TABLE OF CONTENTS

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635(22g) - 2022 Summary - In-Car HMI UX Evaluation & Benchmarking

The 2022 HMI UX Benchmarking Report Summary has been created to provide a fair, unbiased and objective view of the latest in-vehicle HMI solutions are carried out by SBD usability experts with a deep understanding of CASE domains, specifically the Connected Car and ADAS & autonomy domains.

CON

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Digital Cockpit & Infotainment Forecast

Since its introduction to consumer vehicles, the digital cockpit has relied on the correlation between technology readiness and vehicle lifecycle management, as well as the customer's own expectations and acceptance of the system. Today, more intelligent cockpit solutions are being rolled out by an increasing number of OEMs around the world, with software-focused solutions constantly improving through over-the-air updates.

As the digital cockpit continues to evolve, it is essential that OEMs, suppliers, and developers alike remain ahead of their competition to match current and future consumer needs. These needs are especially important as newer solutions work to accommodate the digital experiences familiar to users from the world of consumer electronics.

SBD Automotive's Digital Cockpit & Infotainment Forecast provides an outlook on the penetration of cockpit elements and key cockpit features, showing their fitment rate by market ten years into the future. Throughout the report, OEMs can benefit from deep analysis broken down by region, connectivity, and service type, as well as a defined methodology that utilizes top-down and bottom-up approaches.

COVERAGE

GLOBAL NA CHINA EUROPE

FREQUENCY

ANNUALLY QUARTERLY ONE-OFF

PUBLICATION FORMAT

PDF POWERPOINT EXCEL ONLINE

PAGES

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Key questions answered

- How will major OEM groups deploy cockpits in the next 10 years?
- What is the expected evolution of specific infotainment features?
- How will cockpit fitment and services vary per region?

This research supports

- Product Planners
- Engineering
- Marketing
- IT

Do I have access?

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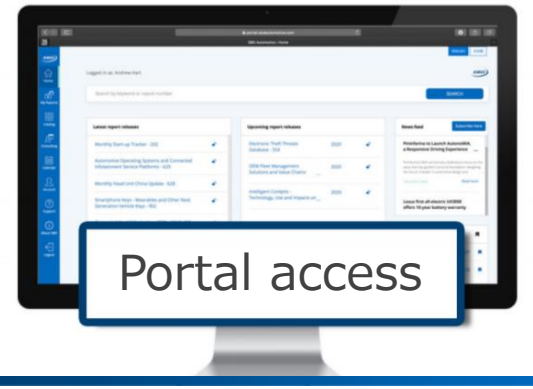
50k+
Slides of insights, forecasts & data

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



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Annual Report for 2023

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Digital Cockpit & Infotainment Forecast

Contents

644 – Digital Cockpit and Infotainment Forecast 2023

Total number of pages - 124

Introduction

Introduction

Since its introduction to consumer vehicles, the digital cockpit has relied on the correlation between technology readiness and vehicle lifecycle management, as well as the customer's own expectations and acceptance of the system. Today, more intelligent cockpit solutions are being rolled out by an increasing number of OEMs around the world, with software-focused solutions constantly improving through over-the-air updates.

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Section	Content
Executive Summary	A summary of the data provided with this report and an outline of the fundamental cockpit features that are supporting the roll out of more advance. OEMs are grouped based on their approach to new technology. In this section, OEMs are grouped based on their approach to new technology, for example, innovators, early adopters and late adopters.
Key Trends	Key trends in today's technology are highlighted and the associated barriers and drivers explained. The aim of this section is to provide an analysis of accompanying data.
Future Insights	An outline of the future cockpit features including timelines for adoption and expected barriers to deployment.
Summary Tables	This chapter provides summary tables for the head-unit types in each region. OEMs are split into their technology adoption segments: innovators, early adopters, early majority, late majority and laggards. Key OEM business strategies are outlined in this section.

