



TABLE OF CONTENTS

Executive Summary

Introduction to this Report

Features and Functionality

Execution

Perceived Quality

ADAS Domain

Infotainment Domain

Navigation Domain

Voice Recognition Domain

Connected Features Domain

Convenience Domain



In-car HMI UX Evaluations

#635

In-Car HMI UX Evaluation & Benchmarking

Xiaomi SU7

In this edition of the In-Car HMI UX Evaluation and Benchmarking series, the UX team is testing the Xiaomi SU7.

RELATED SBD REPORTS

619 – UX Benchmarking Series

A precursor to the new **In-Car HMI UX Evaluation & Benchmarking Series**, SBD Automotive's UX Team evaluates the infotainment user experience of over 40 vehicles.

806 – ADAS HMI Evaluations

A precursor to the new **In-Car HMI UX Evaluation & Benchmarking Series**, SBD Automotive's Autonomous Car Team evaluates the ADAS performance and usability of over 20 vehicles.

COVERAGE



GLOBAL



NA



CHINA



EUROPE

FREQUENCY



ANNUALLY



QUARTERLY



6 CARS PER YEAR

PUBLICATION FORMAT



PDF



POWERPOINT



EXCEL



ONLINE

PAGES



150+

Request price



Scoring

- > **Features and functionality:** evaluating whether the solutions provide features that customers expect, need and solve problems (or provide a wow factor).
- > **Reliability/stability:** evaluating the repeated usability and whether the users can have a similar (positive) experience each time.
- > **Usability:** evaluating whether the features available are easy to learn and use. This considers areas such as ergonomics, legibility, usability characteristics and how the system implements the various features.
- > **Perceived quality:** evaluating the potential perception in quality of the HMI components and how this contributes to the overall customer experience.

This research is useful for

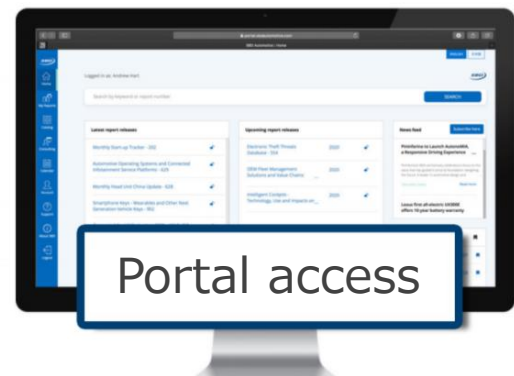


Do I have access?

100+ Reports published per year

50k+ Slides of insights, forecasts & data

4,000+ # of auto professionals who access our reports



Portal access



 May 2024 In-Car HMI UX Evaluation & Benchmarking Xiaomi SU7 635-24(24c)

Request a quote for

In-Car HMI UX Evaluation & Benchmarking Series
Xiaomi SU7

Request price >



May 2024
In-Car HMI UX Evaluation & Benchmarking
Xiaomi SU7

635-24(24c)

635 - In-Car HMI UX Evaluation & Benchmarking – Xiaomi SU7

Introduction»

5

- Report introduction

Bird's-eye view»

7

- UX principles
- What's new in vehicle UX?
- Comparison of past vehicles
- 645 Hands-free driving
- OTA, FaaS + SW-defined features guide
- The cockpit guide
- Health and wellbeing in automotive
- Digital cockpit & infotainment forecast

Executive summary»

16

- Key takeaway 1
- Key takeaway 2
- Key takeaway 3
- Ranking
- Scoring

The basics»

23

- Aim of report
- Scope of report
- 2024 vehicles
- SBD experience
- Methodology
- Report structure

Analysis»

30

- SUS scores by domain
- Kano analysis
- Positive and negative implementations
- CX recommendations
- Potential improvements

Features and functionality»

37

- Overview
- Delight and performance features
- Hygiene and navigation
- ADAS feature set
- IoT integration, music, entertainment and information

Execution»

43

- Overview
- System scoring
- UX laws
- System performance
- Stability
- Ergonomics
- Legibility and readability

635 - In-Car HMI UX Evaluation & Benchmarking – Xiaomi SU7

<u>Perceived quality»</u>	61	<u>Navigation domain»</u>	107	<u>Convenience domain»</u>	134
<ul style="list-style-type: none">▪ Introduction▪ Definitions▪ Evaluation results▪ Highlights		<ul style="list-style-type: none">▪ Summary▪ UX heuristics▪ Navigation specific scoring▪ Key positive and negatives		<ul style="list-style-type: none">▪ UX heuristics▪ HVAC summary▪ HUD summary▪ Sentinel mode▪ Phone reminder▪ Rear seat display▪ Dynamic seat	
<u>ADAS domain»</u>	69	<u>Voice recognition domain»</u>	124	<u>Future outlook»</u>	145
<ul style="list-style-type: none">▪ Summary▪ UX Heuristics▪ SAE L0▪ SAE L1&2		<ul style="list-style-type: none">▪ Summary▪ Functionality▪ Recognition▪ SUS score▪ SBD UX principles▪ Command structure▪ Localization▪ Level of integration		<ul style="list-style-type: none">▪ Introduction▪ UX principle groups	
<u>Infotainment domain»</u>	91			<u>Next steps»</u>	150
<ul style="list-style-type: none">▪ Summary▪ UX heuristics▪ Key positive and negative				<u>Contact us»</u>	159



Introduction



Report Introduction

Welcome to the 2024 HMI benchmarking report series. This report has been created to provide a fair, unbiased and objective view of the latest in-vehicle HMI solutions in the US, European, and Chinese markets. Evaluations are carried out by SBD usability experts with a deep understanding of CASE domains such as the Connected Car and ADAS & autonomy domains.

