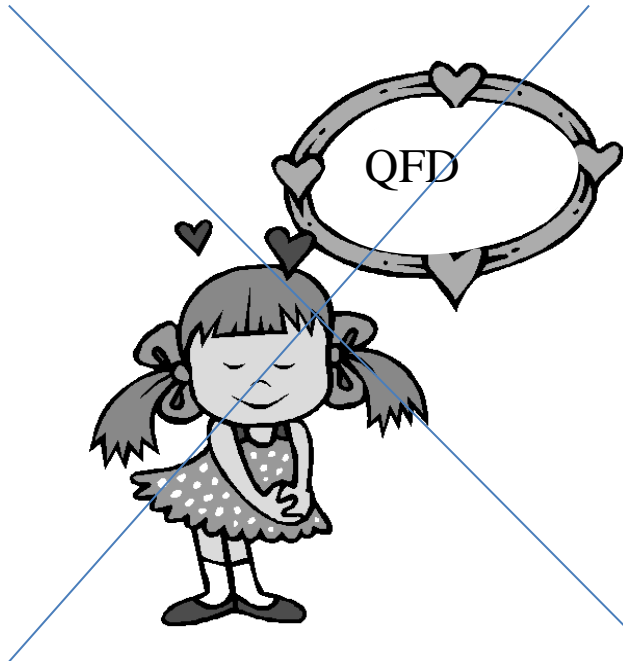
Generation Y engineers

Generation Y customers

## Most important brand characteristics for Generation Y



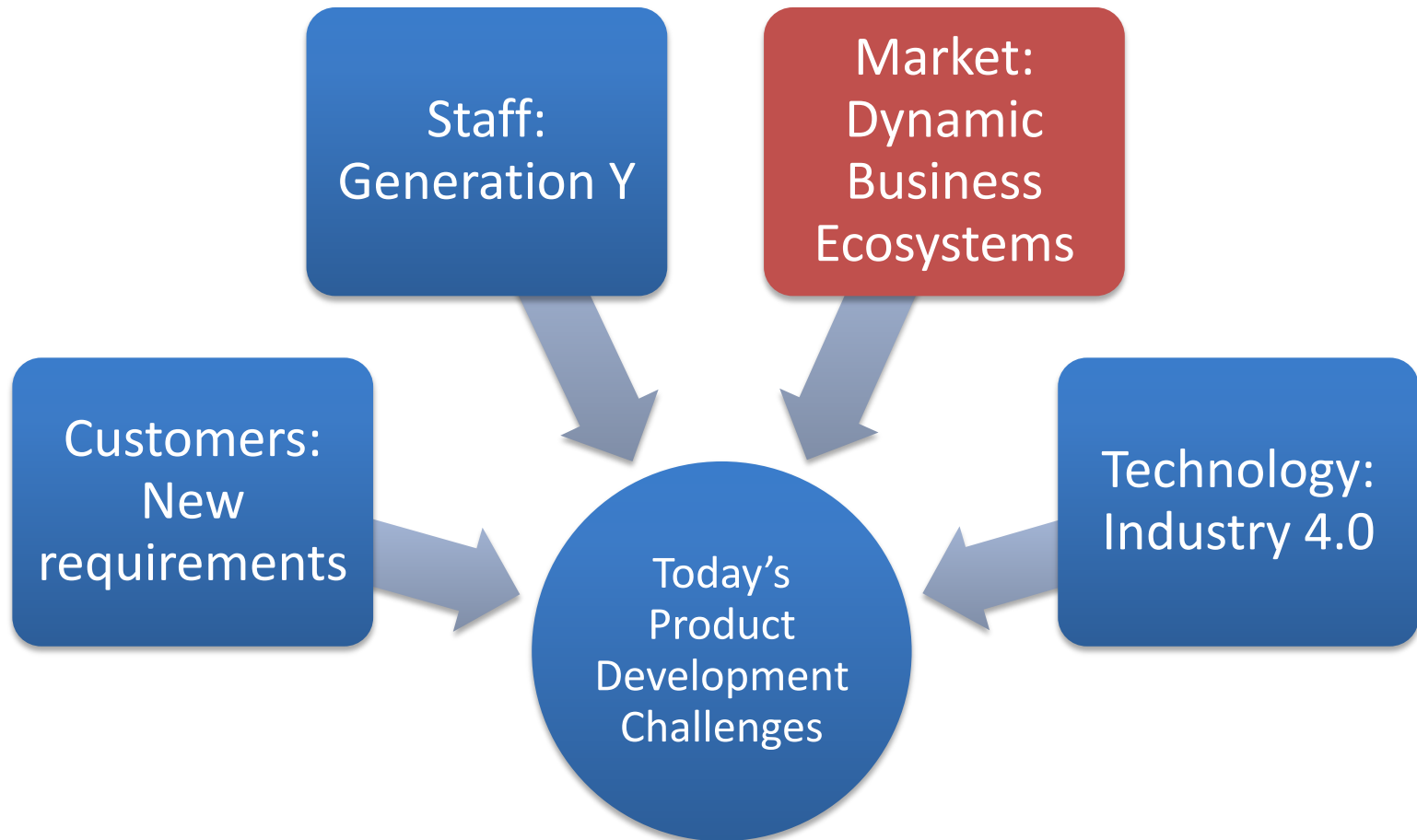
# QFD has to become a „cool“ method



# QFD

“This standard demonstrates the dynamic nature of a customer-driven approach. Since its inception in 1966, QFD has broadened and deepened its methods and tools to respond to the changing business conditions of QFD users, their management, their customers, and their products. “