Example slides from the report

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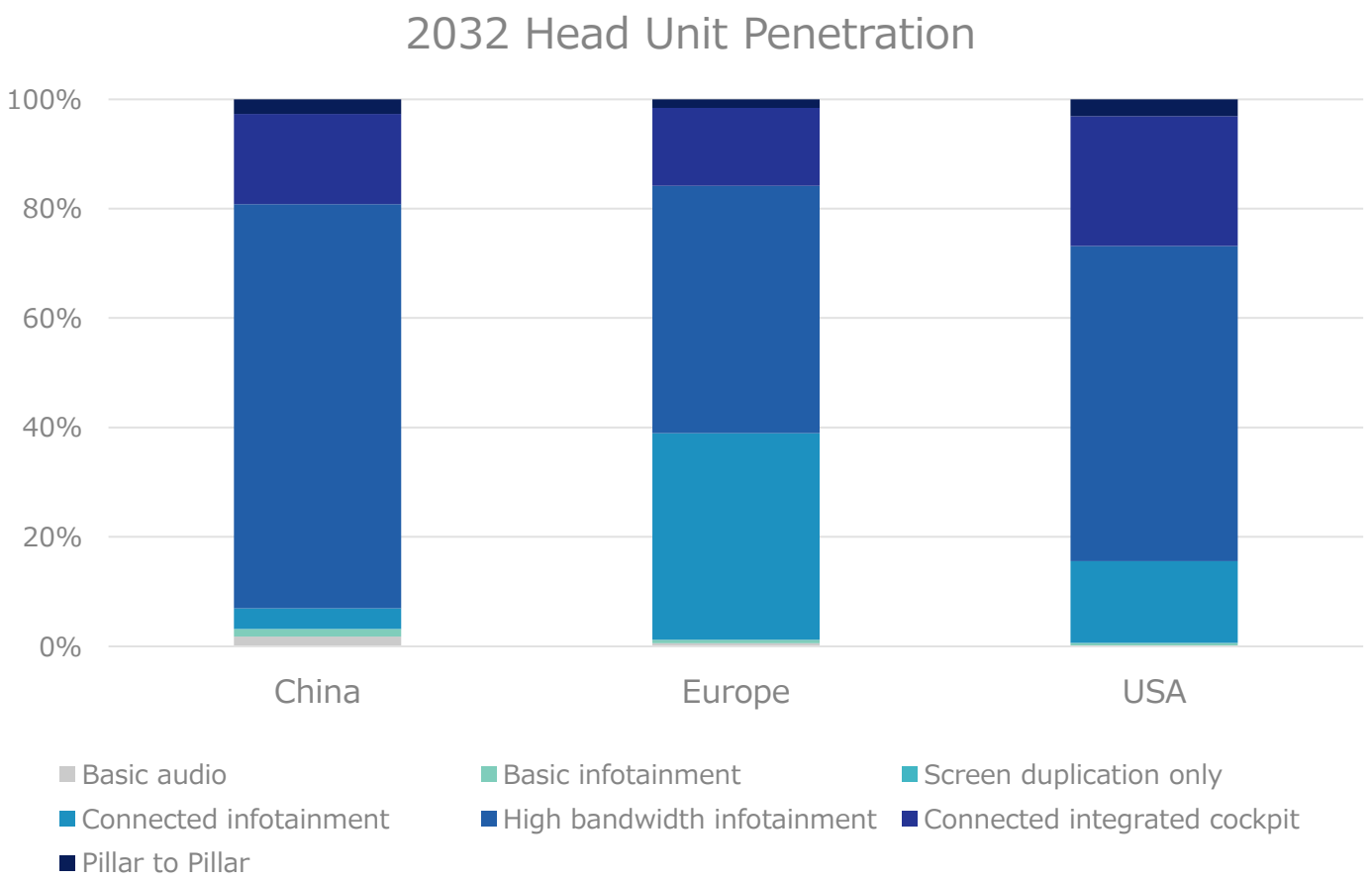
More advanced head units will enable other technologies

Background

- In this report, head unit types are shown as enablers for more advanced cockpit features. More advanced head unit types, like the connected integrated cockpit and high bandwidth infotainment can be a foundation for other features like movie streaming, navigation and virtual personal assistants.
- OEMs that are quicker to introduce more advanced head unit types will be best placed to introduce more advanced features.