SBD supports clients throughout the development of new HMI and products from a relatively simple companion app to a more complex multi-domain infotainment solution. The methodologies used in these reports take into account many years of experience with consumer testing and custom client projects to provide a fair and, as much as possible, objective methodology.

All viewpoints and analysis within the report are aimed defining areas of concern through a data driven approach. This report aims to benchmark and score solutions whilst also being able to provide actionable recommendations to design and development teams.

Please note that due to the ever-evolving automotive technology market, SBD updates it's methodology each year, but does not update scores from the previous years. Therefore, please assume a slight drop in scores for both user experience (UX) and functionality from the previous year.



Intuitive



Supportive



Flexibility



Consistency



Brevity



Depth



Presentation

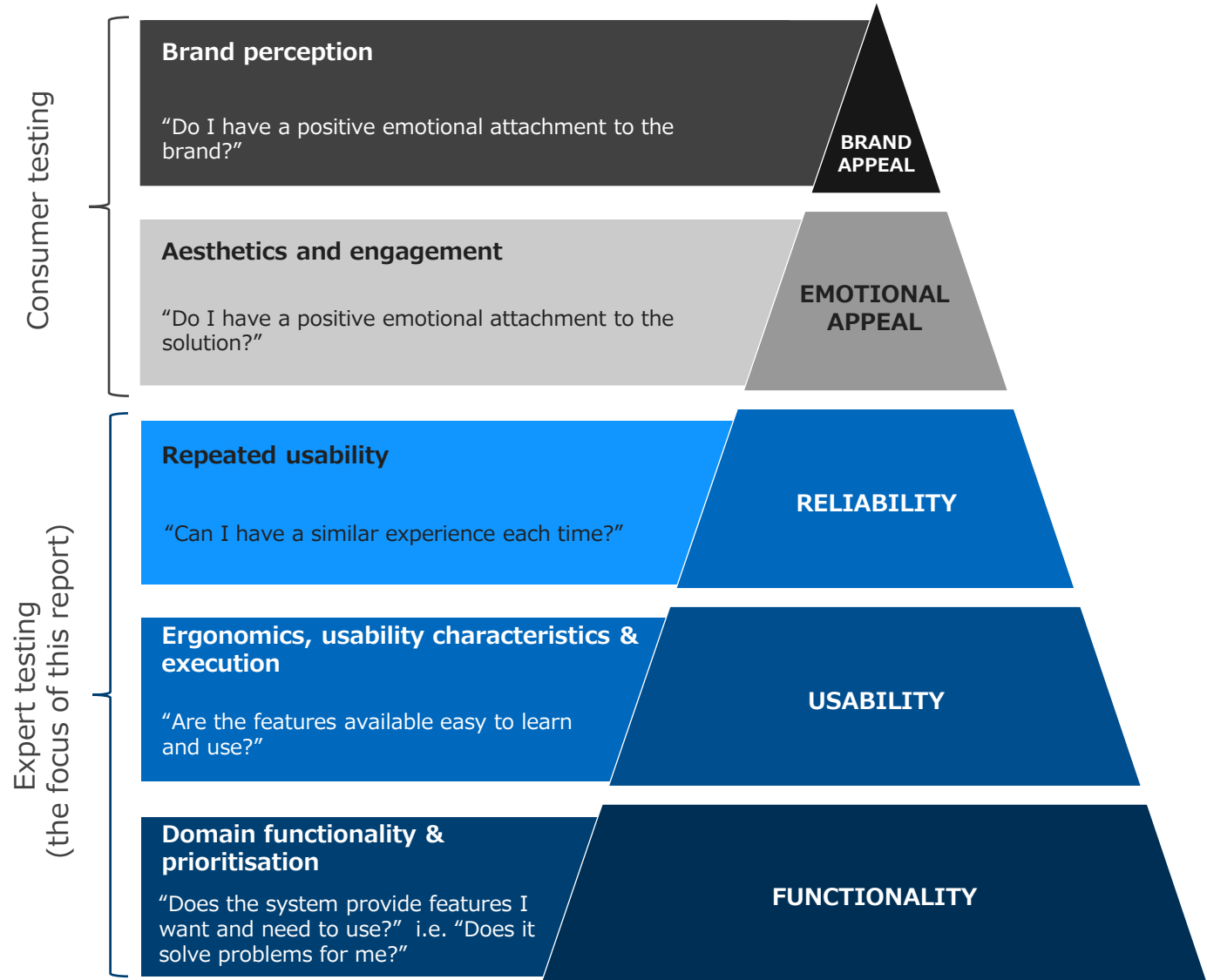
Section	Content
Birds Eye View	An overview of the key findings from SBD's various CX related and adjacent reports.
Executive Summary	Presents key highlights and conclusions from the report.
The Basics	What do you need to know about SBD's CX evaluation methodology?
Analysis	Analysis of report findings by SBD experts.
Features and functionality	Overview of key features and functionality by domain.
Execution	Assess success of implementation and overall execution of various system elements.
Perceived quality	Scoring and analysis of interior perceived quality levels.
ADAS domain	Highlight and analysis of key positive and negative points within the ADAS domain.
Infotainment domain	Highlight and analysis of key positive and negative points within the infotainment domain.
Navigation domain	Highlight and analysis of key positive and negative points within the navigation domain.
Voice recognition domain	Summary and scoring of various aspects of the voice recognition system.
Convenience domain	Summary of various convenience focussed features.
Future Outlook	Seven UX principles are considered against drivers and barriers into the future of this reports test vehicle.
Next Steps	Can SBD help you with any unanswered questions?