# Changing problems since QFD was introduced



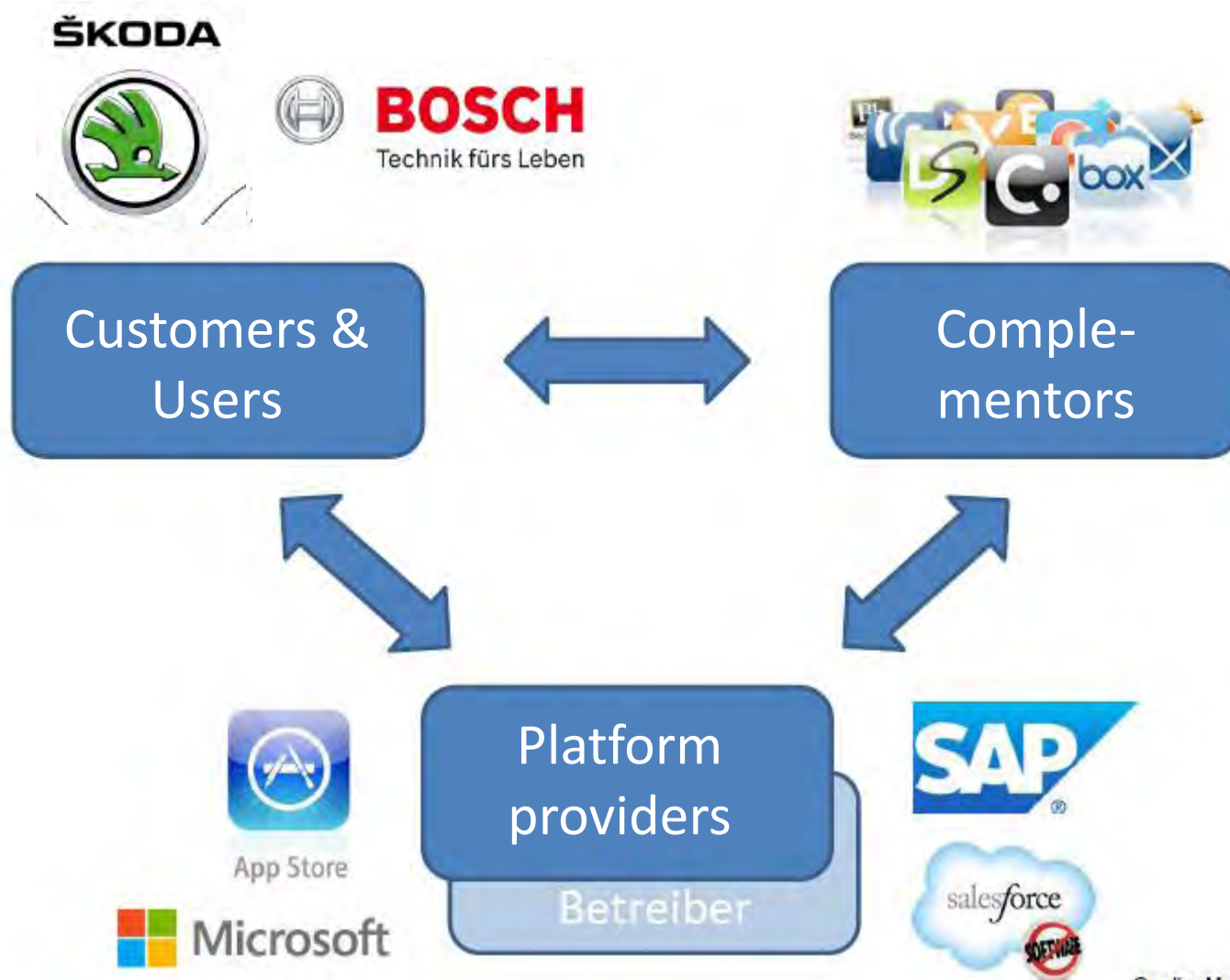


# Business Eco-Systems?!



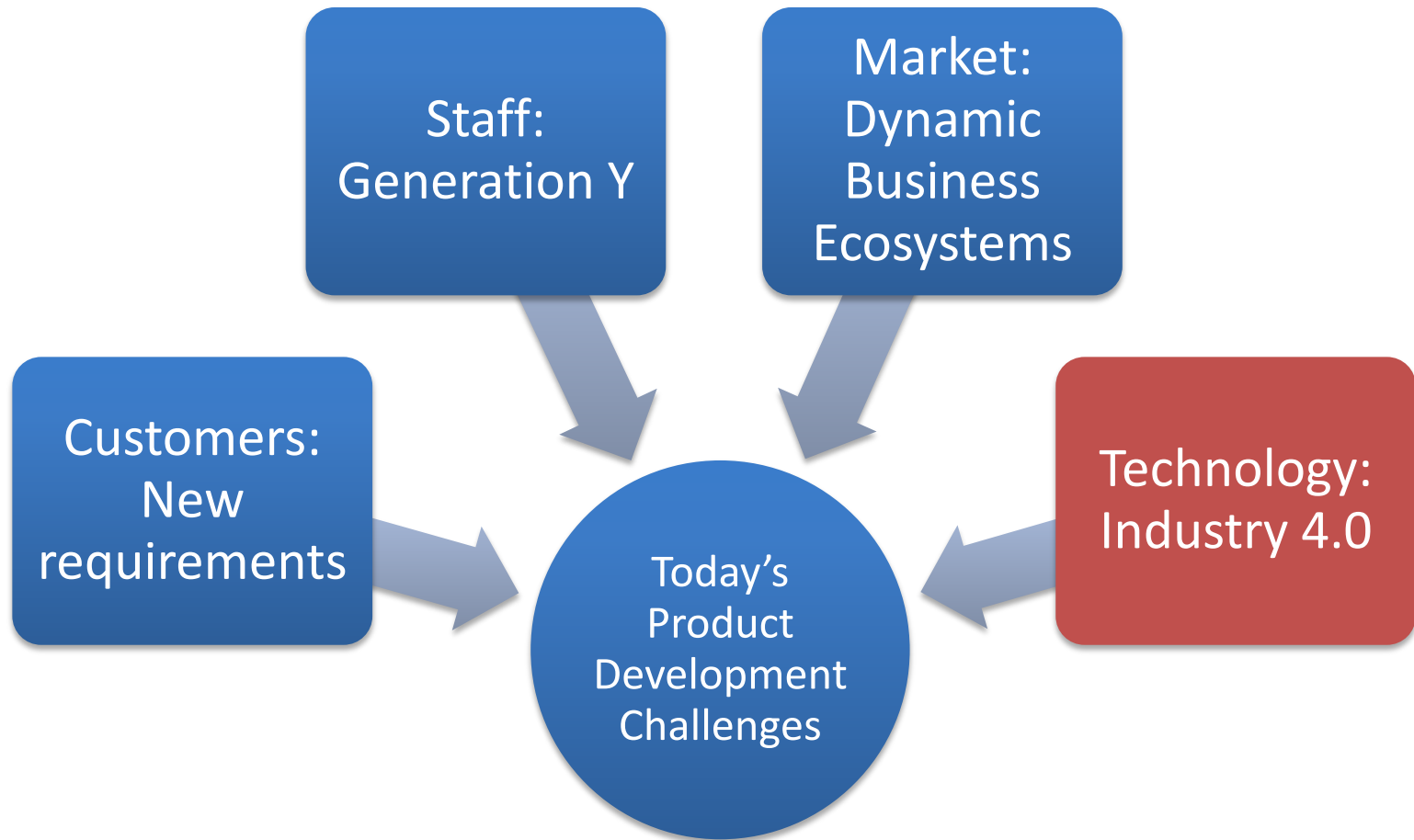
Illustration by Jeff Grader / property of Delta Education

