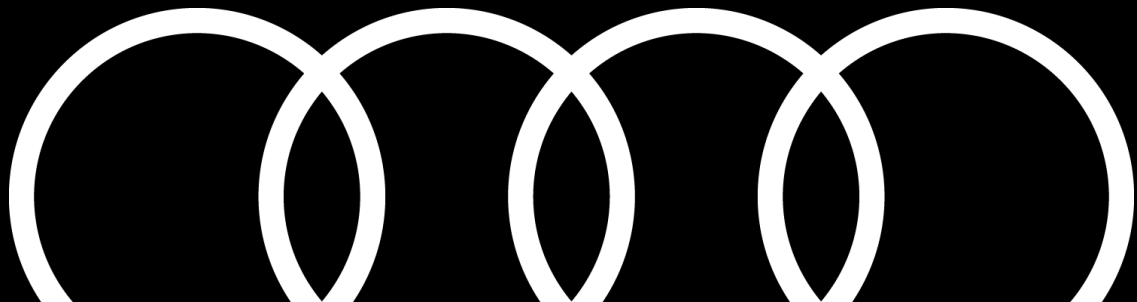


The Art of Anticipation:

How empathic systems change the user experience in the vehicle

Doreen Engelhardt | AUDI AG



Vision

Understand individual user needs
and create personal and empathic
user experiences

“Audi Intelligence Experience”

Benefits

- › Positive user experience [1, 2]
- › Efficient and effective [3, 4, 5]
- › Individual assistance [6]
- › Reduce mental workload [7, 8]

Deep dive

Industry

Inflationary usage of terms like:

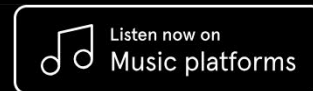
- empathic
- adaptive
- intelligent
- smart
- personalized or
- AI powered

for different levels of adaptivity

Endel

Personalized soundscapes
to help you focus, relax, and sleep.
Backed by neuroscience.

Try Today





Click to change the ambiance



Bright



Tokyo



Tropical
Twilight



Soho

Smart mood lighting

GENIUS X

THE REVOLUTIONARY GENIUS X WITH ARTIFICIAL INTELLIGENCE

Recognizes your brushing style. Guides you to brush better every day.



Scientific world

A common definition is missing [6]

Definition „Intelligent Systems“

“Adaptation, automation, and interaction provide a common denominator for what many researchers regard as intelligent.” [6]

Definition „Intelligent Systems“

“**Adaptation**, automation, and interaction provide a common denominator for what many researchers regard as intelligent.” [6]

Definition „Adaptive Systems“

“...technological component of joint human-machine systems that can change their behavior to meet the changing needs of their users, often without explicit instructions.” [12]