Aim of this report

One of the core goals of these studies is to provide a true indication of what the final customer experience of each solution could be. To do this evaluations are focused on providing scoring and analysis in the following areas:

- **Features and functionality:** evaluating whether the solutions provide features that customers expect & need, and solve problems (or provide a wow factor)
- **Usability:** evaluating whether the features available are easy to learn and use. This considers areas such as ergonomics, legibility, usability characteristics and how the system implements the various features
- **Reliability/stability:** evaluating the repeated usability and whether the users can have a similar (positive) experience each time
- **Perceived quality:** evaluating the potential perception in quality of the HMI components and how this contributes to the overall customer experience



SBD's view on the hierarchy of needs for CX benchmarking



Scope of report: focus on in-car HMI evaluations

The scope of evaluations in this report are constrained to the in-car HMI experience, in both static and dynamic conditions. One notable element is driver distraction which SBD covers at only a high level in this study as carrying out a full driver distraction evaluation requires biometrics test equipment to ensure the collected data is unbiased and objective.



A full evaluation of the end-to-end customer experience is not within scope of this report, but it is something which SBD has many years experience in from both a consumer and expert perspective. Other areas such as the companion app, online portal and in-home smart devices are not in scope as they are defined as “out of car” experiences.

Within the vehicle, any HMI element the user interacts with is evaluated including steering wheel controls, touch screen displays, voice control, HUDs and digital keys. The features and services on offer have been broadly grouped into the following domains (or test areas):

- ADAS domain
- Infotainment domain
- Navigation domain
- Voice recognition domain
- Convenience domain





2024 vehicle list

SBD has chosen nine cars to evaluate in 2024, based on two selection categories. New/interesting UX focuses on systems with 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 includes vehicles in segments that are sold in high numbers and are entering a new generation of UI for that vehicle. While we make best efforts to adhere to the chosen cars and schedule, the last two years have seen release dates slipping significantly, so it may be necessary to make substitutions.

Group A

Cars tested



BMW X1

- First BMW to be released with iDrive9
- Android based system
- US market test



Mercedes-Benz E-Class

- All-new MBUX Superscreen
- Unique features, apps and games
- German market test

Priority target vehicles for 2024



Lincoln Nautilus

- BlueCruise hands free
- Digital Experience
- All-new infotainment system
- US market test



Hyundai Kona/Kona Electric

- 12.3-inch cluster and central display
- New Bluelink+ services
- US market test



Volvo EX90

- Volvo Pilot Assist
- 14.5-inch central display
- EU or US market test

Group B

Cars tested



Xiaomi SU7

- Xiaomi's first vehicle offering
- New vehicle from CE company
- Xiaomi Pilot MAX
- Chinese market test

Other vehicles being considered for 2024



Audi Q6 e-tron

- All-new "Digital Stage" infotainment system
- AR HUD integration
- EU market test



Acura ZDX

- Google built-in
- AcuraWatch 360+ with hands free cruise
- US market test



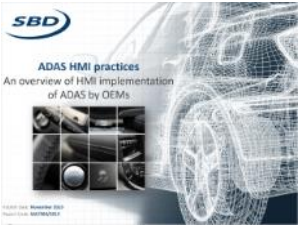
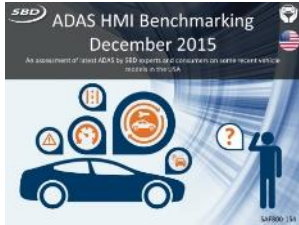
Avatr 12

- Harmony 4.0 OS
- Huawei ADS 2.0 (ADAS)
- Innovative displays
- Chinese market test



SBD experience through years of testing in-car solutions

Over the last ten years SBD has evaluated over 100 solutions from a Connected Car or ADAS perspective for our public report series (many more for private client evaluations). This current report series is an evolution of both test methodologies to provide a holistic view of in-car HMI. Furthermore, custom evaluations methodologies used across the globe for SBD clients have been included where applicable to enhance to overall approach.





One page methodology overview

One of SBD's core goals of this report is to be as objective, fair and as transparent as possible. To achieve this, various methodologies are used throughout the testing to evaluate different areas of the solution in various conditions.

