China Insights Consultancy

Industry Report of the Passenger Vehicle Intelligence Industry

- With focuses on smart cockpit solution industry and intelligent vehicle connectivity industry

PATEO

September 2025

CIC Introduction, Methodologies and Assumptions

China Insights Consultancy is commissioned to conduct the research and analysis of, and to produce an industry report of the passenger vehicle intelligence industry. The report commissioned has been prepared by China Insights Consultancy independent of the influence of the Company or any other interested party.

China Insights Consultancy is an investment consulting company originally established in Hong Kong. Its services include industry consulting services, commercial due diligence, strategic consulting, and so on. Its consultant team has been tracking the latest market trends in catering services, agriculture, chemicals, consumer goods, marketing and advertising, culture and entertainment, energy and industry, finance and service, healthcare, TMT, transportation, etc., and has the most relevant and insightful market intelligence in the above industries.

China Insights Consultancy undertook both primary and secondary research using various resources. Primary research involved interviewing key industry experts and leading industry participants. While secondary research involved analysing data from various publicly available data sources, including the National Bureau of Statistics of China, company annual reports, independent research reports, and China Insights Consultancy's own internal database, etc. The information and data collected by China Insights Consultancy have been analyzed, assessed, and validated using China Insights Consultancy's in-house analysis models and techniques.

The market projections in the commissioned report are based on the following key assumptions: (i) the overall social, economic, and political environment in China is expected to remain stable during the forecast period; (ii) China's economic and industrial development is likely to maintain a steady growth trajectory during the forecast period, accompanied by continuing urbanization; (iii) there is no extreme force majeure or unforeseen industry regulations in which the market may be affected in either a dramatic or fundamental way. China Insights Consultancy believes that the assumptions used in preparing the report including those used to make future projections, are factual, correct, and not misleading. The reliability of the report may be affected by the accuracy of the foregoing assumption and factors as well as the choice of primary and secondary sources.

All statistics are reliable and based on information available as of the date of this report. Other sources of information, including those from governments, industry associations, or marketplace participants, may have provided some of the information on which the analysis or its data is based. All information about the Company is sourced from the Company's own audited reports or management interviews. China Insights Consultancy is not responsible for verifying the information obtained from the Company.

Terms and Abbreviations (1/2)

Terms:

- **Automotive E/E architecture:** refers to the electrical and electronic systems and components in a vehicle. It encompasses the network of wires, connectors, control units, sensors, actuators, and other electronic devices that enable communication and control of various functions in the vehicle. 汽车电子电气架构
- **Compound Annual Growth Rate (CAGR):**refers to the year-over-year growth rate which is calculated by taking the root of the total percentage growth rate over a specified period of time. The formula for calculating CAGR is: (ending value / beginning value)^(1/number of years)-1.年均复合增长率
- **Domain controller:** a high-performance and highly reliable automotive control system that integrates various sensors and controllers to centrally manage the electronic control units, enabling intelligent control and management of the entire vehicle. 域控制器
- **Comprehensive R&D capabilities:** refers to a company that does not rely on external procurement, but develops technologies and produce crucial components including software, algorithms, and hardware in-house, and is capable of providing integrated solutions and flexible delivery methods. 全栈自研能力
- **HD map:** refers to a highly detailed and accurate digital map that provides precise information about road geometry, lane markings, traffic signs, and other relevant features of the road network specifically designed to support ADAS and autonomous vehicles. 高精地图
- **Mass production:** refers to the manufacturing of large quantities of standardized products, often using assembly lines or automation technology. 量产
- **NEV:** New energy vehicles refer to the use of new power systems, completely or mainly relying on new energy-driven vehicles, including pure electric vehicles, plug-in hybrid vehicles and fuel cell vehicles etc. 新能源汽车
- **Original Equipment Manufacturer (OEM):** In the automotive industry, original equipment manufacturer refers to the company that is engaged in the R&D, manufacturing and sales of vehicles.整车厂
- **Passenger Vehicles:** vehicles are intended for personal use and typically have seating capacity for up to nine individuals, including the driver. 乘用车

Terms and Abbreviations (2/2)

Abbreviations:

- **ADAS**: Advanced Driver Assistance System 高级辅助驾驶
- **B-call:** Breakdown Call 道路救援呼叫
- **CAGR:** Compound Annual Growth Rate 复合年均增长率
- **CPCA:** China Passenger Car Association 中国乘用车市场信息联席会
- **DCU:** Domain Controller Unit 域控制器单元
- **DMS:** Driver Monitoring System 驾驶员监测系统
- **DVR:** Digital Video Recorder 硬盘录像机
- **E-call:** Emergency Call 紧急救援呼叫
- **ECU:** Electronic Control Unit 电子控制单元
- **E/E architecture:** Electrical/Electronic Architecture 电子电气架构
- **HMI:** Human-machine Interaction 人机交互
- **HUD：** Head-Up-Display 抬头显示
- **ICE:** Internal Combustion Engine 内燃机汽车
- **IMS:** In-cabin Monitoring System 舱内监测系统
- **IoT:** Internet of Things 物联网
- **IVI:** In-Vehicle Infotainment 车载信息娱乐系统
- **LCD:** Liquid-crystal Display 液晶显示器
- **MSRP:** Manufacturer Suggested Retail Price 厂商建议零售价
- **NEV:** New Energy Vehicle 新能源汽车
- **OEM:** Original Equipment Manufacturer 汽车主机厂
- **OMS:** Occupancy Monitoring System 乘客监测系统
- **OS:** Operating system 操作系统
- **OTA:** Over-the-air 远程无线升级
- **PCB:** Printed circuit board 印制电路板
- **PV:** Passenger Vehicle 乘用车
- **RVC：** Rear View Camera Display System 后视影像显示系统
- **R&D:** Research and Development 研究与开发
- **SOA:** Service-Oriented Architecture 面向服务的架构
- **SoC:** System on Chip 系统级芯片
- **TSP:** Telematics Service Provider 汽车远程服务提供商
- **T-BOX:** Telematics-BOX 车联网控制单元
- **V2I:** Vehicle to Infrastructure 车辆与基础设施
- **V2P:** Vehicle to Pedestrian 车辆与行人
- **V2V:** Vehicle to Vehicle 车辆与车辆
- **V2X:** Vehicle to Everything 车联万物

Table of Content

1. Overview and Trend of Global and China's Passenger Vehicle Market

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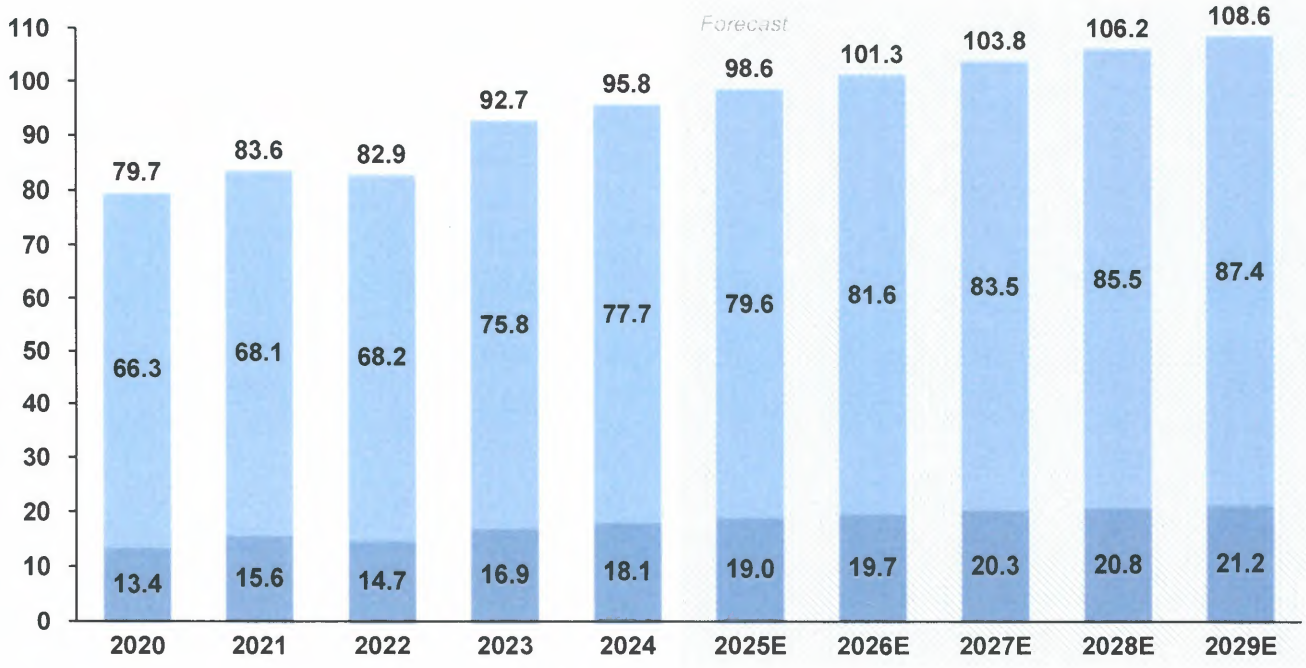
Global Sales Volume of Automobiles by Vehicle Type

- The global automobile market has exhibited a generally stable growth in the recent years. In 2024, the global sales volume of automobiles reached 95.8 million units, and is projected to reach 108.6 million in 2029 with a CAGR of 2.5%.

Global sales volume of automobiles, by vehicle type, 2020-2029E

Unit: Million

	CAGR	
	2020-2024	2024-2029E
Global automobiles	**4.7%**	**2.5%**
Passenger Vehicle	4.1%	2.4%
Commercial Vehicle	7.8%	3.2%



Sales volume of global PVs as % of the global automobile market

Key analysis

- The global automobile market has exhibited a generally stable growth in the recent years. In 2024, the global sales volume of automobiles reached 95.8 million units. Automobiles are classified into two main categories based on their intended use and design: passenger vehicles and commercial vehicles. Passenger vehicles are designed and manufactured primarily for transporting people rather than goods, and constitute a much larger market than commercial vehicles globally. The global sales volume of passenger vehicles and commercial vehicles reached 77.7 million units and 18.1 million units in 2024, accounting for 81.1% and 18.9% of the global automobile market in 2024, respectively.
- As the global economy rebounds, the purchasing power of consumers continues to strengthen, and industries such as logistics and freights are also experiencing sustained recovery and prosperity. The global sales volume of passenger vehicles and commercial vehicles is expected to increase to 87.4 million units and 21.2 million units, respectively, in 2029, leading the global sales volume of automobiles to reach 108.6 million units in 2029, with a CAGR of 2.5% from 2024 to 2029.

Source: OICA, CPCA, China Insights Consultancy

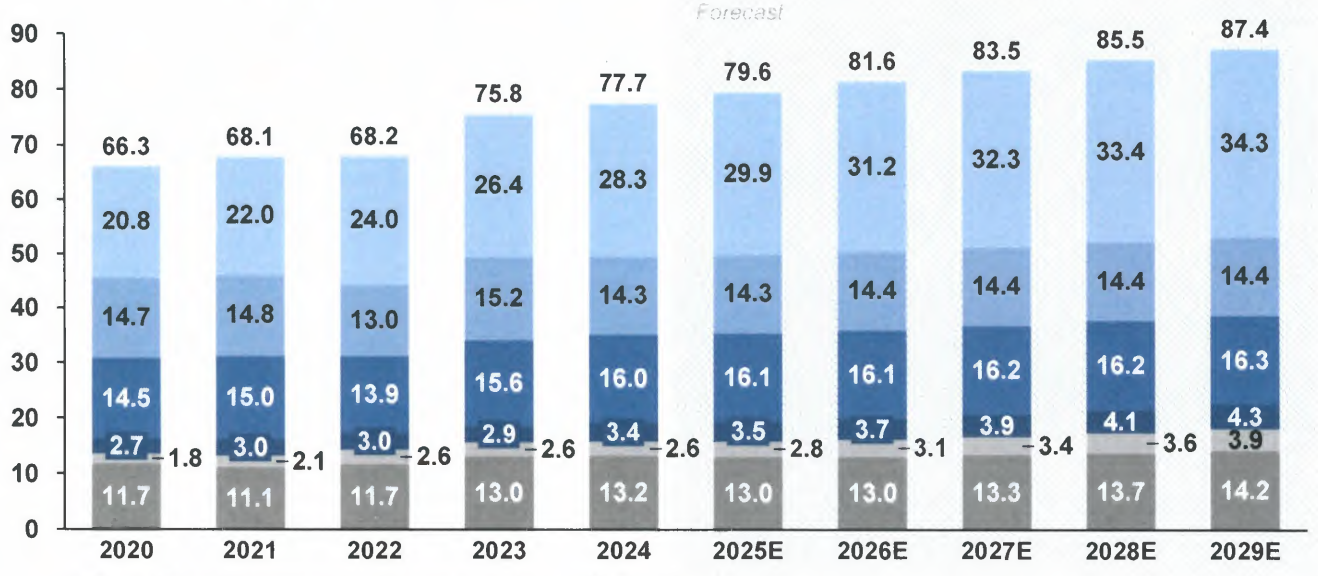
Global Sales Volume of Passenger Vehicle Market by Region

- In 2024, global sales volume of passenger vehicle has reached 77.7 million units. From 2024 to 2029, it is anticipated that the global sales volume of passenger vehicle will recover and reach 87.4 million units in 2029, at a CAGR of 2.4% between 2024 and 2029.

Sales volume of passenger vehicle, by region, Global, 2020-2029E

Unit: Million

	CAGR	
	2020-2024	2024-2029E
Total	**4.1%**	**2.4%**
China	8.0%	3.9%
Europe	-0.8%	0.2%
US	2.4%	0.4%
South America	5.4%	4.9%
Southeast Asia	9.5%	8.8%
Rest of the World	3.0%	1.5%



* Rest of the World includes North America excluding the US, Africa, Asia excluding China and Southeast Asia, etc.

Sales volume of PVs in China as % of the global PV market

31.3% → 36.4% → 39.3%

Key analysis

- Passenger vehicle market has gradually recovered as global economy rebounds since 2023. In 2024, global sales volume of passenger vehicles has reached 77.7 million. From 2024 to 2029, it is anticipated that the global sales volume of passenger vehicles will recover, mainly driven by the increasing demand of New energy vehicles (NEV) in European countries, Southeast Asia, etc. The total sales volume of passenger vehicles is expected to reach 87.4 million units in 2029, at a CAGR of 2.4% between 2024 and 2029.
- China has the world's largest passenger vehicle market with a sales volume increasing from 20.8 million units in 2020 to 28.3 million units in 2024, accounting for 36.4% of the global total sales volume in 2024. Driven by the continuous implementation of favorable policies for stabilizing vehicle consumption and promoting vehicle upgrades, as well as the growing acceptance of new energy vehicles in the market, the sales volume of passenger vehicles in China is expected to further grow to 34.3 million units in 2029.

Source: OICA, CPCA, China Insights Consultancy

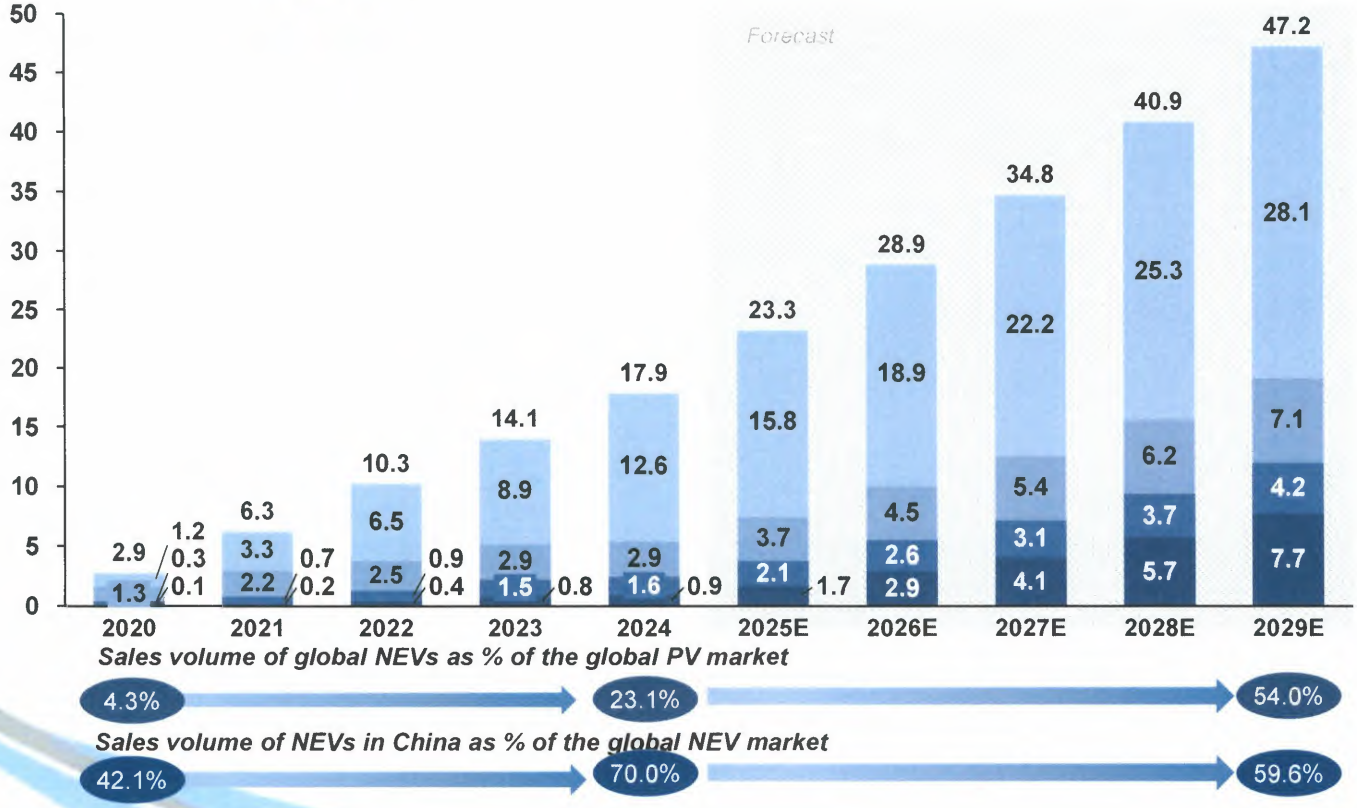
Global Sales Volume of NEV Market by Region

- Between 2020 and 2024, the sales volume of NEVs in China, Europe, the US, and the rest of the world grew at CAGRs of 79.8%, 23.0%, 48.6%, and 96.3%, respectively. Among major regions with a significant volume of NEV sales, China is the largest NEV market, with its sales volume of NEVs reaching 12.6 million units in 2024.

