Driver-car Interaction and Safety Conference
16-17th June 2016, Prague

QFD example in interaction with HMI

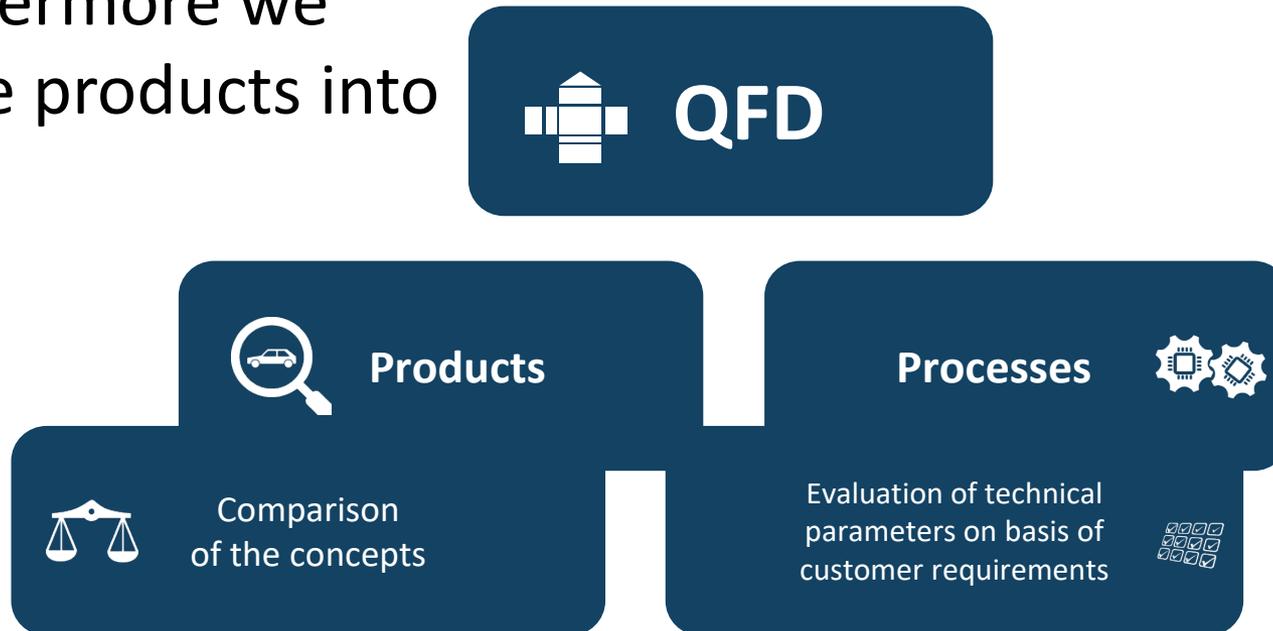Ing. Inga Chudjakova

Ing. Jaromír Tobiška

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QFD application

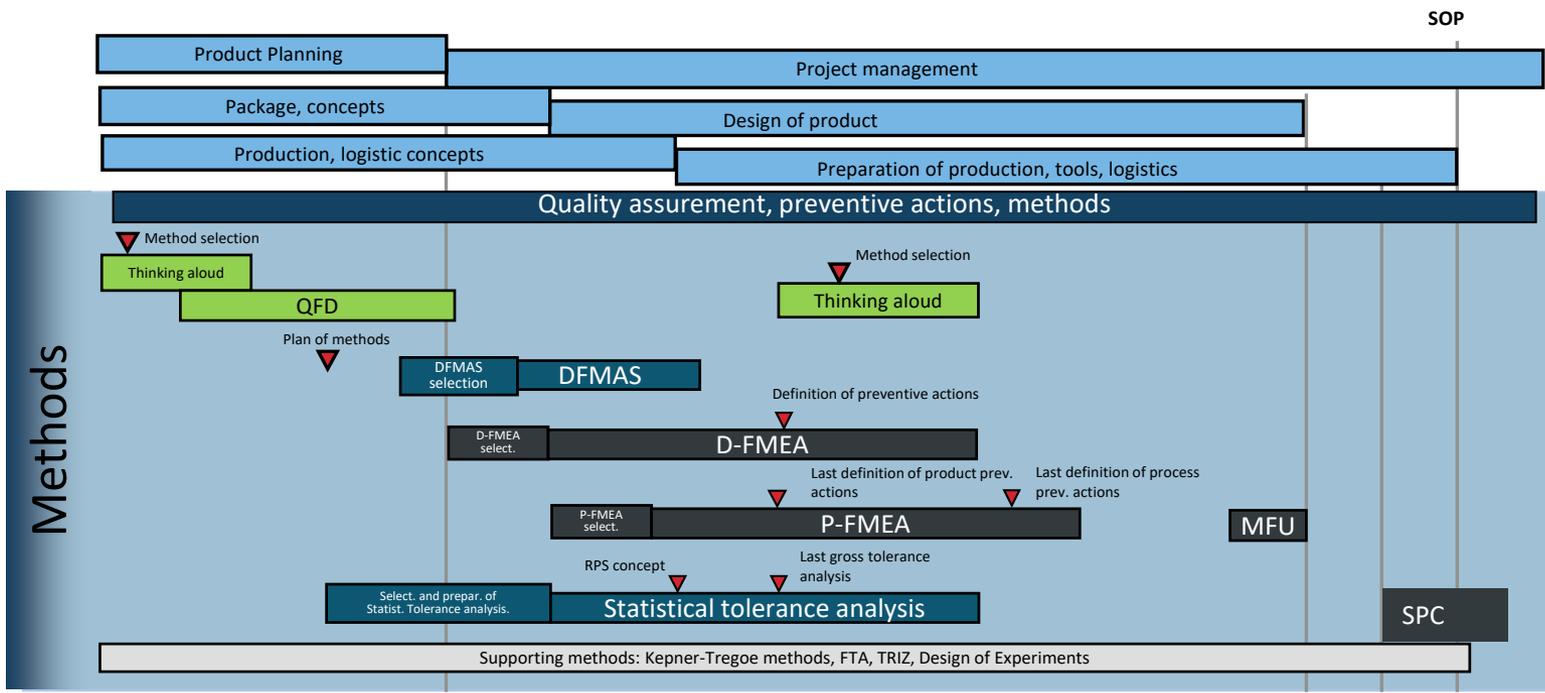Two main application areas of QFD methods