These methodologies are a mix of different types of tests:

- **Objective tests:** where the value provided is not influenced by a tester's viewpoint e.g. response time
- **Subjective tests:** the test score is based on the expert testers' viewpoints e.g. task ease of use
- **Task-based:** evaluations carried out based on a predefined task list e.g. navigate to a pizza restaurant near location X
- **Freeform:** random free testing by the tester with no clear pre-defined task list. This allows the testers flexibility to dig deeper into various parts of a solution when needed
- **Scoring range:** ranges and definitions of how to score a test element e.g. poor depth and accuracy score = the results provided are not in line with what is reasonably expected by the user
- **Static:** tests are carried out when the vehicle is not moving
- **Dynamic:** tests are carried out when the vehicle is moving in various road conditions and locations e.g. motorways/highways, cities, villages, country roads etc.
- **Misuse/failures:** carried out to evaluate the stability of the solution in unusual conditions e.g. repeatedly pressing the voice command button

This document does not provide a detailed description of the methodology and this page serves to provide an overview of the approach.

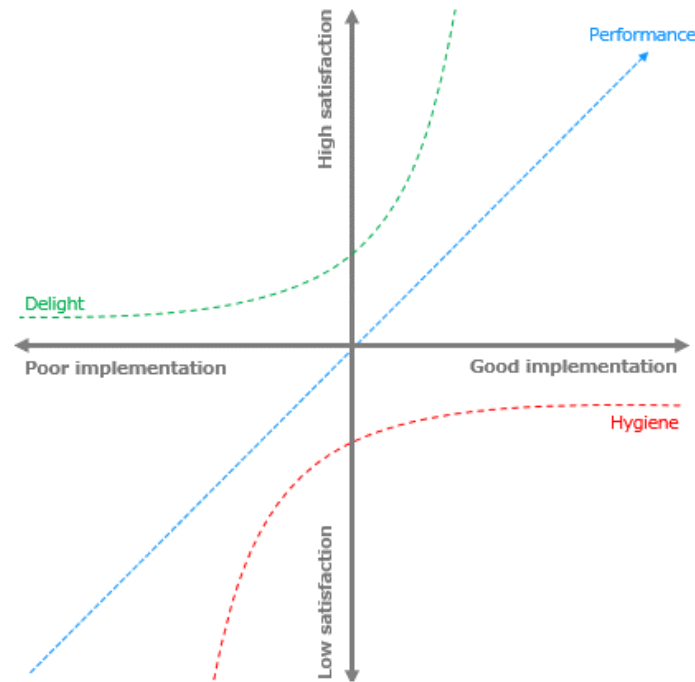
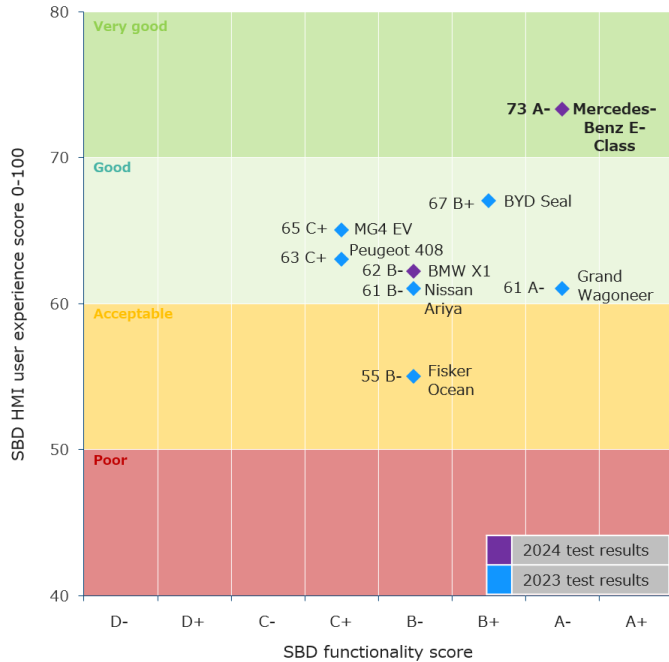
For a detailed discussion and presentation of SBD's methodology please [contact us](#).

Test area	Type of tests							
	Objective	Subjective	Task based	Freeform	Scoring range	Static	Dynamic	Misuse/failures
First impressions		✓		✓		✓	✓	
Static tasks	✓	✓	✓		✓	✓		
Dynamic tasks	✓	✓	✓		✓		✓	
Random free	✓	✓		✓		✓	✓	✓
Navigation specific tests	✓	✓	✓		✓		✓	✓
Voice recognition	✓	✓	✓	✓	✓	✓	✓	✓
Performance & response	✓		✓			✓	✓	✓
System Usability Scale (SUS)		✓			✓			
Final SBD UX score	✓	✓			✓			
ADAS	✓	✓	✓		✓	✓	✓	
UX heuristics	✓		✓			✓	✓	
Execution		✓			✓			
Ergonomics	✓	✓	✓			✓	✓	
Legibility & readability	✓		✓			✓	✓	
Perceived Quality (PQ)	✓	✓	✓	✓	✓	✓	✓	

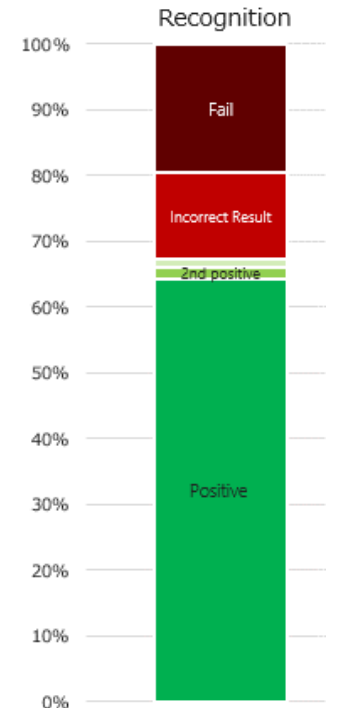


Report structure and how to interpret certain data sets

Throughout the testing and evaluation process SBD uses multiple methodologies to align to the situation and test area. Outputs from these evaluations can be broadly grouped into the following three types of report outputs - SBD's goal with these options is to ensure understanding of the results are as clear and fair as possible.