Triggers for adaptivity

01 **User**
User initiated or state

Triggers for adaptivity

02 System
State or mode

Triggers for adaptivity

03 Environment
State or event

Triggers for adaptivity

04 **Task/Mission**
Task status or mission event

Triggers for adaptivity

05 Spatio-Temporal
Location or time

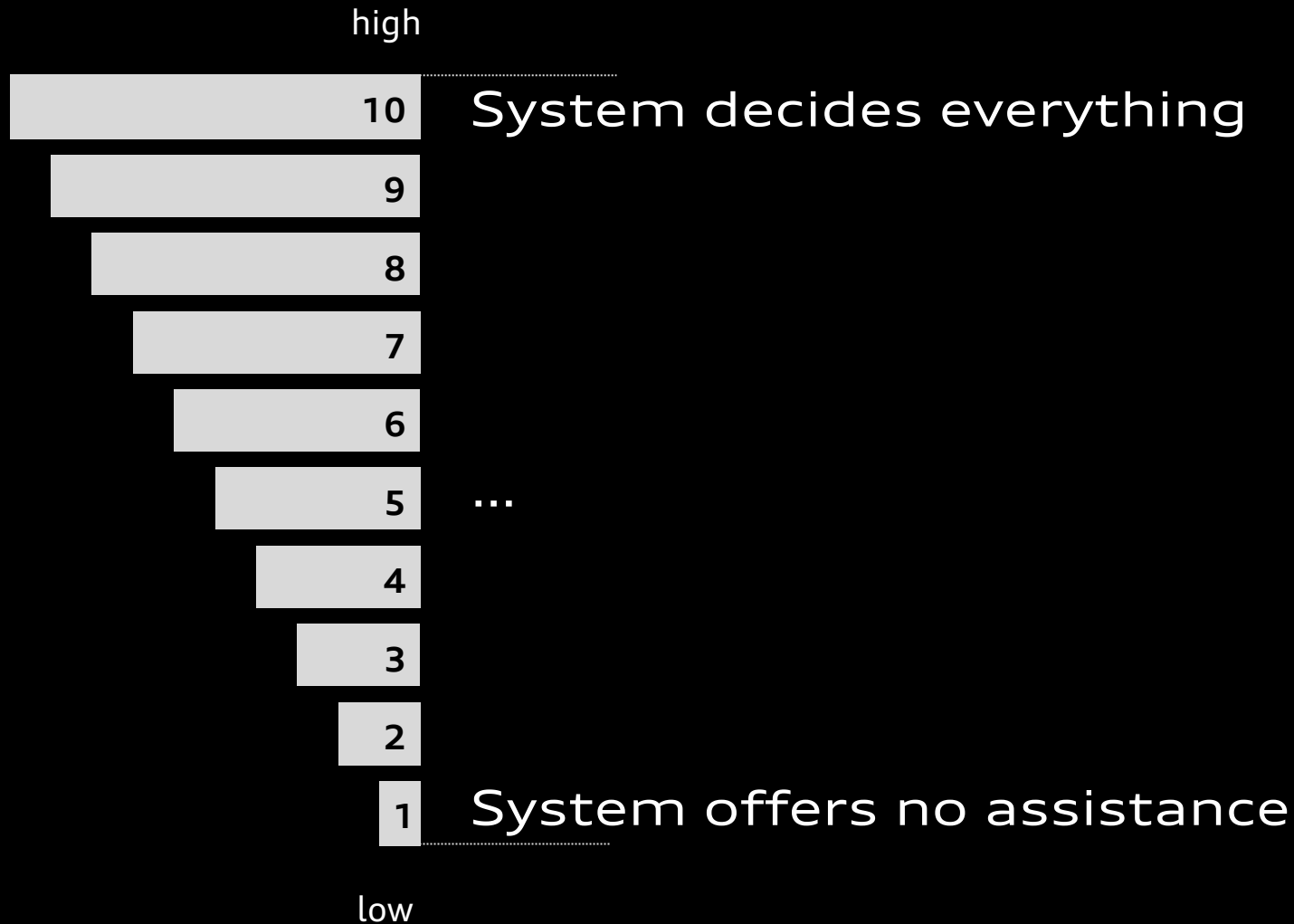
Summary definition „Adaptive Systems“

- ⊘ No distinction with regard to different levels of personalization





Definition „Intelligent Systems“

“Adaptation, **automation**, and interaction provide a common denominator for what many researchers regard as intelligent.” [6]