Head Unit Innovators

- In each market, the leading OEMS rolling out more advanced head unit types are Mercedes-Benz, Tesla and Nio.



Highlights

- Despite increasing during the forecast, in 2032 the Pillar-to-Pillar cockpit type has a low penetration across each market.
- By 2032, high bandwidth infotainment is the most popular choice in cockpit type. It is likely that the unit available on premium OEMS will generally have more features than other models despite having a similar unit type.

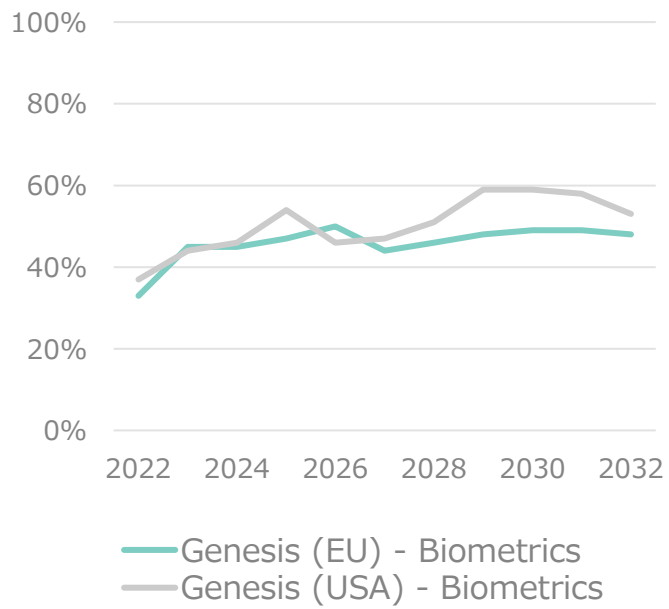
Varying Approaches to Biometrics

Biometrics are a valuable component of future intelligent systems. Facial recognition and a fingerprint reader are fitted.

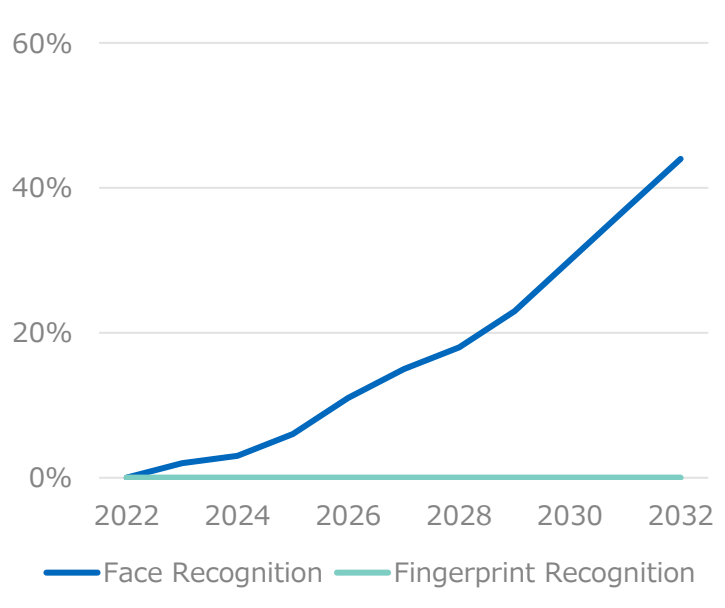
Facial recognition is the most seamless of the biometric options, so is prioritized over fingerprint recognition.

Biometrics find market penetration both for safety reasons and also to simplify the user login process. In the Chinese markets, early adopters were the Haval F7x and AIWAYS U5.