UX heuristic	Score
Cockpit clutter	Good
GUI clutter	OK
Display quality/size	Good
Map aesthetics	Very good
Map layout	OK
Navigation routing	OK
Instrument cluster	Good
General system HMI	OK



UX & functionality score

Final usability scored based on a 100-point scale with solutions scoring less than 40 defined as "not fit for purpose" with major user complaints expected and score above 80 defined as "exceptional".

Functionality score based on eight core feature set areas: delight features, performance features, hygiene features, navigation feature, ADAS, IoT integration, music, entertainment and info features.

Modified Kano feature analysis

Features plotted against three lines based on their implementation and satisfaction levels:

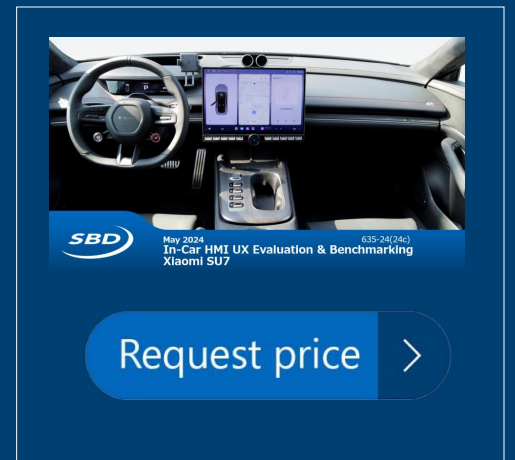
- **Delight** features: "wow" features likely to provide high satisfaction even with poor implementation
- **Performance** features: as the level of implementation increases so does the customer satisfaction
- **Hygiene** features: poor implementation provides low satisfaction, but good implementation may not provide positive satisfaction as it can be considered as expected functionality


Subjective & objective scores

Scoring across multiple areas through subjective scoring with pre-defined ranges, definitions, and comparison to past results.

Objective scoring generally based on a pass/fail criteria or time-based considerations. SBD attempts to minimize subjectivity as much as possible with results aimed at being fair and reasonable with a minimal level of bias.

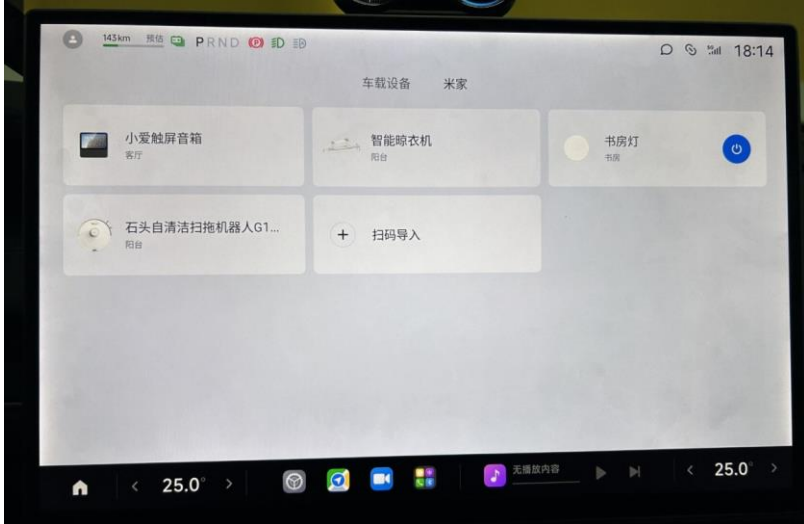
Example slides from the report

An example slide from the report, featuring a photograph of a car's interior dashboard and steering wheel. The slide includes the SBD logo, the text 'May 2024 In-Car HMI UX Evaluation & Benchmarking Xiaomi SU7', and a 'Request price >' button.

 May 2024 In-Car HMI UX Evaluation & Benchmarking Xiaomi SU7 635-24(24c)

[Request price >](#)

Impressive feature set, largely stable system



Car to X Synergy

As part of the IoT integration feature set, many car-to-home and home-to-car interactions are possible. For support for the control of smart home devices is offered including smart door locks, homes camera and lights. Geo fencing scenarios can be created to run certain home routines. Home-to-car synergies include doorbell vision via the central display and the ability to control many vehicle settings from a Xiaomi smart speaker. This level of connection adds to user convenience levels.



LLM (Large Language Model)

The large language model used to support the voice recognition system allows for a more human like interaction, which many users are likely to enjoy using. The integration of the LLM means a very high success rate at completing tasks quickly and accurately. It is noted that the depth of results and data is very good, especially when compared to other system that do not employ an LLM.