Levels of Automation

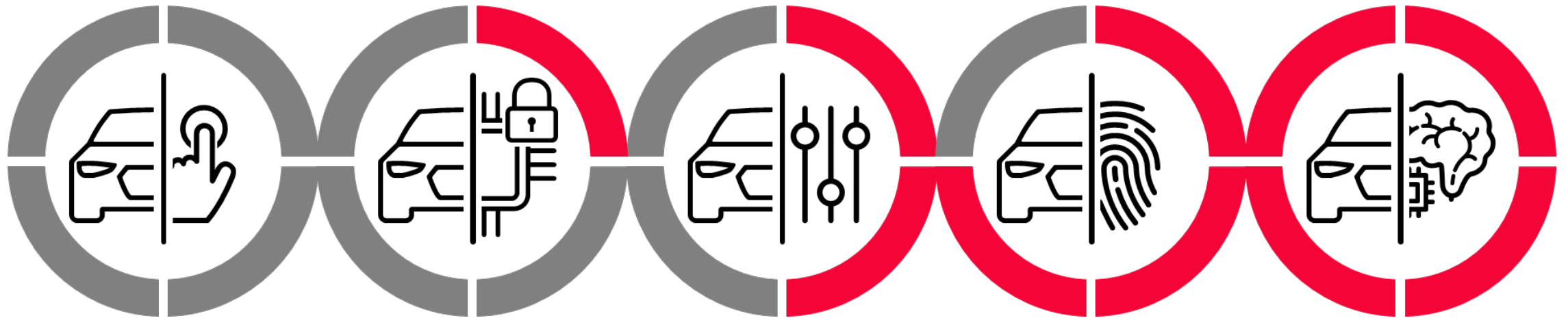


Summary “Levels of Automation“

-  Learned adaptation not included
-  No personalization
-  User state not included
-  Too much differentiation

Levels of Adaptive Sensitive Responses (= LASR)

- › Presented by Rittger, Engelhardt & Schwarz in 2022 [2]
- › Official ISO document to be published in 2024



Question

What should be classified, the UI or the underlying algorithm?

Answer

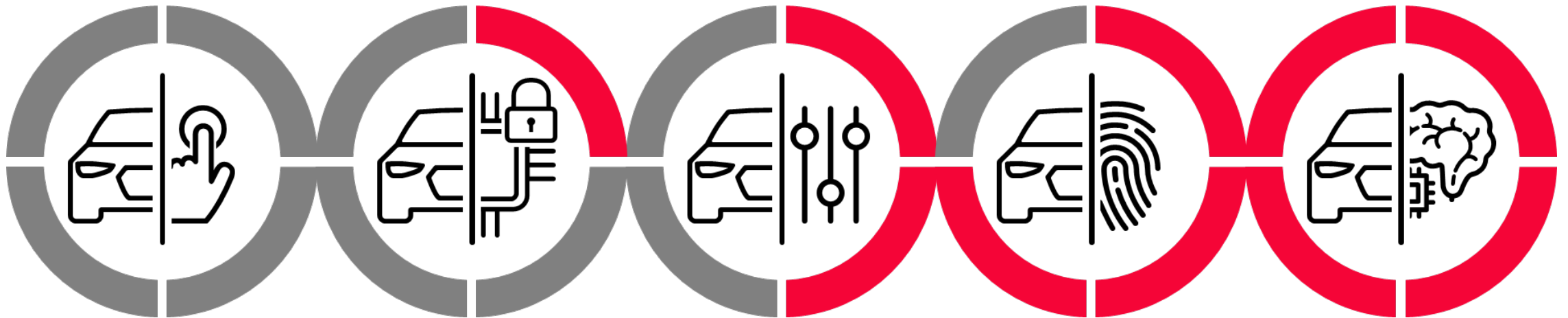
1. Highly complex algorithms can have a rather simple UI
 2. The algorithms used provide information about what personal data is used.
- >> LASR focuses on the user-adaptivity based on used data processing



Level of data processing defines LASR (0-4)



Levels of Adaptive Sensitive Responses (= LASR)



Description

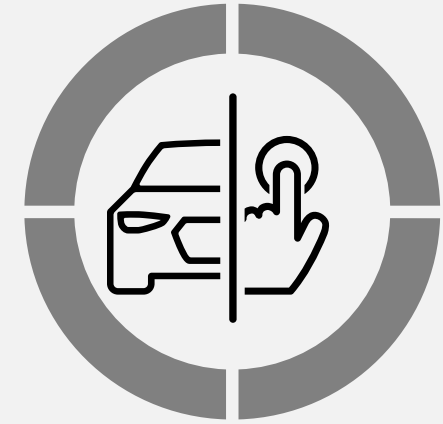
User needs to activate or deactivate the function every time.