Furthermore we divide products into

QFD

Products

Comparison of the concepts

Processes

Evaluation of technical parameters on basis of customer requirements
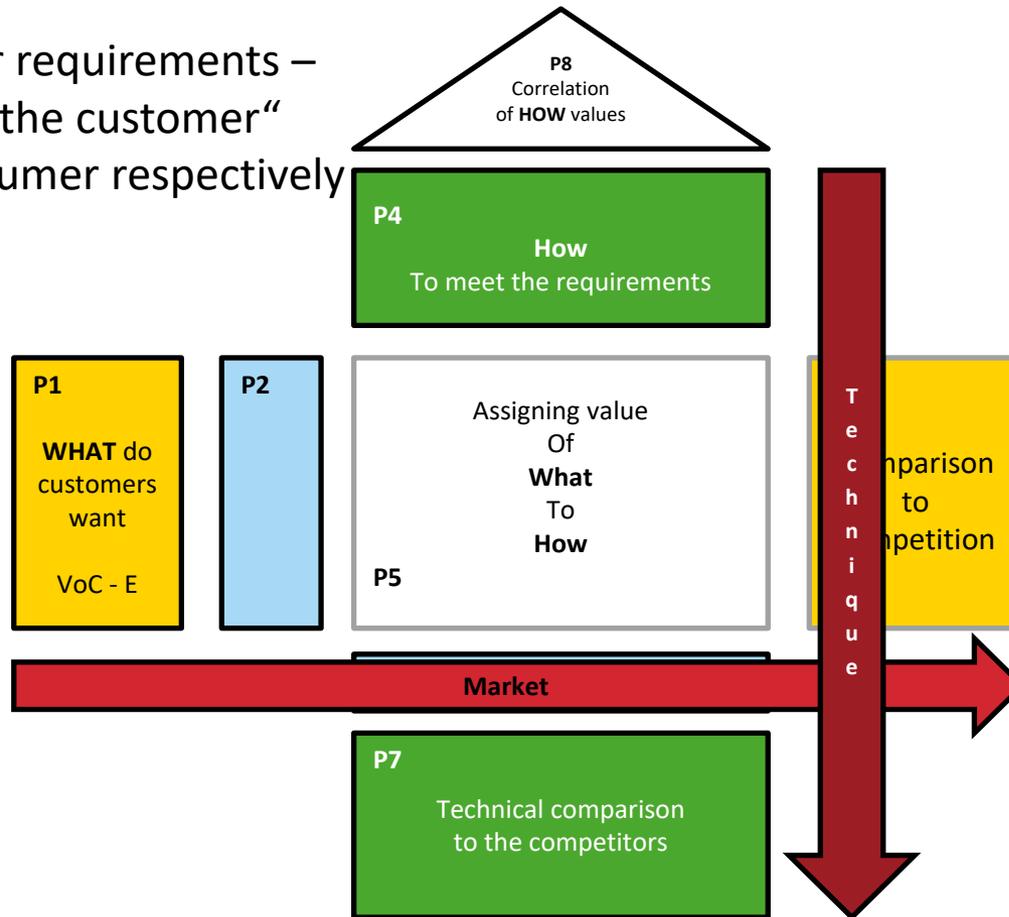
Customer requirement implementation methods.

