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May 2020
INFOTAINMENT EXPERT UX EVALUATION
Porsche Taycan

CON619-20 (20c)

About SBD Automotive

Management & technology consultants to the automotive industry for over 20 years

Our expertise:



Our role:

As our industry faces...

Uncertainty



We provide our clients with...

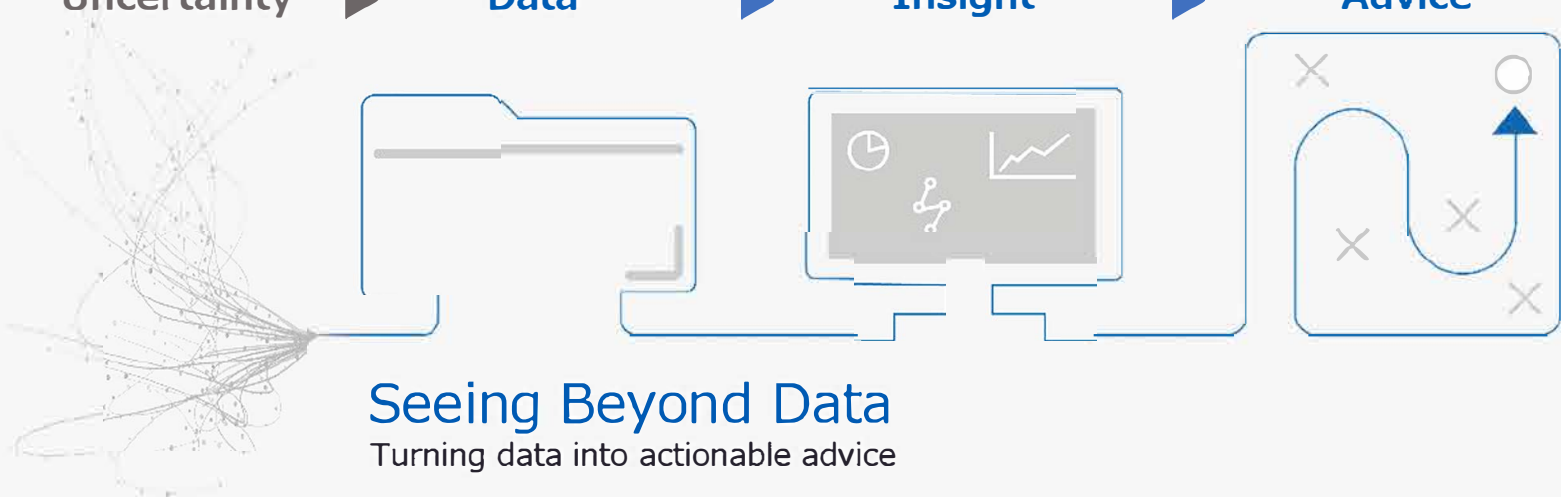
Data



Insight



Advice



Seeing Beyond Data

Turning data into actionable advice



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Consulting Services



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Introduction

Introduction to this report series

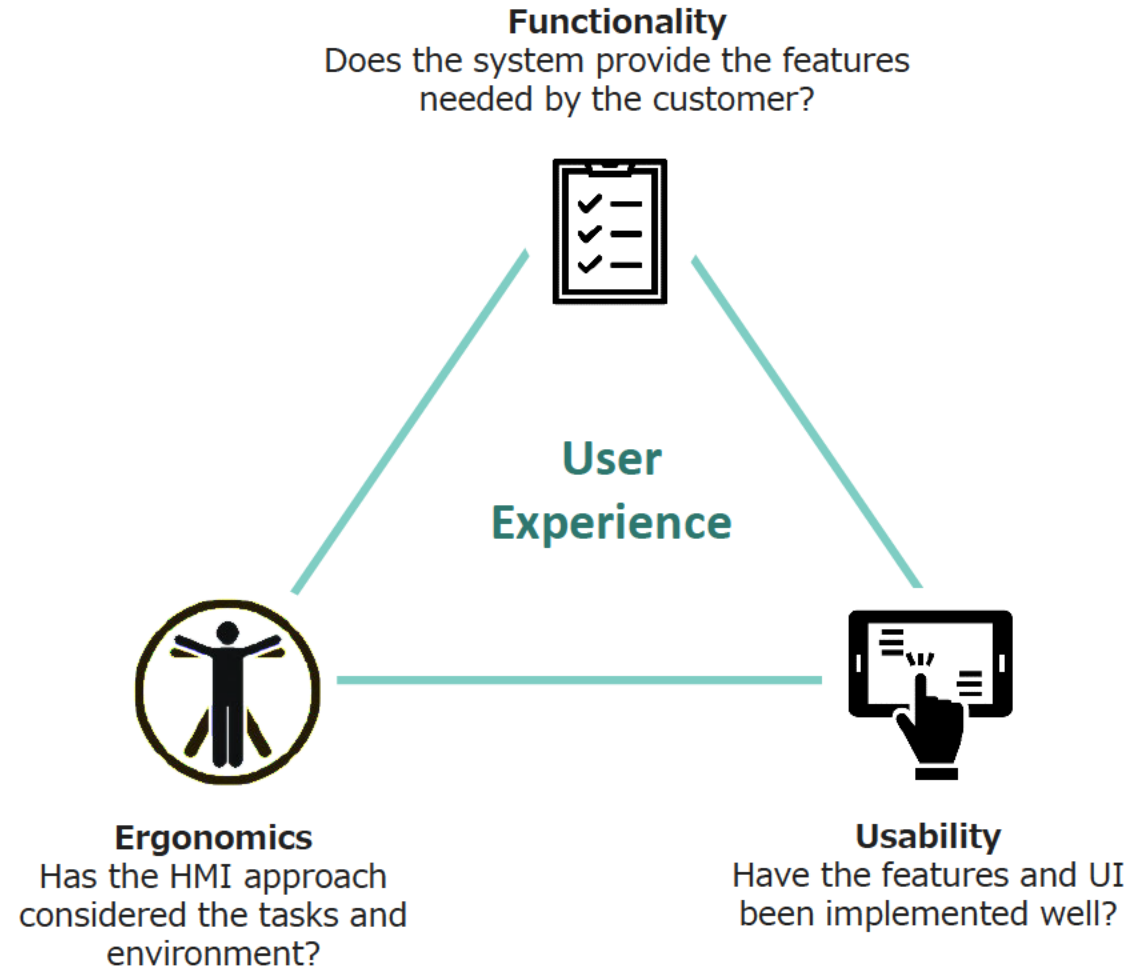


Welcome to the third of SBD's 2020 infotainment expert user experience evaluation reports, part of a collection of twelve evaluations planned to be carried out this year. In these reports we provide an **expert evaluation** of the leading navigation and infotainment systems in the European, US, Chinese and Japanese markets (where applicable).

This report series has four main objectives which are aimed at supporting our clients at various stages of the development cycle.

- Benchmark & score**
- Define areas of concern**
- Outline best practice**
- Provide tangible recommendations**

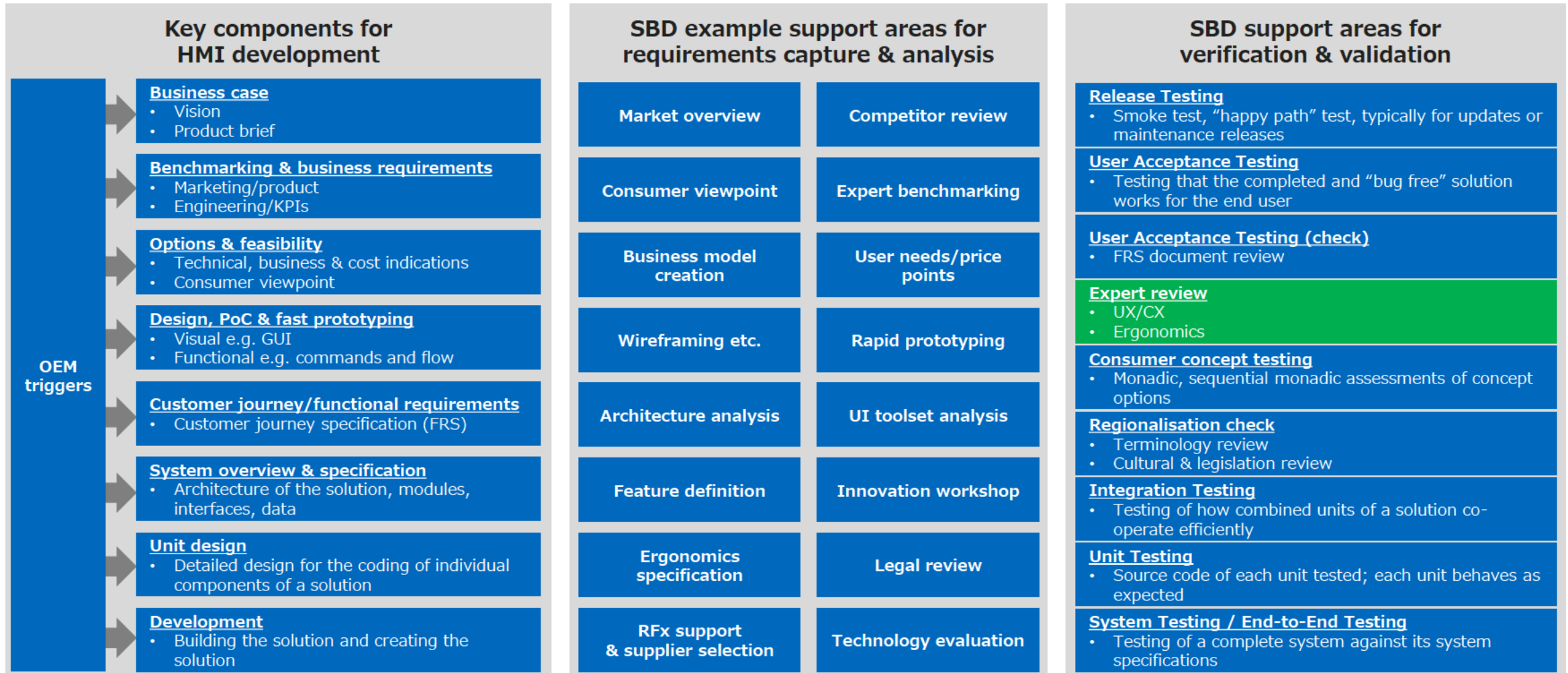
For these studies SBD evaluates the three core components of user experience, functionality, ergonomics and usability, to ensure a fair score can be provided across each system evaluated.



Development cycle and SBD expert test methodology



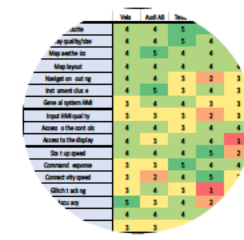
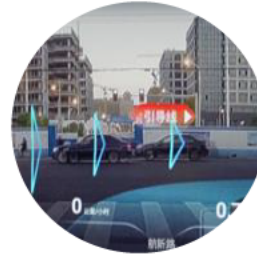
The methodology used by SBD has been refined over many years and is based on ISO 9241-110 principles. The methodology incorporates objective data results as well as subjective values that are used to derive an overall usability score with reasoning and analysis. SBD follows a modified V cycle approach when considering infotainment solutions with this [expert evaluation](#) being just one component of the verification and validation area.



Expert testing methodology flow overview



This report takes the form of an expert technical evaluation. Tests focus on the navigation and infotainment systems and do not take into account the wider architecture of the car. This vehicle was **German specification** tested on motorways and urban roads in and around Munich, Germany. **Minor differences might exist for other markets.** Outlined on the next page are all the components of which SBD carried out some form of evaluation. Two SBD usability experts carry out expert evaluations of the system over a three-day duration.



Before vehicle testing

High level feature review to understand what the system may have and make sure no innovative HMI methods or features will be missed in the testing

Static vehicle testing

- First impressions
- Ergonomics
- Onboarding
- Voice
- Use case/task list testing

Dynamic vehicle testing

- Voice
- Use case/task list testing

Validation & comparison of results

Final scoring of the solution taking into account all testing with results validated against past tests and competitor solutions

Reporting

Final reporting including the PowerPoint report and Excel raw data scoring document

Methodology



SBD's UX testing methodology covers many different areas and in some cases is a required test specification. A prime example of this is the voice recognition testing which can be carried out in much greater depth for bespoke client projects compared to the test specification used for this report series. Outlined below are the major test components for this evaluation series – if required SBD will be happy to take any clients through this detailed methodology.

Component	Criteria
Build quality	Any comments should be noted that a pre-production vehicle. Steering wheel controls have some tolerance, many HVAC controls also have to tolerate, particularly fan rotary, laterally and
Ease of visibility	Steering wheel and dash obscure bottom right of central screen, message screen not visible if driver on, especially while driving. Left mirror panel is not visible by driver. Screen good for
Reach from seat	All within reasonable reach apart from left screen and particularly left button panel. Top left corner of driver central display requires slight lean forward but this is generally considered acceptable.
Attention	Passenger screen is not suitable for driver usage. In the current configuration it is likely the driver would need to switch the screen to some extent at least initially.
Readability	
Colour, graphics and layout	This screen has not been judged due to the car being in production.
Information architecture	Good use of colour - all lines with the feel of the car. Diagonal sections clear coded, lots of orange, this colour would be further avoided.
Where feature	Distribution between two screens is unclear in current default setting. Some core functionality is on left menu, some on right, suggesting driver needs to use both but this is not good as passenger screen is not optimal for driver. All soft keys not work acceptably as selection to access additional apps. Screen customisation panel is slow, but also not satisfactory solution. Navigation has a completely different interface with sub-menu. Media is installed into different channels which does not work without the driver having only one
Other factors	elder user may be confused and unable to use much functionality straight away (fob, SAE, wallpaper).

First impressions

Feature	Definition
Navigation	<ul style="list-style-type: none"> Is there a "back" button to return from a subsection, and does the "back" logic return to the previous screen and not another screen several layers previous? Is the "back" action consistent? (Same logs/wording/positioning and consistent action, not one step back in one section, to home screen in another). Does the UI offer multiple input methods (e.g. touchscreen, central controller, voice recognition, handwriting input, steering wheel controls)? Is the menu grouping/structure broad rather than deep? Are all regional variations taken into account for the car's specified country (e.g. languages, currency symbols, mapping restrictions, religious considerations)? Does content shown in the main display match the same content displayed in the instrument cluster? If there are multiple input methods, do all inputs result in the same output? Are features, functions, terms and labelling consistent throughout and with industry standards? Is on-screen keyboard layout consistent across all instances throughout the system? Are text lists displayed vertically (not horizontally)? Does the interface look and feel for the current function match other functions in the system? When navigating various parts of the current function, if scrolling or panning must be performed, does it match user expectation, other parts of the system and industry standards?

Feature list

Issue	Priority	Frequency	Severity	Complexity
Is there a "back" button to return from a subsection, and does the "back" logic return to the previous screen and not another screen several layers previous?	Major	1	1	1
Is the "back" action consistent? (Same logs/wording/positioning and consistent action, not one step back in one section, to home screen in another).	Major	1	1	1
Does the UI offer multiple input methods (e.g. touchscreen, central controller, voice recognition, handwriting input, steering wheel controls)?	Major	1	1	1
Is the menu grouping/structure broad rather than deep?	Minor	1	1	1
Are all regional variations taken into account for the car's specified country (e.g. languages, currency symbols, mapping restrictions, religious considerations)?	Critical	1	1	1
Does content shown in the main display match the same content displayed in the instrument cluster?	Critical	1	1	1
If there are multiple input methods, do all inputs result in the same output?	Critical	1	1	1
Are features, functions, terms and labelling consistent throughout and with industry standards?	Critical	1	1	1
Is on-screen keyboard layout consistent across all instances throughout the system?	Major	1	1	1
Are text lists displayed vertically (not horizontally)?	Critical	1	1	1
Does the interface look and feel for the current function match other functions in the system?	Major	1	1	1
When navigating various parts of the current function, if scrolling or panning must be performed, does it match user expectation, other parts of the system and industry standards?	Critical	1	1	1

Binary task list

Task	Time (seconds)	Glances	Score
Navigation to a city	10.5	10	2
Change radio station	1.8	2	2
Change other media	1.1	1	2
Make phone call	10.5	5	2
Answer phone call	1	1	3
Set waypoint - fuel	10.7	8	3
Change destination to home	10.5	1	1
Stop route guidance	4.5	1	3

Static tasks

Issue	Priority	Frequency	Severity	Complexity
Clicking on 'Regulation climate control' sometimes causes haptic buttons around central controller are poor to register. Sometimes screen presses don't register. Touch input is registered (you can hear)	Major	1	1	1
Weird selection logic (number of touches required)	Major	1	1	1
Text in various places is cut off with no ability to expand by composing and sending a message, the message navigation ends route guidance. "Cancel navigation" is affected by fan noise and the fan is not notified how to use the radio - system thought for a radio screen jumps from time to time, possibly as it	Major	1	1	1
Ignition on, engine running. Pushed home, button cannot do temperature to HI or LO unless you use	Major	1	1	1

Dynamic tasks

User 1	SUS: Communication				
	1. Strongly disagree	2. Disagree	3. Neither	4. Agree	5. Strongly Agree
I think that I would like to use this feature frequently				X	
I found this feature unnecessarily complex		X			
I thought this feature was easy to use				X	
I think that I would need assistance to use this feature		X			
I found the various functions in this feature were well integrated		X			
I thought there was too much inconsistency in this feature		X			
I would imagine that most people would learn to use this feature very quickly				X	
I found this feature very awkward to use	X				
I felt very confident in using this feature				X	
I needed to learn a lot of things before I could get going with this feature	X				

SUS

Issue	Priority	Frequency	Severity	Complexity
Navigation	Major	1	1	1
Connect infotainment	Major	1	1	1
UI setting	Major	1	1	1
Additional info	Major	1	1	1
Additional info	Major	1	1	1
Additional info	Major	1	1	1

Performance

Issue	Priority	Frequency	Severity	Complexity
Navigation	Major	1	1	1
Connect infotainment	Major	1	1	1
UI setting	Major	1	1	1
Additional info	Major	1	1	1
Additional info	Major	1	1	1
Additional info	Major	1	1	1

H/W S/W specific

Issue	Priority	Frequency	Severity	Complexity
Clicking on 'Regulation climate control' sometimes causes haptic buttons around central controller are poor to register. Sometimes screen presses don't register. Touch input is registered (you can hear)	Major	1	1	1
Weird selection logic (number of touches required)	Major	1	1	1
Text in various places is cut off with no ability to expand by composing and sending a message, the message navigation ends route guidance. "Cancel navigation" is affected by fan noise and the fan is not notified how to use the radio - system thought for a radio screen jumps from time to time, possibly as it	Major	1	1	1
Ignition on, engine running. Pushed home, button cannot do temperature to HI or LO unless you use	Major	1	1	1

Software bugs

Type	Task	Time (seconds)	Glances	Score
Navigation	Navigation to a city	10.5	10	2
Navigation	Change radio station	1.8	2	2
Navigation	Change other media	1.1	1	2
Navigation	Make phone call	10.5	5	2
Navigation	Answer phone call	1	1	3
Navigation	Set waypoint - fuel	10.7	8	3
Navigation	Change destination to home	10.5	1	1
Navigation	Stop route guidance	4.5	1	3

Voice recognition

Please note this evaluation service does not include the following methodologies: smartphone companion app UAT, smartphone mirroring, detailed voice recognition evaluation, ADAS HMI, content benchmark, detailed performance, consumer testing and biometric evaluations.

