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In-car HMI UX
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#635

In-Car HMI UX Evaluation & Benchmarking

NIO ET9

Welcome to the 2025 HMI benchmarking report series, where SBD's user experience experts carry out thorough UX evaluations of the features and technologies offered in the latest vehicle releases.

In this edition, our experts test the new NIO ET9. The team admired the ambition of the EV's HMI offering, which implements advanced cockpit technologies such as steer-by-wire, an AR HUD, rear displays, and an on-board AI assistant. While praising the variety of this offering, and the performance of these features across the board, our experts also noted some implementation issues with the car's hygiene features that could be detrimental to the long-term use of key vehicle functions.

COVERAGE



GLOBAL



NA



CHINA



EUROPE

FREQUENCY



ANNUALLY



QUARTERLY



CARS PER YEAR

PUBLICATION FORMAT



PDF



POWERPOINT



EXCEL



ONLINE

PAGES



90+

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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

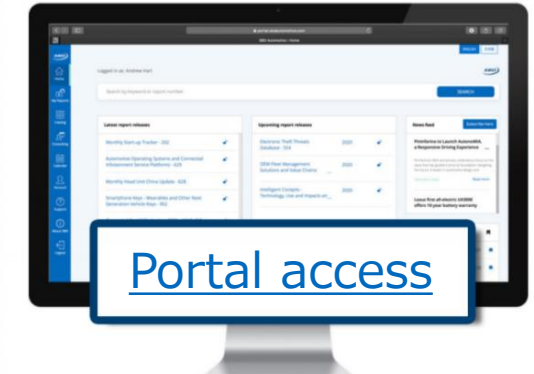


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June 2025
In-Car HMI UX Evaluation & Benchmarking
NIO ET9

635-25(25g)

635 - In-Car HMI UX Evaluation & Benchmarking – NIO ET9

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Please note: This report is lacking ADAS analysis due to almost no ADAS functionality being available at the time of testing.



Introduction



Report Introduction

Welcome to the 2025 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 its methodology each year, but does not update scores from the previous years. Therefore, please assume a drop in scores from the previous year for both user experience (UX) and functionality.

**Intuitive****Supportive****Flexibility****Consistency****Brevity****Depth****Presentation**

Layer	Section	Conclusion
STRATEGY & IMPACT	Executive Summary	This report provides an in-depth look at the user experience (UX) the vehicle provides across many domains and provides an overall UX score and features and functionality score in order to benchmark vehicles against each other.
	System Usability	An in-depth look at factors impacting overall usability including Execution, System Performance, Legibility, Ergonomics, and System Stability.
LEARNING & ACTION	Features & Functionality	Breaks down the vehicle's features and functionality offering into three categories, Hygiene, Performance or Delight features.
	Perceived Quality	An evaluation of 17 different attributes that impact perceived quality of a vehicle, in which each are given a score which is calculated into the overall usability score.
CORE INSIGHTS	Analysis by domain	An in-depth analysis of each domain including the major and minor positive and concern points for Voice recognition, General system, Navigation, ADAS, Other domains.
CONTEXT	Birds Eye View	Please read the 635 25j Summary Report (available December) for consideration of the wider CX context
	Future Outlook	
	Next Steps	



Report series & test vehicle

This report series offers insights, analysis, and perspectives based on a well-defined testing methodology. SBD Automotive has been conducting UX and HMI testing for automakers since 2012, initially focusing on connected vehicle solutions across global markets. Over time, our methodology and approach have evolved in response to industry advancements and client feedback.

The 2025 series marks our fourth major update, featuring the following enhancements:

- Inclusion of safety considerations and risk assessments
- Integration of AI testing
- Streamlined HMI heuristic evaluations
- Updated voice, static, and dynamic use cases
- Improved legibility to align with ISO guidelines
- Introduction of emotion evaluation to perceived quality evaluations
- Restructured ADAS testing to reflect current industry trends
- Simplified report structure

The NIO ET9 has been evaluated in this report with testing conducted in China in May 2025. This vehicle was chosen as it is NIO's latest solution with an updated 15.6-inch touch screen infotainment display, AR-HUD, NOMI Mate, NOMI Intelligence, steer-by-wire and car-phone projection (NIO phone only).



Software version tested: Cedar 1.0.1 CN



Methodology overview

Testing is conducted by two SBD usability experts over a five-day period. Evaluations are aiming to be fair and unbiased covering the vehicle's infotainment and ADAS HMI solutions. The key components of the methodology are outlined below.