Data Processing

Not existing

Example

User activates and deactivates a relax playlist



LASR 0: NO ADAPTATION

Description

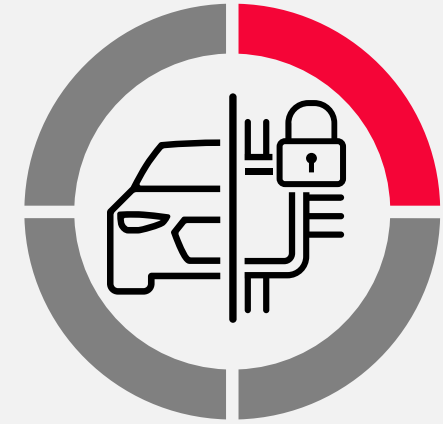
Individual settings can be saved in the vehicle manually by the user

Data Processing

Saving and connecting settings to a specific user

Example

User saves a relax playlist as default setting



LASR 1: SAVED

Description

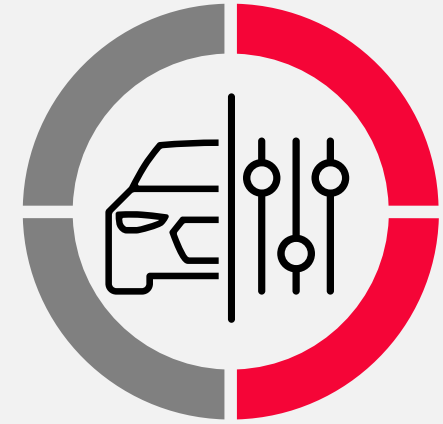
Based on pre-defined if-then rules and apply to all users or user groups

Data Processing

Execute pre-defined adaptations

Example

Relax playlist is recommended when users are stuck in traffic



LASR 2: DEFINED

Description

- Based on learning from individual users in a specific contexts
- Adaptation happens in real time during the interaction with the system

Data Processing

- Real time learning
- Continuous learning

Example

System detects that the relax playlist is always activated by an individual user on the way home

→ System recommends the relax playlist in this situation



LASR 3: LEARNED

Description

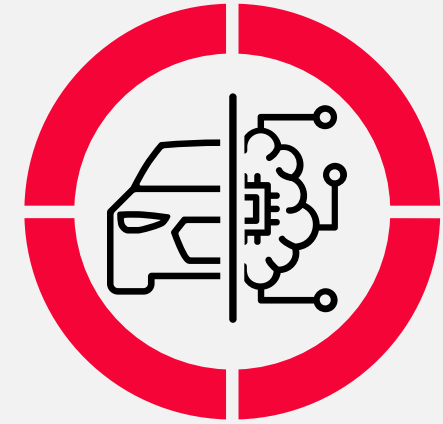
- System interprets user's inner state
- System can adapt to similar and unknown

Data Processing

- Real time learning
- Continuous learning is influenced by interpretations of user states

Example

System recommends the relax playlist whenever the user is stressed

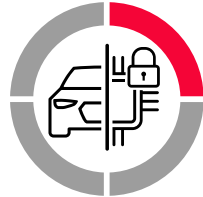


LASR 4: INTERPRETED

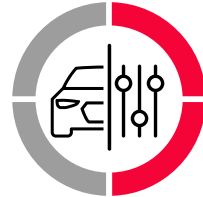
Summary



LASR 0: NO ADAPTATION



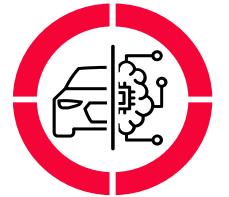
LASR 1: SAVED



LASR 2: DEFINED



LASR 3: LEARNED



LASR 4: INTERPRETED

LASR

QUIZ

Input data

User presses on the phone menu icon.

Output data

Phone menu opens.



LASR 0: NO ADAPTATION



LASR 1: SAVED



LASR 2: DEFINED



LASR 3: LEARNED



LASR 4: INTERPRETED

Input data

User-specific seat heating settings were learned.

Output data

User-specific seat heating settings are set.



LASR 0: NO ADAPTATION



LASR 1: SAVED



LASR 2: DEFINED



LASR 3: LEARNED



LASR 4: INTERPRETED

Input data

The user sits in the rear seat. Fatigue is detected based on various factors.

Output data

The lights are dimmed and the temperature is increased, as this user has already done in similar situations.



LASR 0: NO ADAPTATION



LASR 1: SAVED



LASR 2: DEFINED



LASR 3: LEARNED



LASR 4: INTERPRETED

HMI dimensions

Guidelines for Human-AI Interaction

Initially

1

Make clear what the system can do.