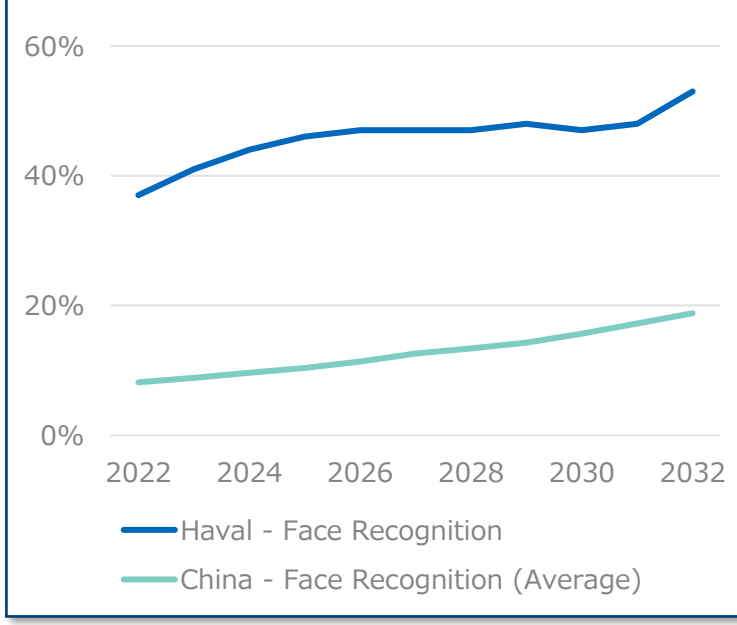
Genesis have announced the introduction of biometrics. Biometrics will be a relatively cheap way to provide valuable contextual information to inform AI and other systems.



Face recognition is a common feature across Chinese OEMs. OEMs continue to introduce it to models throughout the forecast. Fingerprint recognition is not introduced because of impracticalities.

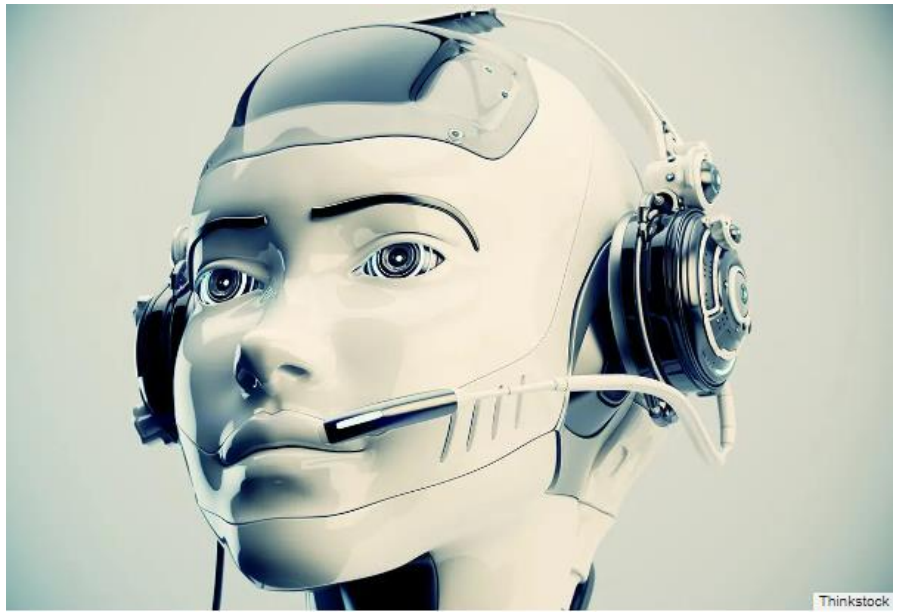


Haval was an early adopter of face recognition. They are ahead of the market average and are expected to maintain this advantage.



Artificial Intelligence

AI creates opportunities to significantly advance the digital cockpit. AI enables deeper understanding of driver and passenger needs.



VPA likely to be first in-cockpit use case

What's the benefit?