# Roles in an Automotive Software Eco-System



Quelle: Mautsch (2014)

# Changing problems since QFD was introduced



# SWOT Analysis of Industry 4.0

## Internal Perspective

### Strengths

- Process efficiency leading to High Precision and Quality
- Security
- Less Human Intervention
- Customized
- Reduced Usage of Energy
- Lean Processes & Easy Monitoring

### Weaknesses

- Data security in a cloud
- Complex & Costlier to implement / maintain
- Not applicable for all businesses (SME, some sectors)
- Less manual labor needed (Role of government critical at Zalando!)
- Fear of technology leads to non-implementation
- Industry 4.0 in the beginning – fear of “baby” mistakes

## External Perspective

### Opportunities

- Competitive advantage due to process efficiency (For Germany & its Industries: First mover advantage)
- Knowledge based industry and Hub
- Flexibility remains a key factor for the manufacturing work in Germany

### Threats

- Low acceptance level from workers
- Competition: non—trust from competitors to share datasets
- Outsourcing threat
- E-commerce “return rate” as a risk for environment

Source: <http://de.slideshare.net/sarathygurushankar1/shaping-towards-a-connected-world-of-supply-chain-industrie-40>



## The need for change

**If people are changing,  
our products and  
the way how we  
develop products  
have to change as well**



# Agenda

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Elektrotechnik			
Telekommunikation			

- Challenges of product development in the Internet age

Prozess / Schritt	Ziele (z.B. Customer Satisfaction, "Vollzeit")	Zentrale Dimensionen	Technische Dimensionen	Personelle Dimensionen	Organisatorische Dimensionen
9.9 8.5	Standardisierte IT-Infrastruktur an den Standorten (5)	○	○	○	○
9.9 8.6	Bessere Abstimmung von Anforderungen (zwischen IT & Fachbereichen) (4)	○	○	○	○
8.6 7.0		○	○	○	○
7.4 6.0		○	○	○	○
7.4 6.0		○	○	○	○
7.4 6.0		○	○	○	○
7.4 6.0	Bindung von IT-Kompetenzen (14)	○	○	○	○
4.9 4.9		○	○	○	○

- History of QFD standardization

**ISO TC 69/SC 8**

Date: 2014-12-XX

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- Outlook and next steps

## History of QFD standardisation

- First idea was presented in 1995 at ISQFD'95 Tokyo, Japan by JUSE-QFD committee but rejected by other countries, e. g. USA and Germany
- Japan decided to develop a national QFD standard: “Guidelines for Quality Function Deployment” were included into JIS Q9025, published in 2003
- In 2008 Prof. Dr. Hiroe Tsubaki, The Institute of Statistical Mathematics, Tokyo, Japan supposed ISO a standard in statistics that included QFD as one important method
- In 2009 Georg Herzwurm, Glenn Mazur and other international QFD experts from ICQFD have been asked to join the committee

# ISO customer voice analysis

**Goal: To make an ISO QFD standard more useful.**

**Standards easy to use. (L: .244 G: .244)**

**Easy to apply. (L: .525 G: .128)**

**Minimal effort to be successful. (L: .088 G: .011)**

**Scope of standard is easy to apply. (L: .066 G: .008)**

**Easy for my vendors to follow the standard. (L: .216 G: .028)**

**I can meet the standard using methods I already know. (L: .058 G: .007)**

**Easy to understand data type (attributes) for different QFD Stages & Fields (L: .272 G: .035)**

**Guides users in application of QFD to new designs (L: .300 G: .038)**

**Anybody can understand (L: .065 G: .016)**

**Easy to find (L: .319 G: .078)**

**Always up-to-date (L: .091 G: .022)**

**Standard helps us improve. (L: .176 G: .176)**

**Supports other standards I must follow. (L: .444 G: .444)**

**Clarifies other standards and specifications. (L: .169 G: .075)**

**Helps me meet other standards. (L: .831 G: .369)**

**Standard is widely accepted (L: .043 G: .016)**

**Supports requirements traceability. (L: .078 G: .029)**

**Standard helps me meet regulatory requirements. (L: .278 G: .103)**

**Standard helps my products get certified. (L: .363 G: .134)**

**Standard helps my processes get certified. (L: .149 G: .055)**

**Standard helps us pass audits. (L: .090 G: .033)**

**I can do the best QFD possible. (L: .135 G: .135)**

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- Challenges of product development in the Internet age