Sales volume of NEV, by region, Global, 2020-2029E

Unit: Million

	CAGR	
	2020-2024	2024-2029E
Total	**58.4%**	**21.4%**
China	79.8%	17.5%
Europe	23.0%	19.6%
US	48.6%	21.8%
Rest of the World	96.3%	53.4%



Key analysis

- Driven by continuous efforts made by government worldwide to promote electrified mobility, new energy vehicles, as ideal substitutes for ICEs, have gained wider popularity throughout the world. Between 2020 and 2024, the sales volume of NEVs in China, Europe, the US, and the rest of the world grew at CAGRs of 79.8%, 23.0%, 48.6%, and 96.3%,, respectively. Between 2024 and 2029, sales volume of NEVs in China, Europe, the US and the rest of the world are expected to expand at a CAGR of 17.5%, 19.6%, 21.8%, and 53.4%, respectively. This is attributed to wider acceptance of NEVs by consumers in major regions, increasing availability of NEVs resulting from a growing number of NEV models being developed by major automobile manufacturers worldwide and the development of battery technology and the increasing accessibility of charging facilities for NEVs.
- China was the world's largest NEV market and the world's largest manufacturing country of NEVs, with a sales volume of 12.6 million in 2024, accounting for 70.0% of the global passenger vehicle market.
- The proportion of sales volume of NEVs in global PV market grew from 4.3% in 2020 to 23.1% in 2024. It is expected to reach 54.0% in 2029.

Source: OICA, CPCA, China Insights Consultancy

Sales Volume of Automobiles in China by Vehicle Type

- China stands as the world's largest automobile market as measured by sales volume. The sales volume of automobiles in China increased to 32.2 million units in 2024, with passenger vehicle sales at 28.3 million units and commercial vehicle sales at 3.9 million units.

Sales volume of automobiles in China, by vehicle type, 2020-2029E

Unit: Million

	CAGR	
	2020-2024	2024-2029E
China's automobiles	**5.6%**	**3.7%**
Passenger vehicle	8.0%	3.9%
Commercial vehicle	-6.8%	2.2%

Sales volume of PVs in China as % of the China's automobile market

80.2% → 88.0% → 88.8%

Key analysis

- China stands as the largest market of automobiles globally, giving rise to the world's foremost automotive intelligence solutions market. The sales volume of automobiles in China reached 32.2 million units in 2024, accounting for 33.6% of the global sales volume of automobiles, and is expected to reach 38.6 million units in 2029.
- Passenger vehicle market and commercial vehicle market in China have gradually recovered as the economy rebounds, with the sales volume reaching 28.3 million units and 3.9 million units in 2024, accounting for 88.0% and 12.0% of the China's automobile market in 2024, respectively. Due to the continuous implementation of favourable policies for stabilizing vehicle consumption and promoting vehicle upgrades, as well as the increasing acceptance of new energy vehicles in the market, the sales volume of passenger vehicle in China is projected to rise to 34.3 million units in 2029 representing a CAGR of 3.9% from 2024 to 2029, while the sales volume of commercial vehicle in China is anticipated to grow to 4.3 million units in 2029, showing a CAGR of 2.2% from 2024 to 2029.

Source: OICA, CPCA, China Insights Consultancy

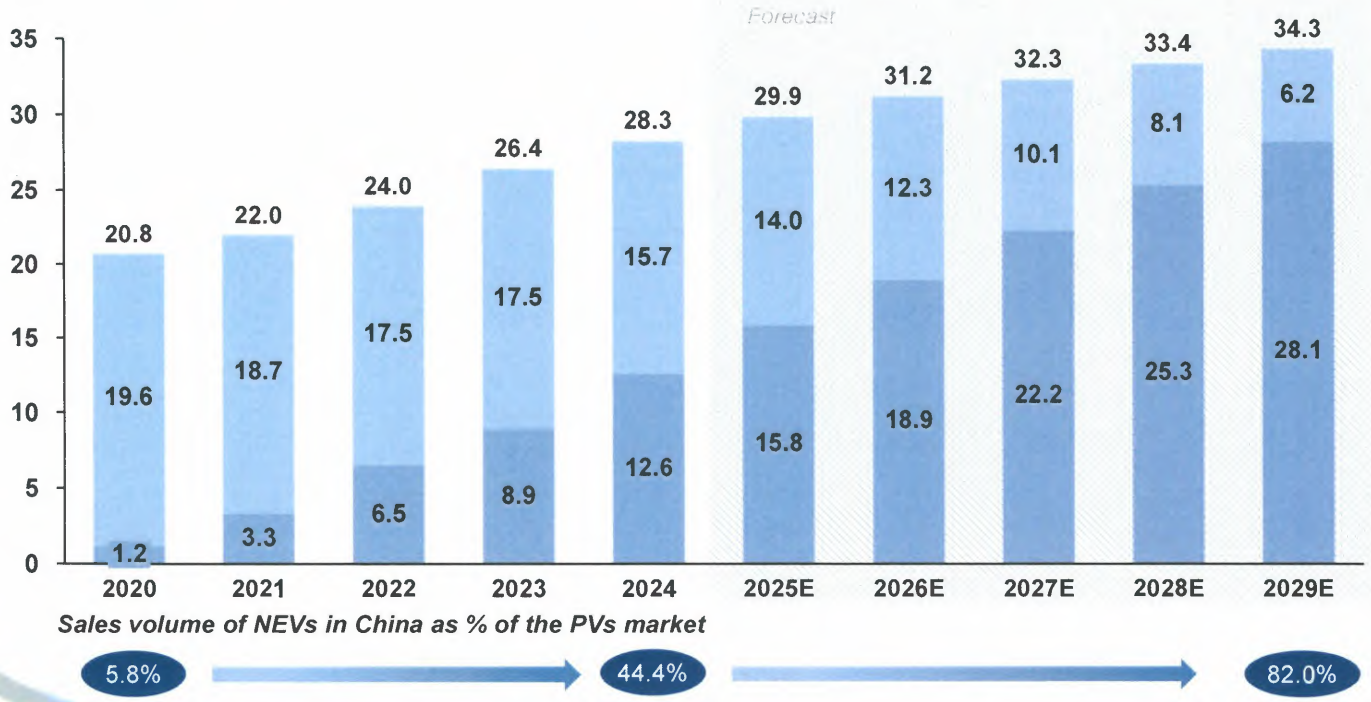
Sales Volume of Passenger Vehicle Market in China by Energy Type

- China was the world's largest passenger vehicle market with a sales volume of 28.3 million in 2024, and the sales volume is expected to reach 34.3 million in 2029. The penetration rate of NEVs has grown from 5.8% in 2020 to 44.4% in 2024 and is expected to be 82.0% in 2029.

Sales volume of passenger vehicle, by energy type, China, 2020-2029E

Unit: Million

	CAGR	
	2020-2024	2024-2029E
Total	**8.0%**	**3.9%**
ICE	-5.3%	-17.1%
NEV	79.8%	17.5%



Note: ICE refers to internal combustion engine and hybrid electric vehicle. NEV refers to new energy vehicle.

Key analysis

- The automotive industry is an important pillar of the Chinese economy. China was the world's largest passenger vehicle market with a sales volume of 28.3 million in 2024, and the sales volume is expected to reach 34.3 million in 2029 at a CAGR of 3.9% from 2024 to 2029.
- From 2020 to 2024, the sales volume of NEVs in China increased from 1.2 million units in 2020 to 12.6 million units in 2024, at a CAGR of 79.8% during the period.
- From 2024 to 2029, the sales volume of NEVs in China is expected to further increase to 28.1 million units in 2029, growing at a CAGR of 17.5% from 2024 to 2029, which is expected to be much higher than other segments.
- The proportion of sales volume of NEVs in China's PV market grew from 5.8% in 2019 to 44.4% in 2024. It is expected to reach 82.0% in 2029.

Source: CPCA, China Insights Consultancy

Definition and Classification of Original Equipment Manufacturers (OEMs) in China

- OEMs in China can be divided into three types, Chinese domestic OEMs, joint venture OEMs and foreign OEMs. Due to high degree of localization, Chinese domestic OEMs are better equipped to satisfy the demands of domestic customers.

Definition and classification of OEMs in China

Classification	Definition	Characteristic	Major player
Chinese domestic OEMs	• Chinese domestic OEM refers to an automobile brand that is fully owned and controlled by a Chinese local enterprise, with products sold in both domestic and international markets.	• They typically have **more flexible market strategies**, allowing them to adapt to market changes more quickly. • Due to their **high degree of localization**, they are better equipped to satisfy the demands of domestic customers.	BYD, 吉利汽车 GEELY AUTO, 长安汽车, CHERY 奇瑞汽车, 长城汽车 Great Wall, 上汽通用五菱 BAOJUN
Joint venture OEMs	• Joint venture OEM refers to an automobile brand established by a partnership between domestic and foreign companies, with both parties making mutual investments and operating the business together.	• They typically benefit from the **technology and management expertise** of their foreign partners while enjoying **high recognition and reputation in China**. • Due to the usually higher financial and technical support of joint ventures, they have certain advantages in product quality, technological level, and service experience.	一汽-大众 FAW-VOLKSWAGEN, 上汽大众 SAIC VOLKSWAGEN, TOYOTA, 上海通用汽车 SHANGHAI GM, 一汽丰田, 东风日产
Foreign OEMs	• Foreign OEM refers to an automobile manufacturer from abroad that mainly sell its products through imports.	• They typically possess advanced technology and management expertise, providing **high guarantees for product quality, safety, and reliability**. • Due to their **relatively low localization in China**, they may face certain challenges in adapting to local consumer demands.	TESLA, TOYOTA, BMW, Mercedes-Benz, VOLVO, PORSCHE

Source: China Insights Consultancy

Definition and Classification of Passenger Vehicle Brand in China by Manufacturer Suggested Retail Price (MSRP)

- Passenger vehicle brand in China can be divided into three types, mass-market brand, premium brand and luxury brand.

Definition and classification of passenger vehicle brand in China by MSRP

Classification	Definition	Major player
 **Mass-market brand**	• Mass-market brand refers to passenger vehicle brand whose models with different configurations are generally sold at an average MSRP below RMB250,000 in China.	Volkswagen, TOYOTA, HONDA, NISSAN, HYUNDAI, CHEVROLET, BYD, 长安汽车 CHANGAN, 吉利汽车 GEELY AUTO, 五菱汽车, CHERY 奇瑞汽车, AION 埃安
 **Premium brand**	• Premium brand refers to passenger vehicle brand whose models with different configurations are generally sold at an average MSRP between RMB250,000 and RMB500,000 in China. • Premium brands often provide car models that come with more advanced intelligence and comfort features, compared with mass-market brands.	理想, NIO, TANK, DENZA 腾势, SERES, ZEEKR, 岚图, TESLA, Audi, LEXUS
 **Luxury brand**	• Luxury brand refers to passenger vehicle brand whose models with different configurations are generally sold at an average MSRP above RMB500,000 in China.	LOTUS, LAND ROVER

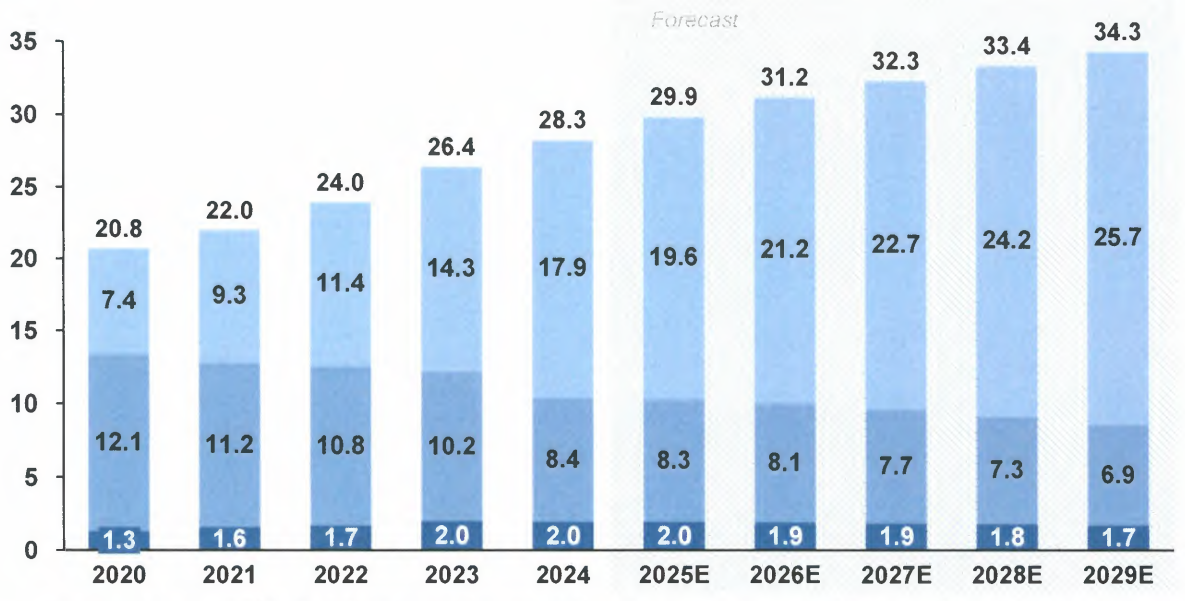
Source: China Insights Consultancy

Sales Volume of Passenger Vehicle Market in China by OEM Type

- Sales volume of passenger vehicles in China manufactured by Chinese domestic OEMs increased from 7.4 million units in 2020 to 17.9 million units in 2024, at a CAGR of 24.8% during the period. From 2024 to 2029, it is anticipated that the sales volume of passenger vehicle in China manufactured by Chinese domestic OEMs will reach 25.7 million units in 2029.

Sales volume of passenger vehicle, by OEM type, China, 2020-2029E

Unit: Million	CAGR	
	2020-2024	2024-2029E
Total	**8.0%**	**3.9%**
Chinese domestic OEMs	24.8%	7.5%
Joint venture OEMs	-8.7%	-4.0%
Foreign OEMs	11.1%	-2.7%



Sales volume of PVs in China manufactured by Chinese domestic OEMs as % of the PVs market

35.6% → 63.3% → 75.0%

Key analysis

- Sales volume of passenger vehicles in China manufactured by Chinese domestic OEMs increased from 7.4 million units in 2020 to 17.9 million units in 2024, at a CAGR of 24.8% during the period, which was the highest among all segments.
- Chinese domestic OEMs have been investing significantly in research and development (R&D) to enhance the quality and features of their vehicles, making them more appealing to domestic consumers. The customer demand for smart technology in cars is met by the flexibility of Chinese OEMs in their product development, enabling quick innovation and the ability to offer competitive products with advanced features. Moreover, the expansion of distribution networks and strategic partnerships with dealerships have enabled Chinese domestic OEMs to reach a wider customer base, further boosting their sales volume. The sales volume of passenger vehicle in China manufactured by Chinese domestic OEMs is expected to further increase to 25.7 million units in 2029, growing at a CAGR of 7.5% from 2024 to 2029.
- The proportion of sales volume of passenger vehicles in China manufactured by Chinese domestic OEMs in the PV market reached over 60% by 2024, establishing their position as the mainstream in China's passenger vehicle market. The proportion of sales volume of passenger vehicles in China manufactured by Chinese domestic OEMs in the PV market grew from 35.6% in 2020 to 63.3% in 2024. It is expected to reach 75.0% in 2029. Furthermore, Chinese automotive brands are capturing a larger market hare of high-end vehicles in addition to economy models. This shift reflects the strengthened capabilities of Chinese OEMs to meet evolving consumer preferences and the enhanced competitiveness of their offerings.

Source: CPCA, China Insights Consultancy

Top-tier Customer Coverage rate of the Company (1/3)

- The Company has yielded strong top-tier customer coverage rates, its top-tier customer coverage rate among the top 10 OEMs and the top 10 Chinese domestic OEMs, in terms of sales volume in China, are 50% and 60%, respectively.

Top 10 OEMs, by sales volume, China, 2024

Ranking	OEMs	Sales volume, 2024* (Unit: Million)
1	BYD	3.7
2	Geely	1.8
3	FAW-VK	1.6
4	Chery	1.3
5	Changan	1.3
6	SAIC VOLKSWAGEN	1.2
7	SGMW	0.9
8	GAC TOYOTA	0.8
9	FAW TOYOTA	0.7
10	Great Wall	0.7

- Top-tier customer coverage rate of the Company among the top 10 OEMs, in terms of sales volume in China, is **50%**

Top 10 Chinese domestic OEMs, by sales volume, China, 2024

Ranking	OEMs	Sales volume, 2024* (Unit: Million)
1	BYD	3.7
2	Geely	1.8
3	Chery	1.3
4	Changan	1.3
5	SGMW	0.9
6	Great Wall	0.7
7	Li Auto	0.5
8	Seres	0.4
9	HONGQI	0.4
10	GAC Aion	0.3

- Top-tier customer coverage rate of the Company among the top 10 Chinese domestic OEMs in terms of sales volume in China, is **60%**

The Company's customers

Note: Sales volume refers to retail sales volume

Source: CPCA, China Insights Consultancy

Top-tier Customer Coverage rate of the Company (2/3)

- Premium Chinese emerging PV brands are poised to lead the development trend of automotive intelligence due to their strong emphasis on comfort and sophistication. The Company has yielded strong top-tier customer coverage rates, and its customers include 40% of the top 10 premium Chinese domestic automotive brands in China.