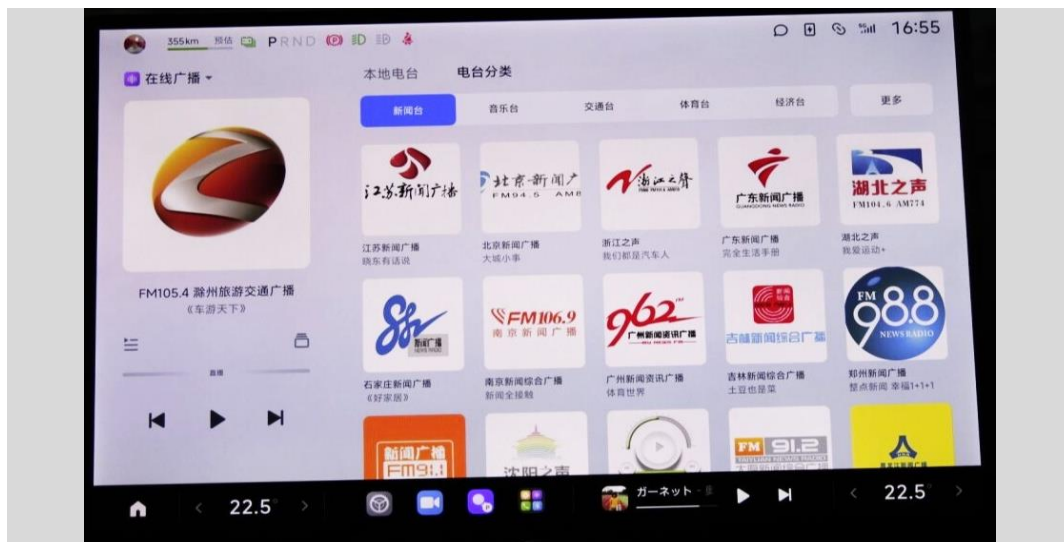
Good level of stability and performance

During testing, only one instance of instability is noted. This low level of encountered instability not only has a positive effect on user experience and brand perception as a whole, but also has a significant effect on the overall score for this vehicle. Demonstrating a largely stable system may be linked to Xiaomi's experience in the CE world. Performance is also considered fast, regarding either cold or warm boot, to route calculation times.



Hygiene features lacking, intuitive navigation features

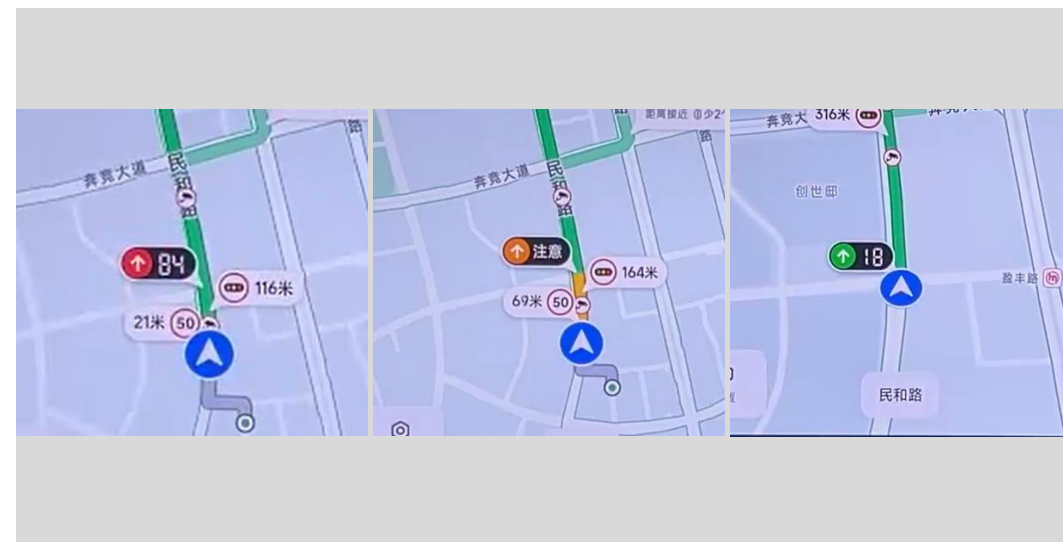
- Users are not able to save radio presets or station favorites in the radio menu for FM/AM stations.
- Users are restricted on how they can search for radio station and cannot search for radio stations by radio number.
- Input method types are limited and several common input methods in China are not accepted.



Not able to save favourite FM/AM radio stations

The most notable missing hygiene feature from this system is the lack of ability to save FM/AM radio station favorites or presets for easy and quick recall later. This is something that nearly all users are likely to expect as a hygiene feature in all modern vehicles. Even though FM/AM station may not be as widely used in China, this functionality should still be made available. The absence of this feature will likely lead to frustration and disappointment among some users.

- Traffic signal countdown feature integrated into the map display during active route guidance.
- Automatic charge point route calculation plots a route to incorporate multiple charge points on the way to a given destination.
- Limited POI subcategories make it difficult to search for more specific types of POI like restaurant cuisines.



Traffic light countdown feature

An effective and accurate red-light countdown feature is integrated into the navigation map display. This feature communicates the remaining time left at a red light and shows extra information on amber and green lights during active route guidance. Not only is this feature an added convenience element, but it may also contribute to enhanced levels of safety. However, it is noted that the display of this feature is small and compact, making it hard for drivers to see while the vehicle is in motion. It also adds to a sense of visual clutter experienced throughout the wider HMI.