Relevanz / Wichtigkeit	Zielfeld	Zentrale Dimensionen	Technische Dimensionen	Formale Dimensionen	Interdisziplinäre Dimensionen
9.9	8.5	○	○	○	○
9.9	8.0	○	○	○	○
8.6	7.0	○	○	○	○
7.4	6.0	○	○	○	○
7.4	6.0	○	○	○	○
7.4	6.0	○	○	○	○
7.4	6.0	○	○	○	○
4.9	4.0	○	○	○	○

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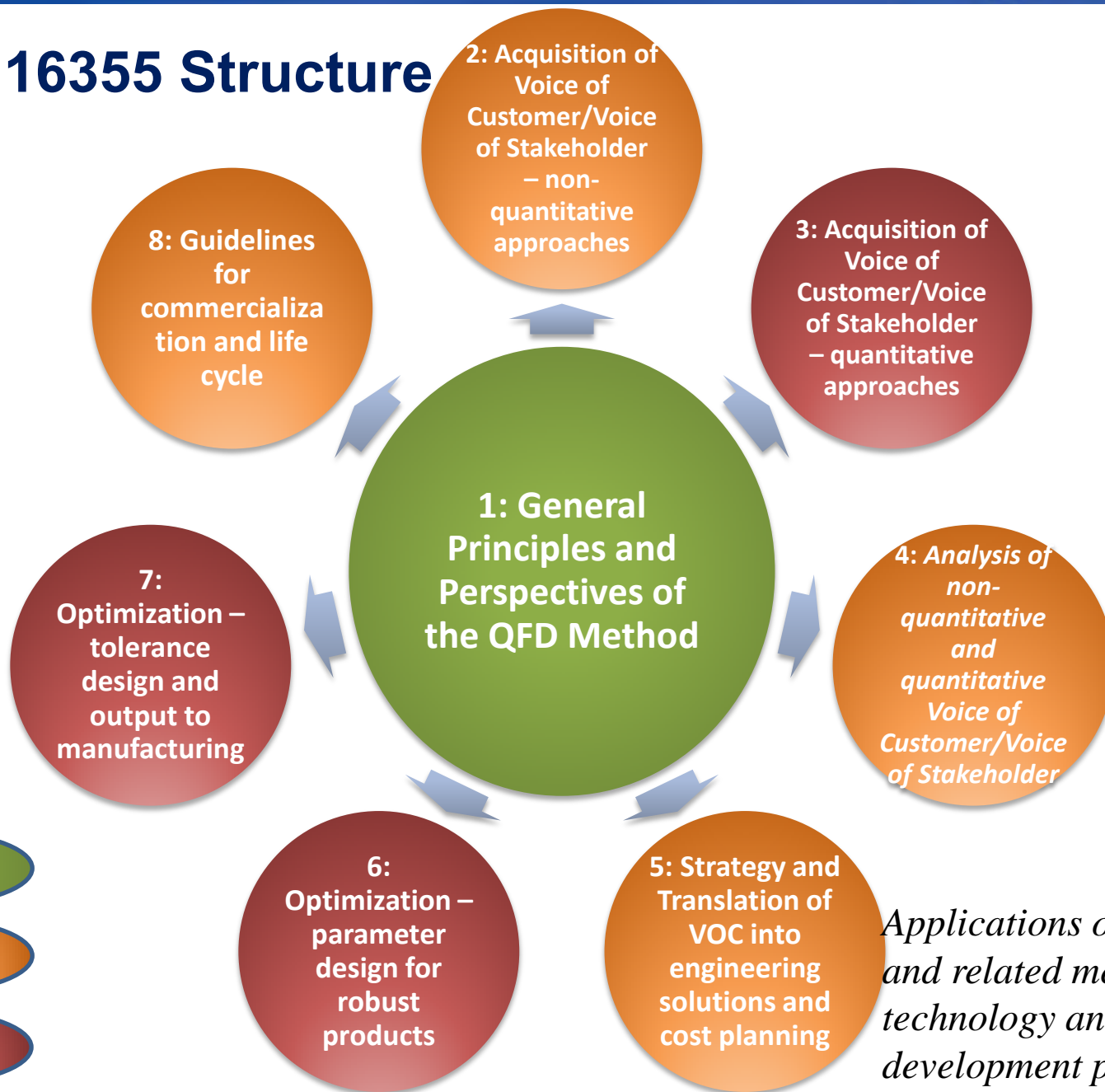
- Overview on ISO 16355