Top 15 of premium Chinese domestic automotive brands, by sales volume in China, 2024

Ranking	Brands	Sales volume, 2024*	Emerging NEV brands
1	Li Auto	504,308	Y
2	Seres	396,781	Y
3	ZEEKR	211,314	Y
4	Nio	205,370	Y
5	Xiaomi	136,788	Y
6	Denza	106,561	N
7	Tank	102,765	N
8	iM Motors	57,336	Y
9	VOYAH	57,177	Y
10	Avatr	56,498	Y
11	LUXEED	50,717	Y
12	Jiyue	13,691	Y
13	STELATO	7,622	Y
14	Yangwang	7,341	Y
15	Formula Leopard	7,300	Y

The Company's customers

Note: Sales volume refers to retail sales volume

Key analysis

- Premium Chinese emerging PV brands are poised to lead the development trend of automotive intelligence due to their strong emphasis on enhancing user experience, particularly in fields including human-machine interaction, intelligence, etc. Viewing intelligence as a critical avenue for enhancing product competitiveness and user experience, premium Chinese emerging PV brands heavily invest in R&D of advanced intelligent driving systems, smart cockpit systems, and intelligent vehicle connectivity systems, to deliver more comfortable and convenient driving experiences.

- Customer coverage rate of the Company among the top 10 premium Chinese domestic automotive brands in terms of sales volume in China is **40%**

Source: CPCA, China Insights Consultancy

Top-tier Customer Coverage rate of the Company (3/3)

- The Company has yielded strong top-tier customer coverage rates, its top-tier customer coverage rate among the top 10 Chinese emerging NEV brands and the top 10 Chinese premium emerging NEV brands in terms of sales volume in China are 30% and 50%, respectively.

Top 10 Chinese emerging NEV brands, by sales volume, China, 2024

Ranking	Brands	Sales volume, 2024*
1	Li Auto	504,308
2	Seres	396,781
3	Aion	346,404
4	LEAPMOTOR	271,834
5	ZEEKR	211,314
6	Nio	205,370
7	XPENG	171,095
8	Xiaomi	136,788
9	Qiyuan	135,510
10	Deepal	135,244

- Top-tier customer coverage rate of the Company among the top 10 Chinese emerging NEV brands in terms of sales volume in China, is **30%**

Top 10 Chinese premium emerging NEV brands, by sales volume, China, 2024

Ranking	Brands	Sales volume, 2024*
1	Li Auto	504,308
2	Seres	396,781
3	ZEEKR	211,314
4	Nio	205,370
5	Xiaomi	136,788
6	iM Motors	57,336
7	VOYAH	57,177
8	Avatar	56,498
9	LUXEED	50,717
10	Jiyue	13,691

- Top-tier customer coverage rate of the Company among the top 10 Chinese premium emerging NEV brands in terms of sales volume in China, is **50%**

The Company's customers

Notes: Sales volume refers to retail sales volume
Emerging NEV brand refers to technology innovation brand that has emerged in recent years and only launched NEVs.

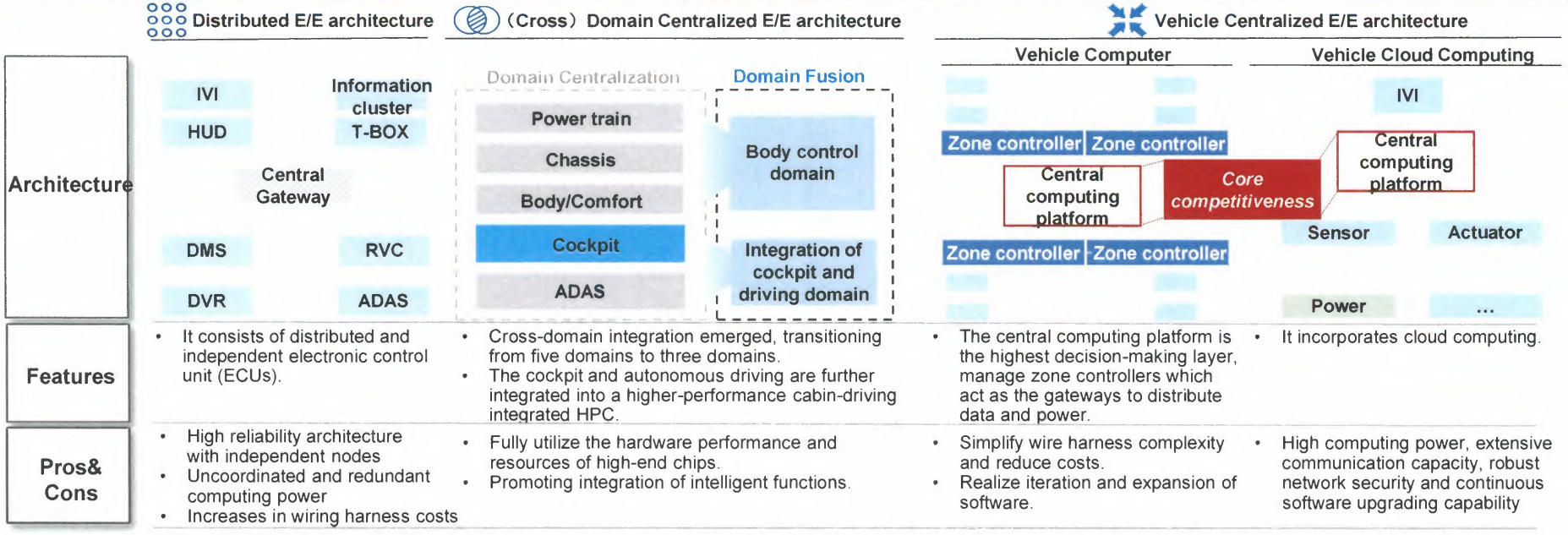
Source: CPCA, China Insights Consultancy

Trends of Global and China's Passenger Vehicle Industry (1/5)

- The future trends of the passenger vehicle market include transitioning towards centralized electrical/electronic architecture, integration of intelligent functions, growing significance of automotive intelligence, connectivity of intelligent vehicles and smart cities, accelerating development of Chinese domestic OEMs, expansion into overseas market at an accelerated pace.

1.Transitioning towards centralized electrical/electronic architecture and integration of intelligent functions

Evolution of automotive E/E architecture



Key analysis

- E/E architecture refers to the design and arrangement of electrical and electronic systems, including hardware and software, that control various functions such as active safety, infotainment, and vehicle control. As vehicles become more electrified and intelligent, the number of Electronic Control units (ECUs) increases, necessitating a more efficient, simplified, and intelligent E/E architecture. This has led to the adaption of domain-centralized E/E architecture, which consolidates ECUs preforming similar functions into specific domains.
- Typically, domain-centralized E/E architecture is divided into five functional domains: smart cockpit, intelligent driving, powertrain, chassis, and body . The smart cockpit domain, serving as the primary interface between the driver and the vehicle, is crucial for user interaction and significantly impacts the driving experience. Technological advancements and innovations in the smart cockpit domain are essential for enhancing overall vehicle intelligence.
- With the progress of high-performance computing platforms, further integration of functional domains and demands for improved security and reliability, automotive E/E architectures centralize towards a centralized computing platform which address wire harness complexity, reduce costs and realize iteration and expansion of software. The centralization achieves high computing power, extensive communication bandwidths, robust network security, and continuous software upgrading capability, all contributing to the development of automotive intelligence.

Note: ADAS refers to Advanced Driver Assistance System. DMS refers to Driver Monitoring System. DVR refers to Digital Video Recorder . HUD refers to Head-Up-Display. IVI refers to In-Vehicle Infotainment . RVC refers to Rear View Camera Display System. T-BOX refers to Telematics-BOX

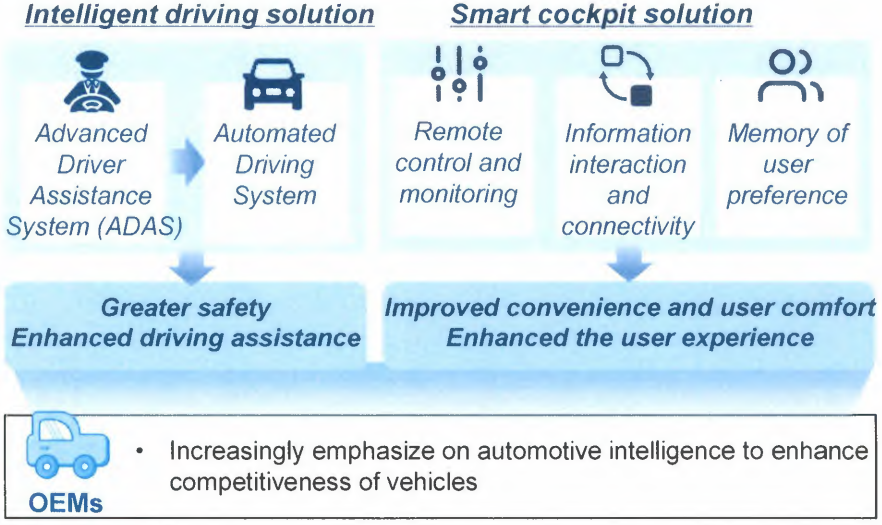
Source: China Insights Consultancy

Trends of Global and China's Passenger Vehicle Industry (2/5)

- The future trends of the passenger vehicle market include transitioning towards centralized electrical/electronic architecture, integration of intelligent functions, growing significance of automotive intelligence, connectivity of intelligent vehicles and smart cities, accelerating development of Chinese domestic OEMs, expansion into overseas market at an accelerated pace.

2. Growing significance of automotive intelligence

Function of automotive intelligence



Comparison of NEVs with ICEs in terms of automotive intelligence

Structure

- NEVs **use electric motors** instead of internal combustion engines
- **Relatively uncomplicated electrical architecture** facilitates the integration and control of intelligent systems.

Power system

- NEVs have a responsive power system which enhances the sensitivity and precision of control systems.
- Automotive intelligence can **effectively manage the motor's output**, **resulting in a consistent driving experience** while also paving the way for advanced autonomous driving functions.

Control systems

- NEVs rely on electronic control systems to manage various vehicle functions, such as battery management and motor control. **The integration of these systems provide greater control and monitoring capabilities of vehicles**, thus advancing the development of NEVs towards achieving greater intelligence for improved management.

Key analysis

- Intelligent driving solution and smart cockpit solution as significant components of automotive intelligence, have a substantial influence on the consumer's experience with smart automotive technology. The introduction of intelligent technology, such as ADAS, remote control and monitoring, information interaction, and connectivity in intelligent driving solution and smart cockpit solution enables vehicles to achieve greater safety while enhancing driving assistance and convenience for users. This improved vehicle user experience contributes to the brand's competitiveness, prompting Chinese OEMs to prioritize intelligent functionalities with significant investment.
- The rising adoption of NEVs in China also contributes to rising automotive intelligence in the country. Compared to ICEs with relatively more complex structures, NEVs have a quicker evolution towards intelligence in vehicle structure, power systems and control systems. NEVs use electric motors instead of internal combustion engines, which makes their electrical architecture relatively uncomplicated. This simplified architecture facilitates the integration and control of intelligent systems. Moreover, NEVs rely more on electronic control systems to manage various vehicle functions, the integration of these systems can offer greater control and monitoring capabilities of vehicles, thus accelerating the development of electric vehicles towards achieving greater intelligence for improved management. As a result, NEVs are poised to progress faster than ICEs towards automotive intelligence. The rising adoption of NEVs in China is expected to spur the advancement of automotive intelligence.

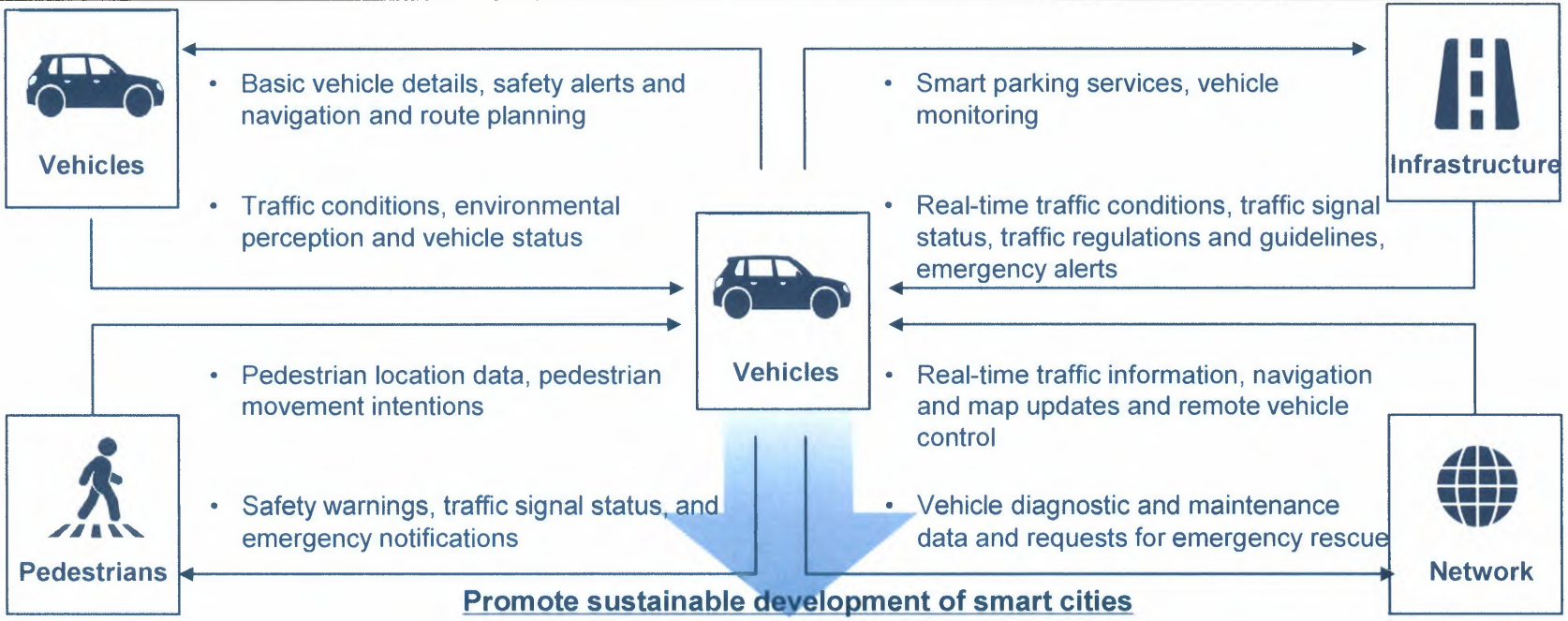
Source: China Insights Consultancy

Trends of Global and China's Passenger Vehicle Industry (3/5)

- The future trends of the passenger vehicle market include transitioning towards centralized electrical/electronic architecture, integration of intelligent functions, growing significance of automotive intelligence, connectivity of intelligent vehicles and smart cities, accelerating development of Chinese domestic OEMs, expansion into overseas market at an accelerated pace.

3. Connectivity of intelligent vehicles and smart cities

Information flow between vehicle, infrastructure and pedestrian



Key analysis

- Connectivity of intelligent vehicles and smart cities is a rapidly growing trend in the automobile industry. Through real-time information exchange between vehicles, infrastructure, and pedestrians, intelligent vehicles can better perceive the surrounding environment and improve driving safety. In particular, the connectivity of smart city infrastructure and intelligent vehicles enables the exchange of information on traffic conditions, traffic signal status, and vehicle monitoring, which allows for improved regulation, navigation, and safety functions. Meanwhile, the development of vehicle-to-vehicle and vehicle-to-pedestrian enables vehicles and pedestrians to share information about traffic conditions, vehicle status, pedestrian location, emergency notifications, which improves traffic flow, and enhance overall safety of vehicles and pedestrians. Hence, connectivity of intelligent vehicles and smart cities will propel the advancement of both vehicles and smart cities. Real-time traffic and other data in smart cities enhance the environmental perception, decision-making capabilities and energy-saving operations of vehicles, driving the development of intelligent vehicles. In addition, intelligent vehicles improve traffic management efficiency and facilitate the intelligent upgrade of urban infrastructure through deep integration with smart city systems, significantly contributing to the advancement of smart cities.

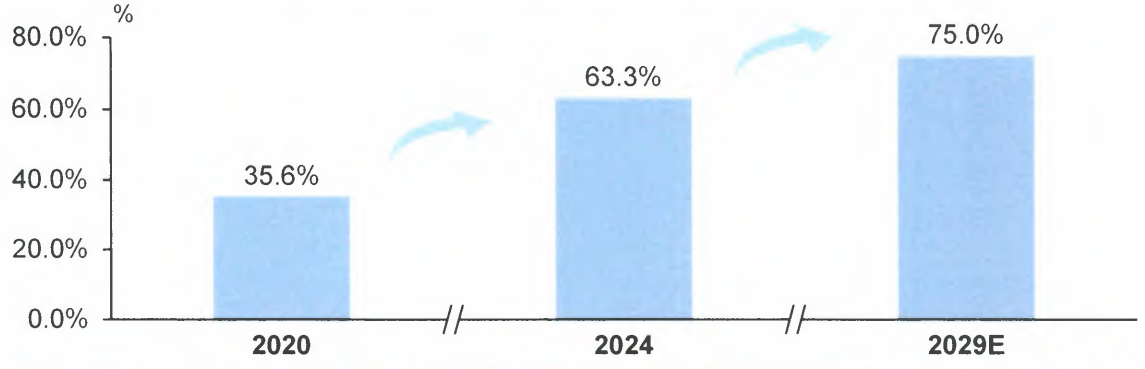
Source: China Insights Consultancy

Trends of Global and China's Passenger Vehicle Industry (4/5)

- The future trends of the passenger vehicle market include transitioning towards centralized electrical/electronic architecture, integration of intelligent functions, growing significance of automotive intelligence, connectivity of intelligent vehicles and smart cities, accelerating development of Chinese domestic OEMs, expansion into overseas market at an accelerated pace.