Perceived Quality: Visual

Level 1

Visual

SBD viewpoint

Harmony/alignment: Most of the controls and buttons in the cabin follow a similar design language and ensure a sense of visual harmony. However, the central display is not so well integrated and dominates the cabin. Physical buttons are minimalist, following the same design philosophy as the cabin.

Geometric: All buttons and controls have shape that is appropriate for the intended function.

Spatial harmony: The lower center console features tab switches which are clear and uncluttered. The steering wheel contain two extra small spokes with a button each. This does contribute to visual clutter but is not considered a major issue.

Branding: Branding is in line with what would be expected from a CE device manufacturer. Crisp and clean lines are dominated by a large screen with only minimal visual branding.

Output HMI: Output HMI throughout the cabin is consistent and follows the accepted norms and conventions.

Interior lighting: Ambient lighting is visually impressive and can be set to react to music. Button panels and displays are well lit both in daytime and nighttime conditions.



Level 2 scoring

Harmony/alignment	Geometric	Spatial harmony	Branding	Output HMI	Interior lighting
Good	Good	Excellent	Excellent	Good	Good

*Below expectation for segment

Good warning in the central display, missing in the side mirrors

Category	System usage	
System	RCTA	
SBD viewpoint	<p>Once the system is turned ON, it will stay in standby mode and be active as soon as reverse gear is selected.</p> <p>Both the surround view camera display and ADAS display are integrated well with RCTA HMI. If the system senses an obstacle passing behind the vehicle with a chance of imminent collision, the system will deploy rapid & strong braking (when set to Warning and Braking mode). A large pop-up warning is shown in the central display at the same time. If in surround view camera display, the edge of impact will be displayed in the bird's eye view in red. If in the ADAS display, the target obstacle will be marked in red. The audio warning is loud, clear and distinctive from other audio warnings used throughout ADAS.</p> <p>If the ADAS display is being shown, multiple types of traffic elements will be rendered (pedestrians, two/three-wheelers, motorcycles and different types of cars).</p>	
UX impact	Minor Positive	
SBD viewpoint	<p>No warning lights are used on the side exterior mirrors for RCTA. Since these are the locations that drivers are likely to be looking at when reversing, an alert light/icon could be implemented to provide an extra level of alert when reversing.</p>	
UX impact	Minor Negative	

RCTA UI integration in different displays (surround view/ADAS display)



No warning in mirror



Good level of UI customization

The system supports customization of several UI components on the homepage.

- When searching for an address on the navigation widget, the keyboard will automatically pop-up. Users can drag the keyboard to move its position. This prevents information from being obscured by the keyboard and also improves the ease of typing for both the driver and passenger.
- Users can use the control bars on the left, right or top of each widget to adjust its size and position in the central display. This allows driver to bring more commonly used features closer to the driver's side of the vehicle.
- Users can display the mapped apps on a mobile device in the form of widgets or full-screen on the homepage (e.g., Drag the control bar on the right side of the mapping screen to enable a full screen display).

Being able to arrange the homepage and keyboard layout allows the user to tailor the system to meet their needs and preferences while prioritizing information that is important to them.