- Outlook and next steps



# ISO 16355 Structure



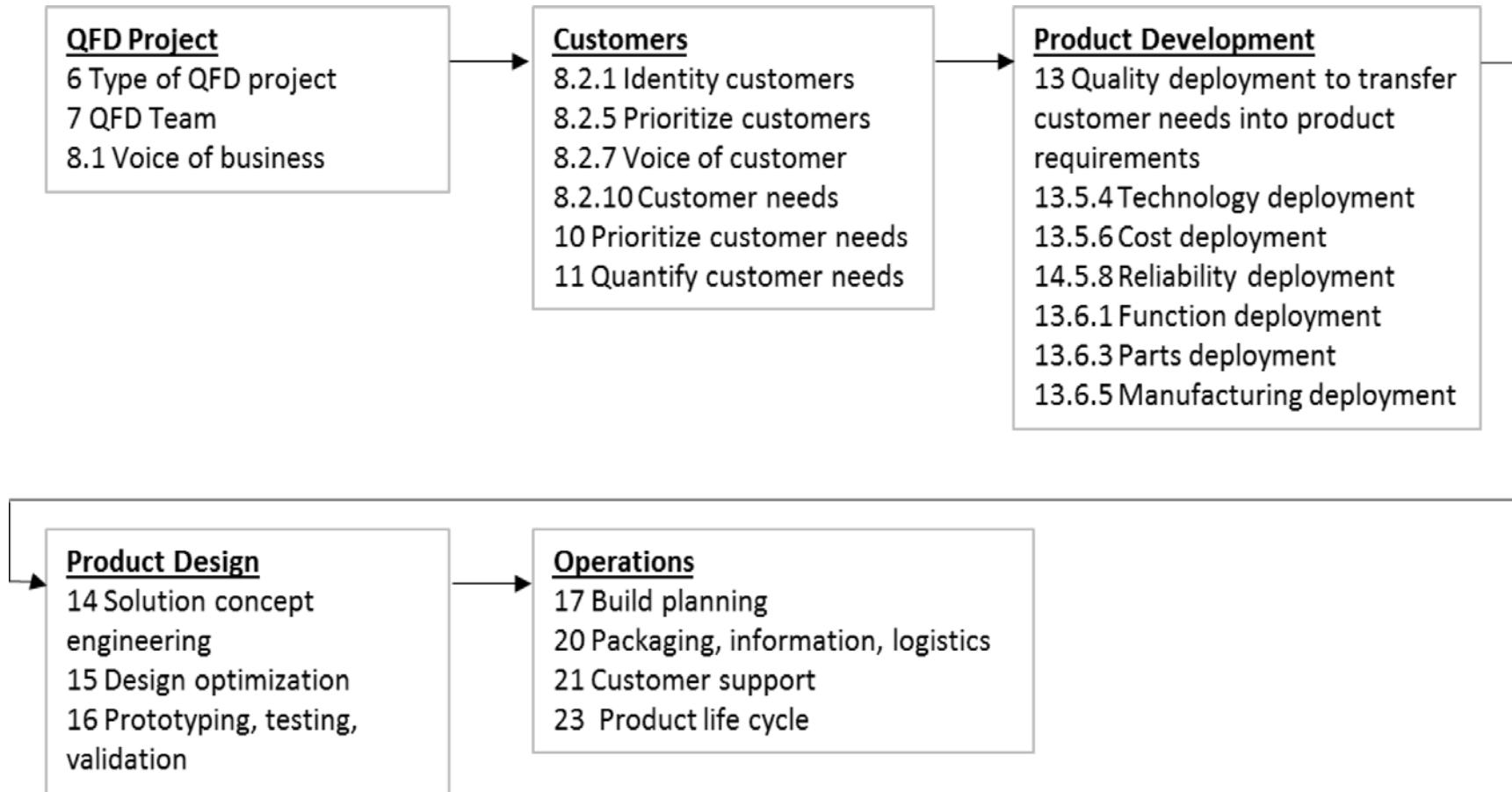
*Applications of statistical and related methods to new technology and product development process*



# ISO 16355-1 Structure



# QFD Flow Chart



## Spirit of QFD according to ISO 16355-1

- A commitment among all critical departments to work together for the benefit of the customer or stakeholder. A personal connection to the customer should be established.
- NOTE
  - As a central principle, customer needs or requirements must be known or acquired, and understood adequately by all relevant stakeholders.
  - Must be validated if product requirements meet the needs of the customer or stakeholder.

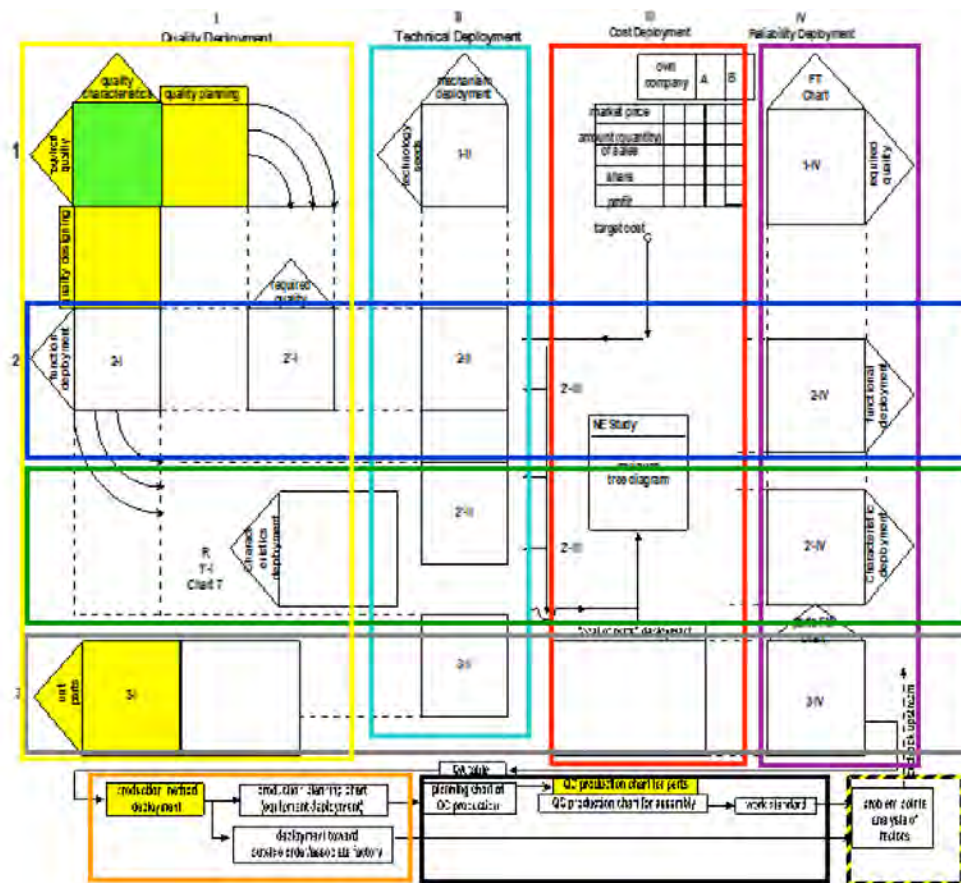
# Appendix: QFD Tools (extract)