4. Accelerating development of Chinese domestic OEMs

Penetration rate of passenger vehicles manufactured by Chinese domestic OEMs, by sales volume of passenger vehicle, China, 2020-2029E



Competitive advantages of Chinese domestic OEMs

Continuous breakthroughs and innovations

- Focusing on independent R&D of core technologies and striving to transform from technology follower to technology leader.
- Huge investment in R&D, so as to keep key technologies in their own hands to achieve technical advantage

Capabilities of integrating value chain

- Fully utilizing the advantages of the domestic value chain, achieving optimal allocation and efficient utilization of resources through close cooperation with upstream and downstream enterprises.
- Compared with foreign investment and joint ventures, Chinese domestic OEMs can respond to market changes faster.

Excellent quality and reasonable price

- Having generally established strict quality control systems.
- Attaching great importance to consumers' feedback and continuously optimize products and services by collecting and analyzing user feedback.
- Providing consumers with more cost-effective products.

Key analysis

- In recent years, the proportion of sales volume of passenger vehicles manufactured by Chinese domestic OEMs has been increasing, which has become an important force in China's automobile market. The proportion of sales volume of passenger vehicles manufactured by Chinese domestic OEMs increased from 35.6% in 2020 to 63.3% in 2024. Due to continuous breakthroughs and innovations, capabilities of integrating value chain and excellent quality and reasonable price, Chinese domestic OEMs are poised for further expansion and heightened competitiveness within the domestic passenger vehicle market. Compared to other brands, Chinese domestic OEMs prioritize innovation through consistent investment in R&D and product promotion. This commitment allows them to broaden their product matrix and provide consumers with a wider range of choices across technology platforms and products. Meanwhile, China has developed an efficient supply chain system in the automotive industry. It support the efficient production and high-quality delivery of vehicles, allowing Chinese domestic OEMs to better serve and benefit consumers. Additionally, vehicles manufactured by Chinese domestic OEMs are cost-effective compared with traditional luxury brands, which contributes to the attractiveness of their car models for consumers. As a result, it is anticipated that Chinese domestic OEMs will continue expanding with the penetration rate of passenger vehicle manufactured by Chinese domestic OEMs in terms of sales volume of passenger vehicle in China reaching 75.0% by 2029.

Source: CPCA, China Insights Consultancy

Trends of Global and China's Passenger Vehicle Industry (5/5)

- The future trends of the passenger vehicle market include transitioning towards centralized electrical/electronic architecture, integration of intelligent functions, growing significance of automotive intelligence, connectivity of intelligent vehicles and smart cities, accelerating development of Chinese domestic OEMs, expansion into overseas market at an accelerated pace.

5. Expansion into overseas market at an accelerated pace

Competitive advantage of Chinese OEMs and upstream suppliers in global PV market

1 *Significant progress in intelligence*

- Chinese OEMs and suppliers in the upstream have made significant progress in intelligent technology.
- They offer strong intelligent configurations.

2 *Consistent innovation*

- Chinese OEMs and upstream suppliers emphasize research and development and technological innovation to continuously introduce new vehicle models.

3 *In-depth user insights*

- Chinese OEMs and upstream suppliers have gained a deeper understanding of consumer needs and preferences, which enable them to offer products that better meet the demands of their target markets.

4 *Cost management ability*

- Chinese OEMs and upstream suppliers are supported by a mature supply chain system and large-scale production capacity, enabling them to offer cost-effective products.

Evolution of joint venture model in China

Traditional joint venture model

Overseas technology + Domestic production

New joint venture model

Independent R&D + Domestic production

Volkswagen and XPeng Motors have agreed upon a framework for technical collaboration.

- Volkswagen acquired around 4.99% stake of XPeng Motors .
- XPeng Motors and Volkswagen Group will jointly develop two models of electric vehicles for sale in China under the Volkswagen brand.

STELLANTIS

Leapmotor signed a strategic cooperation agreement with Stellantis.

- Stellantis strategically invested in Leapmotor and obtain 20% equity
- They created a joint venture called Leapmotor International, focusing on export business

Key analysis

- Chinese OEMs and upstream suppliers have become highly competitive in the global passenger vehicle market by making significant progress in intelligence, consistent innovation, deep user insights and cost management. Through continuous technological research and innovation efforts, Chinese OEMs and upstream suppliers are offering advanced intelligent features, which position them at the forefront of global passenger vehicle market. Additionally, Chinese OEMs and upstream suppliers have developed cost management ability and a deeper understanding of consumer needs and preferences through extensive analysis of market research. This has enabled them to design and provide car products that more effectively meet the demands of their target markets, giving them a competitive edge in the international market. As a result, companies within the automotive value chain in China are all expanding rapidly into overseas markets.
- Due to technological advancements and expanding market opportunities, prominent Chinese OEMs are transitioning from relying on foreign technology acquisition to introducing their own products and technology to broader markets. It is anticipated that Chinese enterprises will have a substantial impact on the global automotive industry.

Source: China Insights Consultancy

2. Analysis of Global and China's Passenger Vehicle Intelligence Market

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Overview of Automotive Intelligence Solution

- The automotive intelligence solution consists of smart cockpit solution, intelligent vehicle connectivity and intelligent driving solution, and they are primary manifestations of automotive intelligence which not only enhance the driving experience but also play an important role in improving safety and convenience.

Definition of intelligent vehicle

- According to "Intelligent Vehicle Innovation and Development Strategy" (《智能汽车创新发展战略》) issued by Chinese government in February 2020, the intelligent vehicles are defined as a new generation of vehicles that are equipped with advanced sensors and other devices, use new technologies such as artificial intelligence (AI), possess intelligent driving functions, and then gradually become intelligent mobile space and application terminals.
- Compared with traditional cars, intelligent vehicles are equipped with automotive intelligence solution, which consists of smart cockpit solution, intelligent vehicle connectivity and intelligent driving solution.

Overview of automotive intelligence solution

Automotive intelligence solution

- With the continuous advancement of technology and changes in consumer demands, intelligence has become one of the crucial development trends of automotive industry. The centralized E/E architecture integrates various functional domains like smart cockpit and intelligent driving, promoting the intelligent development of vehicles to achieve increased safety, advanced driver assistance function, and a more comfortable driving experience. The smart cockpit solution, intelligent vehicle connectivity and intelligent driving solution are primary manifestations of automotive intelligence which not only enhance the driving experience but also play an important role in improving safety and convenience.

Smart cockpit solution

- Smart cockpit solutions encompass DCU (Domain Controller Unit) solution, information interaction and monitoring systems as well as other systems.
- These solutions leverage interactive displays, voice recognition, and personalized settings to create a connected and intelligent environment within the vehicle.

Intelligent vehicle connectivity

- Intelligent vehicle connectivity enable seamless connectivity between vehicles, infrastructure, and other entities, providing real-time updates, remote diagnostics, OTA (Over-the-air) updates, and predictive maintenance.
- These services optimize vehicle performance, enable advanced analytics, and facilitate continuous improvement by leveraging cloud-based computing and data management.

Intelligent driving solution

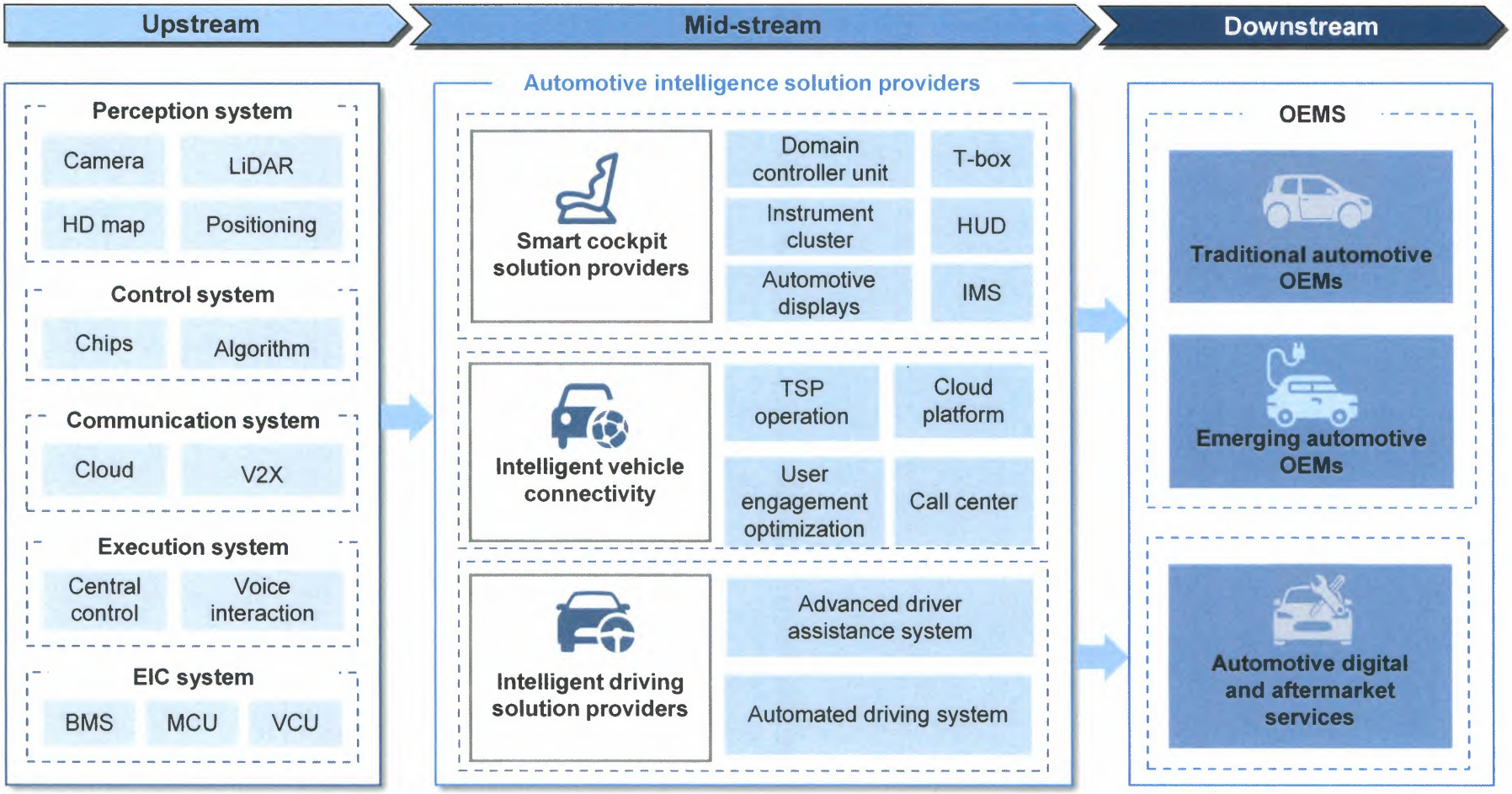
- Intelligent vehicles are equipped with ADAS that can help drivers in various ways, such as with parking, lane departure warning, adaptive cruise control, and collision avoidance.
- These systems use sensors such as cameras, radar, LiDAR, and ultrasonic sensors to detect the vehicle's surroundings and provide real-time feedback to the driver or even take autonomous actions.

Source: China Insights Consultancy

Value Chain of Automotive Intelligence Solution Industry

- The value chain of automotive intelligence solution industry includes key systems in the upstream, automotive intelligence solution providers in the mid-stream, and automotive OEMs and participants of automotive digital and aftermarket services in the downstream.

Value chain of China's automotive intelligence solution industry



- The value chain of automotive intelligence solution represents an upgrade and extension of the traditional automotive industry chain. The upstream includes key systems such as the software and hardware of perception, control, communication and execution systems, as well as EIC systems. The midstream primarily consists of automotive intelligence solution providers offering smart cockpit solution, intelligent vehicle connectivity and intelligent driving solution. The downstream is mainly composed of automotive OEMs and automotive digital and aftermarket services.

Source: China Insights Consultancy

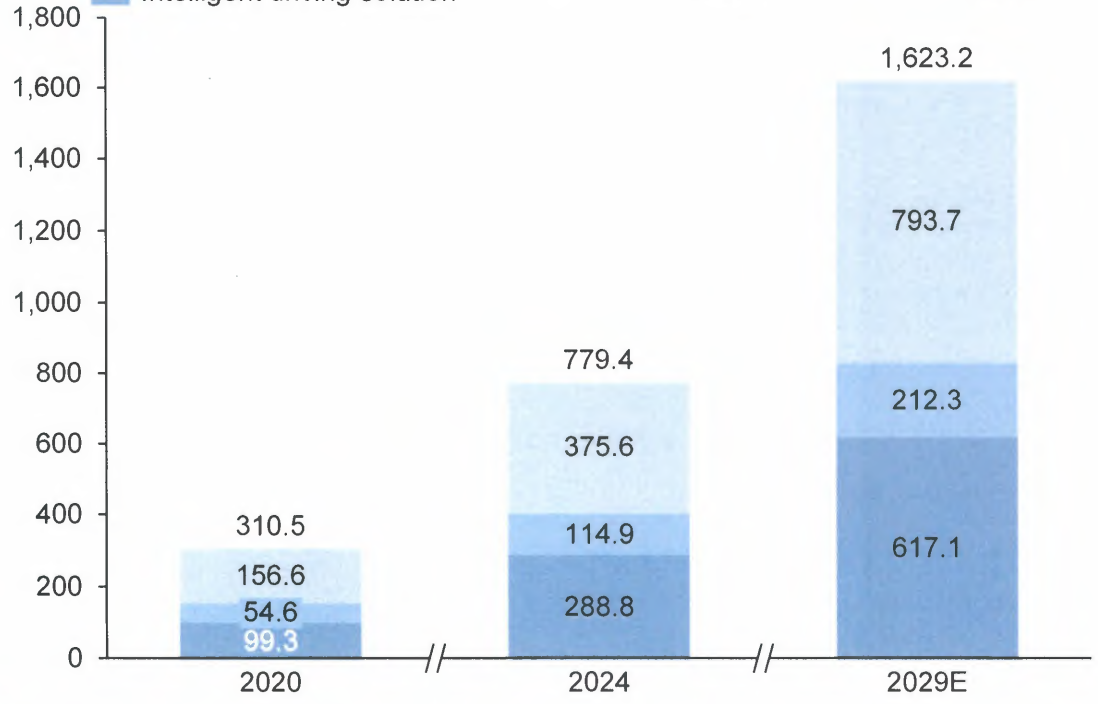
Market Size of Global Automotive Intelligence Solution Industry

- With the integration of intelligence within the automotive industry, the global automotive intelligence market size achieved RMB779.4 million in 2024 and is expected to reach RMB1,623.2 billion in 2029, representing a CAGR of 15.8%.

Market size of global automotive intelligence solution industry, in terms of revenue, 2020-2029E

Billion RMB

	CAGR	
	2020-2024	2024-2029E
Global automotive intelligence solution	**25.9%**	**15.8%**
Smart cockpit solution	24.4%	16.1%
Intelligent Vehicle Connectivity Service	20.5%	13.1%
Intelligent driving solution	30.6%	16.4%



Key analysis

- As technology advances and consumer demands evolve, the integration of intelligence has emerged as a pivotal trend within the automotive industry, for both passenger and commercial vehicles. The automotive intelligence transformation has been fueled by the convergence of the three main pillars, namely smart cockpits, intelligent vehicle connectivity, and intelligent driving, which are propelling higher safety standards, enhanced driving assistance, and a more comfortable user experience. The global automotive intelligence market size increased with a CAGR of 25.9% from RMB310.5 million in 2020 to RMB779.4 million in 2024, and is expected to reach RMB1,623.2 billion in 2029, representing a CAGR of 15.8% from 2024 to 2029.

Note: Intelligent driving solutions enable vehicles to possess autonomous driving capabilities, and realize functions of advanced driver assistance system(ADAS) with Level 1 to Level 2 automation and automated driving system(ADS) with Level 3 to Level 5 automation.

Source: CPCA, China Insights Consultancy

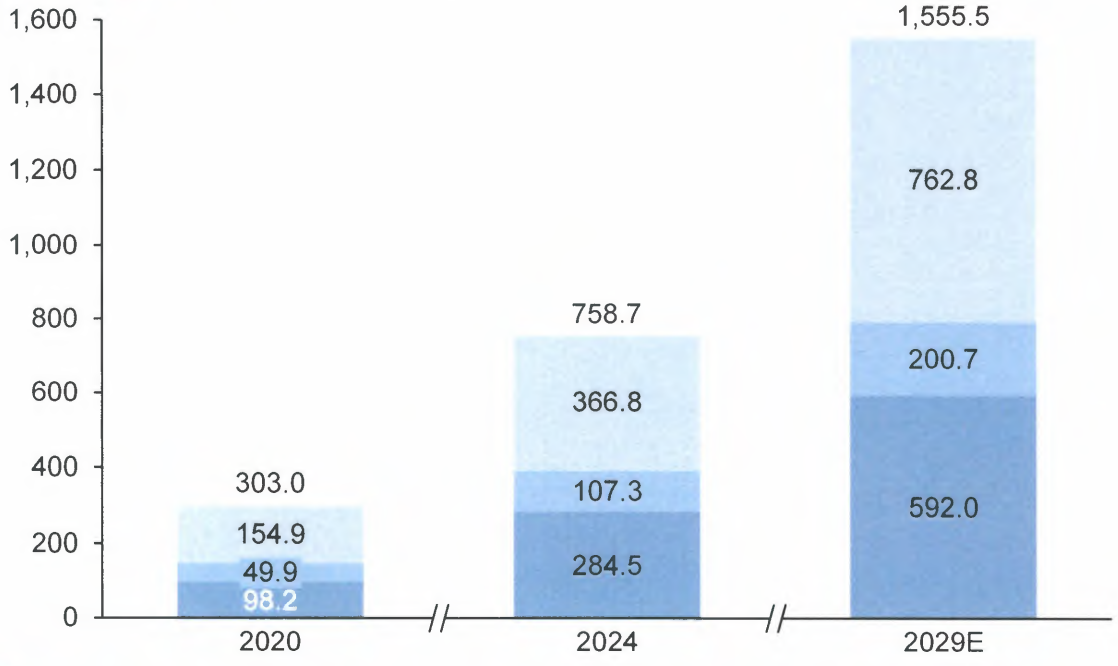
Market Size of Global Passenger Vehicle Intelligence Solution Industry

- The market size in terms of revenue of global passenger vehicle intelligence solution industry has seen significant growth in recent years, reaching RMB758.7 billion in 2024 and is expected achieve RMB1,555.5 billion in 2029 in terms of revenue.