First impressions	Preliminary assessments of key aspects such as build quality, reach, wow factor, and ergonomics
Use cases	Testing of static and dynamic use cases, including acceptability ratings and detailed analysis
Voice recognition	Voice recognition evaluations, focusing on command structure, recognition accuracy, flexibility, localization
Heuristics	General UX guideline assessments, considering factors like error prevention, consistency, and user control
Execution	Analysis of visual elements (GUI, display, map, etc.), responsiveness, and system reliability
Ergonomics	Evaluation of ergonomic factors such as reach, gaze and visibility, strain, and fatigue
Performance	Quantitative testing of practical use cases, including route calculation and rear-view camera delay
ADAS	Assessment of driving assistance features considering Levels 0/1/2/2+/3 (e.g. PD, BSM, RCTA, SAPA/FAPA)
HUD	Evaluation of feature set, HUD quality, and performance under various conditions
Legibility	Assessment of display quality, including contrast, character count, and viewing angle
UX laws	Verification against common UX principles and alignment with in-vehicle usage

SBD's usability & HMI consulting support

Since 2012, SBD has been conducting HMI evaluations for both publicly available research reports and bespoke client studies. Our team of domain experts and seasoned industry professionals ensures that all research findings are data-driven and objective. While this report focuses on expert evaluation methods, our bespoke studies encompass a wide range of topics and HMI use cases. SBD has carried out testing across the globe covering a wide variety of topics and domains; from both in-vehicle and external evaluations.



Expert evaluations

Evaluations carried out by SBD experts with global UX testing experience. Example projects:

HMI best practice guidance: summary results of past system failures, creation of common HMI guidelines and rules, and an overview of technology trends

Prototype bench unit evaluation: Onsite assessments conducted through targeted expert testing to identify key issues, provide recommendations, and rank them by importance based on their impact on overall UX.



Voice of the customer

Evaluations carried out by end consumers with either 'hands-on' or remote testing. Example projects:

Full HMI UX evaluations: A hybrid approach combining expert and consumer perspectives, utilizing both blind and targeted testing methods, exploratory testing, use case analysis, and assessments of emotional engagement.

ADAS Real World Consumer Testing: Designed to understand consumer expectations of partially automated systems, with a focus on real-world usage and perceptions.



Performance testing

Evaluations carried out with dedicated test equipment to evaluate system performance. Example projects:

ADAS performance testing: Testing on proving grounds with prototype solution to evaluate vs upcoming regulations.

EV range performance & CX: Multiple market evaluations of EV range estimates and how the information is presented to the end user (both accuracy and depth of information)

Example slides from the report



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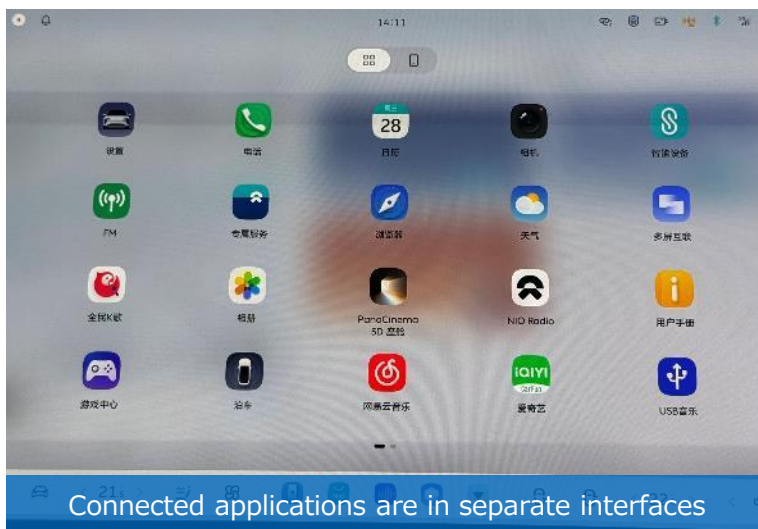


GUI is generally clear but has room for improvement

Overall, the GUI is clear and easy to understand. However, after testing the features and functionality, some issues were identified. The main ones relate to clarity and are further explained below. The homepage features a clear functional layout and clean icons. The app list supports long-press for custom reordering, offering relatively high flexibility.



In certain cases, the GUI lacks clarity. The HVAC control shortcut in the homepage's bottom bar can't actually be customized, despite appearing in the same dark grey as other customizable buttons in editing mode. Some less frequently used button icons within the HVAC control interface are unclear, such as those for the front and rear windscreen heating and the front wiper area heating.



The app interface follows NIO's established design. When connecting the NIO phone to the vehicle's infotainment system, NIO Link applications will appear in a separate interface, differentiating them from the native vehicle apps. Once the NIO phone is connected to the vehicle, a NIO Link icon will appear in the bottom bar of the main interface, allowing users to directly open the phone mirroring window.