	QFD Process Steps																						
	QFD Project		Customers						Product Development						Product Design				Operations				
	6 Type of QFD project	7 QFD Team	8.1 Voice of business	8.2.1 Identity customers	8.2.5 Prioritize customers	8.2.7 Voice of customer	8.2.10 Customer needs	10 Prioritize customer needs	11 Quantify customer needs	13 Quality deployment	13.5.4 Technology deployment	13.5.6 Cost deployment	14.5.8 Reliability deployment	13.6.1 Function deployment	13.6.3 Parts deployment	13.6.5 Manufacturing <del>deployment</del>	14 Solution concept <del>engineering</del>	15 Design optimization	16 Prototyping, testing, <del>validation</del>	17 Build planning	20 Packaging, information, log	21 Customer support	23 <del>Product</del> life cycle
<b>QFD and Related Tools and Methods</b>																							
5S																							
7- and 8-D charts																							
7 Management and Planning tools (Annex)																							
Advanced quality product planning (APQP)																							
Affinity diagram (Annex)																							
Analytic Hierarchy Process - AHP (Annex)																							
Analytic Network Process (ANP)																							
Anticipatory Failure Determination																							
Bill of materials																							
Blue Ocean Strategy																							
Cluster Analysis																							
Conjoint Analysis																							
Continuous QFD (Annex)																							



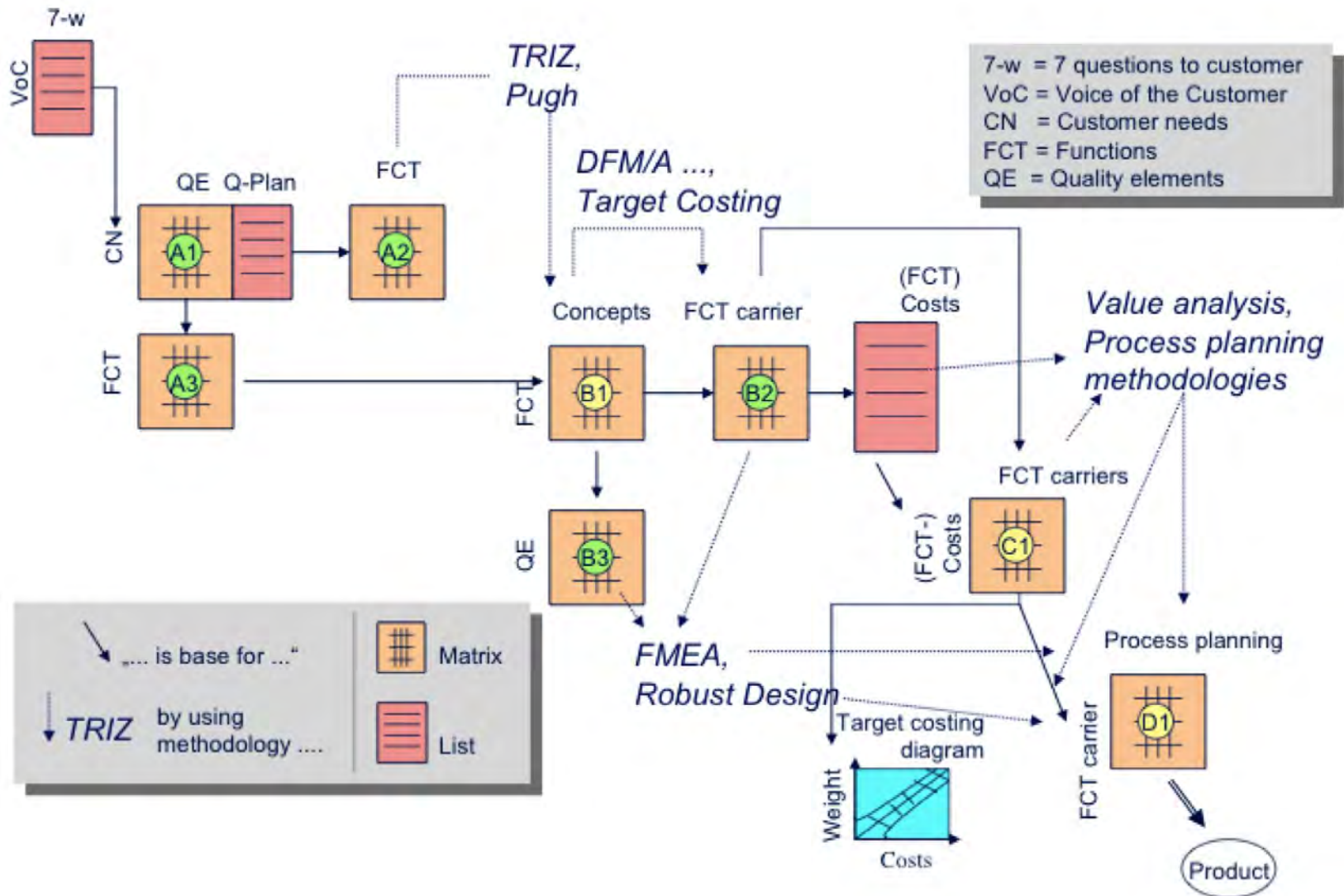
# Appendix: Comprehensive QFD Deployment Flow Diagram

- House of Quality
- 4-Phase QFD for part suppliers
- Quality
- New Technology
- Cost
- Reliability
- Function
- New Concept
- Parts
- Manufacturing
- Production
- Process Improvement