- Has the capability to make predictive and anticipatory services become significantly more accurate.
- Intent recognition of the user's needs could transform the voice interface for infotainment services.

Drivers

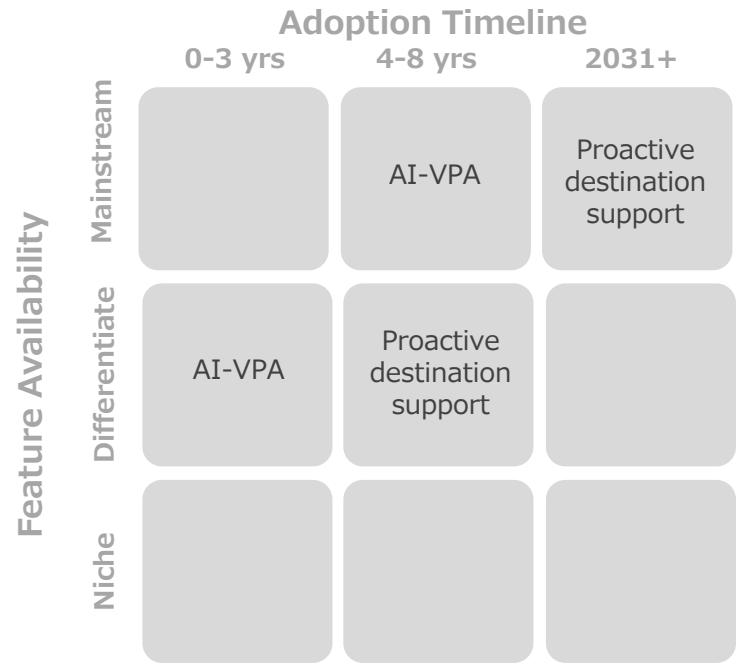
- Provide more intuitive voice control.
- Conversational VPA.
- More accurate driver state monitoring.
- Support more accurate personalization.
- Genuine productivity while driving e.g., instructing VPA to carry out complex tasks.
- Anticipatory services like EV charging recommendations and destination support can be further developed.

Barriers

- Intent misunderstandings are still possible and unpredictable.
- Privacy & confidentiality concerns.
- Bias, discrimination & ethical concerns.
- Liability worries.
- Information shared with a public GPT is essentially public, though private GPTs can be trained to mitigate this.

State of the art today

- Neural Network based language models have been designed for conversational input.
- Such models can only generate data or responses based on the set of data used to train them.
- There is a cutoff date to the 'knowledge' that the model has until it is retrained on newer date.



Health & wellbeing

Enhancing driving safety by alerting drivers of identified health concerns and providing recommended actions.

Health assistant can detect shortness of breath or heart attack

What's the benefit?

- Identify and respond to changes in occupant health status with reference to an individual's "normal" wellness readings.
- The vehicle can adapt internal and external lighting based on occupant activities.

Drivers

- Opportunities to enhance driving safety by identifying and managing medical emergencies.
- By effectively identifying and responding to these medical emergencies, the driving experience can be made safer for all individuals on the road.
- Leveraging automated systems and technologies can play a significant role in detecting and managing medical crises, thereby mitigating risks and ensuring timely assistance.

Barriers

- The system must accurately identify medical crises with a high level of confidence to avoid unnecessarily alarming the driver or occupants.
- In countries like the US, medical intervention can be costly, including expenses for ambulance services and medical treatments.
- Automated requests for medical intervention by the system may prompt the driver to consider recuperating these high costs.
- Adjusting lighting, including smart window tinting, has the potential to momentarily distract a driver or cause frustration.

State of the art today

- Hyundai Mobis has plans to launch health monitoring controller as well as Smart Cabin to add more features, such as carsickness prevention, stress management, and blocking drunk driving.
- In the future, it is also expected that the controller will be able to guide a car to an emergency room in case of emergencies, such as cardiac arrest.