The GUI has a unified and generally minimalist design, with most interfaces being easy to understand. However, some categorization choices could be confusing. For instance, when opening the HVAC settings from the bottom bar, the lighting and audio controls are found within the same interface. In the settings menu, the vehicle energy consumption display is located under the "My ET9" category instead of the "Battery" category.



Delight features bring seamless user experience

Delight

Ultra wide band key

感应距离

携带手机UWB钥匙靠近和远离车辆时，将触发自动解锁或自动落锁

较近

较远

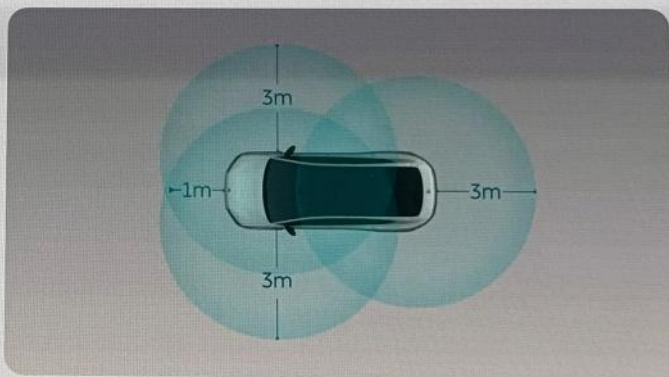
* 调节感应距离仅对手机UWB钥匙生效，实体钥匙不受影响。

An ultra wide band (UWB) key comes as standard with the ET9. This can increase the overall anti-theft capability. The system supports welcome-on-approach effects, including headlight effects and automatic door opening.

Delight

Exterior voice control

车外语音对话



- 出于安全考虑，车内有人时，车外语音不可用
- 可通过默认唤醒词“嗨 NOMI”在车外开启对话，每次发出指令前均需唤醒
- 支持控制车门、车窗、空调等场景，详见[车外指令示例](#)

NOMI supports being woken from outside of the vehicle and can carry out some commands, such as door open/close, window open/close and HVAC on/off. When exterior VPA is on, NOMI Mate will turn to the direction of the user as well.

Delight

Steer-by-wire



NIO ET9 is the first production car in China to be equipped with steer-by-wire. It allows less turning and faster response from the vehicle when maneuvering. It's a novel addition but requires some time to adapt to.



Perceived Quality: Visual

Level 1

Visual

SBD
viewpoint

Harmony/alignment: Overall the HMI and aesthetic are consistent throughout the cockpit. Minor issues exist with the steering wheel buttons with no clear indication of their corresponding function.

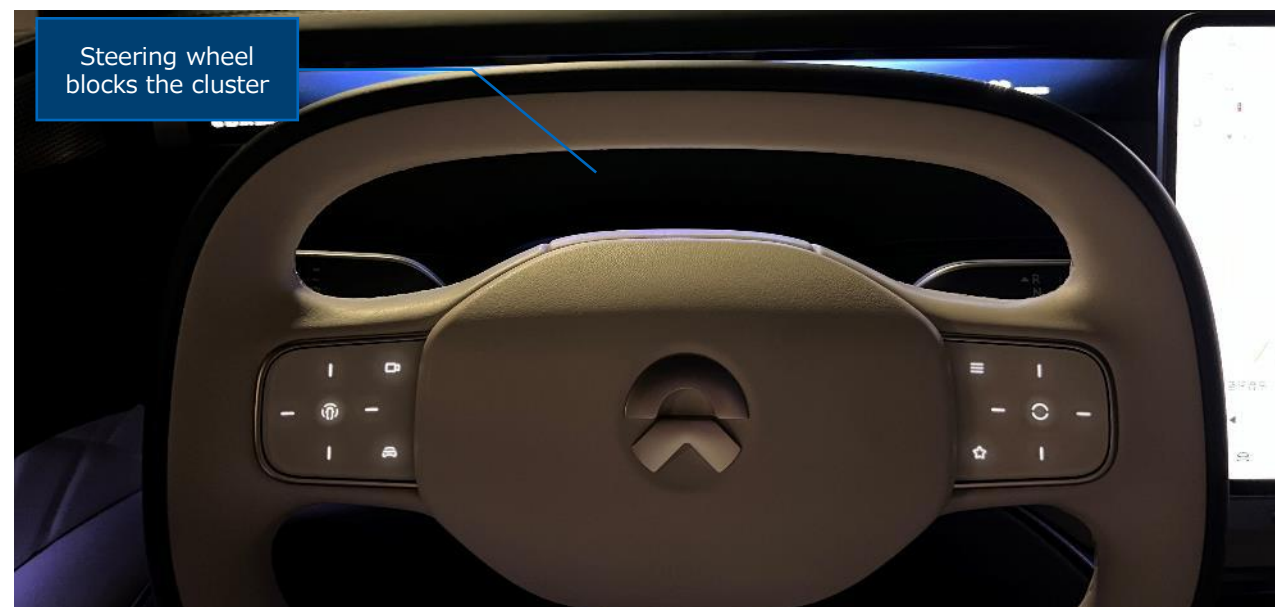
Geometric: Central display provides all core information. However, instrument cluster and passenger side display are small due to a less optimal height. The square steering wheel blocks the cluster for some drivers.