2

Make clear how well the system can do what it can do.

During Interaction

3

Time services based on context.

4

Show contextually relevant info.

System made a mistake

9

Support efficient correction.

11

Make clear why the system did what it did.

Over time

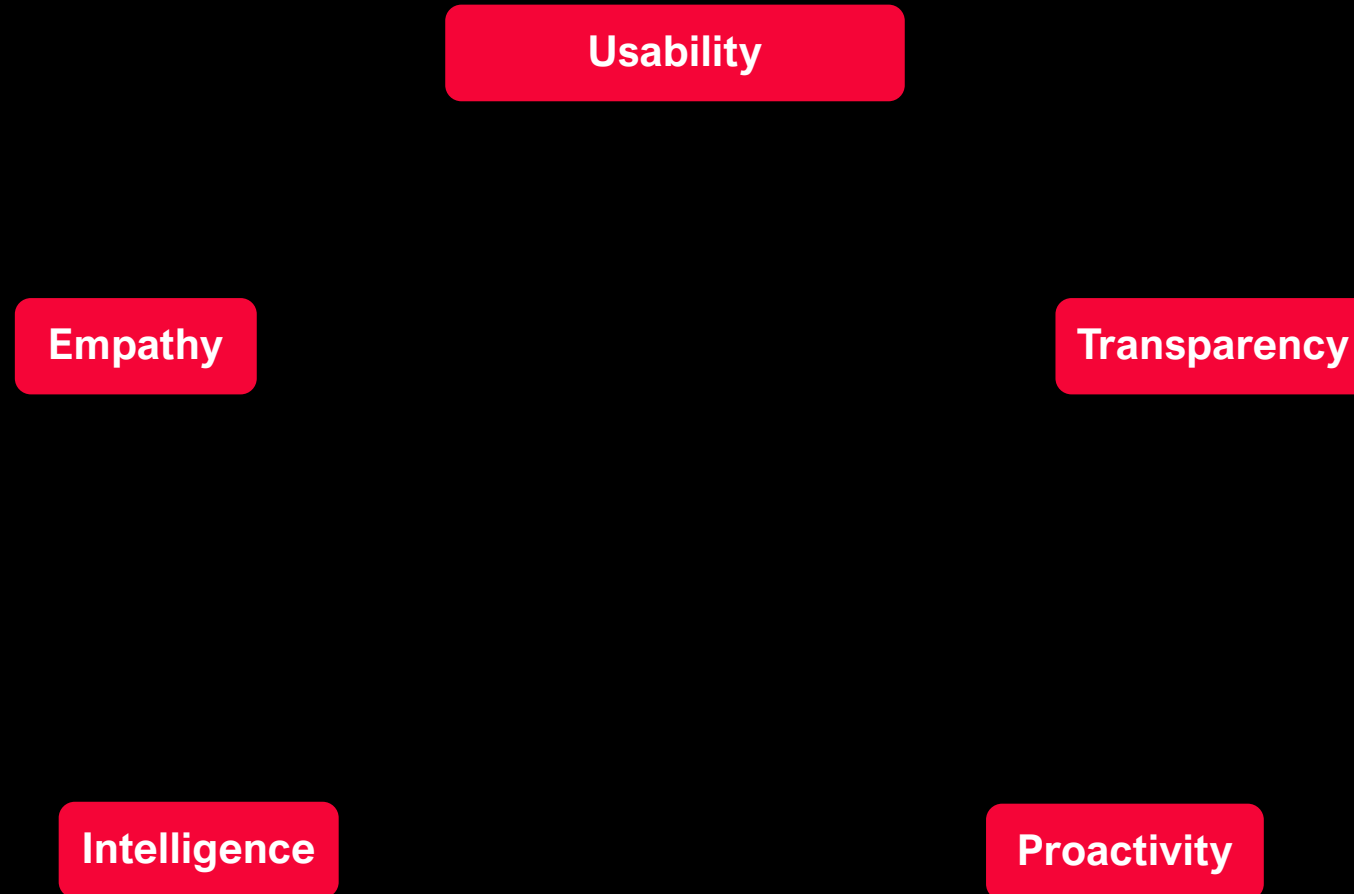
12

Remember recent interactions.