Please contact SBD to discuss the methodology used in this report series or other methodologies: info@sbdautomotive.com

Planned vehicles to be evaluated this year



SBD has chosen 12 vehicles to evaluate in 2020, divided into three selection categories shown below.

New/Interesting UX; This could be due to never-seen-before features or functionality, or the implementation of a solution that has previously been a challenge or pain-point for end-users.

New Mass Market UX; These are vehicles in segments that are sold in high numbers and are entering a new generation of UI for that vehicle.

China/Japan Market UX; Chinese and Japanese consumers have differing expectations from Western markets, focusing more on bold, interesting user interfaces and an emphasis on Virtual Assistants (China) and detailed provision



Leading Ideal ONE



Volkswagen Golf



Porsche Taycan



AIWAYS U5



Honda e



Polestar 2



Genesis GV80



Byton M-Byte



Land Rover Defender



Volkswagen ID.3



Mustang Mach-E



Cadillac Escalade

System components



Services		
Safety	eCall / ACN	✓
	bCall / Roadside Assistance	✓
Security	Stolen Vehicle Tracking	✓
	Stolen Vehicle Control	
Maintenance	Security Alert and Parental Controls	
	Remote Diagnostics	
OTA Update	Proactive Alerts	
	Map Update	
Navigation	Other Software Updates	
	Local and POI Search	
	Send Destination to Car	
	Route Search & Download	
	Traffic Information	
	Speed / Red Light Camera Info	
	Parking Space Information	
	Fuel Price Information	
	Weather Information	
	Location Sharing	
Driving Style	Connected Driving Style Coaching	
Infotainment	Social Networking	
	Internet Radio / Music Streaming	
	Events	
	User Reviews / Reservations	
	News / Stocks / Sports	
	Calendar Integration	
	E-Mail Integration	
	Web Browser	
	In-Vehicle Advertising	
	App / Service Store	
Convenience and Remote Services	Call Centre Concierge / iCall	
	Virtual Personal Assistant	
	Wi-Fi Hotspot	
	Remote Vehicle Access	
	Vehicle Locator	
	Remote Climate Conditioning	
Insurance	Remote Device: Car to Home	
	Remote Device: Home to Car	
	In-Vehicle Payment	
EV Specific	UBI	
	Charging Station Information	
	Charging Station Transaction	
	Remote Charging Control	

Subjective viewpoints: SBD tester 1



The Taycan is **Porsche's first full EV**, and while there's no doubt that Porsche has invested heavily in the drivetrain architecture, it has also **rewritten the interior tech and design language**. On entering the car, one is struck by the **clean lines and immense real estate** occupied by the **four large LCD screens**, the most notable being the **curved** on the cent sitting flush
Expectation
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SBD tester 1



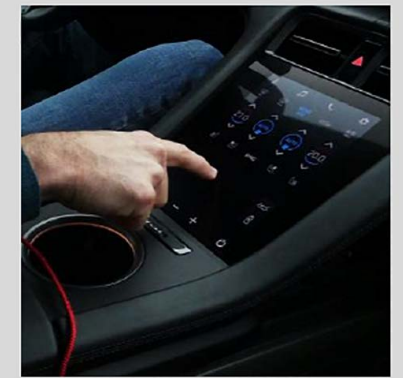
Curved cluster



Navigation bug



Scrolling bug



Lower touchscreen

Subjective viewpoints: SBD tester 2



Porsche has set **high expectations** with its first full EV, and first impressions of the cockpit certainly meet those expectations: the beautiful **curved high resolution driver**
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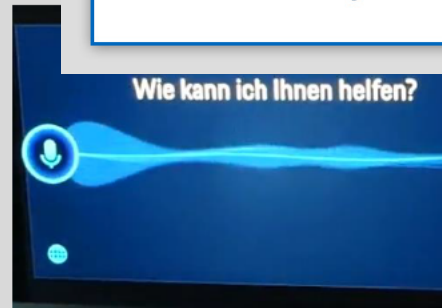
SBD tester 2

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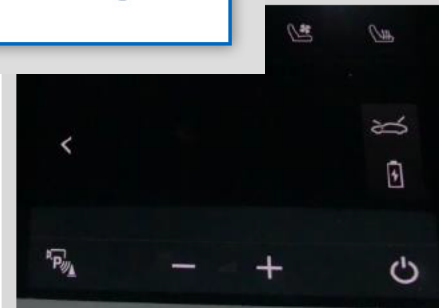
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Cluster controls



System clock



Control touchpad



System clock



Executive Summary

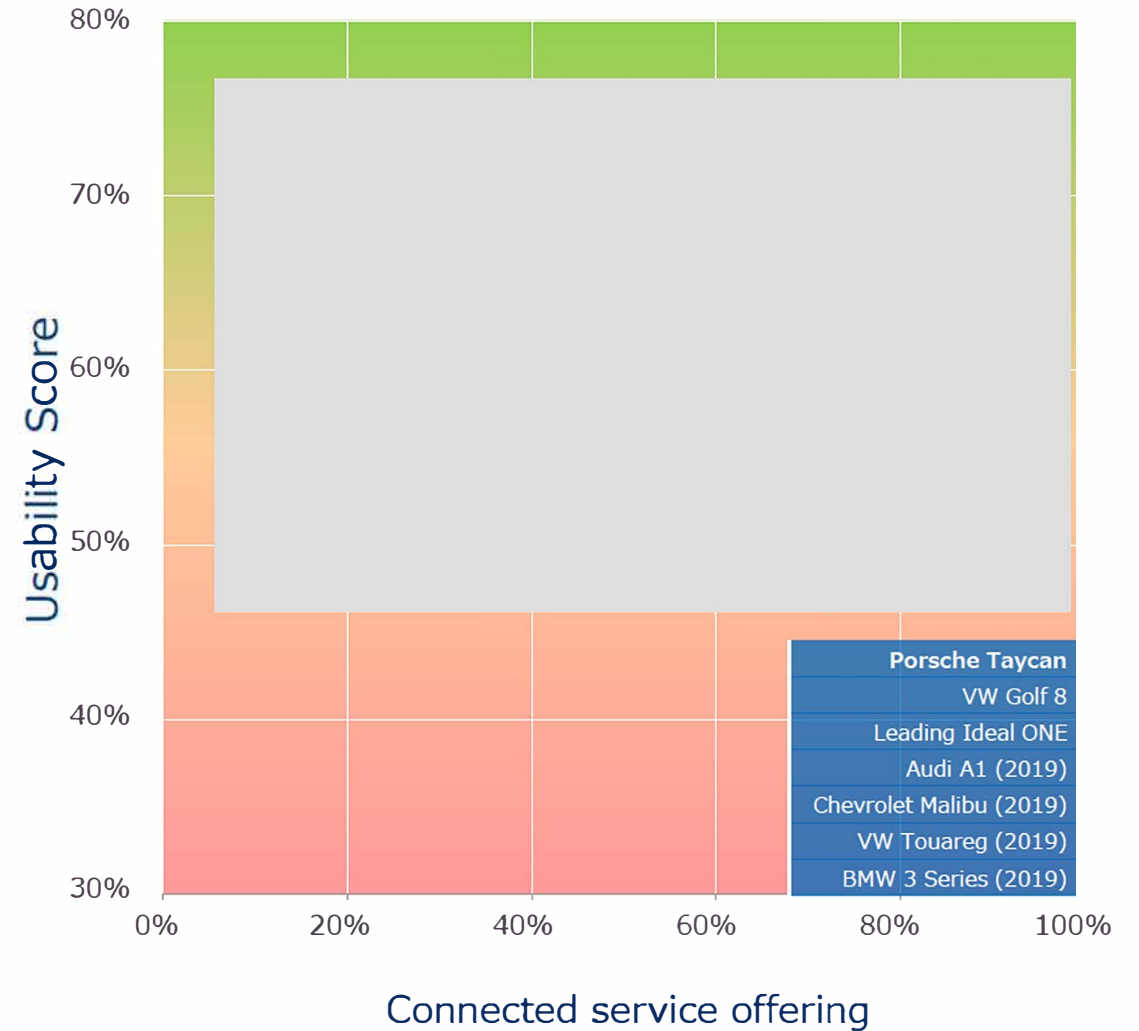
Porsche Taycan usability score

- Design-led approach that attempts to emulate the layout of the original 911 dashboard is mostly successful but the overall usability of the solution suffers because of this

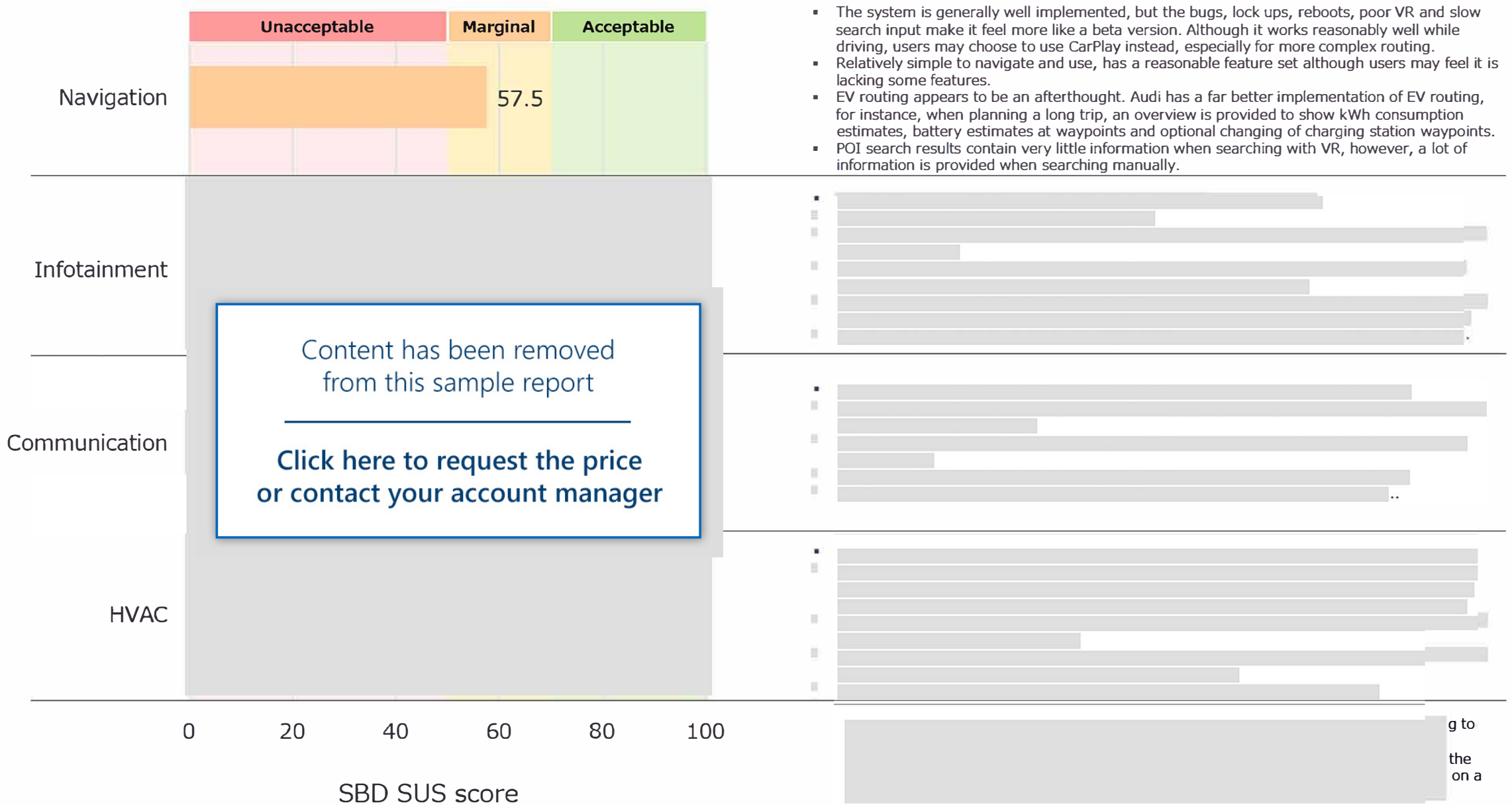
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System Usability Score (SUS) by feature grouping



- The system is generally well implemented, but the bugs, lock ups, reboots, poor VR and slow search input make it feel more like a beta version. Although it works reasonably well while driving, users may choose to use CarPlay instead, especially for more complex routing.
- Relatively simple to navigate and use, has a reasonable feature set although users may feel it is lacking some features.
- EV routing appears to be an afterthought. Audi has a far better implementation of EV routing, for instance, when planning a long trip, an overview is provided to show kWh consumption estimates, battery estimates at waypoints and optional changing of charging station waypoints.
- POI search results contain very little information when searching with VR, however, a lot of information is provided when searching manually.





Passenger display

The Porsche Taycan features an optional passenger display that matches the vehicle's standard-fit 10.9" central display.

This display offers almost all of the central display's main features, with certain features unavailable from this display such as HVAC and vehicle settings.

The lockout of these features from the additional display does not cause any perceivable negative experience as they are still accessible (even for the passenger, if required) by using the centre display.

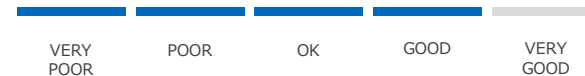
As the passenger display reproduces the main features accessible through the main display (including infotainment, navigation) it doesn't provide a dramatic uplift in usability or general experience for the passenger like it could if passenger-specific entertainment features were included. The only additional feature is the 'Cockpit' app which provides minimal benefit.

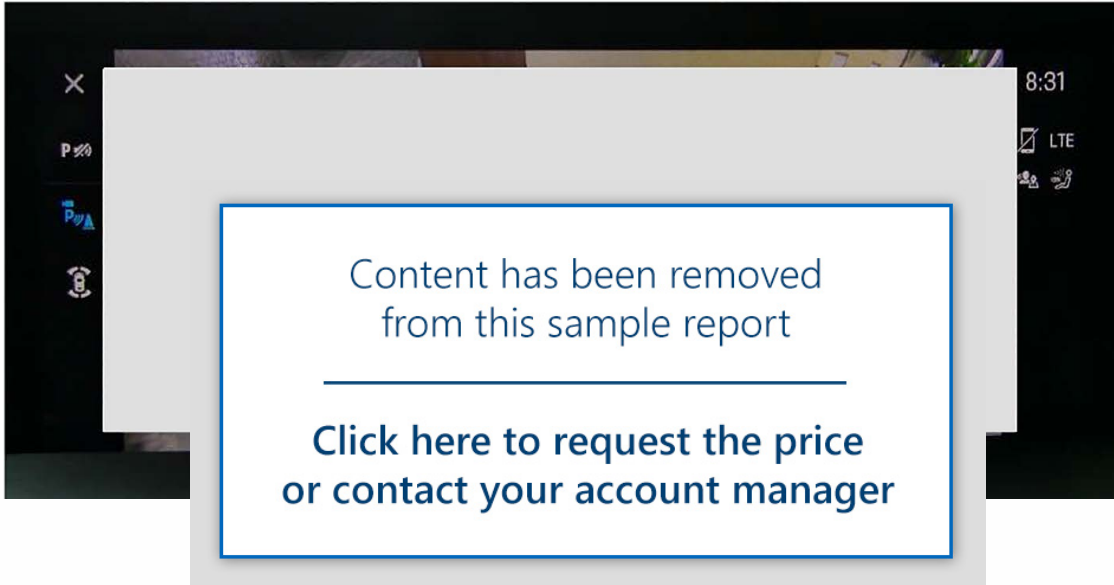
Its inclusion however certainly does not provide a net negative experience as its positioning is adequate and provides the passenger their own interface to use while the driver is operating the central display or following route guidance.

Feature need



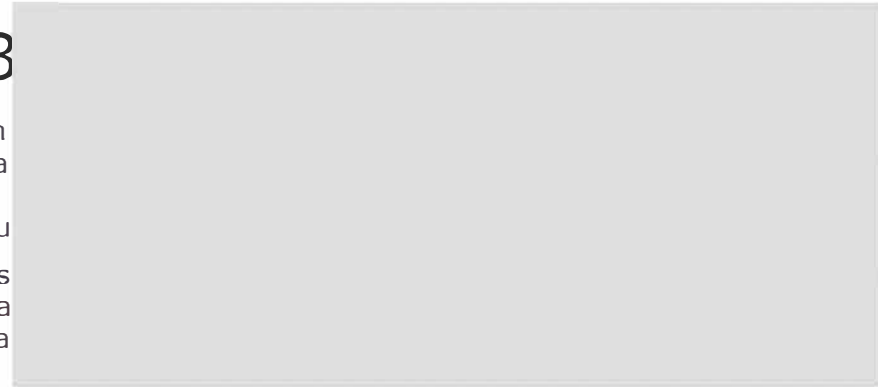
Usability rating





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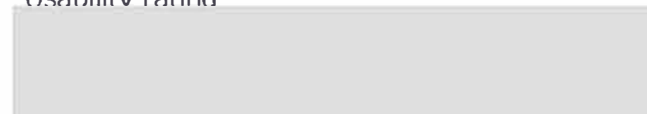