Adoption Timeline

Feature Availability	0-3 yrs	4-8 yrs	2031+
Mainstream	E-Call	Health Notification	Health Alert
Differentiate	Health Notification	Health Alert	Health monitoring
Niche	Health Alert	Health monitoring	Health care assist

Innovators in North America

Brands

2022 penetration rates of each head unit type by brand	Basic Audio	Basic Infotainment	Pillar-to-Pillar	Connected Infotainment	Connected Integrated Cockpit	Screen Duplication Only	High bandwidth Infotainment
	0.0%	0.0%	1.2%	0.0%	84.4%	0.0%	14.4%
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%

2032 penetration rates for each head unit type by brand	Basic Audio	Basic Infotainment	Pillar-to-Pillar	Connected Infotainment	Connected Integrated Cockpit	Screen Duplication Only	High bandwidth Infotainment
	0.0%	0.0%	25.8%	0.0%	63.6%	0.0%	10.6%
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%

Business Strategy – Mercedes-Benz

- **Vision Statement:** To be the world's leading premium car manufacturer, shaping the future of mobility.
- Mercedes-Benz is working on a new operating system called MB.OS, which will be used in all of its future vehicles. This will improve four key areas: infotainment, automated driving, body and comfort, and powertrain systems.
- Mercedes-Benz is investing over €40 billion in battery electric vehicles between 2022 and 2030. This investment will accelerate the company's EV portfolio plan and help to bring forward the tipping point for EV adoption

What the Excel Version Contains

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Excel Database Includes

644 - Digital Cockpit and Infotainment Forecast

C A S E S

2023 - China - EU - USA | Market Penetration

Region	Element	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
China	HUD - Windscreen	5.240.589	5.442.779	5.567.915	5.959.933	6.467.513	7.177.916	7.822.804	8.741.367	9.939.990	10.871.502	11.870.877
China	HUD - Combiner	0	0	0	0	0	0	0	0	0	0	0
China	Face recognition	1.793.741	1.852.888	1.954.381	2.059.758	2.308.280	2.619.014	2.834.884	3.091.937	3.390.116	3.692.738	4.017.533
China	Biometric (Fingerprint)	42.057	50.972	55.741	126.149	161.640	209.259	279.219	377.361	491.814	621.118	753.917
China	Basic audio	380.798	399.240	391.355	388.343	380.162	374.603	363.612	350.629	349.077	347.147	341.250
China	Basic infotainment	292.745	362.521	362.591	362.396	332.850	328.167	320.919	311.268	299.186	279.208	270.774
China	Pillar to Pillar	308.698	216.557	207.639	230.888	276.816	317.738	353.327	395.579	492.336	532.279	651.282