# Appendix: German QFD Institute Best Practice Flow Diagram



# Reverse QFD for solution driven innovations

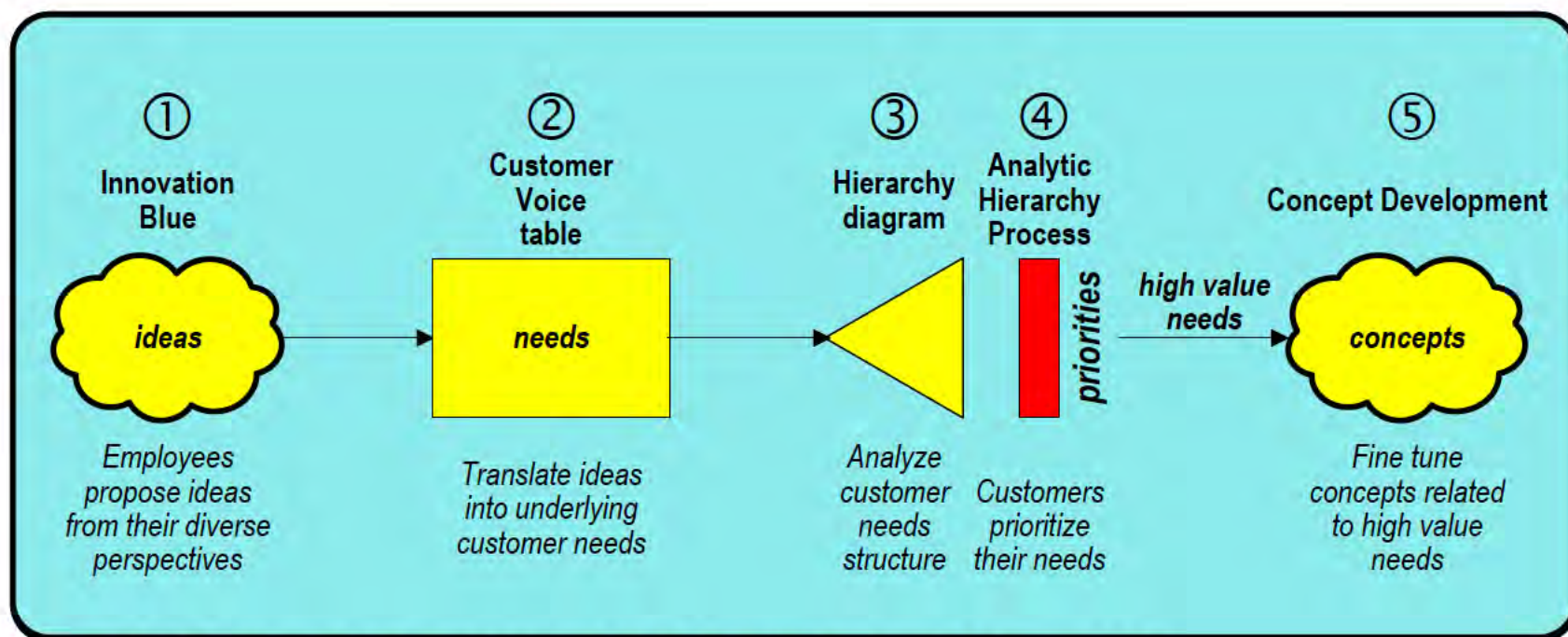


Figure 4 Solution-driven reverse QFD flow (Hines and Mazur 2007)

# QFD in the Internet age

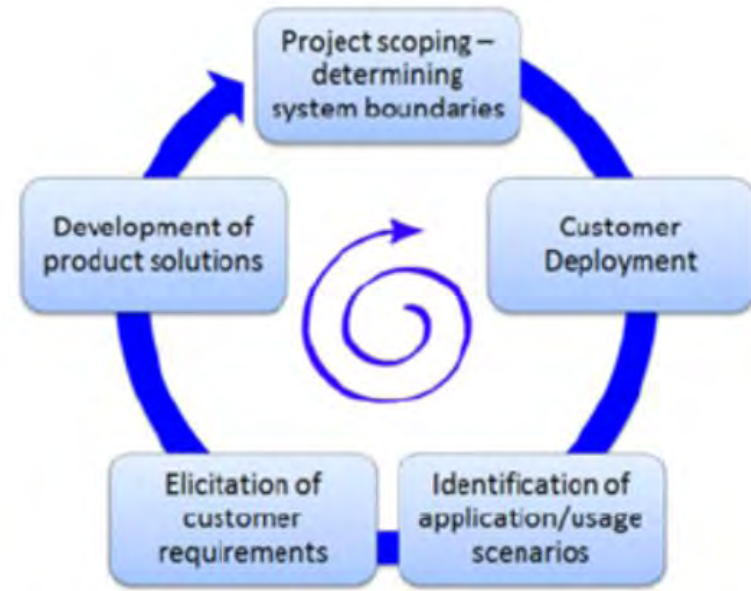
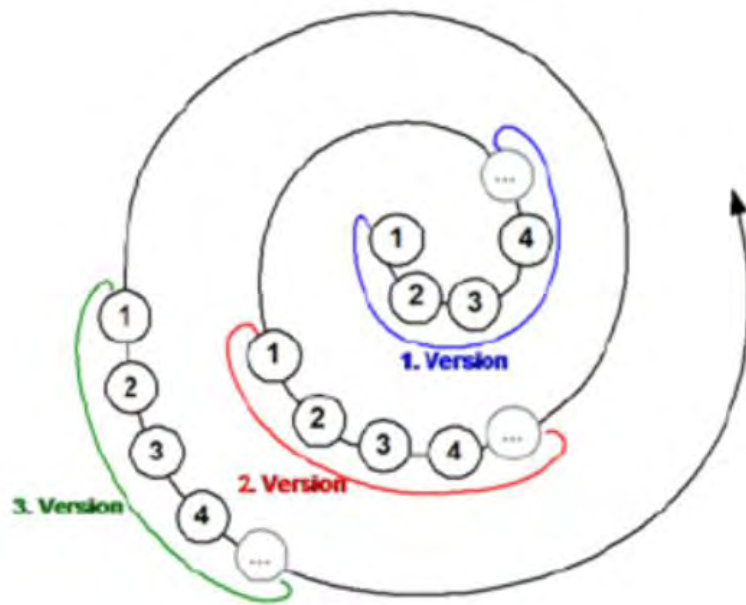
legend:  
 CR = customer requirements  
 PC = product characteristics