Market size of global passenger vehicle intelligence solution industry, in terms of revenue, 2020-2029E

Billion RMB

	CAGR	
	2020-2024	2024-2029E
Global passenger vehicle intelligence solution	**25.8%**	**15.4%**
Smart cockpit solution	24.1%	15.8%
Intelligent Vehicle Connectivity Service	21.1%	13.3%
Intelligent driving solution	30.5%	15.8%



Key analysis

- Benefitting from the expanding passenger vehicle market, ongoing innovations and upgrades in intelligent vehicle technologies, as well as heightened consumer demands for intelligent vehicle features, and supportive government policies, the development of automotive intelligence for passenger vehicles has accelerated both globally and in China. The global market size of passenger vehicle intelligence solutions was RMB758.7 billion in 2024, and is expected to reach RMB1,555.5 billion in 2029, representing a CAGR of 15.4%.

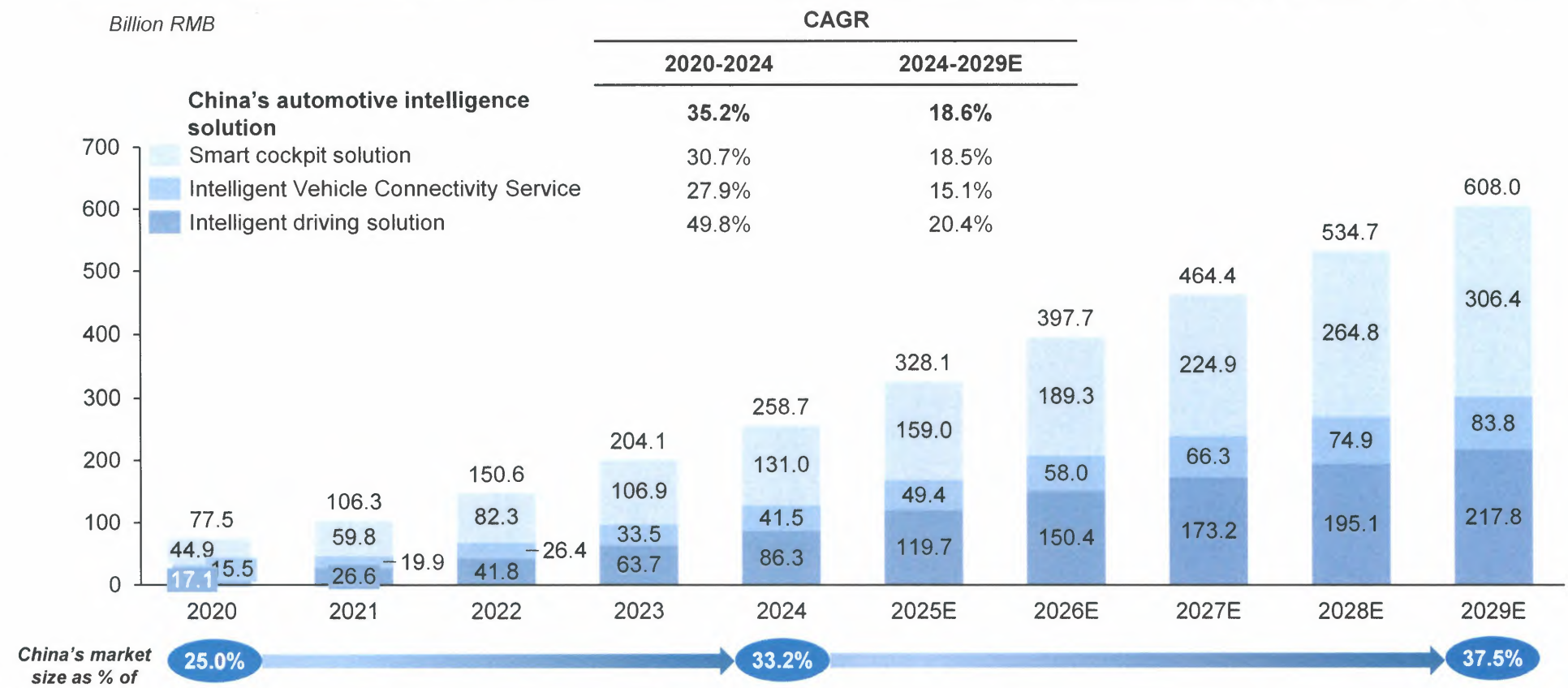
Note: Intelligent driving solutions enable vehicles to possess autonomous driving capabilities, and realize functions of advanced driver assistance system(ADAS) with Level 1 to Level 2 automation and automated driving system(ADS) with Level 3 to Level 5 automation.

Source: CPCA, China Insights Consultancy

Market Size of China's Automotive Intelligence Solution Industry

- The market size in terms of revenue of China's automotive intelligence solution industry has reached RMB258.7 billion in 2024 with a CAGR of 35.2% from 2020 to 2024, accounting for approximately 33.2% of the global market in 2024.

Market size of China's automotive intelligence solution industry, in terms of revenue, 2020-2029E



- As one of the important market of the global automotive intelligence solution industry, the China's automotive intelligence market size increased from RMB77.5 billion in 2020 to RMB258.7 billion in 2024 at a CAGR of 35.2%, accounting for approximately 33.2% of the global market in 2024. And the market is expected to grow to RMB608.0 billion in 2029, representing a CAGR of 18.6% from 2024 to 2029.
- In particular, the intelligence solutions for passenger vehicle are the largest segment of the global and China's automotive intelligence market, accounting for more than 95% of revenue of both markets in 2024.

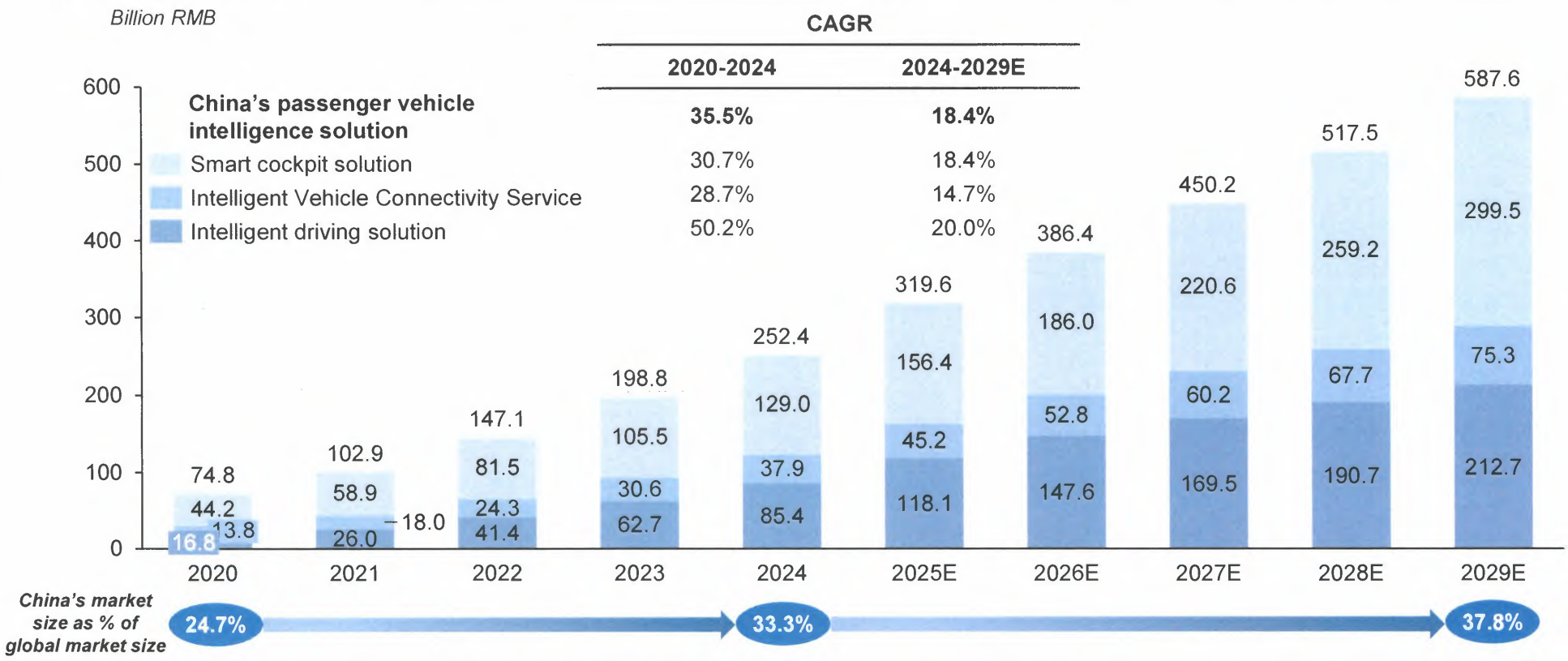
Note: Intelligent driving solutions enable vehicles to possess autonomous driving capabilities, and realize functions of advanced driver assistance system(ADAS) with Level 1 to Level 2 automation and automated driving system(ADS) with Level 3 to Level 5 automation.

Source: CPCA, China Insights Consultancy

Market Size of China's Passenger Vehicle Intelligence Solution Industry

- The market size in terms of revenue of China's passenger vehicle intelligence solution industry has reached RMB252.4 billion in 2024 with a CAGR of 35.5% from 2020 to 2024, accounting for approximately 33.3% of the global market in 2024.

Market size of China's passenger vehicle intelligence solution industry, in terms of revenue, 2020-2029E



- China has emerged as a pivotal player in the market of passenger vehicle intelligence solution, and the market size in terms of revenue of China's passenger vehicle intelligence solution industry has reached RMB252.4 billion in 2024 with a CAGR of 35.5% from 2020 to 2024, accounting for approximately 33.3% of the global market in 2024.
- Additionally, benefitting from the expanding passenger vehicle market, ongoing innovations and upgrades in intelligent vehicle technologies, heightened consumer demands for intelligent vehicle features, and supportive government policies, the opportunities for automotive intelligence solution in the automotive market are vast. The market size in terms of revenue of China's passenger vehicle intelligence solution industry is projected to increase to RMB587.6 billion by 2029, representing a CAGR of 18.4% from 2024 to 2029.

Note: Intelligent driving solutions enable vehicles to possess autonomous driving capabilities, and realize functions of advanced driver assistance system(ADAS) with Level 1 to Level 2 automation and automated driving system(ADS) with Level 3 to Level 5 automation.

Source: CPCA, China Insights Consultancy

3. Analysis of Global and China's Passenger Vehicle Smart Cockpit Solution Industry

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Market Size of Global Passenger Vehicle Cockpit Solution Industry

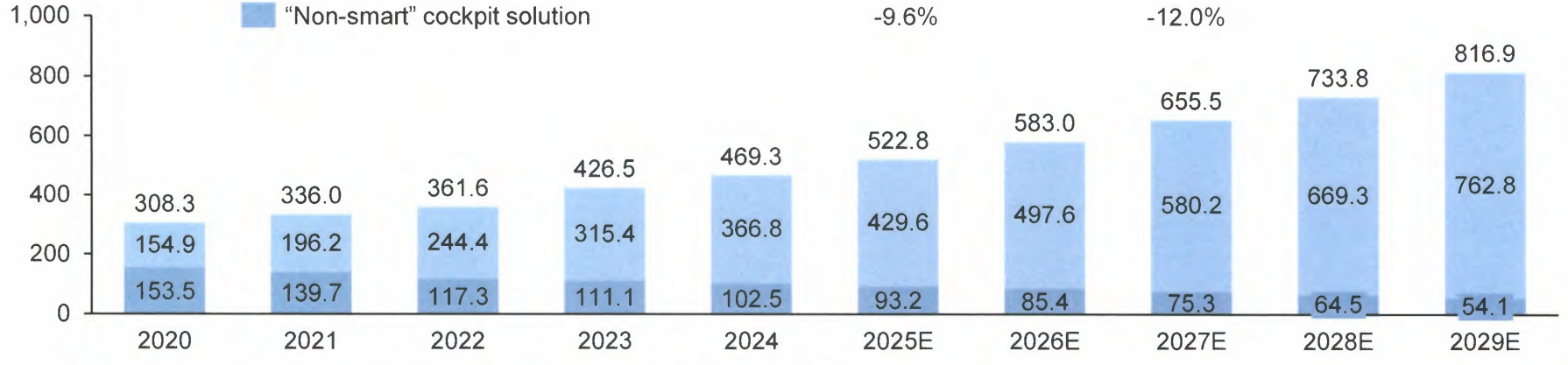
- Passenger vehicle cockpit solutions can be categorized into two main types based on the level of intelligence: "non-smart" cockpit solution and smart cockpit solution. The global market size of passenger vehicle cockpit solution industry reached RMB469.3 billion in 2024, and is projected to grow to RMB816.9 billion in 2029, representing a CAGR of 11.7% during the period.

- Passenger vehicle cockpit solutions can be broadly categorized into two main types based on their intelligence level and functionality: the traditional, or "non-smart" cockpit solution and the smart cockpit solution.
- The traditional cockpit solution, largely mechanical, primarily offers basic vehicle control functions and simple entertainment features which are also relatively static and do not support OTA upgrades. Its hardware and software structures are fairly straightforward, which lack intelligent interaction capabilities, relying on physical buttons and knobs for operation.

Market size of global passenger vehicle cockpit solution industry, in terms of revenue, 2020-2029E

Unit: RMB in billions

	CAGR	
	2020-2024	2024-2029E
Global passenger vehicle cockpit solution	**11.1%**	**11.7%**
Smart cockpit solution	24.1%	15.8%
"Non-smart" cockpit solution	-9.6%	-12.0%



Smart cockpit solution as % of the Global Passenger Vehicle Cockpit Solution Industry

- The cockpit system is a key component of a passenger vehicle, and the global market size of passenger vehicle cockpit solution industry reached RMB469.3 billion in 2024, and is projected to grow to RMB816.9 billion in 2029, representing a CAGR of 11.7% during the period. In terms of revenue, the penetration rate of global smart cockpit solution has increased from 50.2% in 2020 to 78.2% in 2024, and is expected to reach 93.4% in 2029.

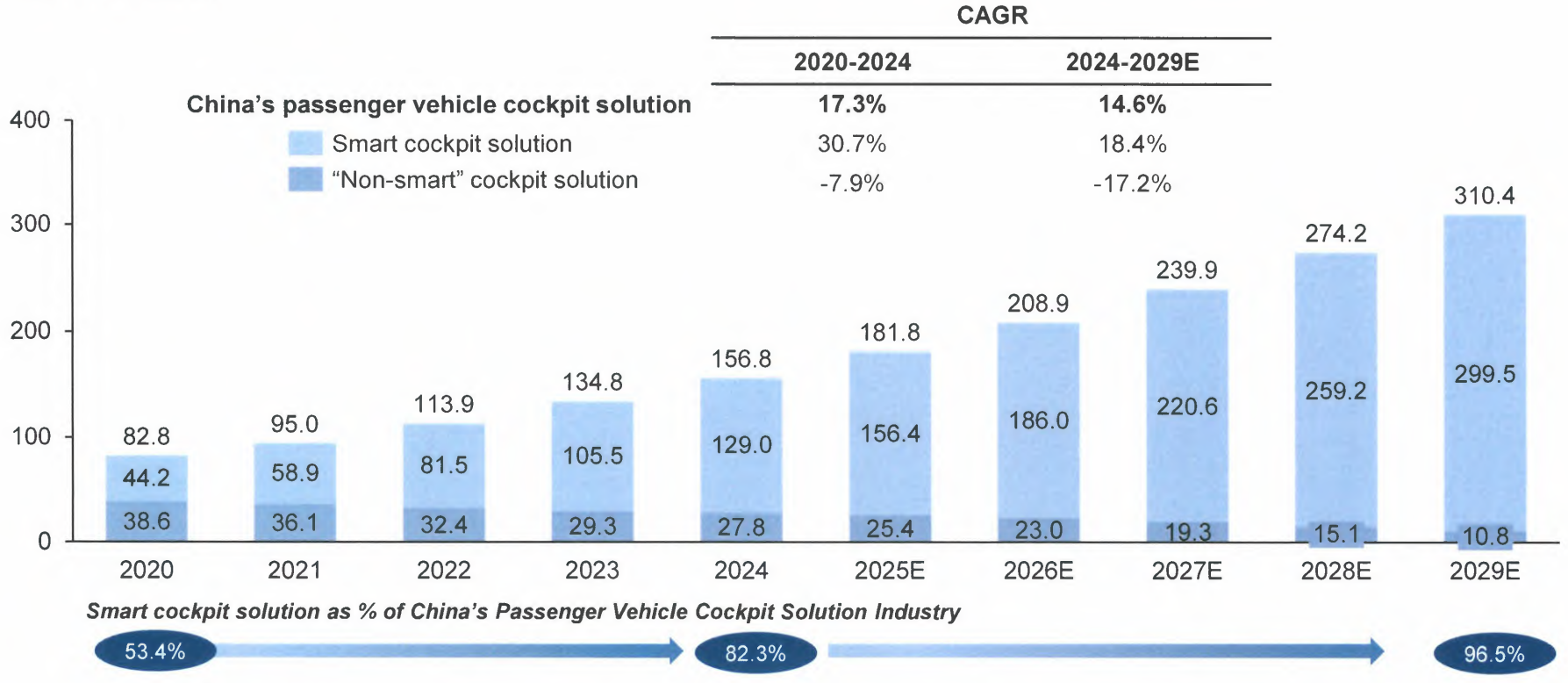
Source: China Insights Consultancy

Market Size of China's Passenger Vehicle Cockpit Solution Industry

- The market size of passenger vehicle cockpit solution industry in China reached RMB156.8 billion in 2024, and is projected to grow to RMB310.4 billion in 2029, representing a CAGR of 14.6% during the period.