China	Connected infotainment	896.901	797.931	755.079	641.070	652.328	668.908	675.637	693.119	675.772	638.991	596.166
China	Connected integrated cockpit	834.699	779.083	806.403	1.138.778	1.302.588	1.537.327	1.910.968	2.263.832	2.552.131	2.824.843	3.031.213
China	Screen duplication only	3.305.809	2.899.169	2.626.784	2.466.893	2.443.899	2.441.909	2.452.608	2.407.000	2.307.848	2.189.807	2.084.571
China	High bandwidth infotainment	15.097.833	14.532.169	14.206.508	13.644.661	13.945.588	14.240.894	14.270.419	14.440.159	14.382.371	14.112.523	14.019.629
China	IC - Partial	7.066.059	6.114.082	5.062.389	3.030.559	2.563.167	1.995.101	1.820.391	1.596.358	436.889	159.285	13.936
China	IC - Full digital	13.818.009	13.743.473	14.073.290	15.893.902	16.766.710	18.212.684	18.756.509	19.372.486	20.998.953	21.035.442	21.114.206
China	IC - Pillar-to-pillar	308.698	216.557	207.639	230.888	276.816	317.738	353.327	395.579	492.336	532.279	651.282
China	Navigation	15.635.355	15.710.110	15.678.986	15.751.254	16.453.769	17.244.543	17.979.299	18.803.449	19.318.225	19.546.584	19.828.023
China	Navigation Features 3D maps	16.271.321	17.897.176	17.478.620	18.098.136	18.896.670	19.710.621	20.173.242	20.605.447	21.444.217	21.296.224	21.255.819
China	Navigation Features HD - Traffic	0	0	0	0	0	0	0	0	0	0	0
China	Navigation Features Real Time Tı	17.266.268	18.750.368	18.283.027	18.678.937	19.189.947	20.037.724	20.465.221	20.884.702	21.648.154	21.469.327	21.364.440
China	Navigation Update OTA	15.744.021	17.516.752	17.170.305	17.775.659	18.579.014	19.455.775	19.946.594	20.407.914	21.409.191	21.292.868	21.341.716
China	Android Automotive GAS	0	0	1	51.587	119.463	109.138	133.941	224.078	235.434	237.932	275.094
China	Linux	0	0	0	0	0	0	0	0	0	0	0
China	QNX	0	0	0	0	0	0	0	0	0	0	0
China	Passenger-side Display	323.984	438.489	455.612	502.482	596.611	690.683	758.311	837.396	924.576	1.003.486	1.107.143
China	VPA	18.237.534	18.120.887	17.935.130	17.931.376	18.616.738	19.344.492	19.912.289	20.550.070	20.843.292	20.802.399	20.860.639
China	Voice Recognition On-board	18.088.503	19.225.256	18.694.307	18.749.857	19.443.776	20.210.661	20.600.635	21.028.187	21.708.613	21.478.844	21.364.440
Europe	HUD - Windscreen	2.143.363	2.404.624	2.831.183	3.254.657	3.506.765	3.673.290	3.780.414	3.848.806	3.895.824	3.886.552	3.893.402
Europe	HUD - Combiner	637.822	634.822	652.424	707.823	533.050	566.458	570.108	570.400	603.946	630.491	693.643
Europe	Face recognition	0	5.610	8.496	24.305	53.539	83.811	108.892	139.459	172.226	210.340	243.881