Cost saving methods

Failure prevention methods.

Supporting methods. Can be applied if necessary, throughout the product development process

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Customer requirements – „Voice of the customer" and Consumer respectively

QFD example in interaction with HMI

> Determination of the technical parameters of vehicle display unit by using QFD method

> Optimization of the display to ensure safe operation while driving.

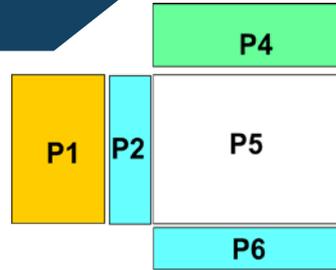> The driver is advised not to takes his eyes of the road for longer period of time than 0,8 sec.

> The main objective of HMI display testing is the minimization of time needed to operate them, and thus the time driver is not concentrating on driving.

> From the aquired results it is possible to determine whether or not the tested concept is suitable for use in a real car.

QFD matrix allows transformation of customer requirements into technical expression

P4

P1 | P2 | P5

P6

Legibility

Adjustments of font and symbol size

Color combination for better legibility

Position close to the driver

		Legibility	Adj. font/symbol			Color comb.		Position					
1		7,36	9	3	9	3	1		9	0	0		
2		7,36	3	3	3	3	0		0	0	0		
	Small driver distraction	**7,36**						**3**	9	1	1		
									3	0	0		
5		7,36							3	0	0		
6		7,36	1	1	0	1	1	0	0	0	0		
7		7,36	0	0	0	0	0	0	0	0	0		
8	Elimination of dazzling light of the display (at night)	7,36	0	1	3	1	1	3	9	3	1	9	
9		7,36	0	0	0	0	0	0	0	0	0		
10		7,36	0	0	0	0	0	9	3	9	0	1	
11		7,36	1	1	1	1	1	9	3	9	0	0	
12		7,36	0	0	0	0	0	0	0	0	0	0	
	Good legibility of displayed information	**7,20**			**9**			3	9	3	1	9	
		7,20	0	3	0	0	9	0	3	9	0	0	0	3
16	Independence from eye correcting supplements	7,20	9	3	9	9	9	9	3	3	9	3	9	0
17		7,20	3	3	3	3	3	1	1	1	3	0	3	0
18		7,20	9	1	3	1	3	0						

| | 348 | 225 | 327 | 357 | 353 | 145 | 146 | 157 | | 504 | 227 | 504 | 51 | 189 |

Ease of use

Legibility
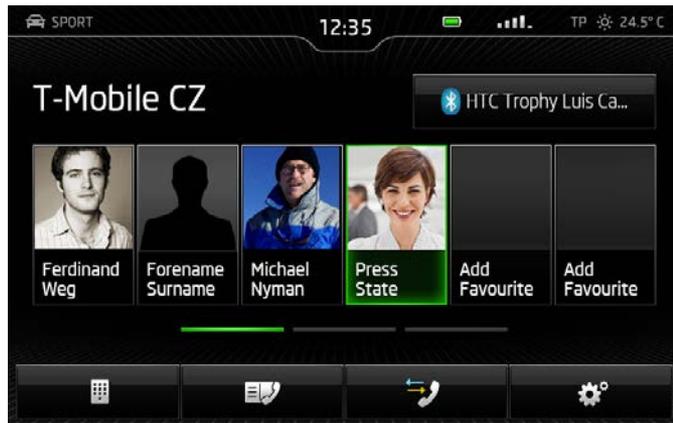
Correlation values (P5):

0 = no effect
1 = low effect
3 = average effect
9 = high effect

Technical clinic – testing using driving simulator

> Font size

> Font legibility

> Text understanding

> Contrast (Contrast x Font size)

A) FONT SIZE

    a. Main title   `0 | 1 | 3 | 9`

    b. Item   `0 | 1 | 3 | 9`

    c. Additional text   `0 | 1 | 3 | 9`

B) TEXT LEGIBILITY (brightness, colors…)   `0 | 1 | 3 | 9`

C) LEGIBILITY DEPENDANCE ON BACKGROUND   `0 | 1 | 3 | 9`

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› **The drivers at the driving simulator chose combination „contrast 1"**
  along with second biggest font size as the most suitable.
› **The biggest font size was, as they said, „too distracting".**

COMBINATION OF FONT SIZE AND CONTRAST