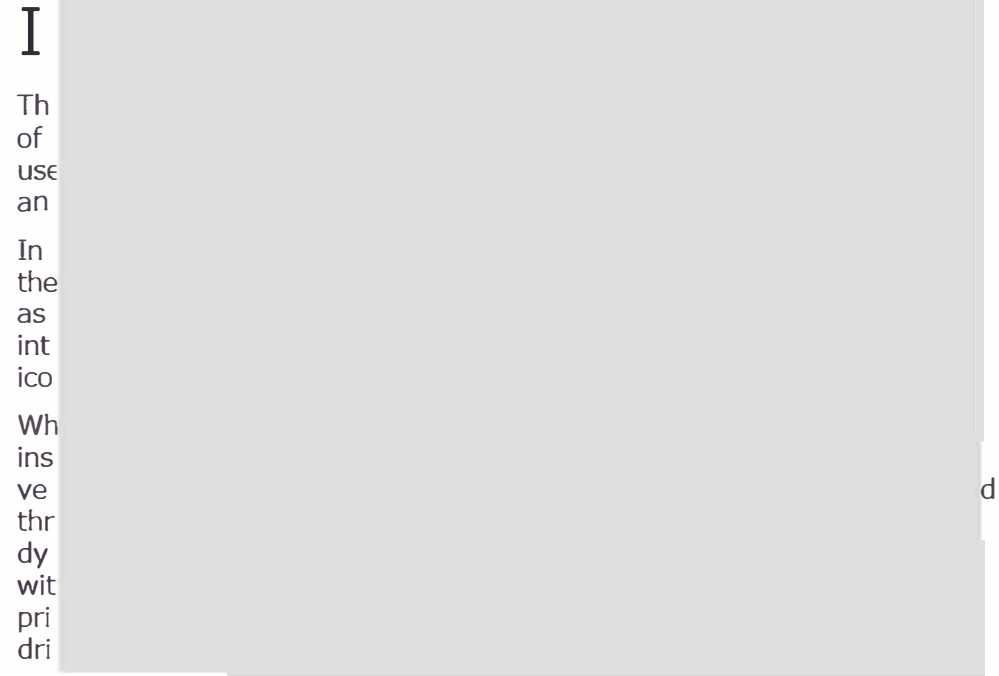
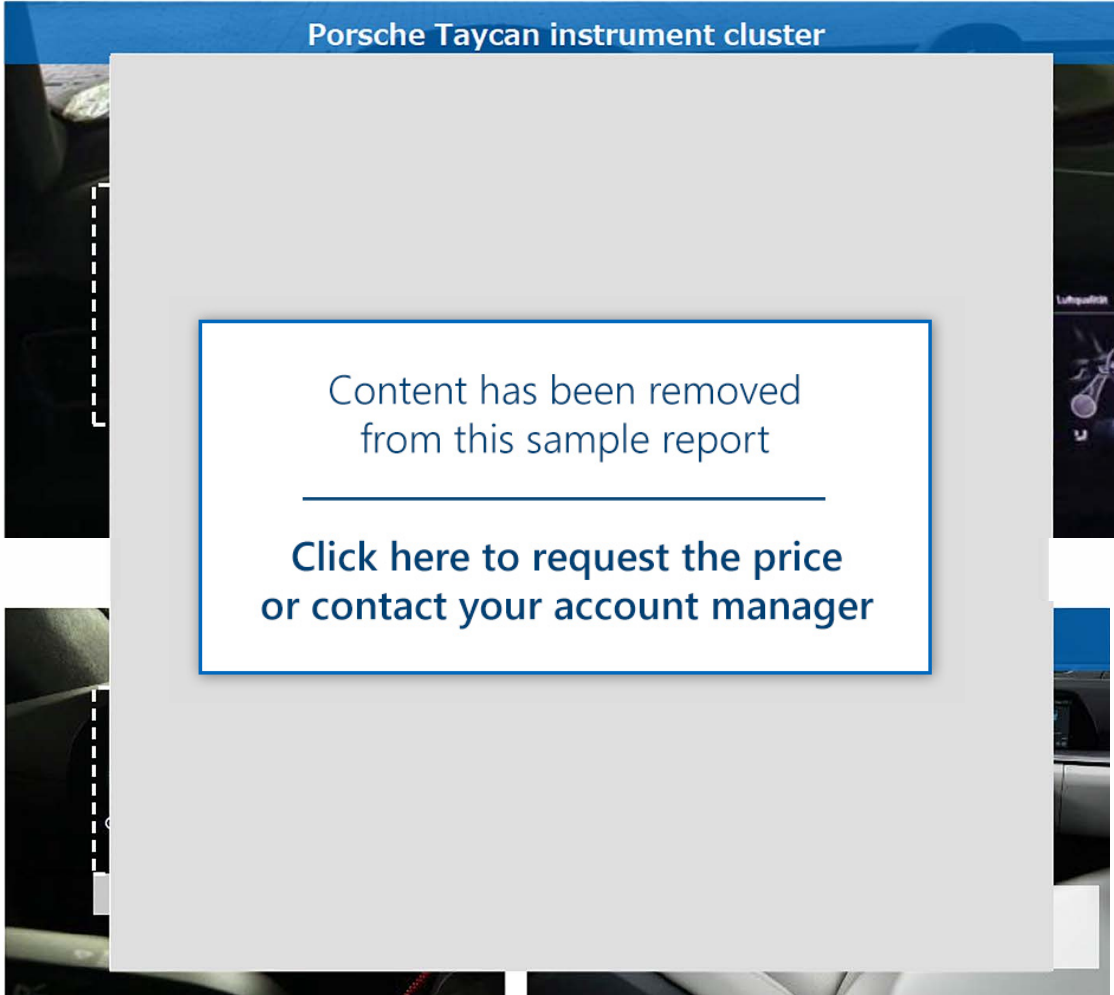
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Feature need



Usability rating



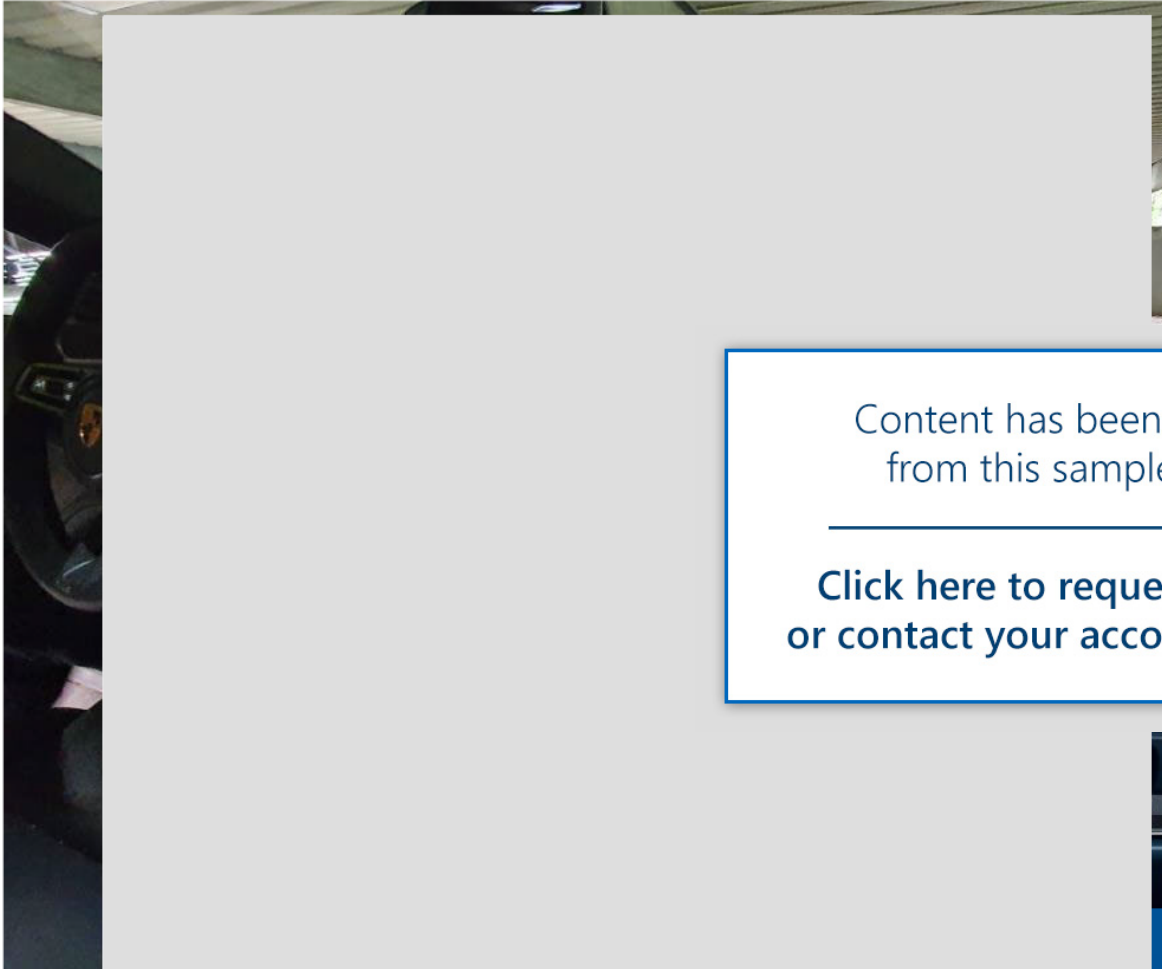


Feature need

[Redacted]

Usability rating

[Redacted]



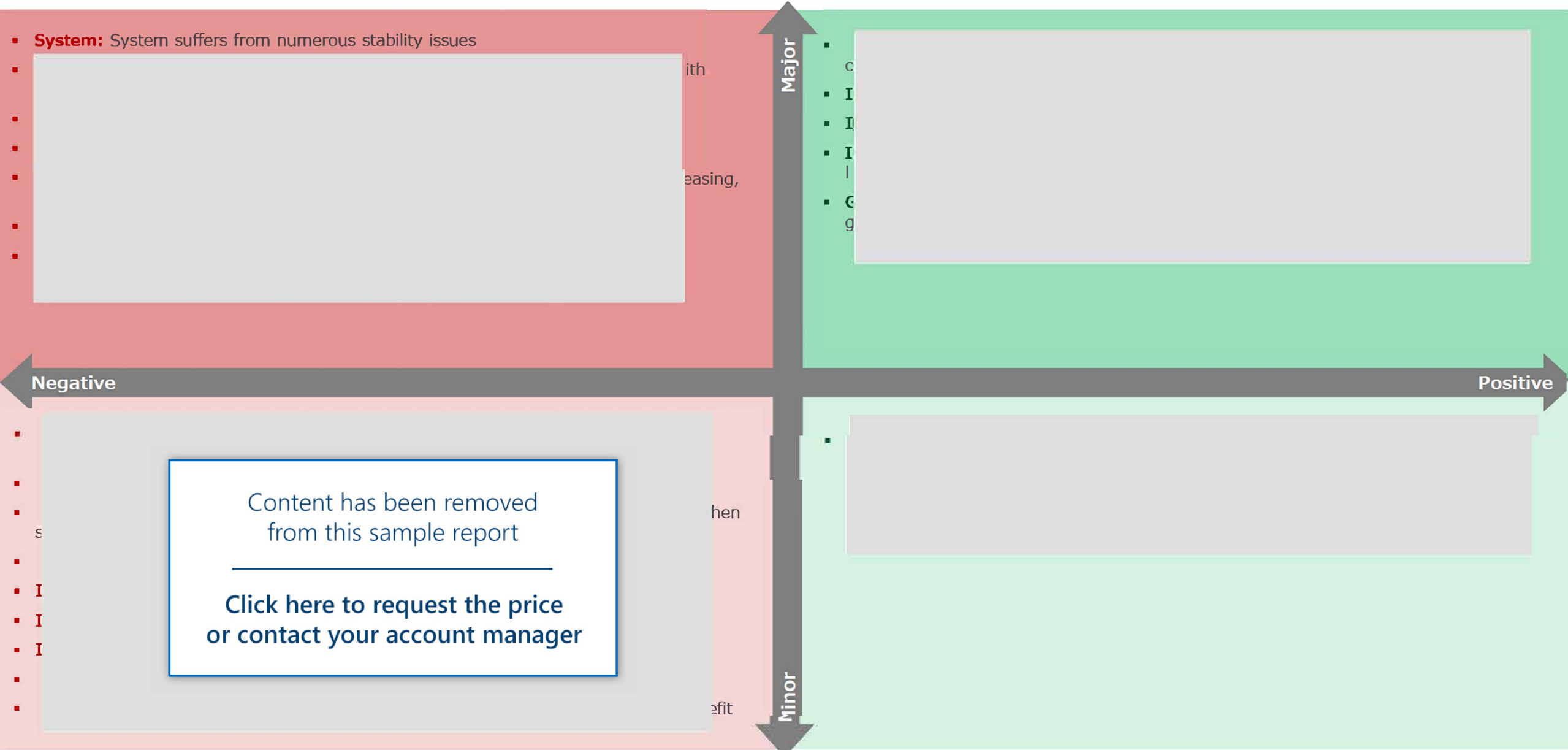
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Usability rating

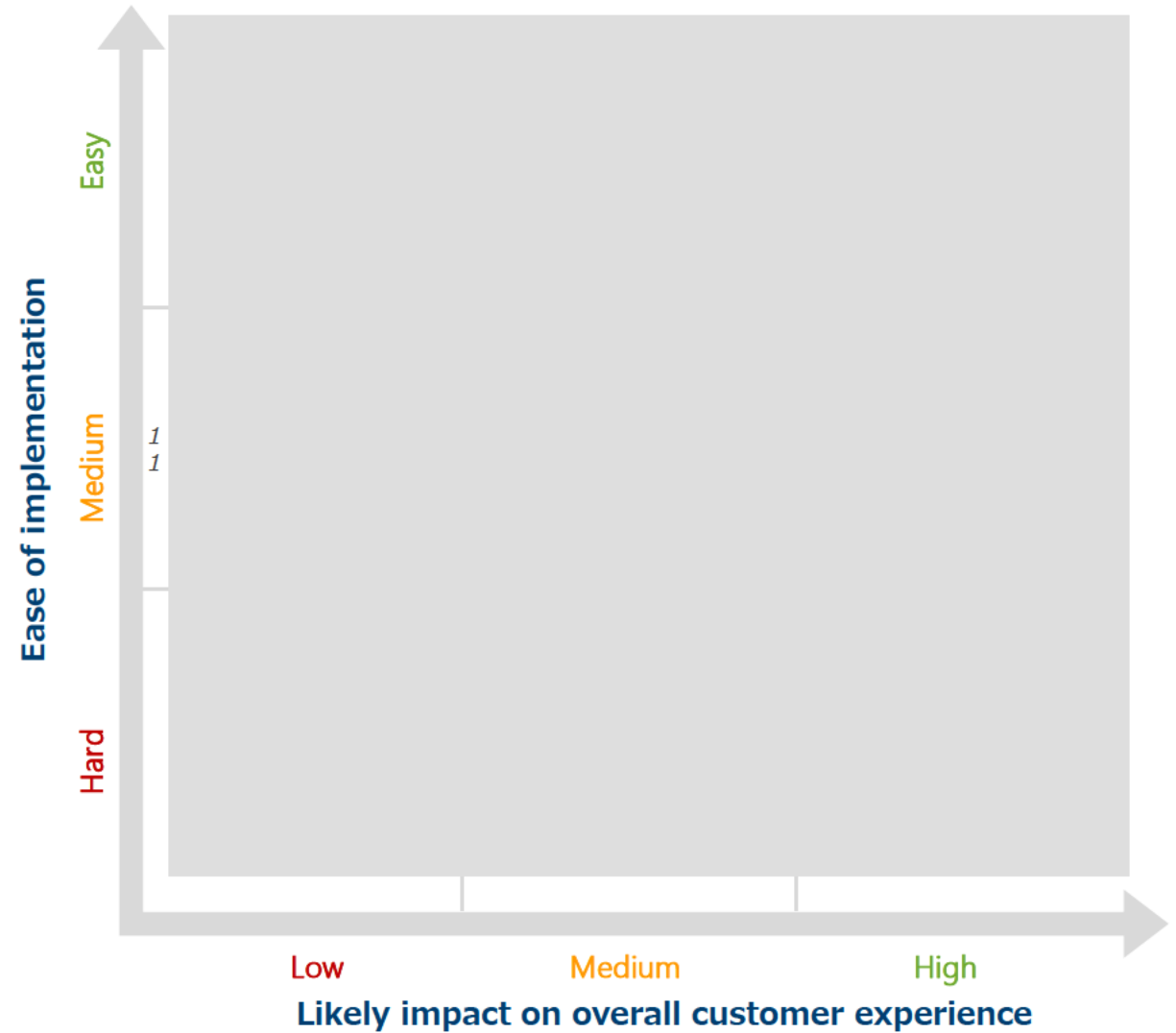
Key system positive and negative points



Usability testing highlighted some areas that could be improved upon. A number of these concerns could be amended based on the following recommendations.

These recommendations are categorised based on what SBD believes the likely impact on overall UX would be and how easy it could be to implement (based on complexity, cost and time).

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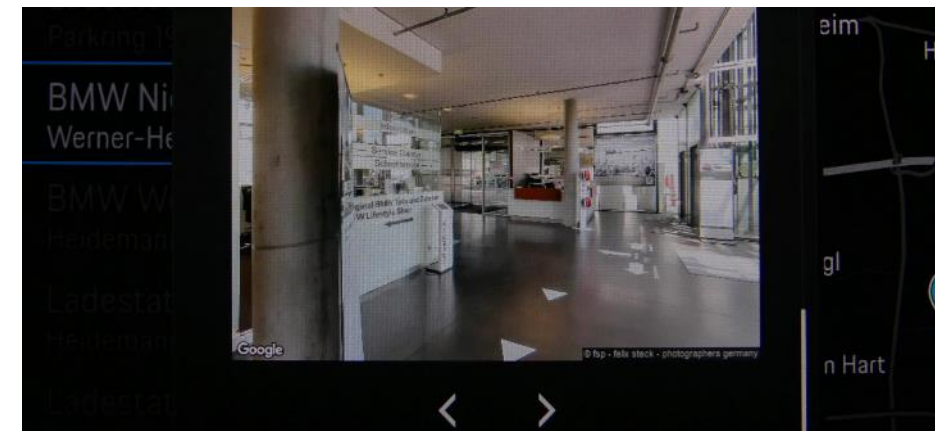




Positive Points

Navigation shows good level of POI detail

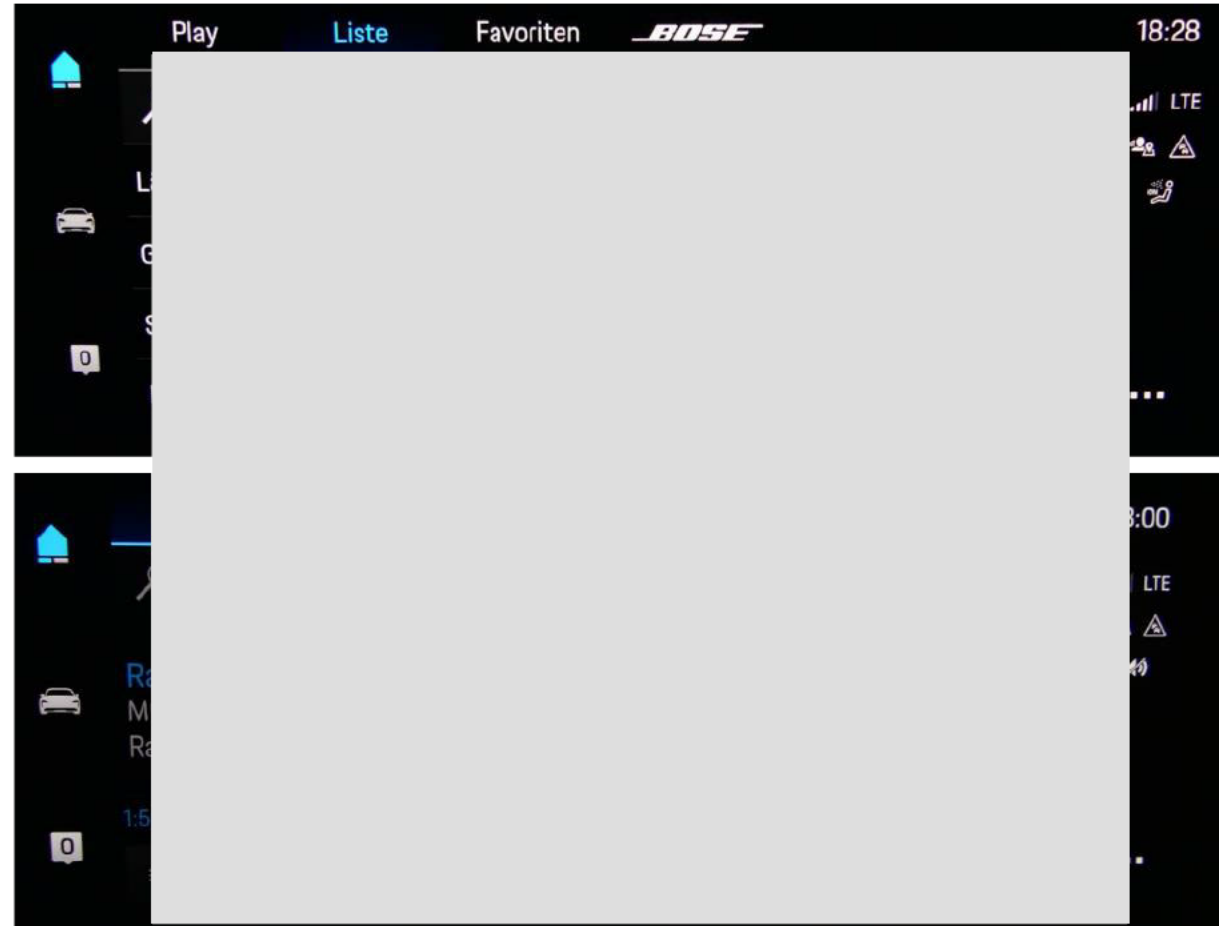
Category	Navigation		
Description	Good detail showing pricing, charge point operator, number of connectors, current status, and a photo		
SBD viewpoint	<p>The PCM system's navigation features detailed POI information to assist users in finding suitable locations and making a selection from the list of results.</p> <ul style="list-style-type: none"> Charging station rate and connector types are shown where this information is provided Occupancy details are also shown to help avoid a wasted trip Parking space availability is shown in the results list without having to first select that POI Charging pricing is shown An image preview of the location is shown to help identify it upon arrival <p>The inclusion of this kind of useful detail provides a tangible usability benefit to the PCM navigation system and allows it to offer performance that can be considered competitive against state-of-the-art consumer electronics alternatives.</p>		
Positive Impact on UX	Low	Medium	High