Characteristics of fuzzy development tasks

Specifics of Continuous QFD

	SOLUTIONS/Characteristics	<b>Incremental planning &amp; implementation cycles</b>							
<b>PROBLEMS/Requirements</b>		- simultaneous collection of CR & PC							
		- large number of short meetings							
		- gradually refined weighing							
		- focus on most important CR/PC							
		- all matrices developed incrementally							
		- simultaneous planning and development							
		<b>employment of IT (QFD tools &amp; Internet)</b>							
		<b>use of templates</b>							
unclear CR/PC			0	0	0	3	3	0	3
dynamic CR/PC				0	0			4	3
uncertain PC (feasibility)								0	
time pressure			0	3		0	0	0	0

# Continuous QFD for dynamic and agile projects



openQFD v.1.0

Bitte geben Sie:

Benutzername: \_\_\_\_\_  
 Passwort: \_\_\_\_\_

**Aktionen**

WER: 1  
 Stimme des Teams  
 Matrix (1) / W  
 Anforderung / Z  
 Gewichtung / Kunden-Gruppe  
 Lösung / Korrelation / Auswertung

**Stimme des Teams**

Aktionen: Anforderungen / 7W / Anforderungen / Lösungen

Anforderung	Gewichtung	Gewichten
gute Performance	30.0	▲ %
Termine für Personen koordinieren	40.6	▲ %
Bequeme Planung von Besprechungen	23.75	Punkte
Termine eintragen für mehrere Personen	11.08	Punkte
individuelle Administration	5.17	Punkte

**Neue Matrix hinzufügen**

Matrix (1): WAS  
 WE

Bezeichnung der neuen Matrix: \_\_\_\_\_



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Elektrotechnik			
Telekommunikation			

- Challenges of product development in the Internet age

Relevanz / Wichtigkeit	Zielfeld (z.B. A.A. Customer Service/Service "Virtuelle")	Zentrale Dienstleistungen	Technische Dienstleistungen	Personaldienstleistungen	Informationsdienstleistungen	Finanzdienstleistungen
9.9	8.9	○	○	○	○	○
9.9	8.9	○	○	○	○	○
8.6	7.6	○	○	○	○	○
7.4	6.9	○	○	○	○	○
7.4	6.9	○	○	○	○	○
7.4	6.9	○	○	○	○	○
7.4	6.9	○	○	○	○	○
4.9	4.9	○	○	○	○	○

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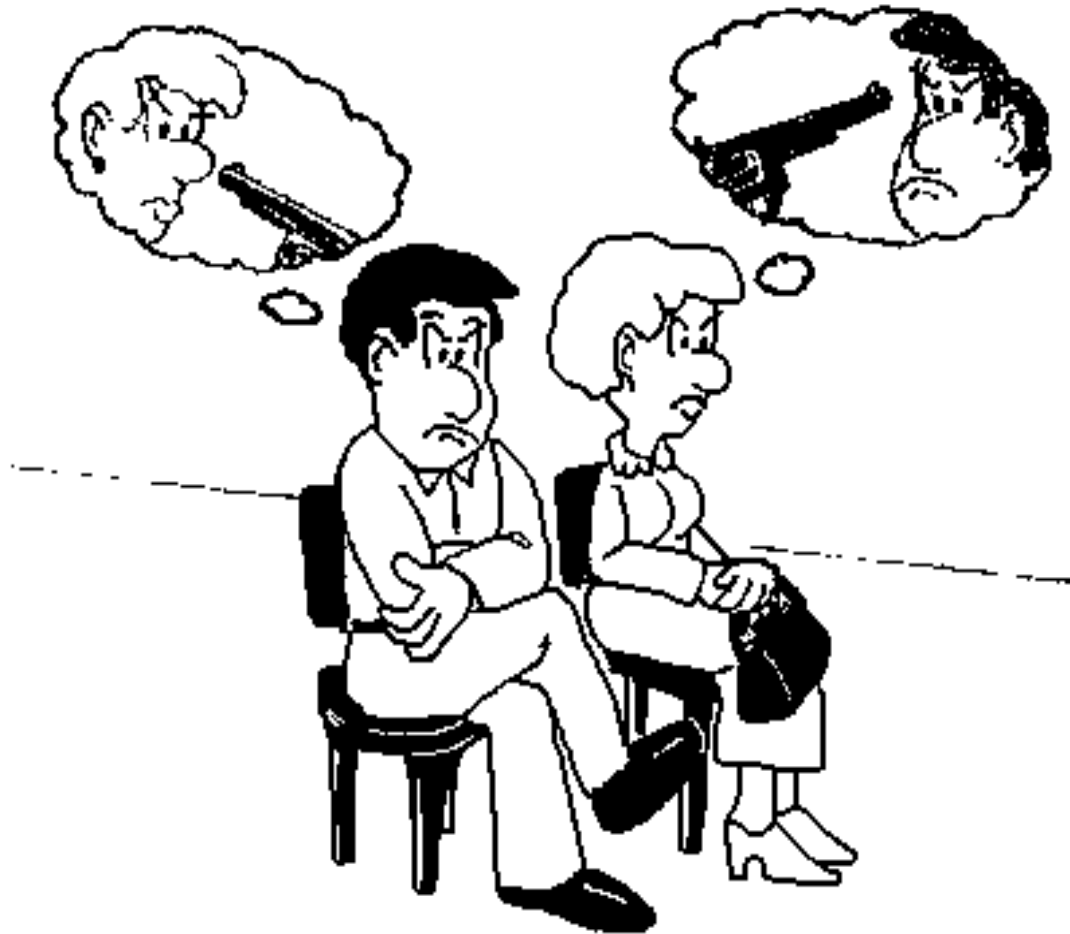


- Outlook and next steps

## The Next Steps

- ISO/FDIS 16355-2, 4, 5, and 8 to be published in 2016
- Finalizing ISO/CD 16355-3, 6, and 7
- Training and Dissemination of the ISO Standards
- Continuously further development in order to meet the product development challenges of the future

# Summary



In order to survive QFD has to solve the problems from today, not the problems from the past!