Spatial harmony: The central display is well placed for convenience of operation and overall cockpit harmony. However, the purpose of the central control panel is initially unclear since it looks like a decoration instead of actual buttons.

Branding: Meets expectations of NIO branding and design language.

Output HMI: NOMI physically moves for music, greetings and interactions, providing good interior HMI output. For exterior, NOMI also moves around when using external VPA. There's also textual display on the central display when using VPA. The AR-HUD provides detailed and clear AR effects and navigation information.

Interior lighting: System meets expectations with multiple choices of colors available. However, ambient lighting is not clear enough in daylight.



Level 2 scoring

Harmony/ alignment	Geometric	Spatial harmony	Branding	Output HMI	Interior lighting
Good -	Poor +	Fair +	Good +	Excellent -	Good -



NOMI GPT makes the VPA more intelligent

Major positive

Adds flexibility and depth to system usage

The ET9 is equipped with the latest version of NOMI GPT and supports creating customized cockpit experiences for both driver and passengers.

- NOMI GPT can be triggered automatically depending on the questions asked, e.g., "I'm tired", "I'm sad", "I want to book a service". When the question is answered, the voice prompt overlay will appear in a larger box with all the relevant answers. For some questions, the system will automatically provide follow-up questions, e.g., when the user says "I'm tired", the system will reply with a comforting response and ask if seat massage should be started. The user can directly say "Yes" to activate the seat massage.
- Besides basic Q&A, NOMI GPT also supports cabin function customization, such as ambient lighting and scenario modes. For ambient lighting, the system supports the user when they ask for a certain mode, the system will provide a related light pattern with a brief introduction. For scenario mode, a new mode can be created with one sentence, e.g., "On weekdays in the morning when I get in the car, automatically navigate to work, turn on the hotspot, set the air conditioning to 23 degrees, and then play the NIO Radio charging station information". NOMI GPT will generate the scenario and name it "Commute to Work".
- NOMI also supports multimodal interactions, such as surrounding environment detection. For example, NOMI GPT is capable of answering "what's the building ahead".

NOMI GPT brings more intelligence to the VPA by integrating multimodal interaction and scenario-based services, offering knowledge Q&A, emotional companion, and scenario mode customization for an immersive experience.





Out of date map data

Minor negatives

During testing, one location was encountered that had out-of-date map data.

- This spot was located in South Changjiang Road, Baoshan District, Shanghai. This junction was under construction with detour in place. By the time of testing, the construction had been completed, and the junction had returned to normal, however, the map still showed the detour, which caused some confusion for the driver.

This issue is more related to the map supplier than NIO itself and can be solved by a quick map data update.

Some unsupportive map data



Incorrect map data



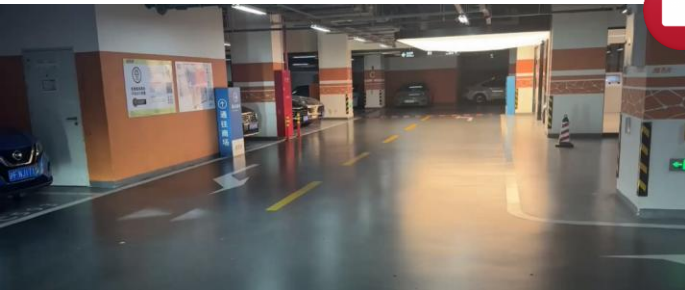
Exterior HMI: light functions for different use cases



Welcoming light when unlocking the car



Light carpet projection



Passenger give way projection

When unlocking the vehicle, a light show is displayed in front of the vehicle as a welcome greeting.

A “digital light carpet” is also provided to show the vehicle trajectory to the driver under dark conditions for extra safety.

Pedestrian give way projection is also available to use, but the driver needs to manually initiate it every time. There’s no automatic trigger for this function.

Hedonic quality – Joy and pleasantness of use

Aesthetic integration	A sense of luxury with the welcoming light	Quite good
Fun	Visually pleasing and quite playful, but not really fun	Acceptable

Pragmatic quality – Usability

Effectiveness	Emphasizes the brand	Very good
Usefulness	Light carpet is useful when driving in dark	Quite good
Visibility	Light carpet and give way is a bit unclear	Acceptable
Safety	No issues	Very good



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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.



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