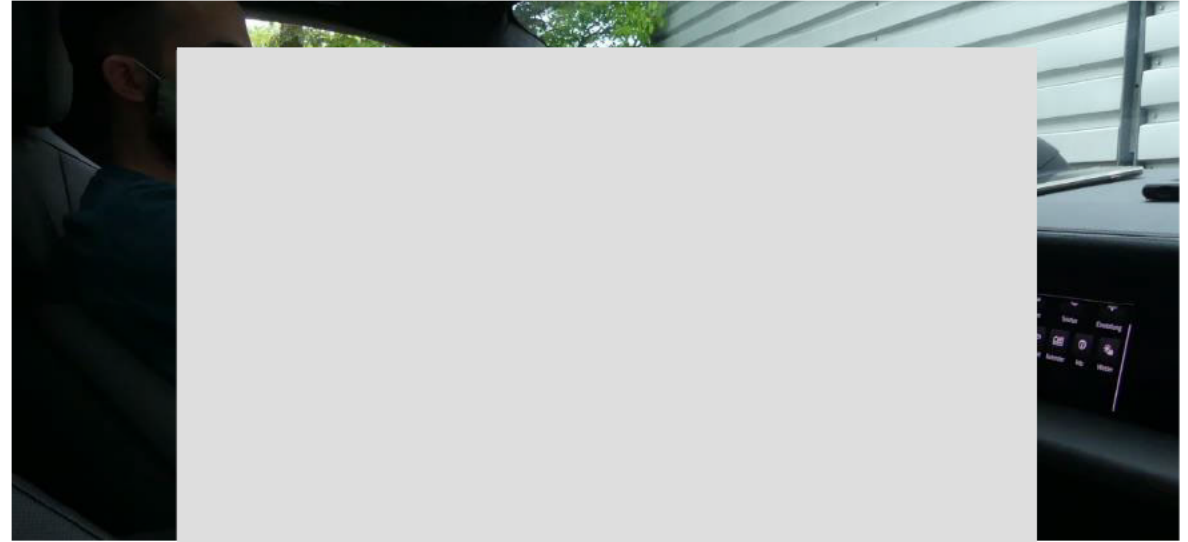
Hi



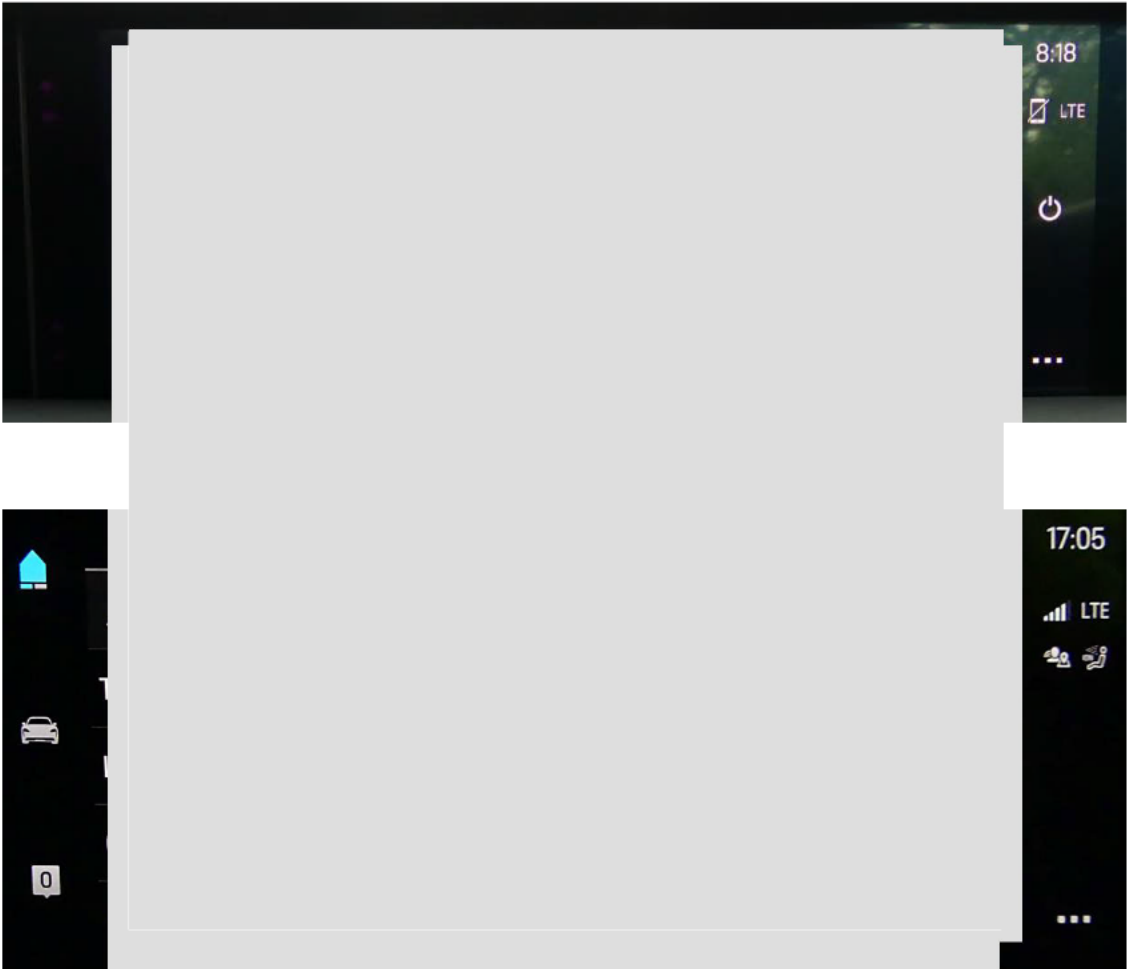
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Description	
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Positive Impact on UX	



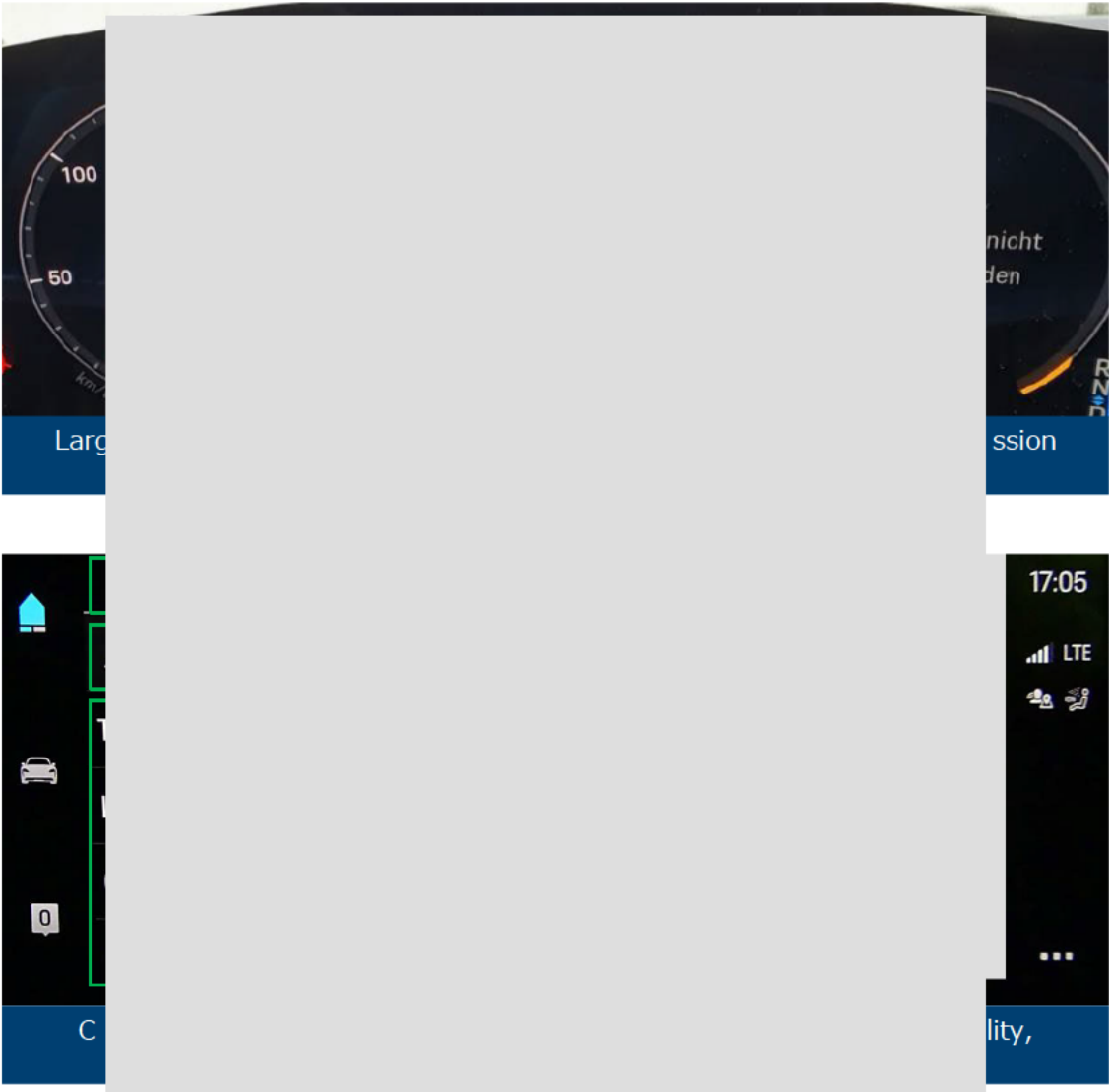
Category	I
Description	T d.
SBD viewpoint	<p>M p c</p> <ul style="list-style-type: none"> • <p>h s</p> <ul style="list-style-type: none"> • <p>O e l o r</p> <p>T i s c t</p>
Positive Impact on UX	



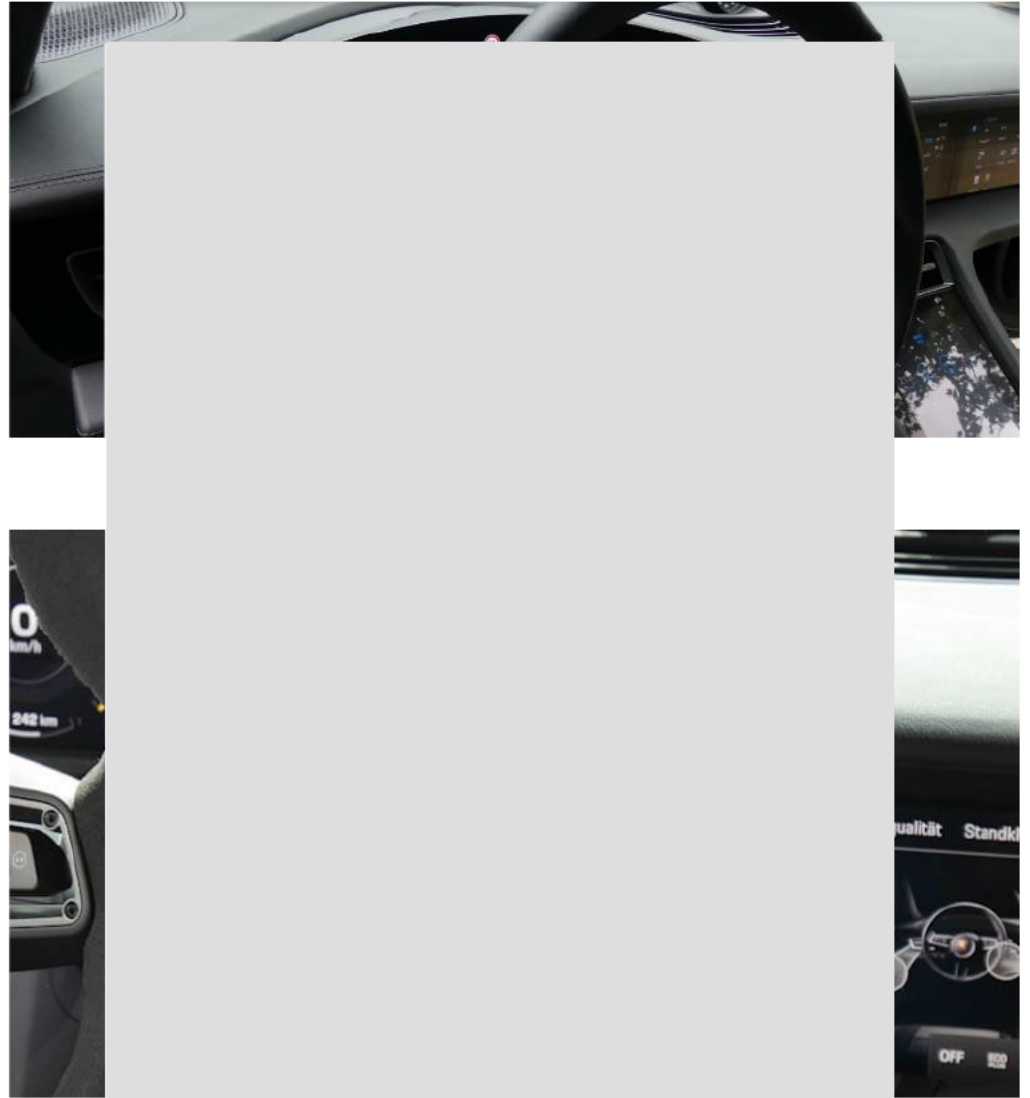
Category	I
Description	T t a
SBD viewpoint	T a T a a t . . O t t s l t
Positive Impact on UX	



Category	G
Description	C p
SBD viewpoint	T g s A t b k s
Positive Impact on UX	



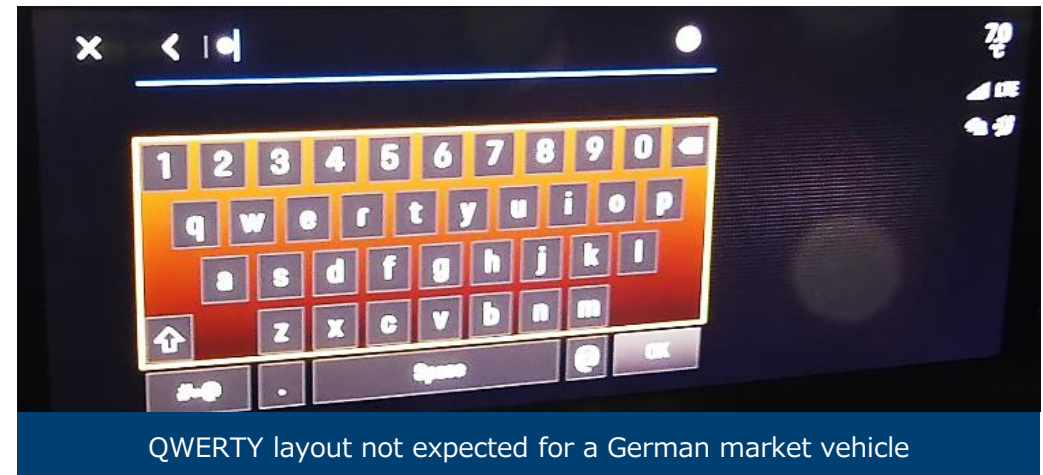
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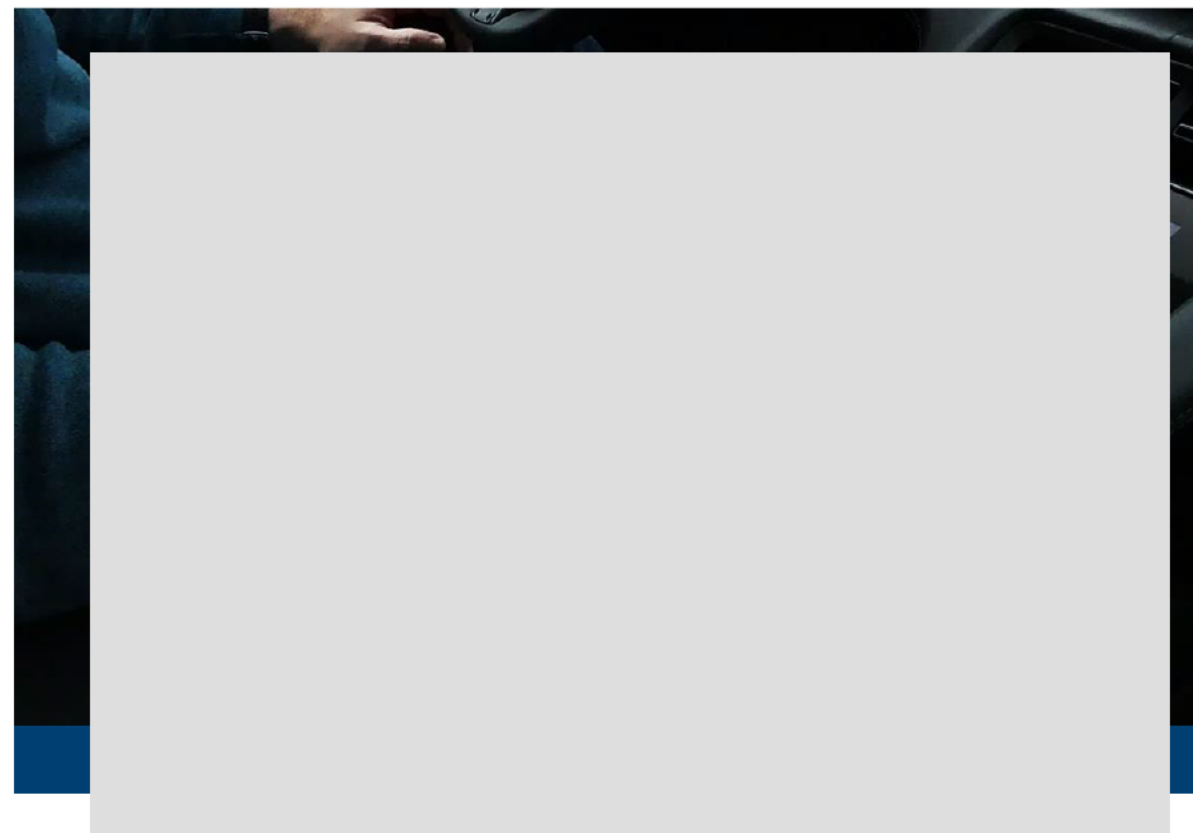
Negative Points