Market size of China's passenger vehicle cockpit solution industry, in terms of revenue, 2020-2029E

Unit: RMB in billions



Smart cockpit solution as % of China's Passenger Vehicle Cockpit Solution Industry

- The market size of passenger vehicle cockpit solution industry in China reached RMB156.8 billion in 2024, and is projected to grow to RMB310.4 billion in 2029, representing a CAGR of 14.6% during the period. In terms of revenue, the penetration rate of China's smart cockpit solution has increased from 53.4% in 2020 to 82.3% in 2024, and is expected to reach 96.5% in 2029.
- As for the different segments of passenger vehicle cockpit solution industry, driven by the increasing adoption of advanced technologies, automation, and connectivity features in passenger vehicles, the traditional cockpit solution has been rapidly replaced by the smart cockpit solution. As a result, the market size of traditional cockpit solution for passenger vehicle has decreased year by year, while the market of smart cockpit solutions for passenger vehicle has been growing rapidly.

Source: China Insights Consultancy

Comparison Between Traditional Cockpit Solutions and Smart Cockpit Solutions

- There are no widely-known quantitative parameters used in determining whether a cockpit solution is a traditional cockpit solution or a smart cockpit solution in the industry.

- In contrast to the classification of autonomous driving, where each level has well-defined autonomous driving functions, the smart cockpit is a complex ecosystem comprising multiple subsystems. The level of intelligence exhibited by the vehicle cockpit cannot be ascertained from a single function or subsystem alone, and here is the comparison of the subsystems between traditional cockpit solution and smart cockpit solution.

Subsystems or functions	*Traditional cockpit solution*	*Smart cockpit solution*	*Penetration rate of the smart cockpit components**
Function control	• ECUs (electronic control units) that control the various subsystems function separately.	• Domain controller unit that enables integrated control of various subsystems function.	44.1%
In-vehicle display	• No central screen or ordinary small central screen.	• Large-sized and high-definition multi-displays.	95.6%
Instrument cluster	• Traditional mechanical instrument cluster.	• LCD instrument panel like an intelligent display.	67.0%
HUD	• None	• a display of instrument readings in a vehicle that can be seen without lowering the eyes, typically through being projected on to the windscreen or visor.	21.6%
Rear-view Mirror	• Traditional rear-view mirror.	• Streaming rear-view mirror that integrates a digital screen to display video feeds from rear-facing cameras, streaming media, and navigation information.	5.2%
Human-machine interaction	• Primarily rely on physical buttons and knobs for control.	• Incorporate more advanced interaction methods, such as voice commands, gesture recognition, eye tracking, etc.	N/A
Other features	• None	• In terms of vehicle safety, IMS are introduced to enhance driver and occupant safety.	N/A

- Given the level of intelligence exhibited by the vehicle cockpit cannot be ascertained from single function or subsystem alone, only individual penetration rates of different subsystems of smart cockpit solution in terms of shipment volume is available. For instance, the penetration rates of domain controller solutions, in-vehicle displays display, LCD instrument panels, HUDs, streaming rearview mirrors, in terms of shipment volume, reached 44.1%, 95.6%, 67.0%, 21.6% and 5.2% in 2024, respectively. However, the penetration rate of overall smart cockpit solutions can only be determined by dividing the overall revenue related to different subsystems of smart cockpit solutions to the overall revenue of cockpit solutions.

**Note: in terms of shipment volume in 2024.*

Source: China Insights Consultancy

Overview of Passenger Vehicle Smart Cockpit Solution

- A smart cockpit solution mainly consists of its core component, the smart cockpit domain controller, and other parts to transform the passenger vehicle into an intelligent mobile space, providing drivers and passengers with a comprehensive experience of safety, intelligence, and enjoyment.

- Contrary to "non-smart" cockpit solution , the smart cockpit system can provide more intelligent in-vehicle experience for drivers and passengers, and is a key component of the passenger vehicle intelligence. A smart cockpit solution mainly consists of its core component, the smart cockpit domain controller, and other parts such as in-vehicle displays (including the central information display as well as the co-driver and rear-seat entertainment displays), LCD instrument panel, head-up display ("HUD"), streaming rearview mirror, and in-cabin monitoring system ("IMS"), T-Box and voice system, etc. It also features robust software capabilities including human-machine interaction, telematics services, and full-scenario expansion. These transform the passenger vehicle into an intelligent mobile space, providing drivers and passengers with a comprehensive experience of safety, intelligence, and enjoyment.

Overview of passenger vehicle smart cockpit solution

Main products

DCU solution

- Refers to a centralized computing and control system that integrates various software and hardware components, allowing for seamless and efficient control of different functional systems. It is the most important unit in the smart cockpit system and the shipping forms include both separate DCU, and DCU plus automotive displays as an integrated solution.

Information interaction and monitoring systems

- Information interaction and monitoring systems consist of a series of automotive displays (including central information display, copilot entertainment display and rear entertainment display), LCD instrument cluster, HUD and streaming rearview mirror and IMS, which can realize the functions of multi-modal HMI, infotainment, vehicle control and monitoring etc., and thus providing a more intelligent driving experience.

Other systems

- Mainly include T-Box and voice systems etc. with the functions of real-time communication and audio playback etc.

Capabilities

1. **Human-machine interaction (HMI)**
   - represents the ability to perceive, understand and make corresponding decisions to serve drivers and passengers.
2. **Connected services**
   - represents the ability to upgrade the in-cabin services from non-networked services to integrated cloud control platform services to enjoy the online resources.
3. **Scenario expansion**
   - represents the ability to expand the driving scenarios from partial scenarios inside the vehicle to finally full scenarios inside and outside the vehicle.

Source: China Insights Consultancy

Analysis of Different Supply Modes Adopted by OEMs in Passenger Vehicle Smart Cockpit Solution Industry

- There usually exists various different supply modes adopted by OEMs in passenger vehicle smart cockpit solution industry.

1 In-house development by OEMs themselves

In recent years, some OEMs have made attempts to develop smart cockpit solutions with higher computing power and sophisticated human-machine interaction capabilities. However, due to high technical barriers, long R&D cycles, significant investments and rapid pace of technological iteration, only a limited number of OEMs have the capability to independently develop smart cockpits, and even fewer can achieve comprehensive development of both software and hardware. Typically, OEMs focus on developing software in-house while outsourcing hardware manufacturing to specialized suppliers. The main challenges faced by OEMs in the R&D of smart cockpits include:

- **High Initial Investment:** Developing smart cockpits independently requires a substantial initial R&D investment, due to the high technical barriers. Accumulating the necessary expertise and resources is challenging, resulting in unstable and extended product development cycles.
- **Pressure of Technological Iteration:** The fast-paced evolution of market demands requires rapid iteration of smart cockpit technologies. OEMs pursuing independent development face significant pressure to keep up with these technological upgrades and innovations. Compared to specialized external suppliers, OEMs lack the cutting-edge R&D experience required to stay ahead in this rapidly evolving field.

2 Procurement from external solution providers

As many OEMs face challenges mentioned above with in-house development mode, they typically prefer to purchase hardware, software, and software-hardware integrated solutions directly from external smart cockpit solution providers. And the external smart cockpit solution providers consist of three types of suppliers based on the solution types offered: software-hardware integrated solution suppliers, software component suppliers and hardware component suppliers:

- **The software-hardware integrated solution suppliers:** refer to those who possess the capability to integrate both software and hardware components to offer a comprehensive smart cockpit solution, that are designed to meet the OEMs' expectations for seamless integration of smart cockpit systems. With the evolving demands of the automotive industry and the increasing adoption of smart cockpit solutions, software-hardware integrated smart cockpit solutions are becoming increasingly popular for passenger vehicle. According to CIC, the software-hardware integrated offering has emerged as one of the mainstream delivery methods for solution providers to the OEMs in China, with a market size of approximately RMB77.9 billion, accounting for 60.4% of the total China's smart cockpit solution market size, in terms of revenue in 2024. Meanwhile, as the Chinese OEMs have emerged as key customers for smart cockpit solution providers, the market size of China's software-hardware integrated smart cockpit solutions installed on passenger vehicles manufactured by Chinese OEMs reached approximately RMB50.6 billion, accounting for 39.2% of the total China's smart cockpit solution market size, in terms of revenue in 2024. Software-hardware integrated smart cockpit solution suppliers have proven to be more competitive due to several key advantages they provide to automotive OEMs:
  - **Cost optimization:** Software-hardware integrated solutions from a single supplier are more cost-effective compared to traditional model of sourcing software and hardware components separately. By combining both components into a single package, OEMs can streamline procurement processes and reduce complexities and expenses involved in managing multiple suppliers. It also helps OEMs avoid compatibility issues that often arise when software and hardware components are sourced separately, further minimizing unexpected costs related to system integration and troubleshooting.
  - **Shortened product R&D cycle:** Integrating software and hardware into a single solution significantly accelerates the R&D progress by reducing the time needed for communication and coordination with software and hardware components suppliers separately. This streamlined development process allows OEMs to bring new products to market more quickly, enabling them to adapt to evolving market demands faster while maintaining high-quality standards.
  - **Improved system performance:** Seamlessly integrated software and hardware components enhance the efficiency and performance of the smart cockpit system. With both components designed to work in harmony, software-hardware integrated solutions offer optimized efficiency, faster response times and improved system stability, delivering a smoother and more reliable user experience.
- **Hardware and software component suppliers:** refer to those who focus on offering hardware or software components separately based on OEMs' demand.

Source: China Insights Consultancy

Analysis of Different Supply Modes Adopted by OEMs in Passenger Vehicle Smart Cockpit Solution Industry

- The factors considered by OEMs in choosing different modes of supply are as following.

1 Factors considered by OEMs in choosing in-house development by OEMs themselves

- **Self-control of core technologies:** Through in-house R&D, OEMs can master the core technologies in critical areas such as the underlying software, AI algorithms, human-machine interaction, and hardware adaptation, thereby appropriately reducing their reliance on external suppliers and mitigating the risks of supply chain disruptions.
- **Differentiated competitiveness:** The smart cockpit serves as the most intuitive carrier for users to experience the intelligence level of a vehicle, and its various intelligent functionalities such as human-machine interaction, intelligent connectivity and so forth, can provide users with a distinctive and unique experience. OEMs can leverage customized interfaces, interaction logic, or exclusive features to create brand-specific characteristics and differentiate themselves from competitors, and thus enhancing their competitiveness in the market.
- **Data security:** The smart cockpit involves plenty of users' personal information and private data, such as driving habits, location information, and entertainment preferences. In-house development allows OEMs to maintain full-control over the collection, storage, transmission, and utilization of data, and to implement effective security measures, thereby reducing the risk of data leakage and protecting users' privacy and rights.

2 Factors considered by OEMs in choosing procurement from external solution providers

- **Supplier expertise:** Leveraging extensive industry insights, deep technological expertise, and reliable supply chains, external solution providers can rapidly provide mature and advanced smart cockpit solutions. This capability can accelerate the overall R&D of OEMs and enhance the intelligence level of vehicle models more efficiently.
- **Rapid technological innovation and iteration:** External solution providers consistently lead the industry in the latest technological innovations and iterations, and they usually invest substantial resources in R&D of key technologies such as operating system optimization, human-machine interface design, artificial intelligence, intelligent voice recognition, and image processing etc. Collaborating with these suppliers allows OEMs to stay at the cutting edge of technology innovation, catering to diverse and customized user preferences.
- **Cost Efficiency:** In-house development of smart cockpits requires OEMs to invest significant capital in technical R&D teams and equipment acquisition. Selecting mature solutions from external solution providers can significantly reduce upfront R&D investment costs and mitigate technological risks during the development process. Meanwhile, leveraging economies of scale and centralized production, external solution providers suppliers can provide OEMs with cost-effective smart cockpit solutions. This enables OEMs reduce internal R&D expenses by procuring completely ready-to-use solutions from external partners, while allocating more resources to other core business areas, such as overall vehicle design and powertrain development, to achieve optimal resource allocation.

- For different smart cockpit components, OEMs usually adopt different procurement models, here are several examples:

1 Domain controllers

- Almost 100% domain controllers procured by OEMs are software-hardware integrated (including those equipped with software components developed by OEMs in-house or provided by other suppliers)

2 In-vehicle displays

- Among all the passenger vehicles equipped with central information display, approximately 18% of them are equipped with display developed by OEMs in-house, approximately 36% of them are equipped with software-hardware integrated display offered by the same external suppliers, and the rest is equipped with display whose software and hardware components are offered by different external suppliers.

3 LCD instrument panel

- Among all the passenger vehicles equipped with LCD instrument panel, approximately 12% of them are equipped with LCD instrument panel developed by OEMs in-house, approximately 66% of them are equipped with software-hardware integrated LCD instrument panel offered by the same external suppliers, and the rest is equipped with LCD instrument panel whose software and hardware components are offered by different external suppliers.

Source: China Insights Consultancy

Development of Passenger Vehicle Smart Cockpit Solution

- Smart cockpit system for passenger vehicle is developing from traditional cockpits to intelligence and digitalization, and are currently at the stage of intelligent assistants to the stage of human-machine shared autonomy, and will finally evolve into the stage of "third living space" in the future.

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Development of passenger vehicle smart cockpit solution

Stage	1 Electronic cockpit system	2 Intelligent assistant	3 Human-machine shared autonomy	4 Third living space
Features	• The automotive electronic information system is initially integrated to form the "electronic cockpit domain" and the system can be divided into different layers.	• Through various sensors and biosensing technologies to collect and process environmental data to enhance the vehicle's HMI capabilities	• A core stage of smart cockpit solution • Multi-modal HMI enables machine autonomous / semi-autonomous decision-making • Multi-domain integration	• Provide AI scenario-based and fully automated services and immersive experiences to create an "intelligent mobile space" and enhance the driving experience
Level of capabilities	• Passive HMI • Non-connected service • Partial scenarios inside the vehicle	• Partly positive HMI • Cloud service • Partial scenarios inside and outside the vehicle	• Partly positive HMI • Open cloud service • Full scenarios inside the vehicle and partial scenarios outside the vehicle	• Positive HMI • Cloud control platform service • Full scenarios inside and outside the vehicle

Source: China Insights Consultancy

Difference between the Smart Cockpit and the Traditional Cockpit

- Due to the various functions of the smart cockpit for passenger vehicle, the value of the smart cockpit solution per vehicle has risen significantly compared with the traditional cockpit, and can reach 3 to 5 times that of traditional cockpit. The changes in the smart cockpit are mainly reflected in the upgrades of original components, emergence of new components and diversification of charging models.

- The smart cockpit system is a key part of the intelligent revolution of automobiles, and the consumers' requirements for driving comfort and entertainment experience have been greatly improved. The intelligent level of hardware and software in the cockpit has been continuously optimized to bring a continuously upgraded experience to end users. Due to the various functions of the smart cockpit for passenger vehicle, the value of the smart cockpit solution per vehicle has risen significantly compared with the traditional cockpit, and can reach 3 to 5 times that of the traditional cockpit. The changes in the smart cockpit are mainly reflected in the upgrades of components, emergence of new components and diversification of charging models.

Difference between the smart cockpit and the traditional cockpit

Upgrade of original components

- The ordinary center control screen is upgraded to a large-sized and high-definition screen, and presents the characteristics of multi-screens
- The automotive-grade chips have developed to the smart cockpit DCU with SoC (System on Chip) chips which have high computing power
- The traditional mechanical instrument panel is replaced by a high-definition LCD instrument panel to improve the accuracy and beauty of driving information system

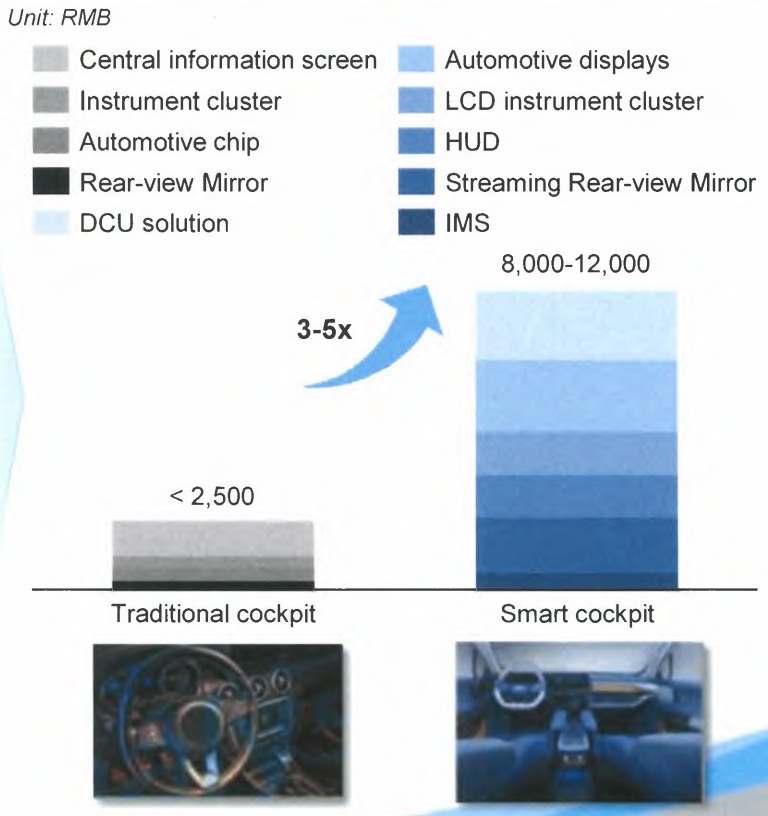
Emergence of new components

- The emergence of head-up display (HUD) and streaming mirrors provides smarter, integrated driver assistance and vehicle information
- The introduction of driver monitoring system (DMS) to monitor passenger perception data in the cockpit will further enhance vehicle safety performance.