Excel Data Points:
80,000+

OEMs Covered:
85

Excel Tabs:
4

Excel Database Includes

644 - Digital Cockpit and Infotainment Forecast

C A S E S

2023 - China - EU - USA | OEM Forecast

Region	OEM	Element	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2022	2023	2024	2025	2026	2027
Europe	Suzuki	High bandwidth infotainment	0	0	0	0	0	0	0	0	0	0	0	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Europe	Suzuki	IC - Partial	50.694	54.165	57.015	52.626	46.501	1.586	0	0	0	0	0	36,7%	31,0%	29,8%	29,4%	28,9%	1,1%
Europe	Suzuki	IC - Full digital	3.611	45.778	58.805	63.989	64.994	104.899	71.663	57.539	40.289	30.642	24.429	2,6%	26,2%	30,7%	35,7%	40,4%	74,3%
Europe	Suzuki	IC - Pillar-to-pillar	0	0	0	0	0	0	0	0	0	0	0	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Europe	Suzuki	Navigation	6.144	39.105	48.031	49.651	46.994	83.628	47.073	42.817	38.739	30.642	24.429	4,4%	22,4%	25,1%	27,7%	29,2%	59,3%
Europe	Suzuki	Navigation Features 3D maps	0	39.105	48.031	49.651	46.994	83.628	47.073	42.817	38.739	30.642	24.429	0,0%	22,4%	25,1%	27,7%	29,2%	59,3%
Europe	Suzuki	Navigation Features HD - Traffic	0	0	0	0	0	0	0	0	0	0	0	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Europe	Suzuki	Navigation Features Real Time Traffic	6.144	39.105	48.031	49.651	46.994	83.628	47.073	42.817	38.739	30.642	24.429	4,4%	22,4%	25,1%	27,7%	29,2%	59,3%
Europe	Suzuki	Navigation Update OTA	0	39.105	48.031	49.651	46.994	83.628	47.073	42.817	38.739	30.642	24.429	0,0%	22,4%	25,1%	27,7%	29,2%	59,3%
Europe	Suzuki	Android Automotive GAS	0	0	0	0	0	0	0	0	0	0	0	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Europe	Suzuki	Linux	0	0	0	0	0	0	0	0	0	0	0	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Europe	Suzuki	QNX	0	0	0	0	0	0	0	0	0	0	0	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Europe	Suzuki	Passenger-side Display	0	0	0	0	0	0	0	0	0	0	0	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Europe	Suzuki	VPA	118.906	165.486	182.948	173.531	156.458	137.814	96.364	65.557	40.833	30.642	24.429	86,0%	94,8%	95,5%	96,8%	97,3%	97,7%
Europe	Suzuki	Voice Recognition On-board	118.906	155.413	174.171	167.468	153.059	135.802	88.316	53.828	28.655	19.433	14.389	86,0%	89,0%	90,9%	93,4%	95,2%	96,2%
Europe	Tesla	HUD - Windscreen	0	0	0	0	0	0	0	0	0	0	0	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Europe	Tesla	HUD - Combiner	0	0	0	0	0	0	0	0	0	0	0	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Europe	Tesla	Face recognition	0	0	0	0	0	0	0	0	0	0	0	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Europe	Tesla	Biometric (Fingerprint)	0	0	0	0	0	0	0	0	0	0	0	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Europe	Tesla	Basic audio	0	0	0	0	0	0	0	0	0	0	0	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Europe	Tesla	Basic infotainment	0	0	0	0	0	0	0	0	0	0	0	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Europe	Tesla	Pillar to Pillar	0	0	0	0	0	0	0	0	0	0	0	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Europe	Tesla	Connected infotainment	0	0	0	0	0	0	0	0	0	0	0	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Europe	Tesla	Connected integrated cockpit	91.186	108.497	115.301	110.073	101.344	99.223	96.354	93.784	93.933	91.293	88.728	39,3%	36,7%	34,0%	31,7%	30,3%	30,1%
Europe	Tesla	Screen duplication only	0	0	0	0	0	0	0	0	0	0	0	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%

Excel Data Points:
80,000+

OEMs Covered:
85

Excel Tabs:
4

Excel Database Includes

OEM Group	Biometric system	Navigation system	Voice system	Operating System	Intelligent Cockpit	Autonomous Cockpit	Others	Future Trends News	Links
								available on existing Alfa Romeo models.	
Stellantis							✓	Peugeot's Inception Concept EV at CES shows a cutting-edge car model that abandons traditional dashboards, unleashing unobstructed road views and elevating the onboard experience. SBD does not expect any features of the concept to be fitted to productin vehicles within the forecast period.	Peugeot
Stellantis								Peugeot E-3008 SUV is the first model to come with the New PEUGEOT panoramic i-COCKPIT® design that houses a 21" HD panel combining the instrument cluster, Head Up Display and central touchscreen. Voice commads are also available. SBD exepects the head up display and voice commands to appear on other Peugeot vehicles within the forecast period. The panaromic dispaly will be offered more widely towards the end, or after, the forecast.	Stellantis
Stellantis								Holographic head-up display startup Envisics gets $50M from Hyundai Mobis, Stellantis and others. This shows strong interest in windscreen and augmented reality head up displays. SBD exepcts this trend to spread across the industry.	Stellantis
Volkswagen Group	✓							VW have announced the ID.Life model with a games console and a projector screen. Both are integrated into the infotainment system. The ID.Life also uses face recognition.	VW
Volkswagen Group							✓	Audi is embracing electromobility by launching only electric models globally from 2026 and phasing out combustion models by 2033	Audi
Volkswagen Group								Cupra teased a high-bandwidth digital cockpit in its 2024 Tavascan EV SUV along with an 12.3" instrument cluster which is in-line with current Cupra models	Cupra

Excel Data Points:
80,000+

OEMs Covered:
85

Excel Tabs:
4

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