Numerous stability issues throughout

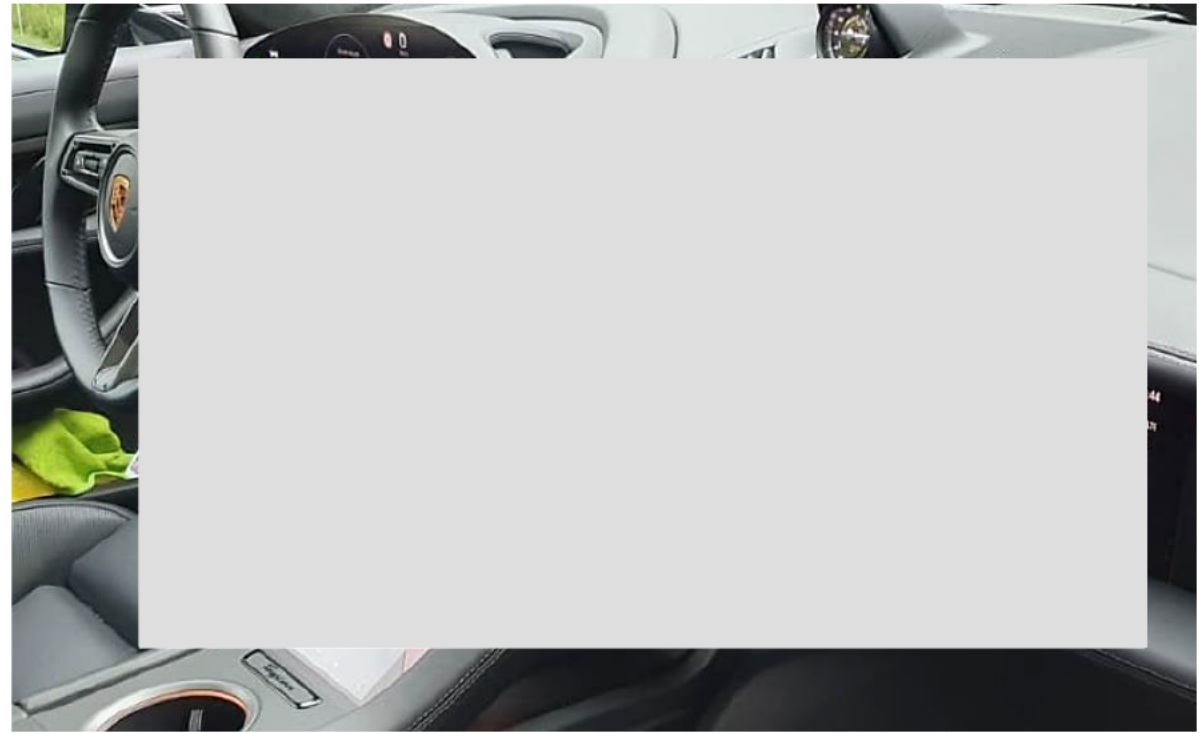
Category	System		
Description	System suffers from numerous stability issues		
SBD viewpoint	<p>Through the course of testing, numerous bugs and other performance-related concerns were found. A full list of those can be found on this slide.</p> <ul style="list-style-type: none"> • Input response lag • Long loading times • Central display scrolling functionality • Incorrect keyboard layout <p>While present, these concerns cause a sensation of frustration and an impression that the technology solution in the Taycan is unfinished. This might be somewhat expected of a smaller newcomer OEM but not from an established carmaker like Porsche.</p>		
Negative Impact on UX	Low	Medium	High



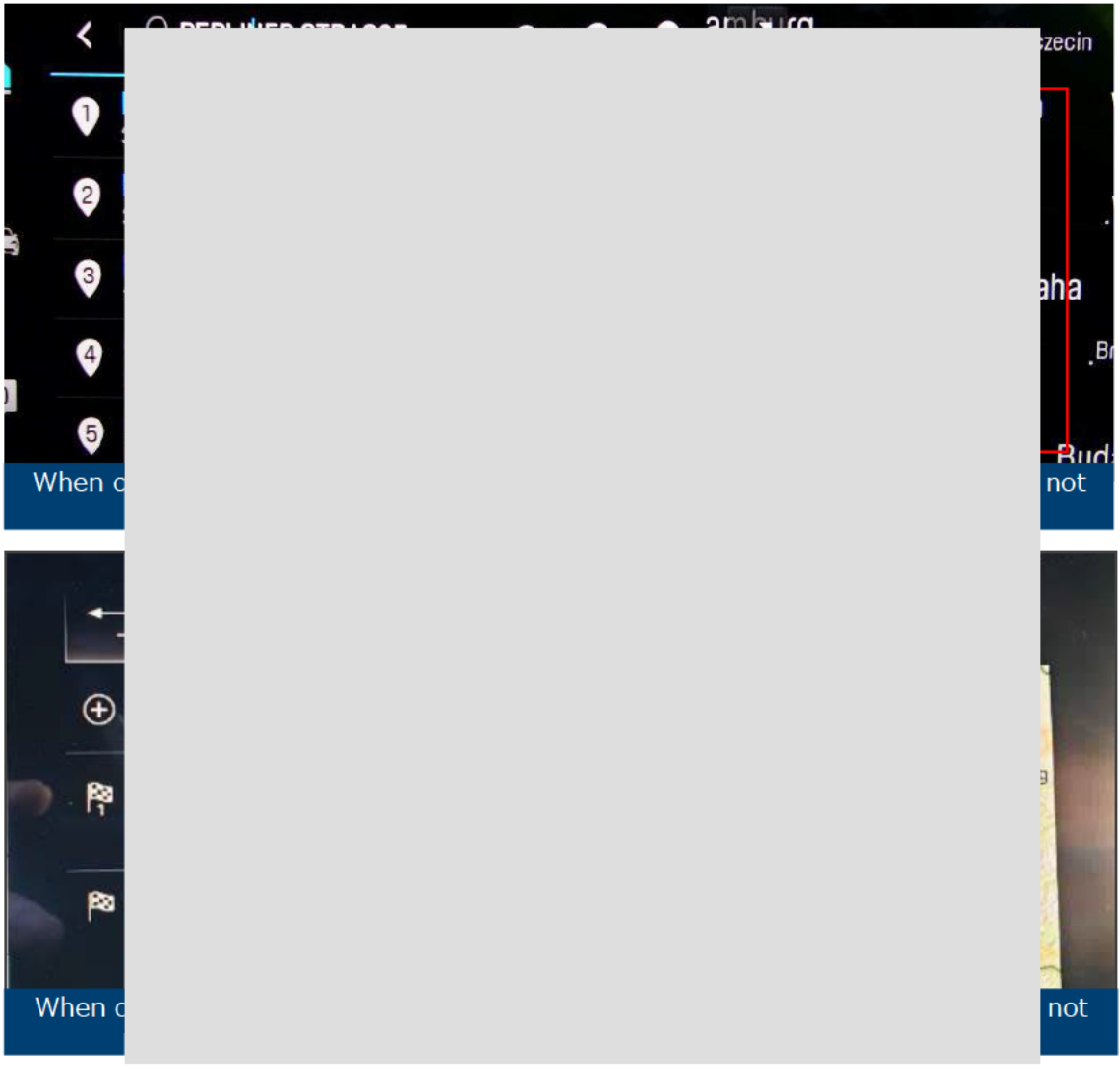
Category	
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SBD viewpoint	r p r
Negative Impact on UX	



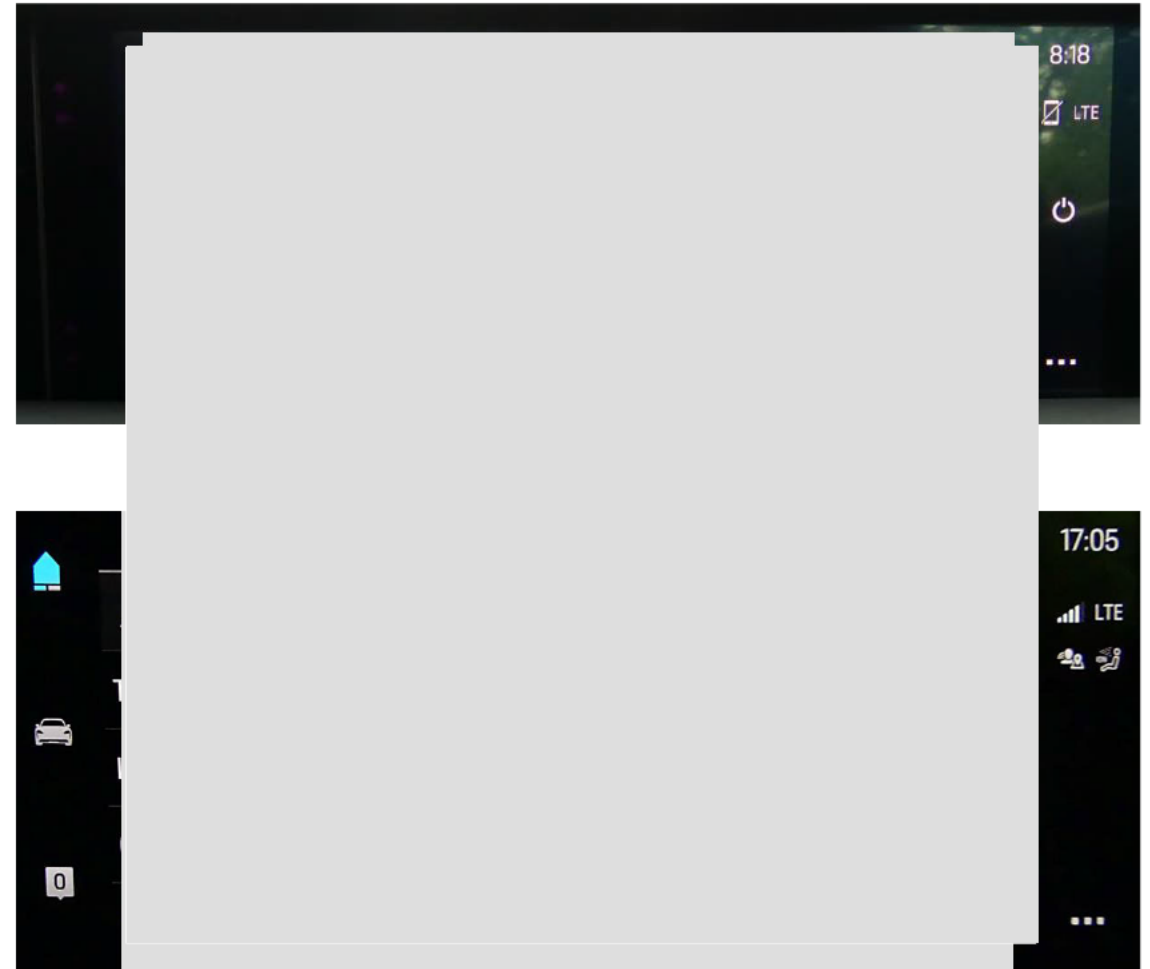
Category	S
Description	O a
SBD viewpoint	T m • • • • • • •
Negative Impact on UX	



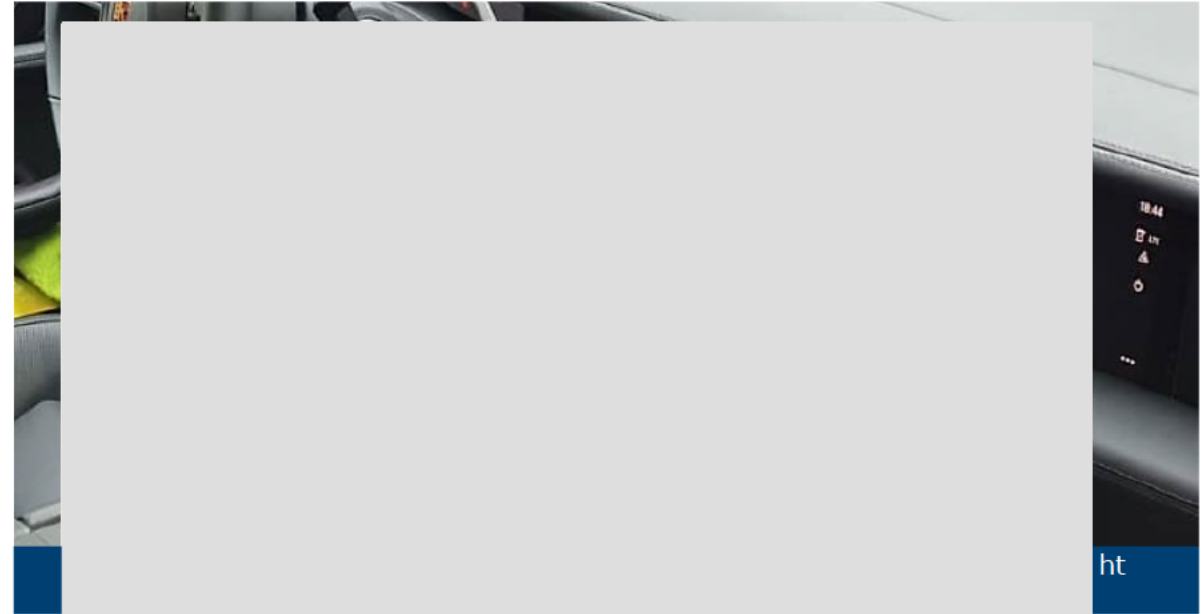
Category	N
Description	E c
SBD viewpoint	E s in o . . . A m b
Negative Impact on UX	



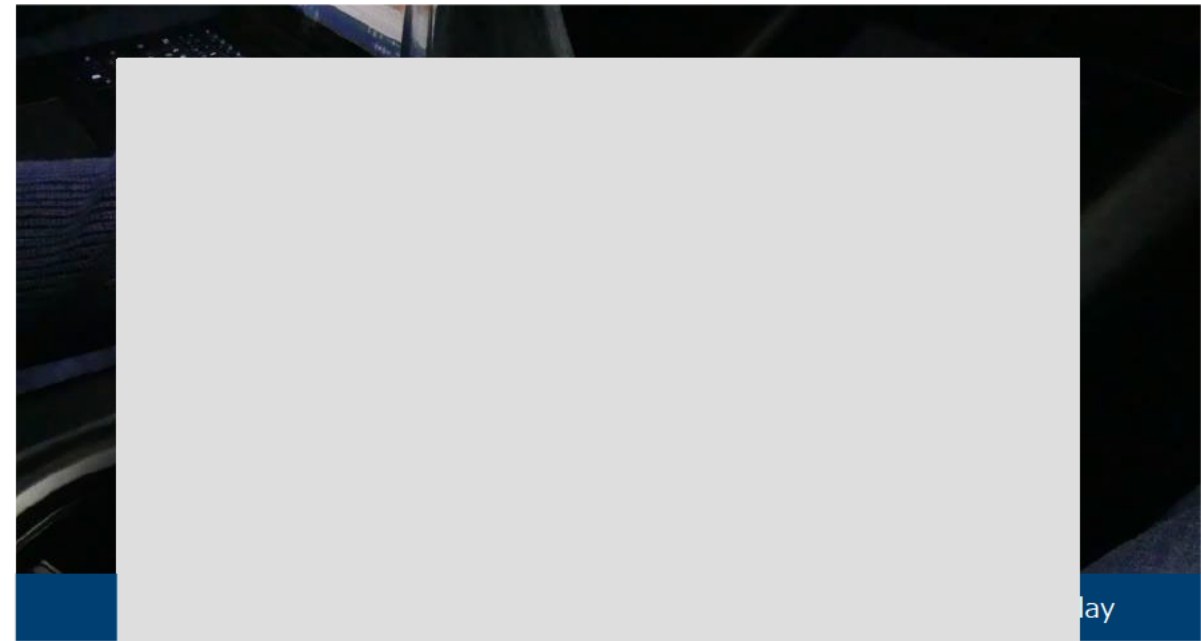
Category	O
Description	G a o
SBD viewpoint	T ve si th m us O of pe in be
Negative Impact on UX	



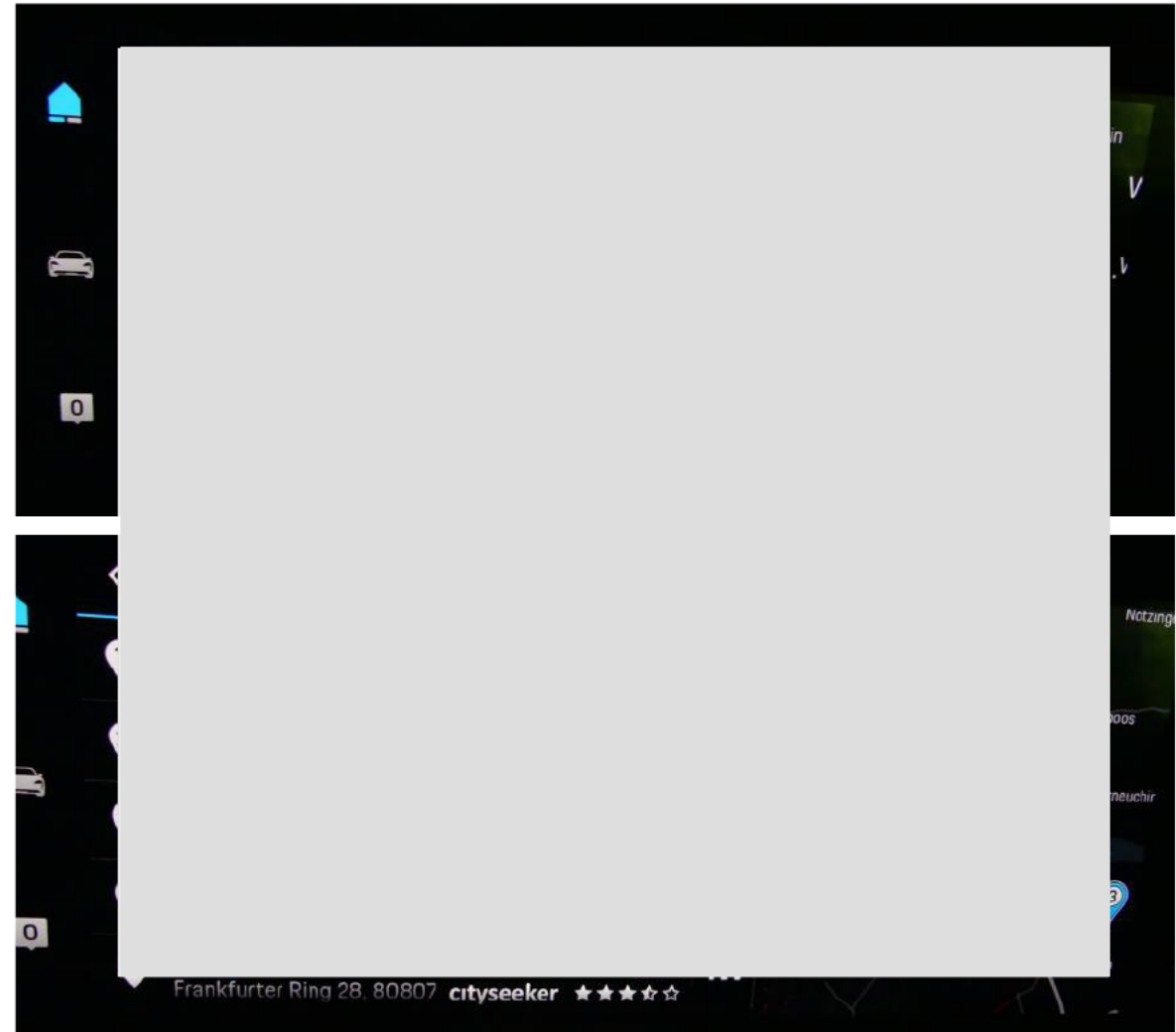
Category	O
Description	L g
SBD viewpoint	T to c W is b " re
Negative Impact on UX	