Diversification of charging models

- Fees of software subscription and OTA upgrade: software service providers may offer subscription services for access to premium features or regular OTA updates to enhance functionality and security
- Advertising revenue: smart cockpit system with integrated displays and connectivity offer opportunities for targeted advertising.

Comparison of the value of the smart cockpit products and the traditional cockpit products



Source: China Insights Consultancy

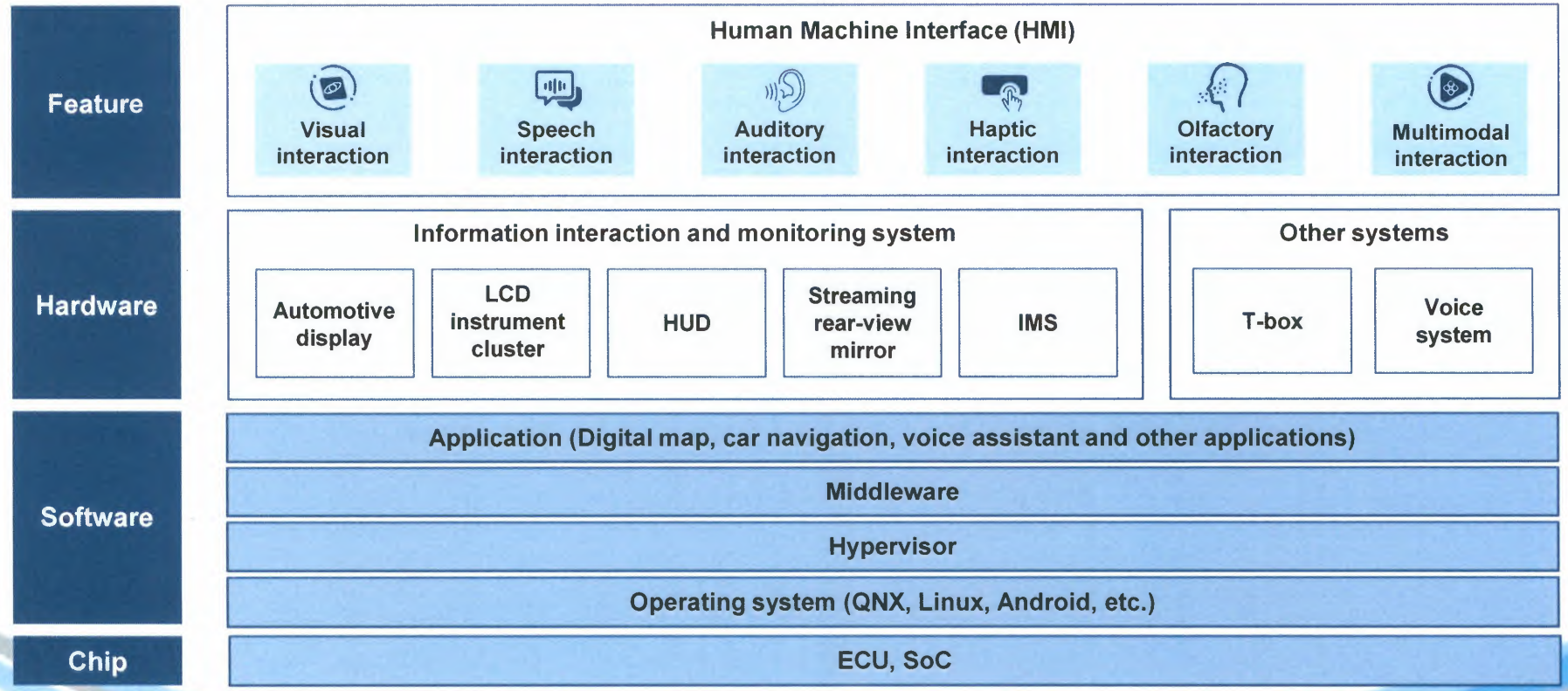
Analysis of Smart Cockpit Architecture

- Smart cockpit technology encompasses various components including chips, software, and hardware to provide a seamless human-machine interface for car drivers, which significantly enhances the overall driving experience for users.

Definition of comprehensive capability of integrated hardware-software-cloud smart cockpit solution

- Comprehensive capability of integrated hardware-software-cloud smart cockpit solution refers to the ability of smart cockpit solution providers to offer **the end-to-end application of combining software, hardware and cloud technology**, and deliver a robust and integrated smart cockpit system for passenger vehicle.
- Providers with comprehensive capability of integrated hardware-software-cloud smart cockpit solution can reach flexibility and adaptability in the system design, performance optimization, faster development and iteration, and cost-effectiveness.

Architecture of smart cockpit

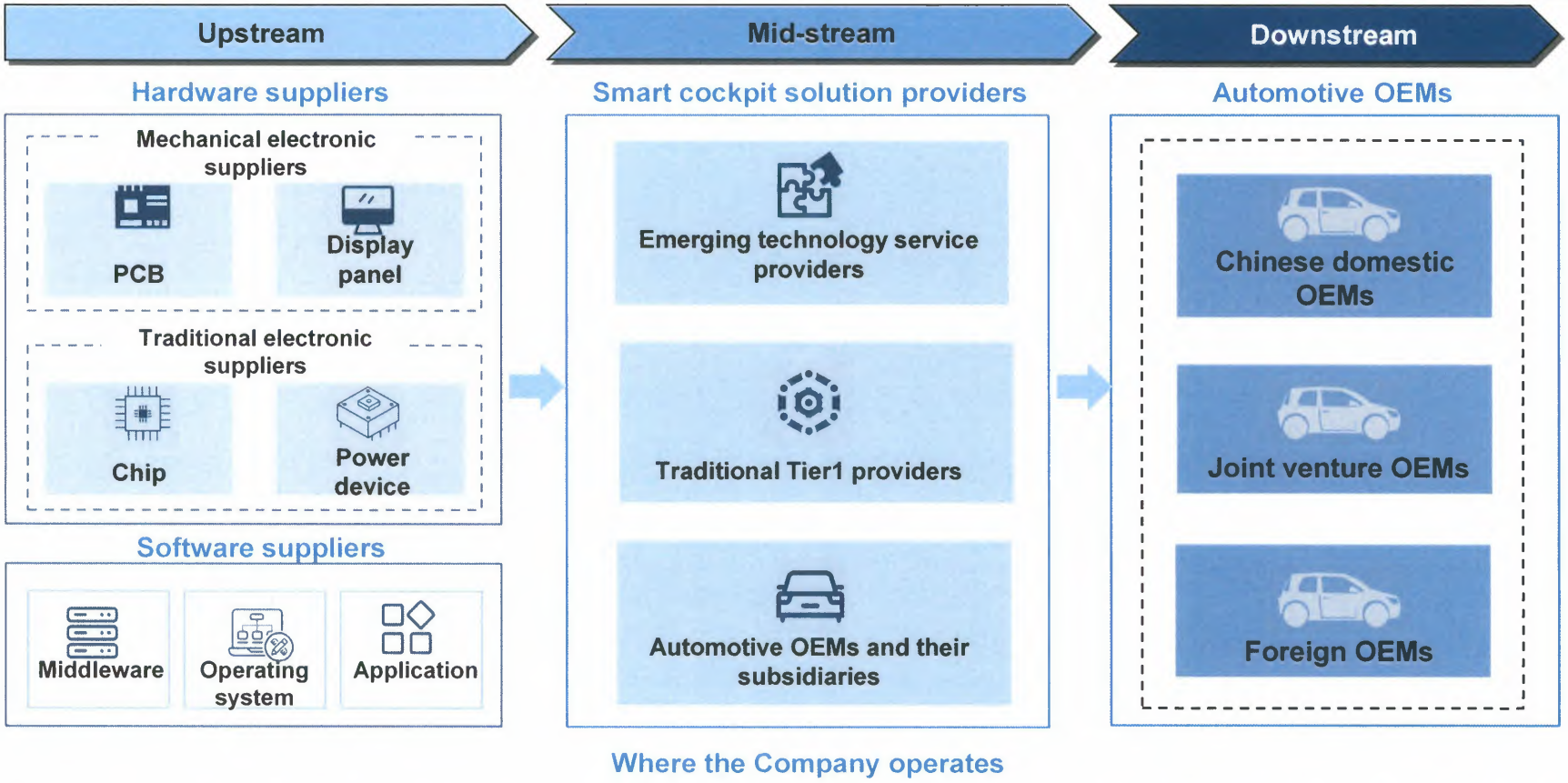


Source: China Insights Consultancy

Value Chain of China's Passenger Vehicle Smart Cockpit Solution Industry

- The value chain of China's passenger vehicle smart cockpit solution industry includes hardware and software suppliers in the upstream, smart cockpit solution providers in the mid-stream, and automotive OEMs in the downstream.

Value chain of China's passenger vehicle smart cockpit solution industry



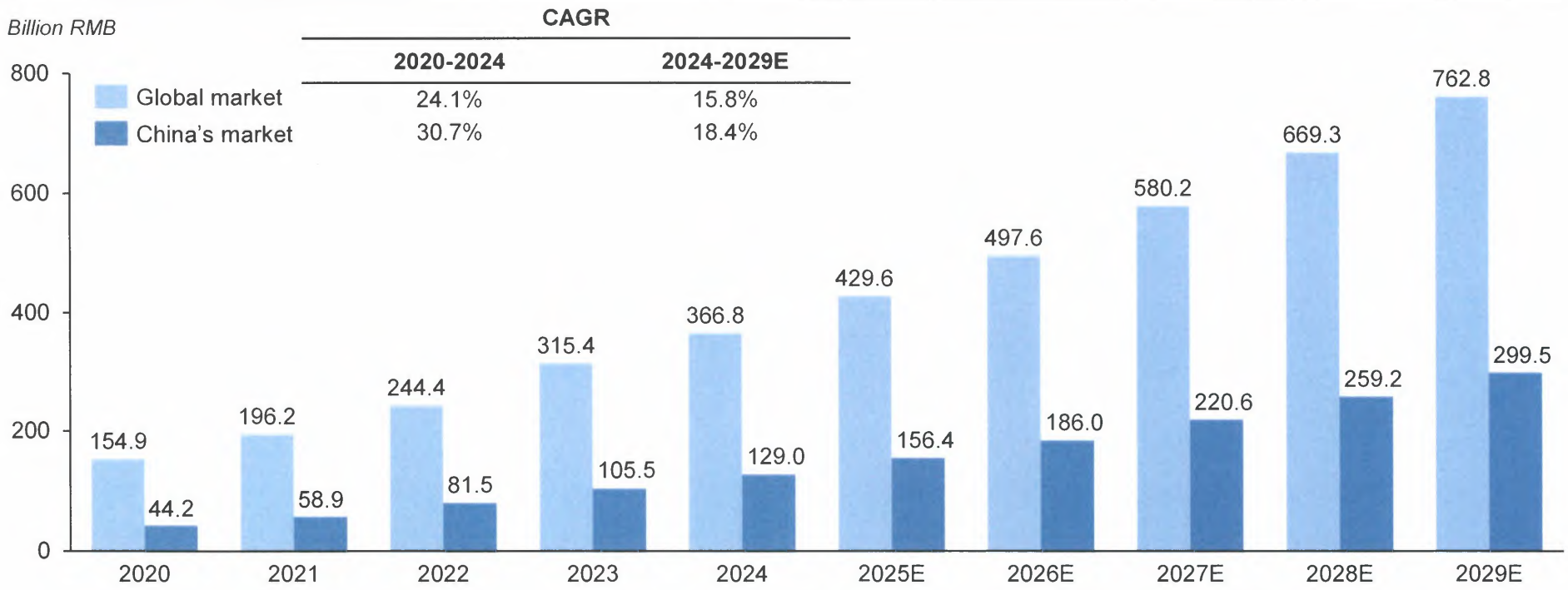
- The value chain of China's passenger vehicle smart cockpit solution industry mainly involves hardware and software suppliers in the upstream, smart cockpit solution providers in the mid-stream, and automotive OEMs in the downstream.
- Upstream participants mainly consist of suppliers of hardware such as PCB, display panels, as well as chips, and suppliers of software such as middleware, operating systems, and applications. Midstream players primarily include emerging technology companies specializing in smart cockpit solutions and traditional Tier-1 suppliers to OEMs. Downstream participants in the value chain are mainly the OEMs.

Source: China Insights Consultancy

Market Size of Global and China's Passenger Vehicle Smart Cockpit Solution Industry

- the market size of global and China's passenger vehicle smart cockpit solution industry, in terms of revenue, reached RMB366.8 billion and RMB129.0 billion in 2024, respectively.

Market size of global and China's passenger vehicle smart cockpit solution industry, in terms of revenue, 2020-2029E



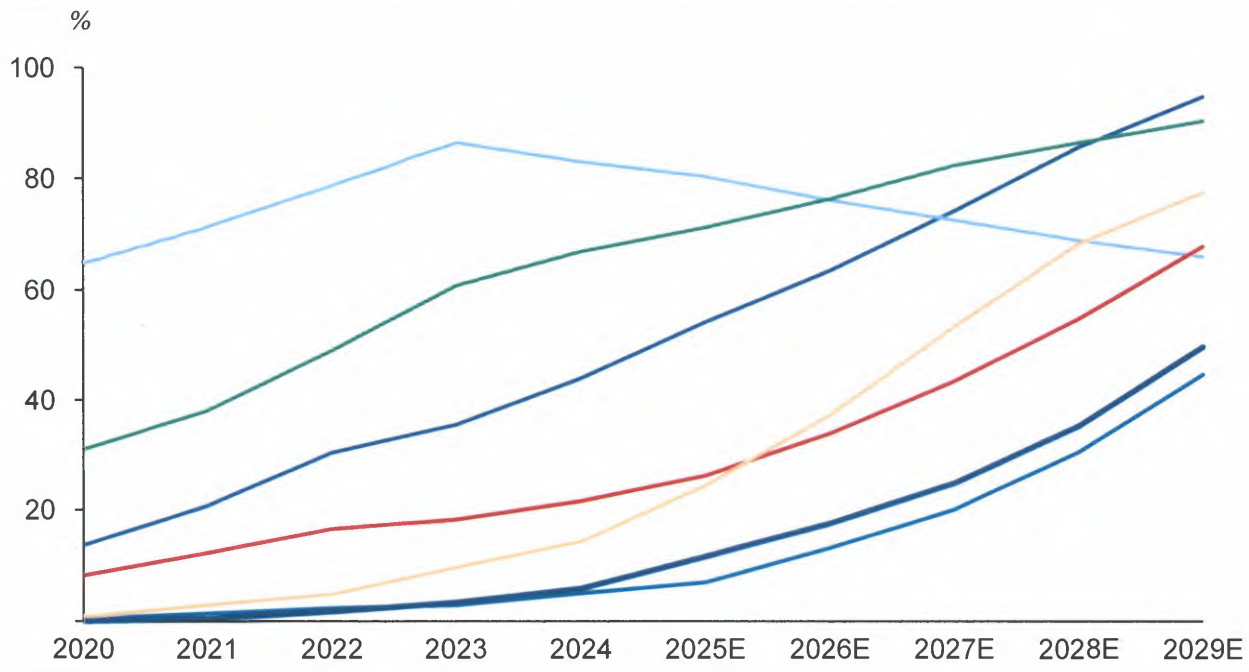
- The industry of smart cockpit solutions for passenger vehicle has been growing rapidly, driven by the accelerating deployment of automotive intelligence by OEMs, evolving consumer demands for better and personalized driving experience, constant innovation of software and hardware technologies, and supportive policies and regulations. The global market size of passenger vehicle smart cockpit solutions grew from RMB154.9 billion in 2020 to RMB366.8 billion in 2024, representing a CAGR of 24.1%, and is expected to reach RMB762.8 billion in 2029, representing a CAGR of 15.8%.
- China is the world's largest passenger vehicle market. Chinese domestic OEMs actively incorporate the latest intelligent technologies to provide drivers and passengers with superior in-vehicle experiences. This fosters the development of smart cockpit solutions in China, making China the largest passenger vehicle smart cockpit solution market in the world. The market size of China's passenger vehicle smart cockpit industry grew from RMB44.2 billion in 2020 to RMB129.0 billion in 2024, with a CAGR of 30.7%. As Chinese consumers' demand for intelligent, connected, and immersive driving experience continues to grow, the size of China's passenger vehicle smart cockpit market is expected to reach RMB299.5 billion in 2029, representing a CAGR of 18.4% from 2024 to 2029.

Source: CPCA, China Insights Consultancy

Main Products in the Passenger Vehicle Smart Cockpit Solution Industry in China

- The passenger vehicle smart cockpit solution industry in China is expected to maintain rapid growth, with the main products showing a rapid penetration trend. In the future, most of the main products for passenger vehicle are expected to enter an accelerating penetration stage.