SBD
viewpoint

UX impact

Major negative

Minor negative

Minor positive

Major positive



Drag to adjust the position of keyboard



Drag to show the Baidu Map app in full-screen



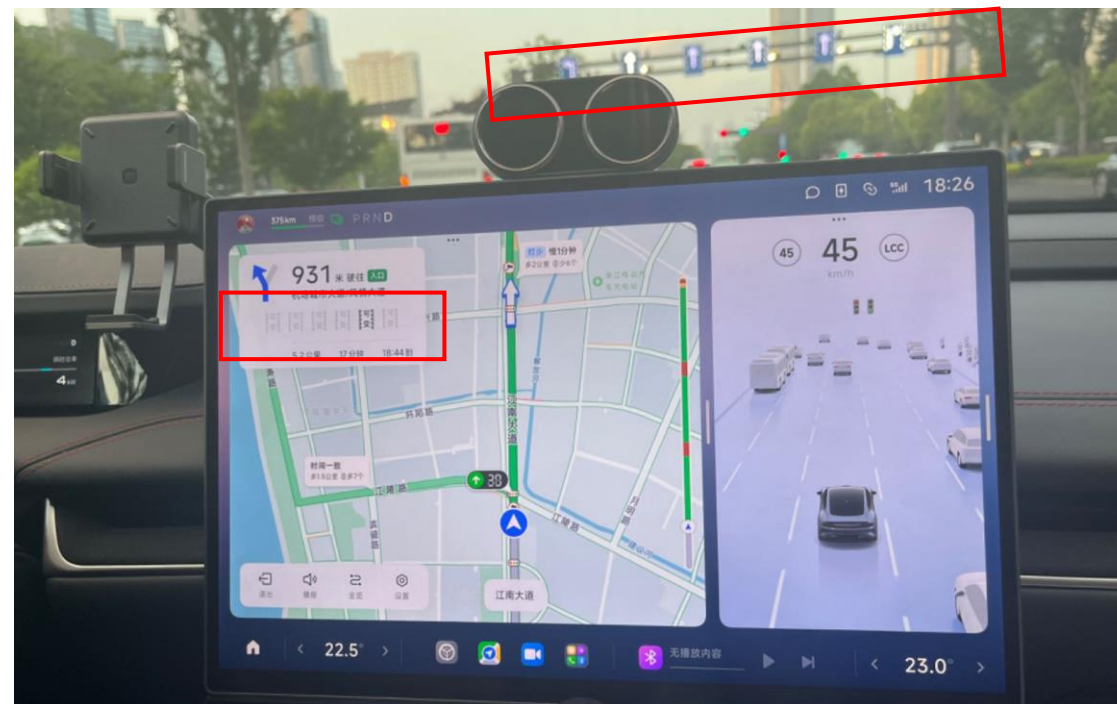
Occasional strange lane guidance

SBD viewpoint

On occasion, the system will only recommend one possible lane when in fact multi lanes can be taken to travel in the same direction.

- As shown in the image to the right, all 6 lanes have free traffic flow. At that time, the middle 4 lanes (2nd to 5th) are the lanes that can go straight. The recommended lane by the system is the second-to-last (5th) one.
- However, the logic for its recommendation is not clear. If the recommendation is based on the level of congestion in each lane, the third lane is the best based on this logic. If it is based on the logic of being closer to the next turn, the second lane would be the best.

While the recommended lane is not actually incorrect, the system does not seem to be following any intelligent logic as to they only that lane is being recommended and not the other possible lanes in addition. This could result in a confusing situation for the driver.



Recommendation logic for tidal flow is a little bit confusing

UX impact	Major negative	Minor negative	Minor positive	Major positive
-----------	----------------	----------------	----------------	----------------

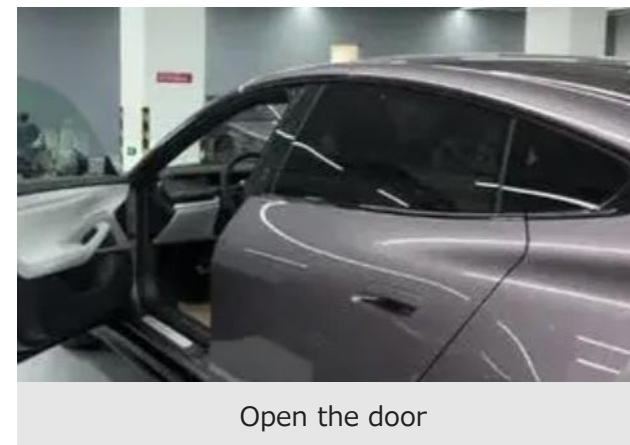


Phone reminder when getting off the car

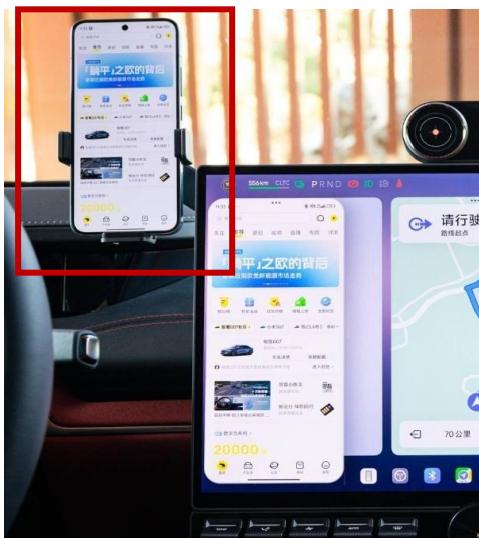
Xiaomi offers a phone reminder feature when the phone is located on the wireless charging pad:

- This feature reminds the user that their phone is still in the vehicle (including phones charged on the wireless charging panel and phones charged on the phone stand) when the user opens the door and leaves the vehicle.
- A phone reminder pop-up message will be shown on the central screen "Detected that your cell phone is still in the car".
- A voice reminder will also be played "Your cell phone is still in the car".

This feature prevents users from forgetting important items when in a hurry. As the phone stand is an optional accessory, this value-added feature also helps to promote the purchase for accessories and realize the purpose of revenue generation.



Open the door



Cell phone stand with wireless charging (optional: RMB 149)




wireless charging panel (standard equipment)




Phone reminder pop-up message on the central screen



Request price for
the full report



 May 2024
In-Car HMI UX Evaluation & Benchmarking
Xiaomi SU7 635-24(24c)

Request price >



Contact SBD Automotive

Do you have any questions?

If you have any questions or feedback about this research report or SBD Automotive's consulting services, you can email us at info@sbdautomotive.com or discuss with your local account manager below.



info@sbdautomotive.com



[Book a meeting](#)

USA

UK

Germany

India

China

Japan



Garren Carr
North America
garrencarr@sbdautomotive.com
+1 734 619 7969

Luigi Bisbiglia
UK, South & West Europe
luigibisbiglia@sbdautomotive.com
+44 1908 305102

SBD China Sales Team
China
salesChina@sbdautomotive.com
+86 18516653761

Andrea Sroczynski
Germany, North & East Europe
andreasroczynski@sbdautomotive.com
+49 211 9753153-1

SBD Japan Sales Team
Japan, South Korea & Australia
postbox@sbdautomotive.com
+81 52 253 6201