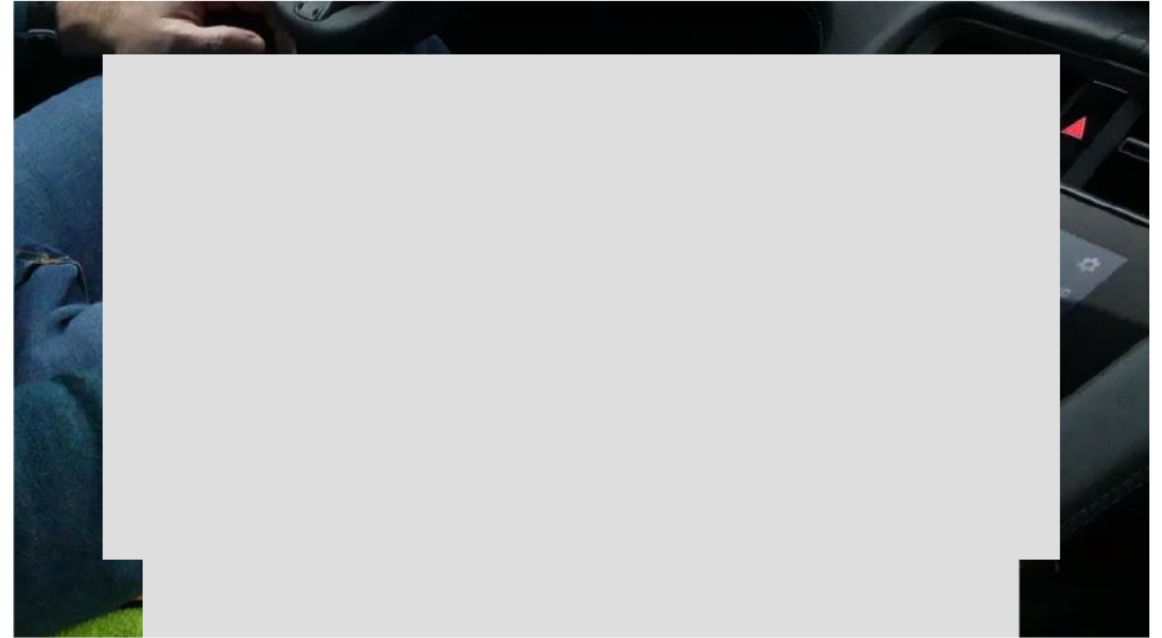
Category	I	
Description	C	
SBD viewpoint	W si A s p m	
Negative Impact on UX		



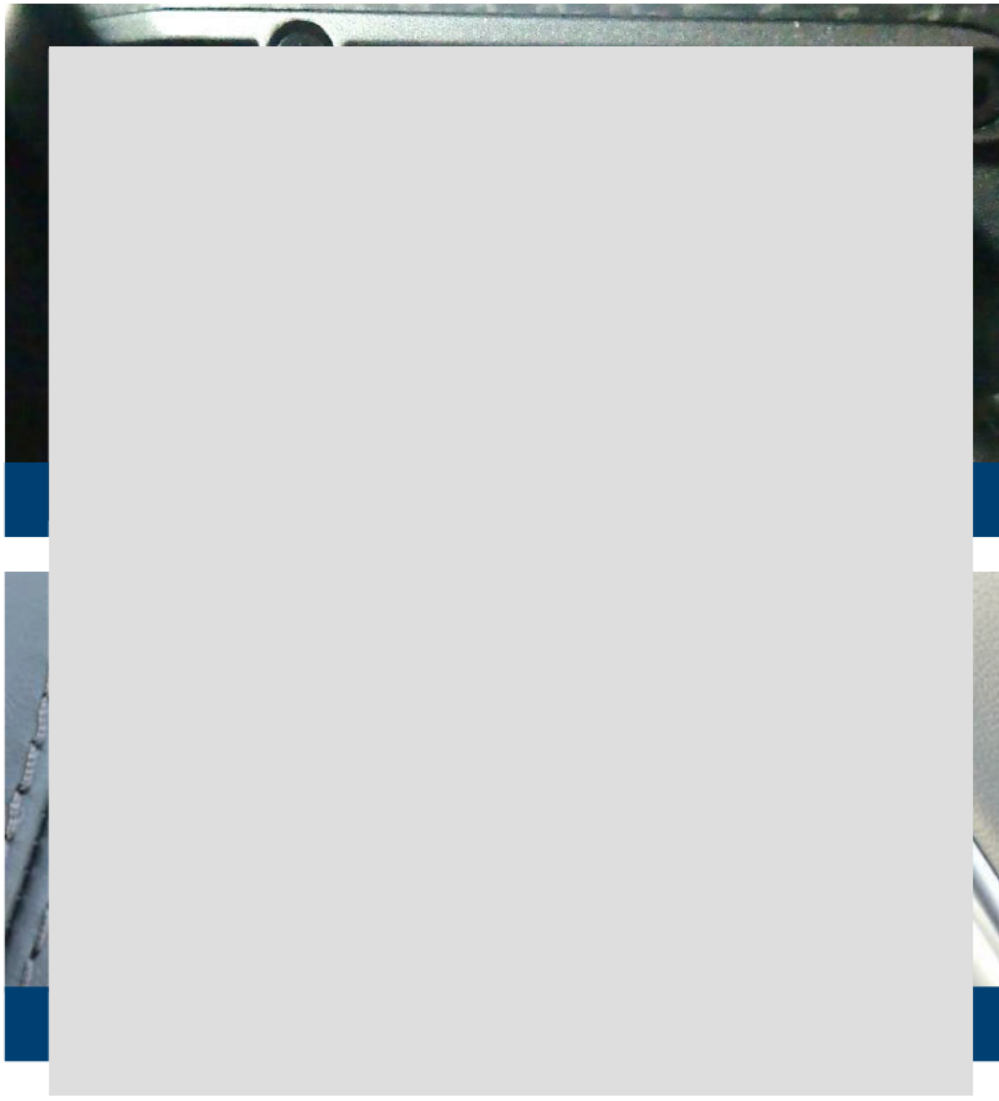
Category	N
Description	S i n
SBD viewpoint	T si la p . . . nt
Negative Impact on UX	



Category	O
Description	H m
SBD viewpoint	H te e se m . . T o th cc b
Negative Impact on UX	



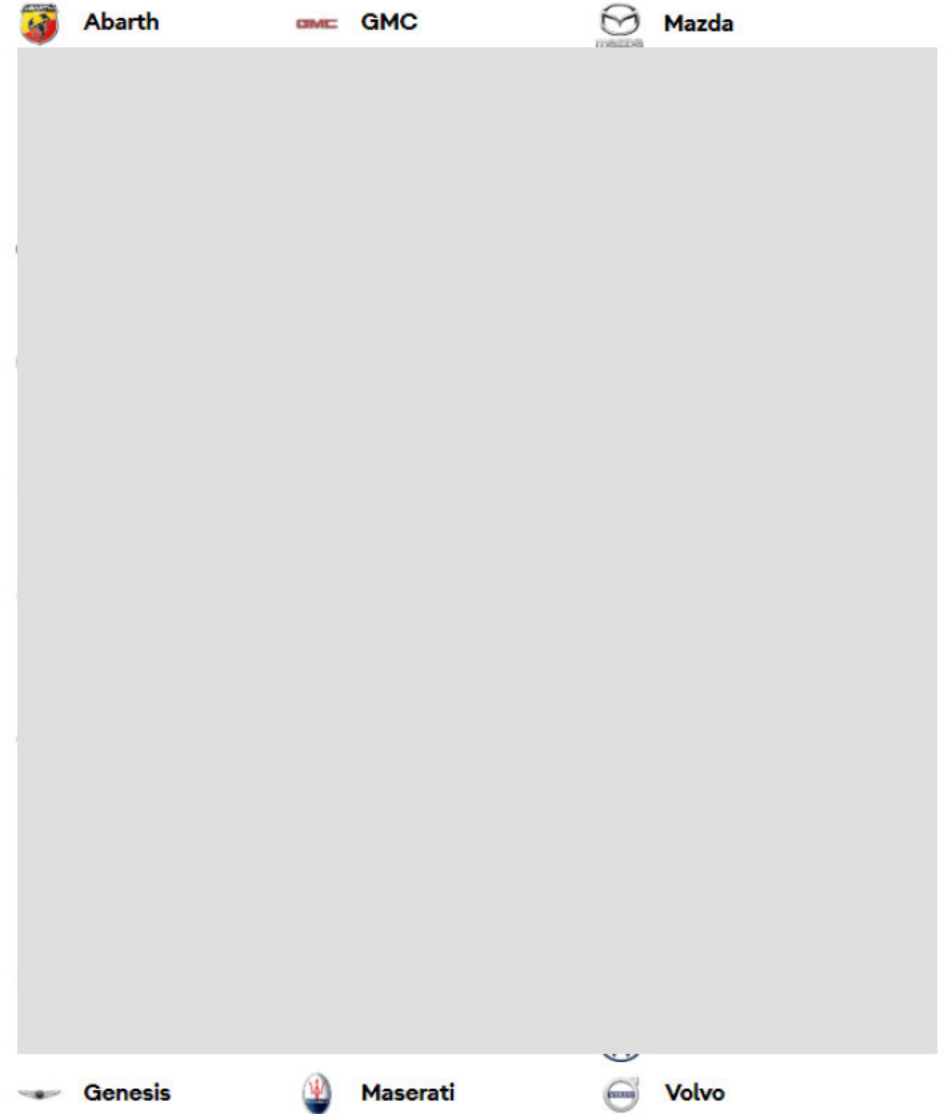
Category	St
Description	C av
SBD viewpoint	<p>The ve dif re</p> <p>The us cl</p> <p>N m th ar st</p> <p>Di ot Th of</p>
Negative Impact on UX	



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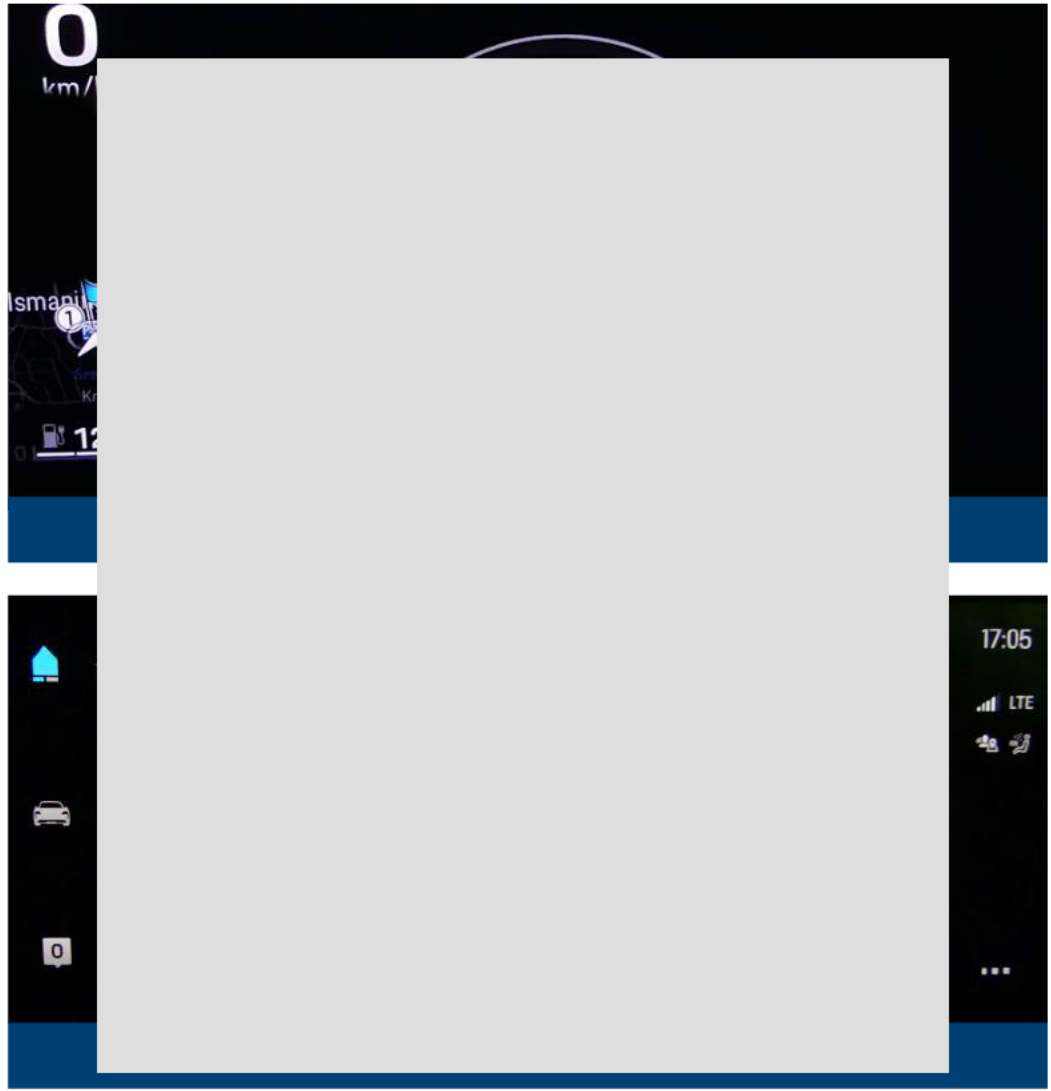
Category	S
Description	Sy
SBD viewpoint	<p>Ca fr A- of A</p> <p>It do ev co</p> <p>Ac Ap po</p>
Negative Impact on UX	



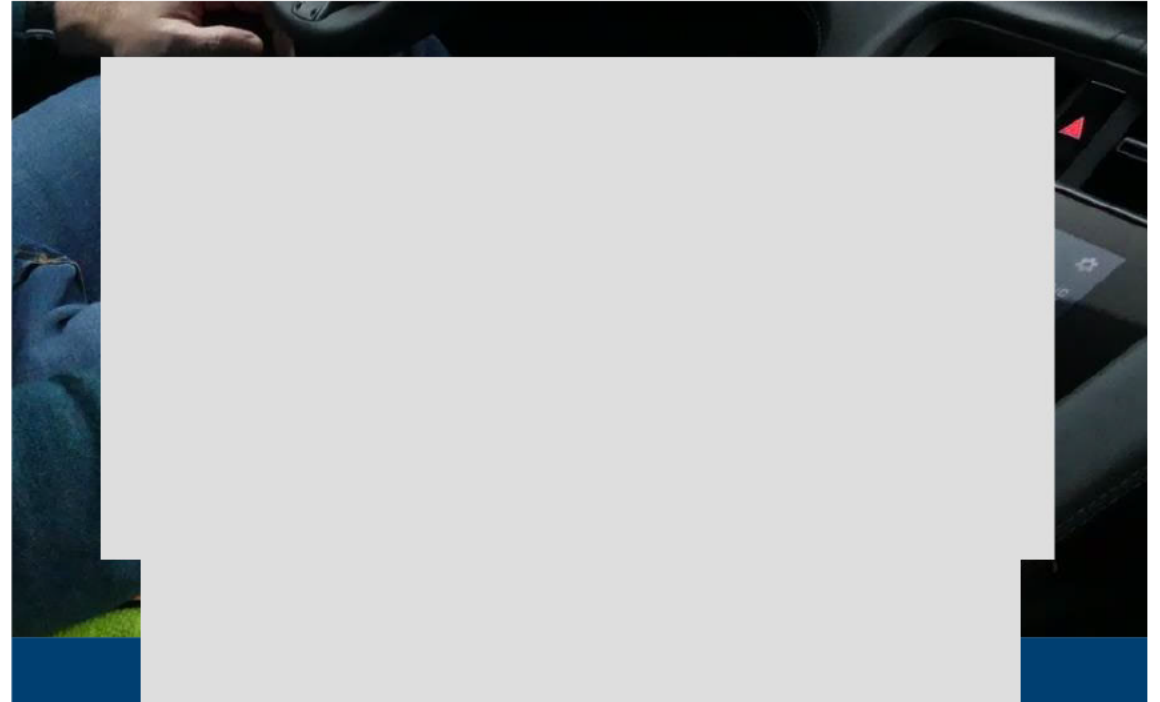
OEMs listed on the Android Auto site as having or soon to have Android Auto

Category	I
Description	
SBD viewpoint	I k l o c s n
Negative Impact on UX	

Category	I
Description	C f
SBD viewpoint	C p c T d s . . A re a s
Negative Impact on UX	



Category	I
Description	Is di
SBD viewpoint	T cc sc A T th a A re of A re
Negative Impact on UX	



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Description	HU	
SBD viewpoint	At i be ho SB the car be Wit yet rig so car	
Negative Impact on UX		

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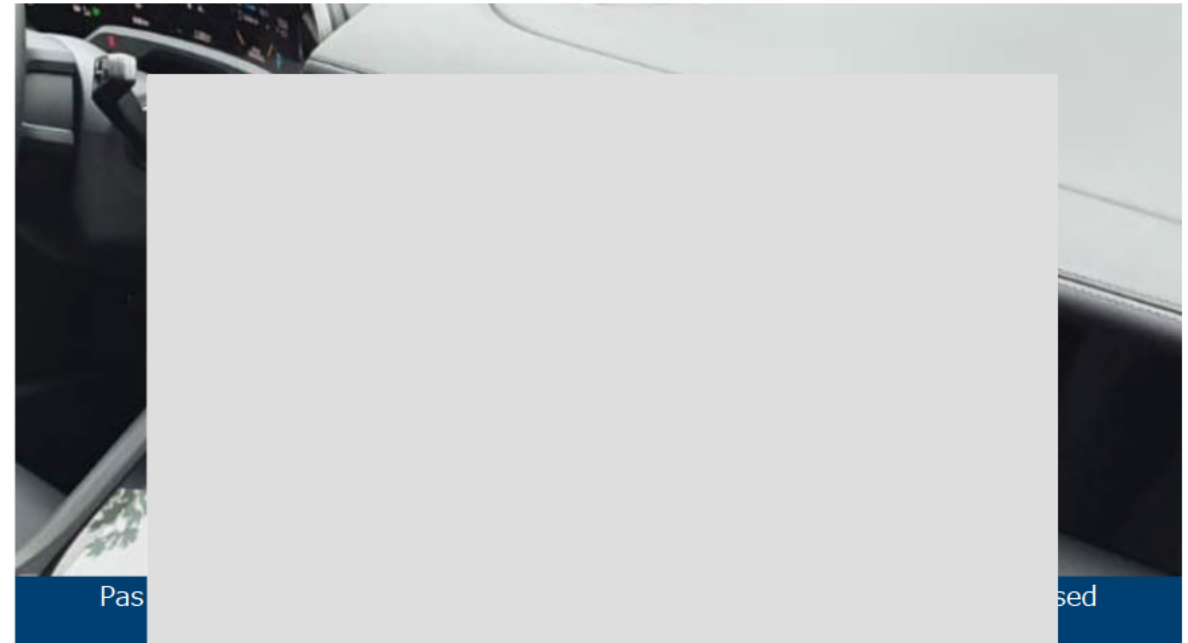
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Category	Pa
Description	Li mi
SBD viewpoint	<p>Th we of</p> <p>Th the sa</p> <ul style="list-style-type: none"> • • <p>Th pa ad</p> <p>Th thi dis ho off of</p> <p>Th fea pa unl nic</p> <p>in a future update</p>
Negative Impact on UX	