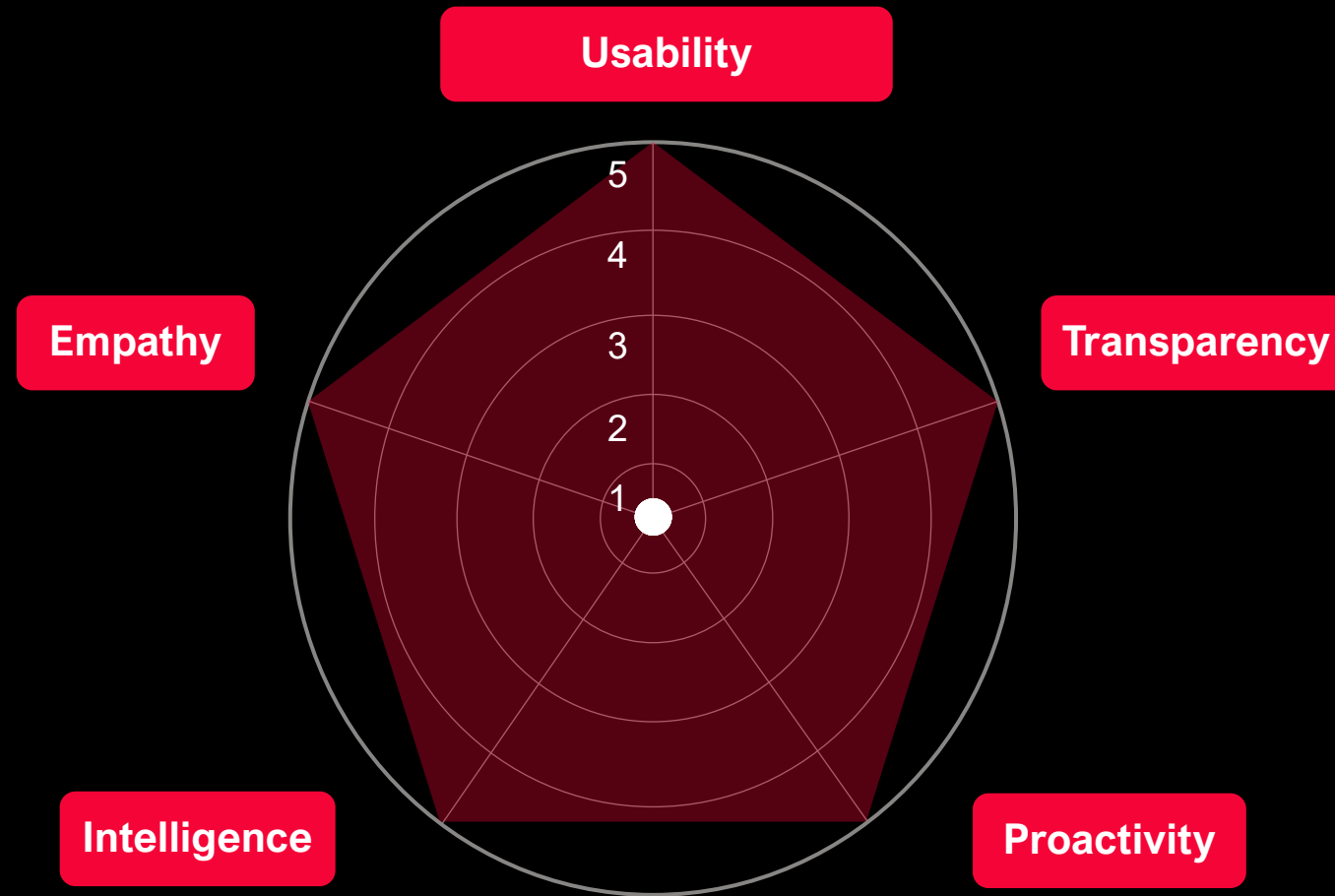
13

Learn from user behavior.