Voice Recognition

Overview

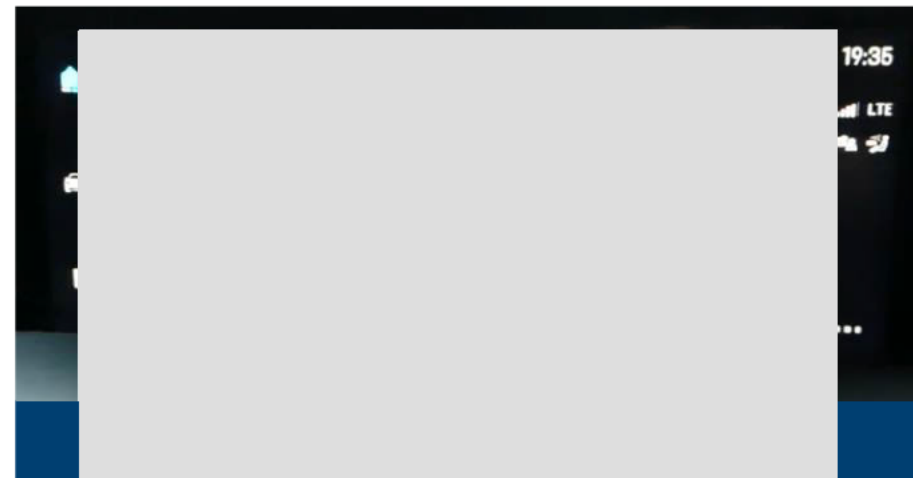
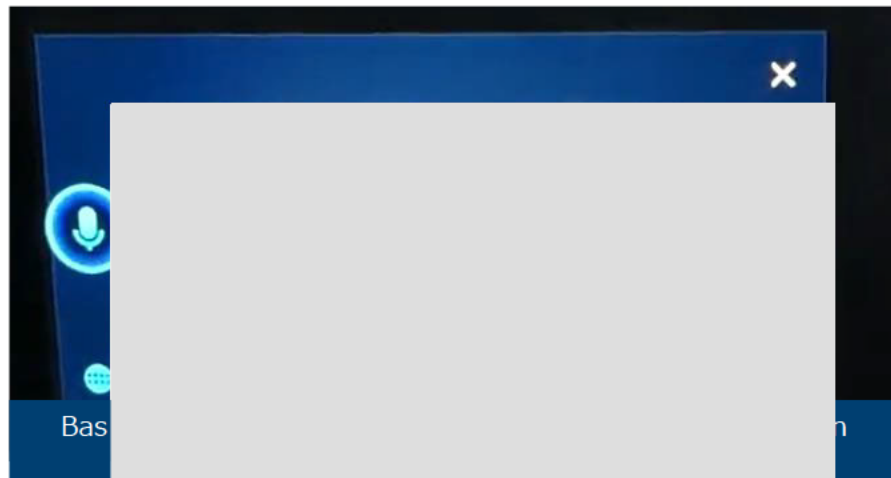


The Porsche Taycan's VR system offers slow outputting and accepting inputs in a more colloquial speech style.

Test component	SBD viewpoint			Reasoning
	Poor	OK	Good	
Functionality	Poor	OK	Good	<ul style="list-style-type: none"> The system shows wide compatibility with the number of use cases that SBD tested. Despite this, poor consistency of recognition and failure to carry out must-have commands like "find parking" result in an impression of poor solution performance.
Performance	[Redacted]			ion. th no
User interface				onse r input or
Command structure				d input med-in
Localisation				ted the lay or not
Level of integration				s were sfully in

Negative points

The key negative points of the system are shown below:

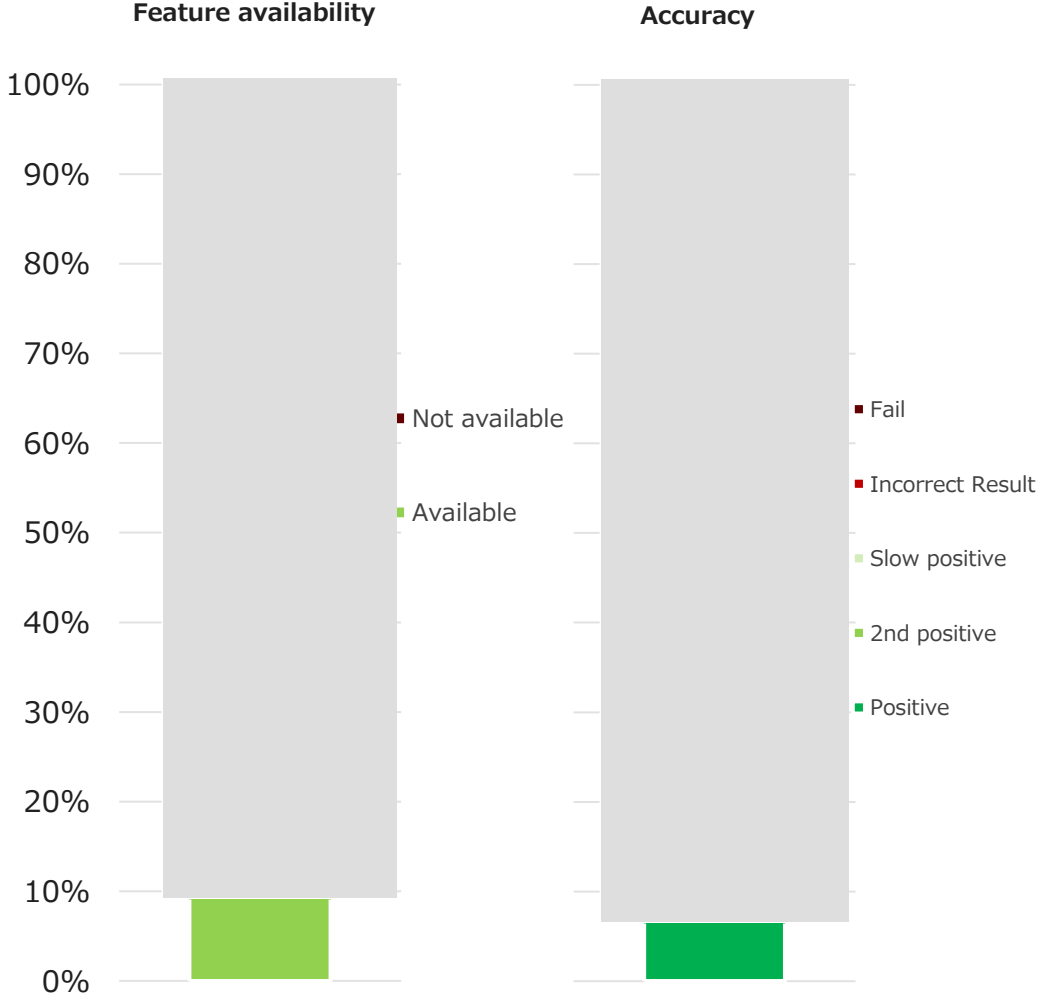
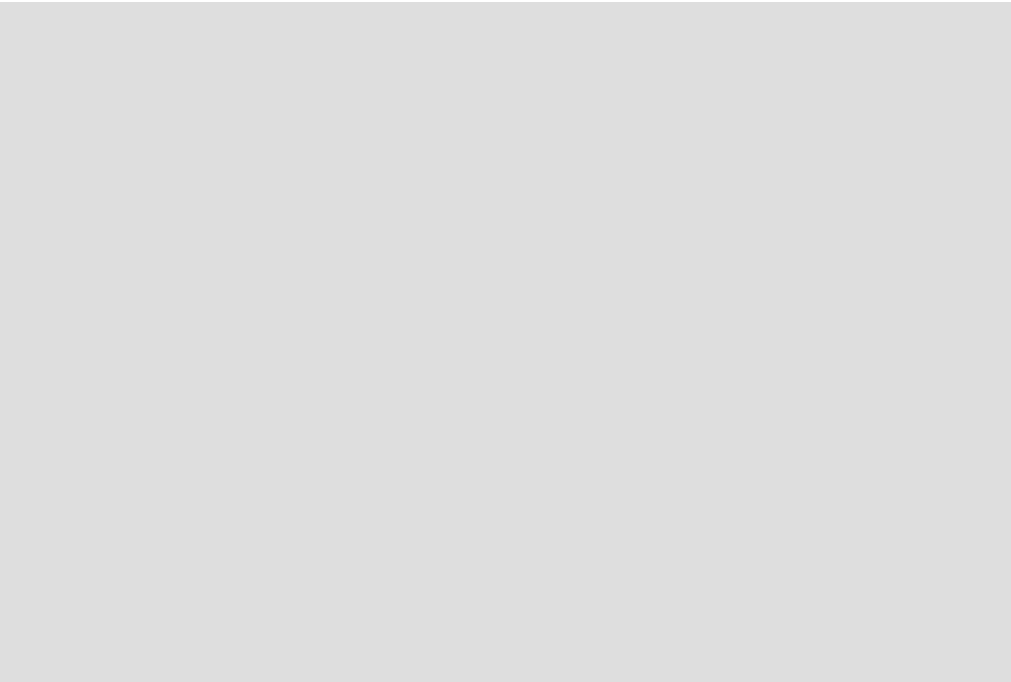


Evaluation results



Below are the key highlights and comparisons observed from voice recognition evaluation of the Porsche Taycan:

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- Bu
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- Re
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System Components

Cockpit clutter

Overall SBD viewpoint

- The fundamental approach of the Taycan's cockpit is design-based, resulting in a minimalistic and highly aesthetic dashboard that harks back to older Porsche models.
- On the dashboard itself there are only two hardware buttons, giving an extremely low level of clutter. Although this does sometimes come at a cost to functionality, the clutter score in isolation is Very Good.

Quality

Very poor

Poor

Satisfactory

Good

Very good

Display quality and size

Overall SBD viewpoint

- [Redacted]
- [Redacted]
- [Redacted]
- [Redacted]

Quality

Overall system HMI

Overall SBD viewpoint

- T [Redacted] menu
- C [Redacted]
- C [Redacted]
- P [Redacted] ific
- f [Redacted]

Quality

Map aesthetics

Overall SBD viewpoint

- Overall SBD viewpoint is

Quality

Map layout

Overall SBD viewpoint

- Colour the junctions
- Many points

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s

Quality

Navigation routing

Overall SBD viewpoint

- Navigation
- Battery
- A battery

Quality

Input HMI Quality

Overall SBD viewpoint

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Quality

Access to the controls

Overall SBD viewpoint

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Quality

Access to the display

Overall SBD viewpoint

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Quality

Components: Central information display



Overall SBD
viewpoint

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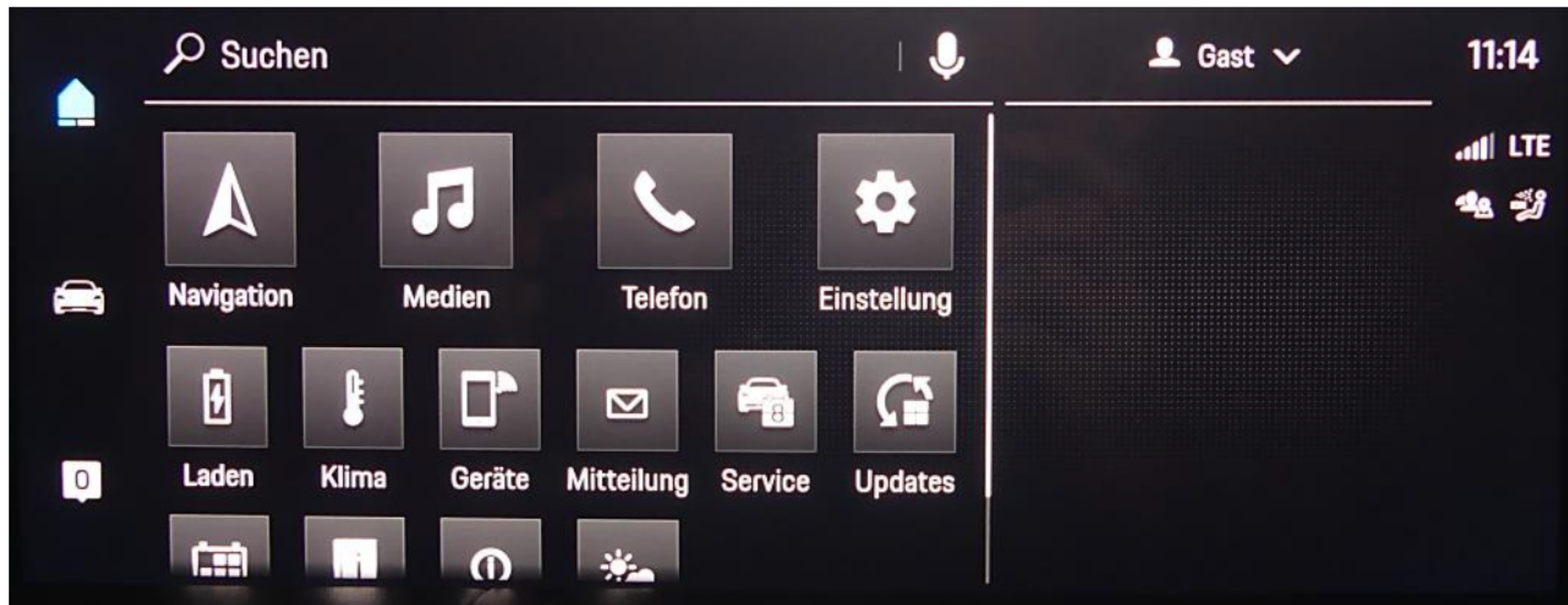
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Components: Passenger display



Overall SBD viewpoint

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Components: Lower central display

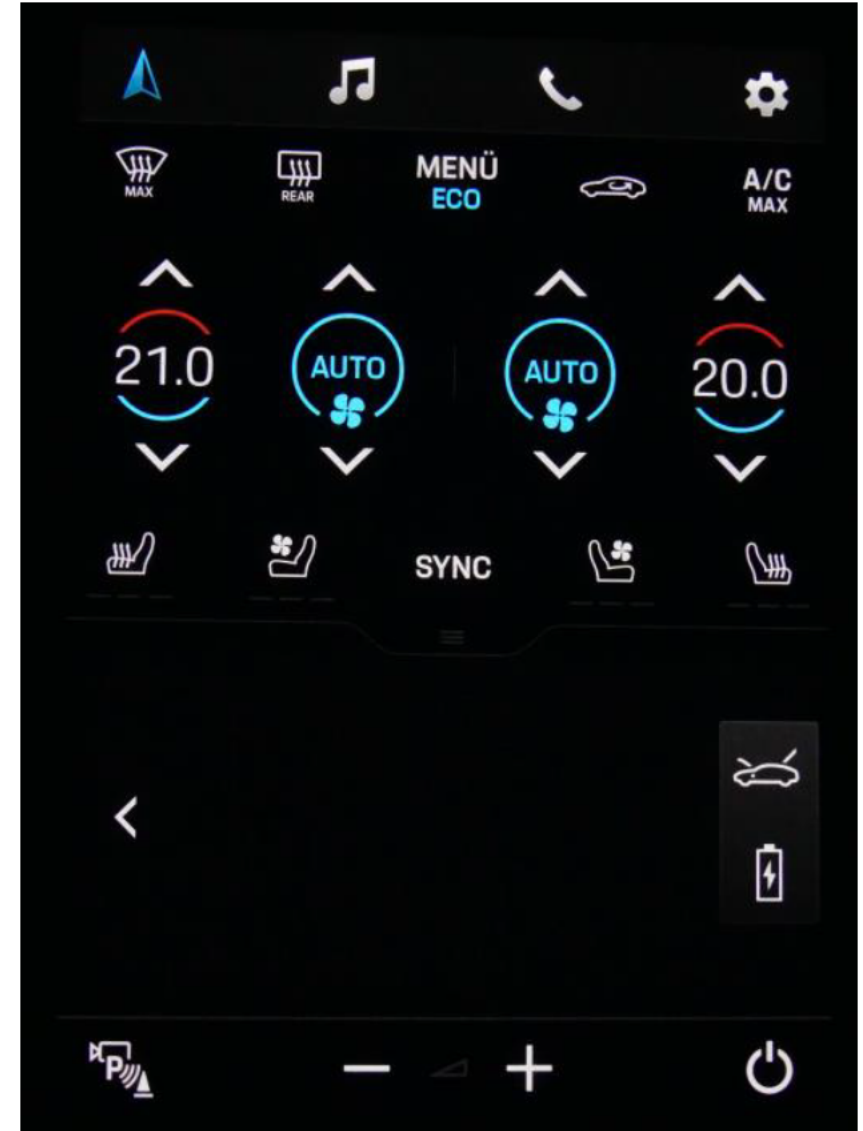


Overall SBD viewpoint

The low touchscreen in the A screen percept This co tuned t mounte
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Quality



Components: HVAC

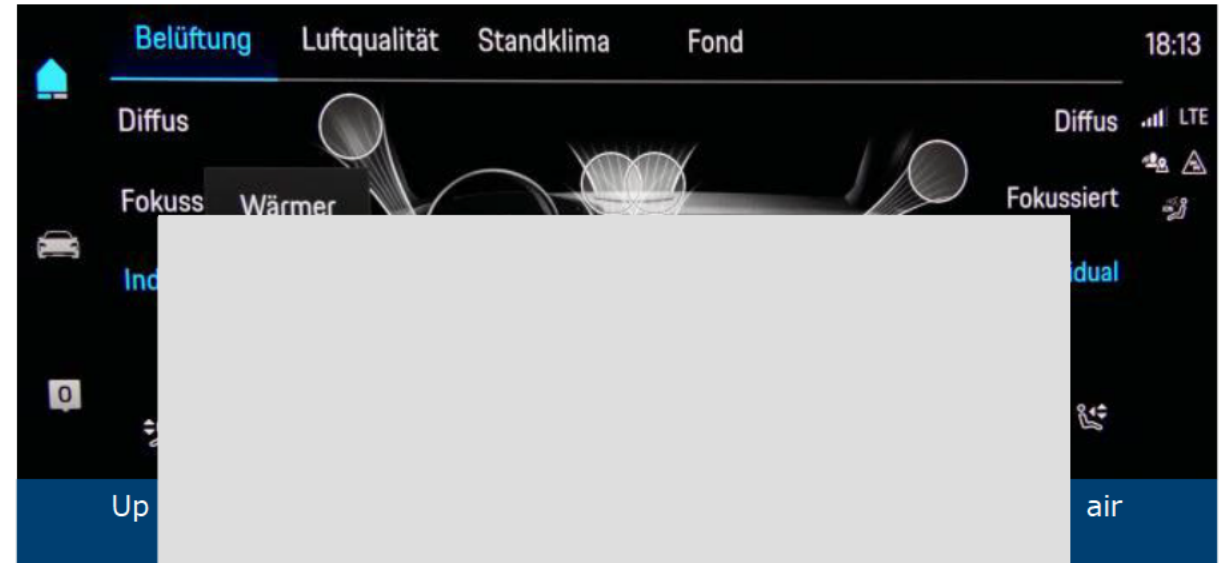
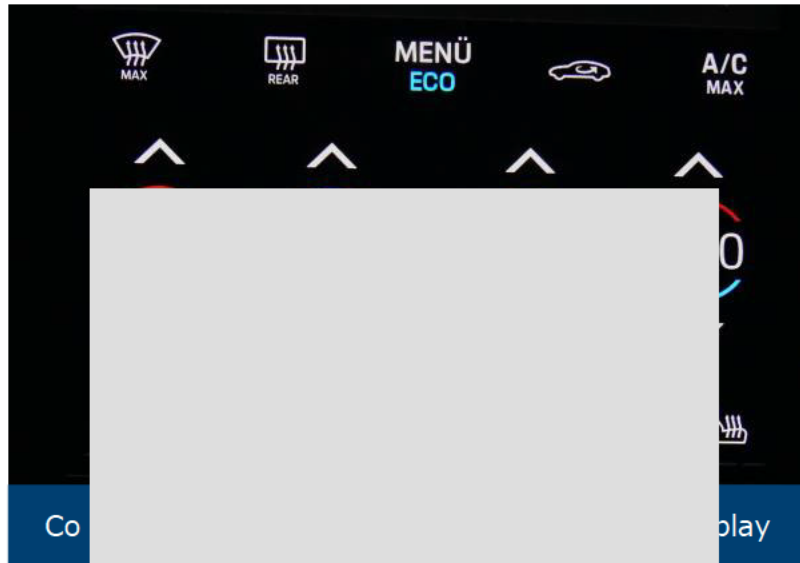


Overall SBD viewpoint

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Components: Instrument cluster



Overall SBD viewpoint

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System Performance

Start up speed

Overall SBD viewpoint

- System start up speed – whether from a cold or warm boot – was extremely quick.
- SBD testers tried many different methods to establish factors that may slow down system start up, such as leaving the vehicle overnight, but none of the methods were able to slow down the time taken by the system to turn on.

Quality

Very poor

Poor

Satisfactory

Good

Very Good

Command response

Overall SBD viewpoint

- System response times
- The system was able to respond to commands within the required time frame.

Quality

Connectivity speed

Overall SBD viewpoint

- With some exceptions, the system was able to connect to the network within the required time frame.
- Some of the exceptions were due to network congestion or hardware issues.

Quality

Performance Testing



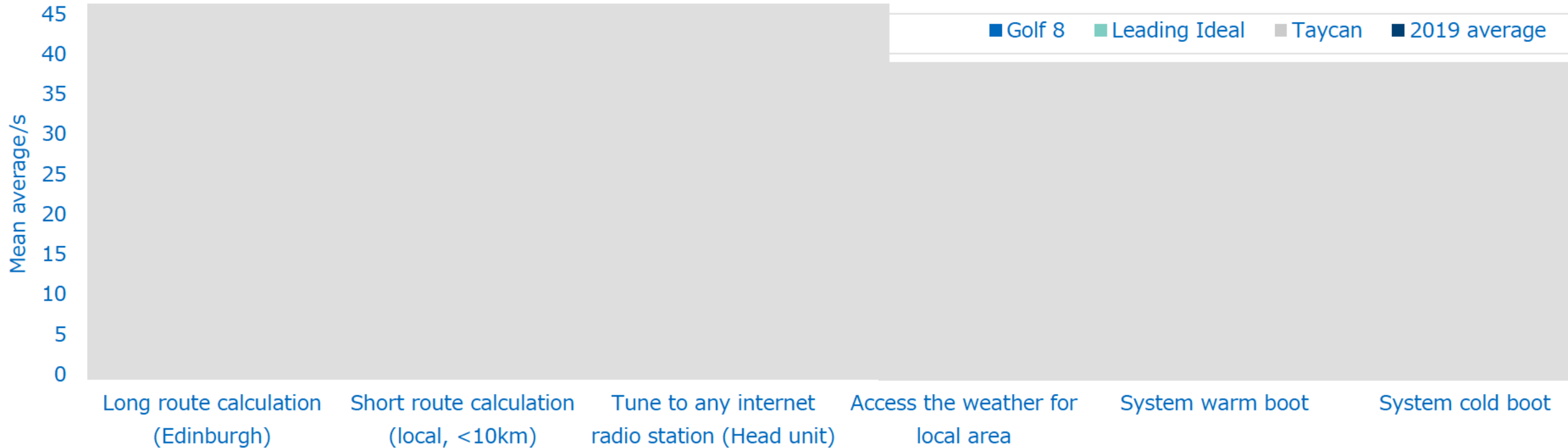
Performance issue tracking

Overall SBD viewpoint

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Quality



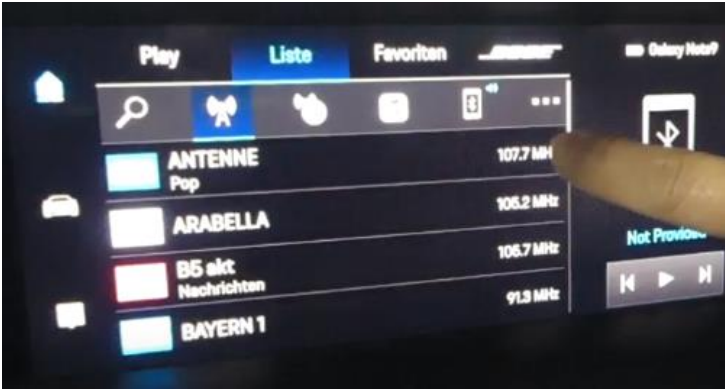
Performance Issues




Overall SBD viewpoint

What is an otherwise well executed and generally pleasing system is dragged down from scoring among leaders due to the frequency of major and critical bugs encountered during testing, some causing the system to crash. These issues would be hard to accept even from a start-up manufacturer, but from an established OEM such as Porsche, delivering a system that could be categorised as a beta version at best, is unacceptable.

Type	Description	Pic. ref. number	Frequency	Severity
System	Central display lost scroll functionality for several hours	1	High	Critical
System	Keyboard exhibits significant lag during password and email entry	2	High	Critical

Type	System		
Description	1. For several hours it was not possible to use scroll bars using touch input on the upper screen even though items could be selected and HVAC focus worked. Instead, the touchpad screen had to be used. Occasionally the screen would move very slightly when a scroll was attempted. This persisted for several hours/ignition cycles before resolving itself.		
Image			
Frequency	Low	Medium	High
Severity	Minor	Major	Critical

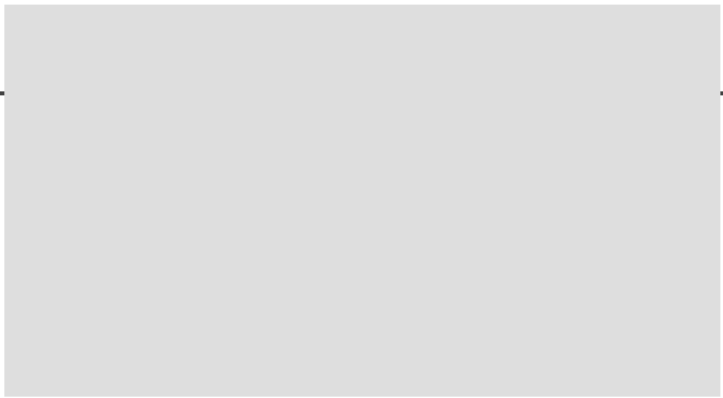
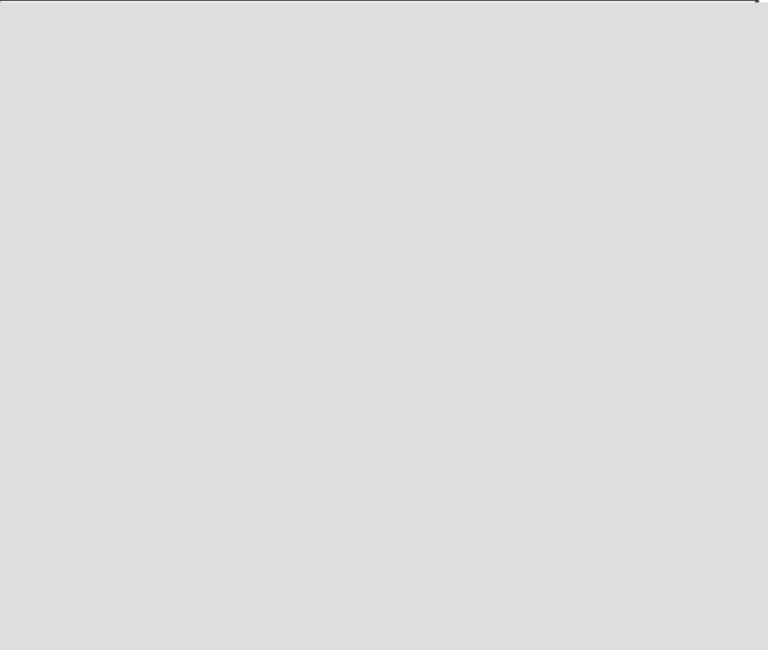
Type	System		
Description	2. During password and email entry, the keyboard exhibited serious lag, causing the input to lag several characters behind.		
Image			
Frequency	Low	Medium	High
Severity	Minor	Major	Critical

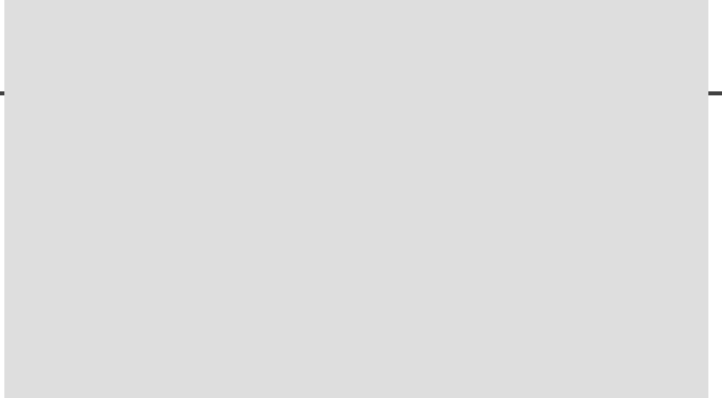
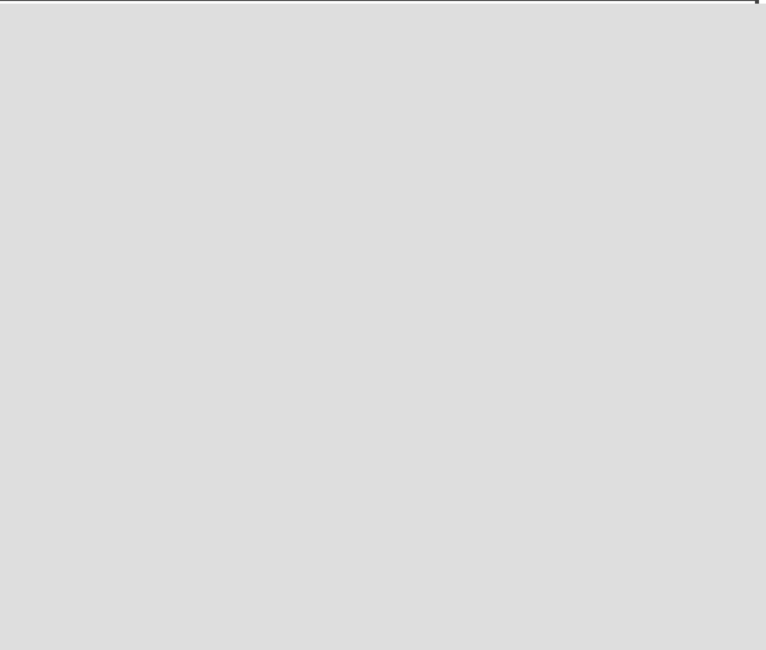
Type	
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Severity	[Redacted]

Ergonomics

Why does SBD perform this evaluation?

As a part of the UX scoring, SBD has always considered the placement and accessibility of the vehicle's IVI HMI in calculating the final UX score for the infotainment solution. SBD has now extended that consideration to other parts of the vehicle cockpit to offer enhanced insight to the overall user experience. Only the IVI HMI remains a component for the infotainment UX score found in the executive summary of this report.

Type of evaluation

This ergonomic evaluation takes the form of an expert technical analysis of the condition of the vehicle's hardware, rated by the expected level of customer satisfaction for users in the 5th to the 95th percentile.

Components carried out for evaluation

Tests focus on the ergonomic performance of the vehicle hardware and do not take into account the user experience of these components. This vehicle was **German specification. Minor differences might exist for other markets, if relevant.** Outlined on the next two pages are all the components of which SBD carried out testing during the evaluation.

Evaluation process flow

Two SBD usability experts carry out expert evaluations of the system over the greater 3 day duration. This includes static and dynamic testing. Example use cases carried out are as follows:

- Unlock the doors
- Open the boot
- Operate the door handle/release mechanism
- Move the seat to a comfortable position

Traditional SBD classification	Unacceptable				Acceptable, some concerns			Acceptable			
New Ergonomics Rating System	Condition is not marketable				Condition is marketable						
	1	2	3	4	5	6	7	8	9	10	
	An unacceptable level of complaints are expected from customers				Complaints are expected from "normal" customers with zero specialist knowledge 5 is the minimum to accept to go in production.		Few complaints expected, mainly from "expert" customers	No complaints. The product is in line with expectations	No complaints. The product is considered excellent	No complaints. The product is considered beyond all expectations	

Evaluation results

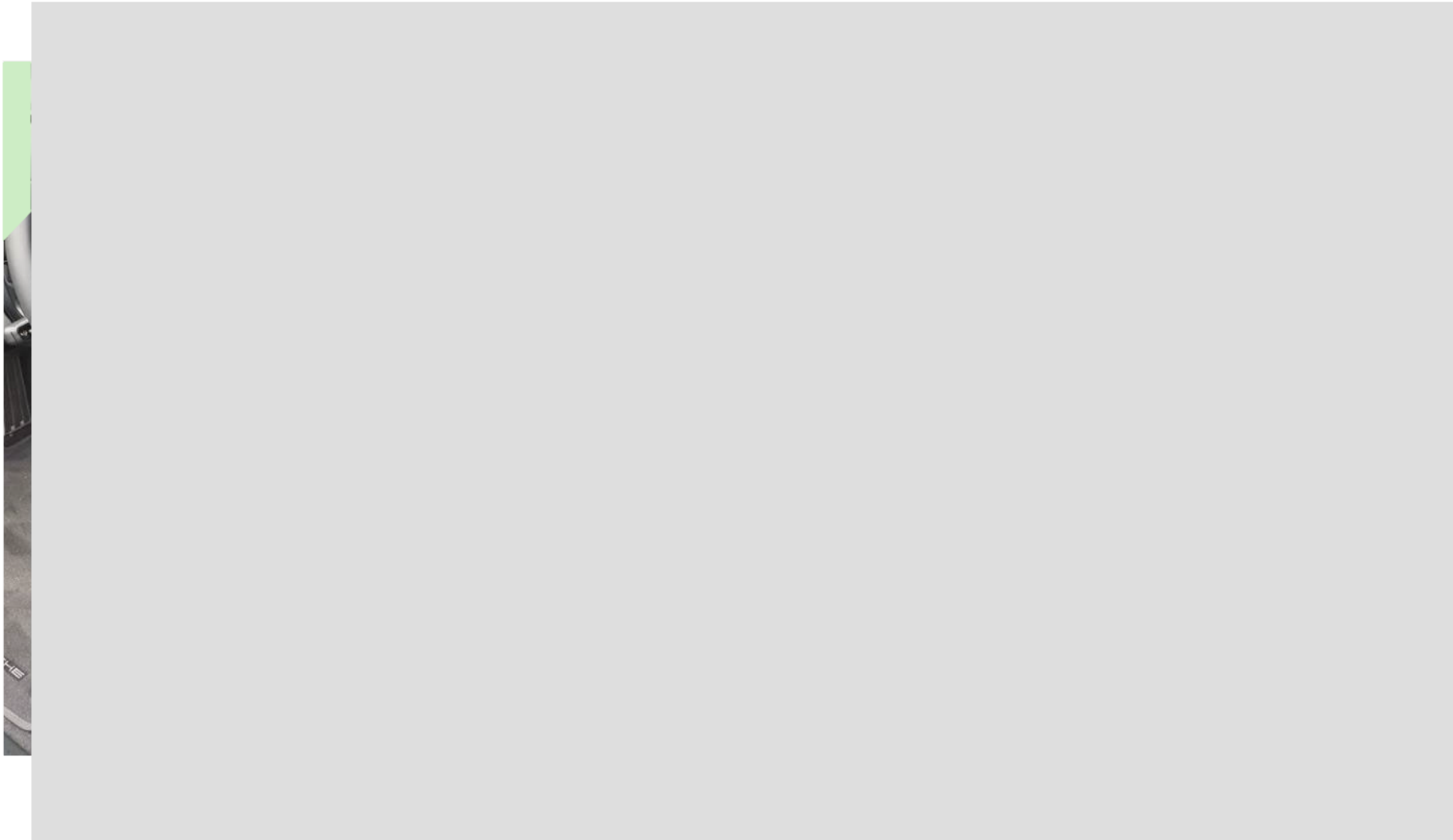


Criteria			Rating					Reasoning
			6	7	8	9	10	
1. Walking up to the car	1.1 Unlocking the car	1.1.1 Unlock the doors			★			<ul style="list-style-type: none"> • Automatic unlock on approach • Button is easy to locate • The buttons wobble noisily when operated Easy to see button (so +1), but must stoop down to press it (so -1)
		1.1.2 Open the boot			★			
	1.2 Opening the door	1.2.1 Operating the door handle/release mechanism						
		1.2.2 Opening the front door						
		1.2.3 Opening the rear door						
	2. Getting into the car	2.1 Front door access	2.1.1 Front door aperture					
2.1.2 Driver-specific access								
2.1.3 Closing the door								
2.2 Rear door access		2.2.1 Rear door aperture						
3. Achieving comfort in the seat	3.2 Adjusting the seating position	3.1.1 Reaching the adjustment controls						
		3.1.2 Moving the seat to a comfortable position						
		3.1.3 Adjusting the steering wheel						
		3.1.4 Adjusting the mirrors or Camera Monitoring System						

Evaluation results - Continued



Criteria			Rating					Reasoning
			6	7	8	9	10	
4. Static condition	4.1 Static use, comfort and movement	4.1.1 Comfort and body movement in the seat			★			see real own or bit board.
		4.1.2 Small item storage						
		4.1.3 Roof console controls - map lamps, hazard lights, SOS call						
	4.2 Starting the car	4.2.1 Using the seatbelt						
		4.2.2 Starting the engine						
5. Driving condition	5.1 Driving comfort and movement	5.1.1 Comfort and body movement in the seat						
		5.1.2 Roof console controls - map lamps, hazard lights, SOS call						
	5.2 Steering wheel operation	5.2.1 Using steering wheel controls						
		5.2.2 Stalk controls						
	5.3 Dynamic use of infotainment	5.3.1 Displays and Touch Displays						
		5.3.2 Touchpads						
		5.3.3 Rotary controllers						
		5.3.4 Buttons						
	5.4 Parking the car	5.4.1 Using the park brake						
		5.4.2 Exiting the car						



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