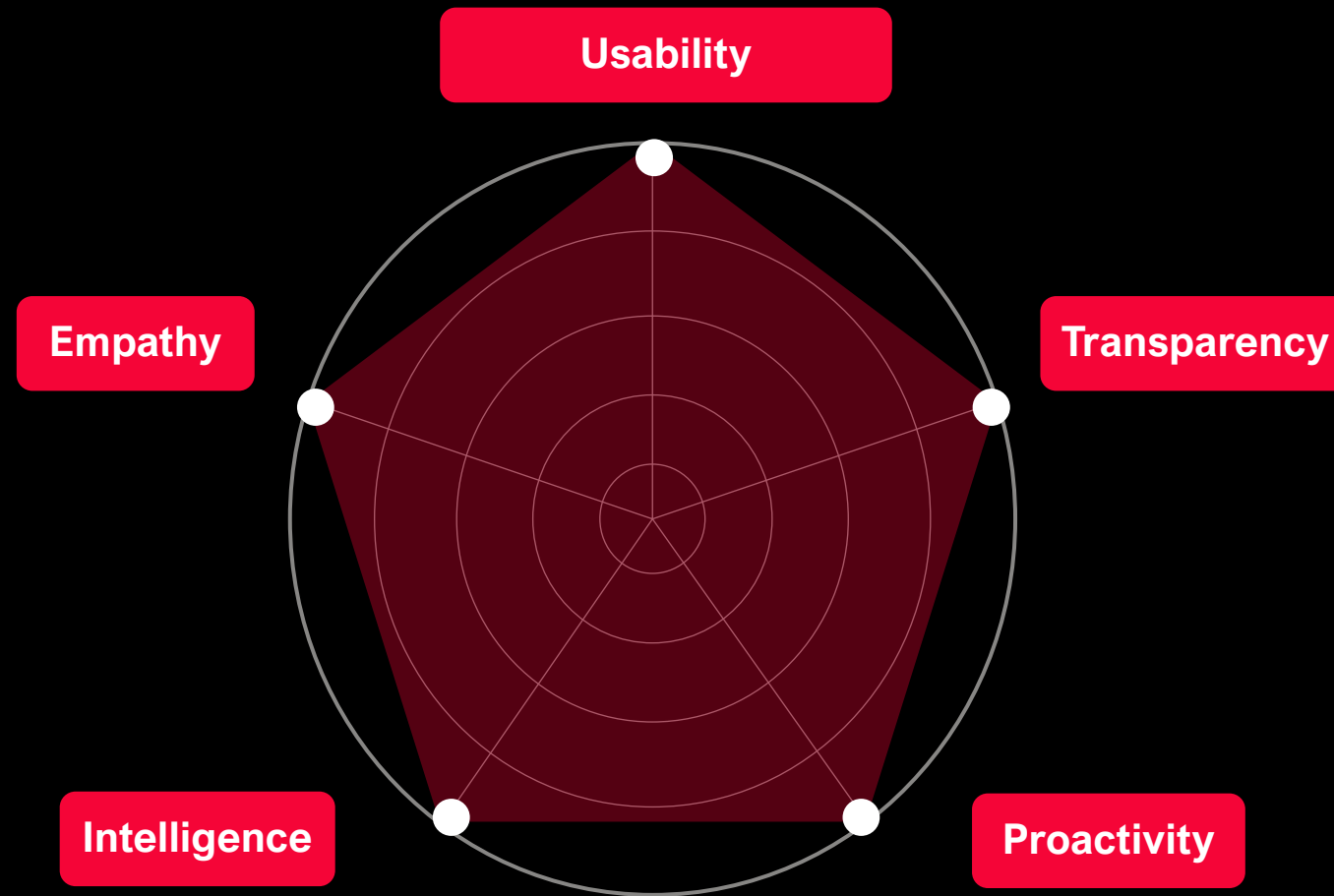
5 HMI dimensions



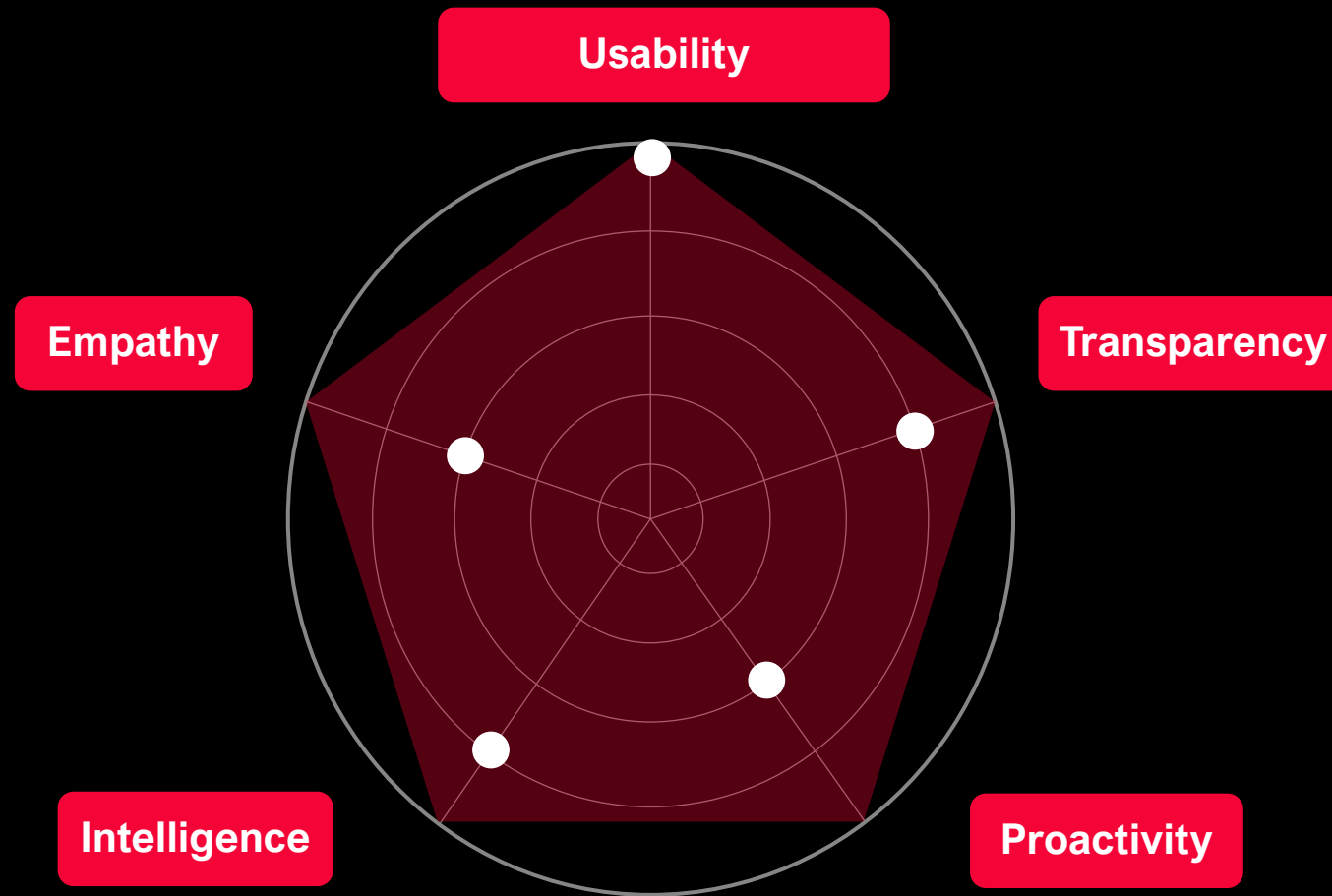
HMI dimensions can be function, context, and user specific



HMI dimensions can be function, context, and user specific



HMI dimensions can be function, context, and user specific



Summary

1. The art of anticipation requires a good understanding of users in specific use cases
2. LASR and HMI dimensions provide a “thinking tool” for UI/UX designer and developers
3. A high LASR does not equal better user experience



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- [10] <https://www.philips-hue.com/en-us/explore-hue>
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Thank you!

Doreen Engelhardt

LASR quiz answers

Input data

User presses on the phone menu icon.

Output data

Phone menu opens.



LASR 0: NO ADAPTATION



LASR 1: SAVED



LASR 2: DEFINED



LASR 3: LEARNED



LASR 4: INTERPRETED

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