Penetration rate of main products in the passenger vehicle smart cockpit solution industry in China, 2020-2029E



Main products	2020	2024	2029E
DCU solution	13.7%	44.1%	94.8%
Automotive displays*	64.9%	83.2%	66.1%
LCD instrument cluster	31.1%	67.0%	90.5%
HUD	8.2%	21.6%	67.8%
Streaming rearview mirrors	0.6%	5.2%	44.8%
DMS	1.0%	14.3%	77.5%
OMS	0.2%	6.0%	49.8%

** Note: Automotive displays here refers to the separate automotive displays without DCU.*

Key analysis

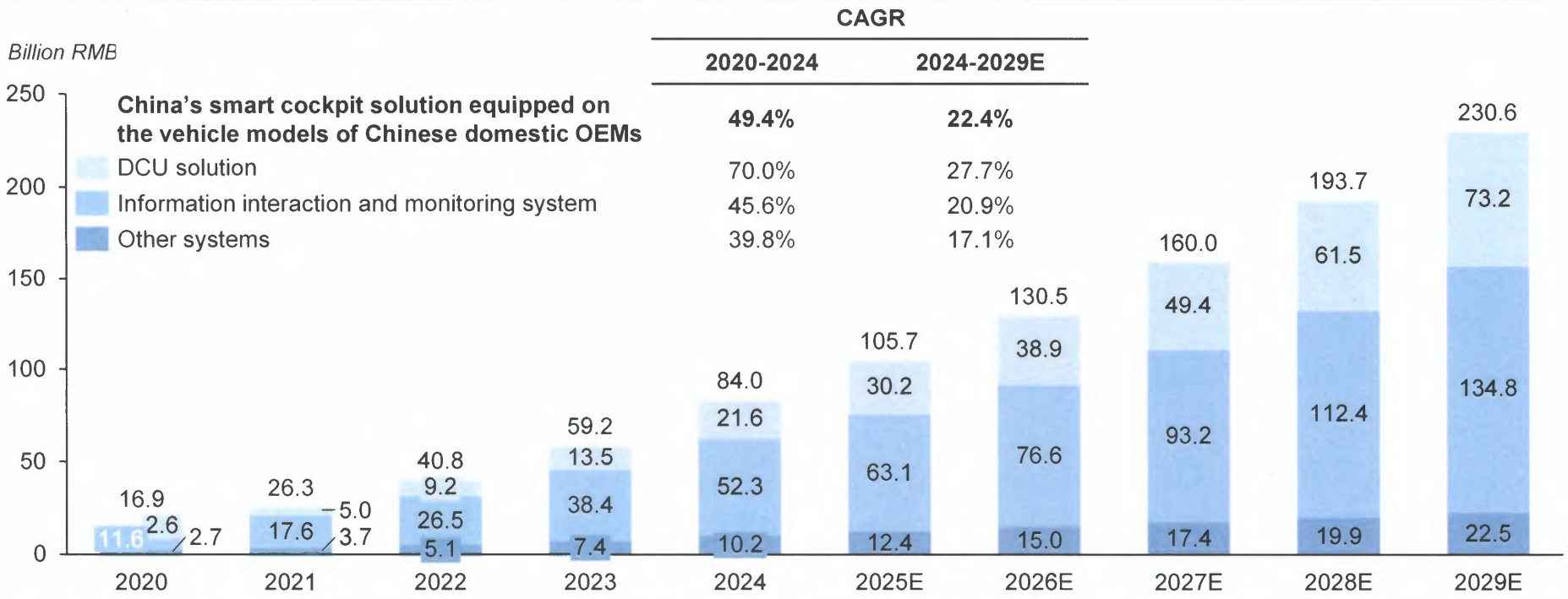
- The passenger vehicle smart cockpit industry in China is expected to maintain rapid growth, with the main products showing a rapid penetration trend. For example, the penetration rates of DCU solution increased from 13.7% in 2020 to 44.1% in 2024, respectively.
- In the future, the DCU solution of smart cockpit for passenger vehicle are expected to enter an accelerating development stage, with a projected penetration rate of approximately 95% by 2029. Specifically, as the integrated shipping form (DCU plus automotive display) of DCU solution becomes increasingly popular, the penetration rate of separate automotive displays has showed a decrease since 2024 after the initial increase from 2019 to 2023.
- The penetration rate of LCD instrument cluster has also witnessed a relatively rapid growth from 31.1% in 2020 to 67.0% in 2024 compared with the penetration rate of HUD and streaming rearview mirrors.
- With the ongoing introduction of favorable policies, the IMS solutions (including DMS (Driver Monitoring System) and OMS (Occupancy Monitoring System)) in China's passenger vehicles market has started their penetration since 2019, and the penetration rates of DMS and OMS reached 14.3% and 6.0% in 2024 respectively and are expected to continue to rise sharply in the future.

Source: China Insights Consultancy

Market Size of China's Smart Cockpit Solution Industry Equipped on the Vehicle Models of Chinese Domestic OEMs

- The market size of China's smart cockpit solution industry equipped on the vehicle models of Chinese domestic OEMs in terms of revenue reached RMB84.0 billion in 2024 and is expected to reach RMB230.6 billion in 2029.

Market size of China's smart cockpit solution industry equipped on the vehicle models of Chinese domestic OEMs, in terms of revenue, 2020-2029E



Market size of China's smart cockpit solution industry equipped on the vehicle models of Chinese domestic OEMs as% of total market size of China's smart cockpit solution industry

38.2% → 65.1% → 77.0%

- With the rising proportion of Chinese domestic OEMs in China's PV market in terms of sales volume, Chinese domestic OEMs have carried out continuous technological innovation and R&D investment in smart cockpit solutions, so the market size of China's smart cockpit solution industry equipped on the vehicle models of Chinese domestic OEMs has also significantly increased from RMB16.9 billion in 2020 to RMB84.0 billion in 2024 at a CAGR of 49.4% during the period. And the market size of China's smart cockpit solution industry equipped on the vehicle models of Chinese domestic OEMs accounted for approximately 65.1% of total market size of China's smart cockpit solution industry in terms of revenue in 2024.
- Along with ongoing technological advancements, collaborations between automakers and tech companies, and increasing consumer demand for intelligent features, the market size of China's smart cockpit solution industry equipped on the vehicle models of Chinese domestic OEMs is expected to reach RMB230.6 billion by 2029, with a CAGR of 22.4% from 2024 to 2029.

Source: CPCA, China Insights Consultancy

Key Drivers of Global and China's Passenger Vehicle Smart Cockpit Solution Industry (1/2)

- Market drivers of the passenger vehicle smart cockpit solution industry include evolving consumer demands for better driving experience and personalization, OEM's accelerating deployment of automotive intelligence and constant innovation of software and hardware technology.

Key Drivers	Key analysis
1 ***Evolving consumer demands for better driving experience and personalization***	• From the consumers' perspective, passenger vehicles have been gradually transitioning from mere transportation tools to becoming an intelligent mobile space, with more emphasis on providing better experience and personalization. According to the "Insight into China's NEV Consumption in 2023" released by AutoHome Research Institute, intelligence has become an important factor in vehicle purchasing decisions, as evidenced by over 80% of automotive consumers having considered buying intelligent vehicles in 2023. The consumer demand of passenger vehicle for user experience and personalization drives the further adoption of smart cockpits on passenger vehicles.
2 ***OEM's accelerating deployment of automotive intelligence***	• Automotive intelligence is projected to be the upcoming trend for vehicles. By introducing technologies such as artificial intelligence, big data, and the Internet of Things (IoT), OEMs are now able to develop more innovative and differentiated products to improve their brand competitiveness. The continual iteration of algorithms has enabled smart cockpits to build a strong software ecosystem with rich applications, continuously optimize the automatic upgrading, as well as enhance the human-machine interaction experience and perception of user needs utilizing multimodal interactions such as voice and touch. Thus, OEMs continue to increase R&D investment in intelligent technologies to address the growing consumer needs, driving the accelerated development of the smart cockpit industry.
3 ***Constant innovation of software and hardware technology***	• Upgrades in software and hardware provide automotive consumers with a more intelligent, convenient, and comfortable driving experience. For example, automotive-grade SoC chips with high performance and compatibility can process multiple parallel tasks faster and more accurately, run complex algorithms, enable high-resolution displays, achieve more intelligent functions, and improve energy efficiency. These advancements are crucial for the evolution of smart cockpit solutions. Moreover, the software architecture is undergoing an upgrade to a Service-Oriented Architecture ("SOA"), a more flexible and scalable architecture for intelligent vehicle software systems, which enables more efficient updates and upgrades. Thanks to the continual improvements in software and hardware technologies, smart cockpits are increasingly incorporating sophisticated and high-value features. Consequently, the price of smart cockpit solution per vehicle in China is expected to rise from approximately RMB4,560 in 2024 to over RMB8,726 in 2029.

Source: AutoHome Research Institute, China Insights Consultancy

Key Drivers of Global and China's Passenger Vehicle Smart Cockpit Solution Industry (2/2)

- Market drivers of the passenger vehicle smart cockpit solution industry include supportive policies and regulations.

Key Drivers	Key analysis
4 *Supportive policies and regulations*	• Many countries around the world have made automotive intelligence an important strategic direction for the transformation and upgrading of the automotive industry, where smart cockpits play a significant part. For example, the implementation of the EU General Safety Regulations has greatly driven the demand for passenger vehicle equipped with smart cockpits. EU Regulation 2019/2144 on "the type approval requirements of motor vehicles and their trailers, and systems, components and separate technical units intended for such vehicles, as regards their general safety and the protection of vehicle occupants and vulnerable road users", more commonly referred to as General Safety Regulation 2 or GSR 2, requires the mandatory fitment of Driver Drowsiness and Attention Warning (DDAW) systems to all new types of M and N category vehicle (i.e. all passenger carrying and goods carrying motor vehicles) from July 6,2022, and to all new vehicles falling into those categories from July 7, 2024. Driver Drowsiness and Attention Warning (DDAW) systems are defined in (EU) 2019/2144 as systems that "assess the driver's alertness though vehicle systems analysis and warn the driver if needed", and DDAW system is a type of IMS (in-vehicle monitoring system) in smart cockpit. The promulgation of the GSR 2 has directly generated a stable and substantial market demand for IMS, because global automotive manufacturers and related suppliers who want to access the European market have to equip their vehicles with IMS systems that comply with the established standards. Meanwhile, the development of IMS industry will also drive the advancement and innovation of smart cockpit-related technologies. IMS systems can be seamlessly integrated and combined with other smart cockpit functions, such as in-vehicle infotainment systems, voice assistants and gesture recognition etc., to provide personalized services and interactive experiences for drivers and passengers, enhancing the safety and driving experience of the smart cockpit, and thus, promoting the widespread adoption of passenger vehicles equipped with smart cockpit. In China, certain governmental authorities have also adopted a series of policies, including the "Strategy for Innovative Development of Intelligent Vehicles" (《智能汽车创新发展战略》), and "Implementation Opinions on Enhancing Reliability in Manufacturing" (《制造业可靠性提升实施意见》), with a view to creating a favorable environment for the development of the smart cockpit solution industry. • Several key Chinese government departments, including the National Development and Reform Commission, Cyberspace Administration of China, Ministry of Science and Technology, and Ministry of Industry and Information Technology, have jointly promulgated the Strategy for Innovative Development of Intelligent Vehicles (《智慧汽車創新發展戰略》), or the Strategy. The Strategy encourages local governments to implement customized policies and measures to effectively promote the innovation and development of intelligent vehicles. It highlights the need for advancing key technologies, such as integrated perception of multi-source sensor data, advanced intelligent terminals, intelligent computing platforms, and automotive wireless communication networks. Local governments are urged to introduce supportive policies and diversify funding channels to drive research and development in these areas and in major engineering projects. As an industry pivoting around these technologies, the Strategy is expected to create a favorable policy environment and financial support for the smart cockpit industry, helping to reduce overall costs, accelerate technological innovation, and drive the commercialization of intelligent cockpit technologies. Additionally, the Strategy promotes the establishment of legal and regulatory frameworks to govern the testing, approval, usage and supervision of intelligent automobiles. It calls for functionality, reliability and safety certifications for key software and hardware components, with certification standards and guidelines tailored to different levels of intelligent vehicles. This is expected to set clear regulatory guidelines and technical standards for the smart cockpit industry, thereby enhancing product safety and reliability, bolstering consumer confidence and driving the innovation and application of smart cockpit technologies. • The Ministry of Industry and Information Technology, Ministry of Education, Ministry of Science and Technology, Ministry of Finance, and State Administration for Market Regulation have jointly promulgated the Implementation Opinions on Enhancing Reliability in Manufacturing (《製造業可靠性提升實施意見》), or the Implementation Opinion. This opinion aims to guide local departments and industry institutions in raising reliability standards in manufacturing, across machinery, electronics, and automobiles sectors. Local authorities are encouraged to establish foundational reliability standards that cover general requirements, management, design, analysis, testing, evaluation and maintenance support throughout manufacturing process, and integrate reliability indicators into mandatory standards. Furthermore, the Implementation Opinion offers tax deductions for research, product design and pilot testing, reducing financial burden on companies operating in smart cockpit industry. These measures are designed to incentivize innovation investment and drive technological advancements within the smart cockpit industry, ensuring the components and systems of smart cockpits meet higher quality standards throughout design, manufacturing and operation.

Source: China Insights Consultancy

Trends of Global and China's Passenger Vehicle Smart Cockpit Solution Industry (1/3)

- Trends of global and China's passenger vehicle smart cockpit solution industry include development towards intelligent and high-end evolution driven by customer needs, OEMs' preference in providers with comprehensive capabilities and rising penetration rate of smart cockpit solutions.

Trends of global and China's passenger vehicle smart cockpit solution industry

Development towards intelligent and high-end evolution driven by customer needs

- Driven by evolving consumer preferences for better driving experience, OEMs around the world strive for high-quality passenger vehicle smart cockpit solutions. In China, domestic OEMs lead this trend and employ flexible R&D and production mechanisms to accelerate innovation and launch of new products with superior user experience, requiring smart cockpit solution suppliers to speed up development of novel solutions. Collaboration between smart cockpit solution providers and Chinese automotive brands can foster robust technological synergy and enhance the overall competitiveness of their passenger vehicles. Furthermore, the trend towards high-end passenger vehicle products led by these domestic OEM is catalyzing the upgrading of hardware and software in smart cockpit solutions, continuously enhancing the driving experience of automotive consumers.

OEMs' preference in providers with comprehensive capabilities

- OEMs tend to collaborate with smart cockpit solution providers that possess comprehensive technology capabilities integrating software, hardware and intelligent vehicle connectivity services. Such smart cockpit solution providers can meet OEMs' diverse customization needs for components, thereby reducing the communication and management costs associated with procuring parts from multiple suppliers. Furthermore, it allows OEMs to improve user experience while aligning with their brand image and creating distinctive products. Providers with strong software capabilities in algorithms, modules, and intelligent vehicle connectivity can integrate multiple functions and process data in real time. When combined with hardware design and manufacturing capabilities, these providers can continuously enhance the intelligence level of smart cockpit solutions. Hence, expertise in software, hardware, and cloud technologies has become pivotal for smart cockpit solution providers to improve competitiveness within the market.
- In China, only a few providers possess comprehensive technology capabilities, affording them a significant competitive edge in the industry. Chinese smart cockpit solution providers equipped with integrated software-hardware-cloud technologies and extensive industry experience are well-positioned to capture opportunities with global OEMs.

Rising penetration rate of smart cockpit solutions

- The penetration rate of smart cockpit solutions is expected to continue increasing in various regions worldwide. In China, the rapid development of intelligent technologies, the transformation of consumer demands, and the introduction of supportive policies have led to the accelerated rise in the penetration rate of smart cockpit solutions. For example, domain controller solutions, an essential component of smart cockpits, have seen their penetration rate in passenger vehicles in China grew from 13.7% in 2020 to 44.1% in 2024, which is expected to reach over 90% by 2029, in terms of shipment volume.

Source: China Insights Consultancy

Trends of Global and China's Passenger Vehicle Smart Cockpit Solution Industry (2/3)

- Trends of global and China's passenger vehicle smart cockpit solution industry include increasing industry concentration, accelerating overseas expansion of Chinese smart cockpit solution providers and multimodal human-machine interaction driven by AI large model technology.

Trends of global and China's passenger vehicle smart cockpit solution industry

Increasing industry concentration

- As the leading OEMs continue to increase their competitiveness, the passenger vehicle market in China is expected to become more concentrated. The market share in terms of sales volume of the top five OEMs in China increased from 33.4% in 2021 to 41.5% in 2024. These OEMs prefer to collaborate with top-tier smart cockpit solution providers to share R&D resources and optimize cost-effectiveness. Therefore, the top-tier smart cockpit solution providers who have a solid collaboration with leading OEMs will enjoy more business growth opportunities. In addition, these top-tier smart cockpits typically have comprehensive capabilities, significant technological accumulation, and production scale effect, which enable them to gain a larger market share, driving the concentration in the smart cockpit solution industry.

Accelerating overseas expansion of Chinese smart cockpit solution providers

- The automotive value chain in China is highly competitive in the international market leveraging advancements in intelligent technology, deep understanding of user needs, and strong cost advantages Chinese OEMs and other companies throughout the automotive industry value chain are accelerating their expansion into overseas markets. This thus expedites Chinese smart cockpit solution providers to enter international markets. Additionally, international OEMs have a growing demand for advanced smart cockpit technologies which drives more collaboration among these OEMs and top-tier Chinese smart cockpit solution providers.

Multimodal human-machine interaction driven by AI large model technology

- Artificial intelligence large models possess robust data processing, semantic understanding and perception capabilities, promoting the development of human-machine interface in smart cockpits. By combining novel large model technology, a smart cockpit system can better cater to preferences of users and realize richer multimodal interaction functions, further enhancing the user experience of the automotive smart cockpit for passenger vehicle. Smart cockpit systems with improved human-machine interaction incorporates voice commands, gesture recognition, eye tracking, and natural language processing to provide a seamless and intuitive user experience. These systems actively provide precise feedback and actions through multi-modal information perception combined with environmental conditions and user habit learning, further enhancing the user experience of smart cockpits for passenger vehicles.

Source: China Insights Consultancy

Trends of Global and China's Passenger Vehicle Smart Cockpit Solution Industry (3/3)

- Trends of global and China's passenger vehicle smart cockpit solution industry include iteration of domain controllers towards higher integration, accelerating integration of cockpit, driving and parking solutions and vehicle cloud computing.

Trends of global and China's passenger vehicle smart cockpit solution industry

Iteration of domain controllers towards higher integration

- Automotive domain controllers are expected to achieve multi-domain fusion and further improve the integration of domain control to be responsible for the vehicle's perception, decision-making, execution, and control, enabling seamless synergy among various systems including vehicle control, driving, and cockpit. It is expected to significantly enhance efficiency and flexibility in the development of vehicles, enabling vehicles to rapidly adapt to a variety of complex road conditions and diverse driving requirements.

Accelerating integration of cockpit, driving and parking solutions

- With the ongoing improvement in hardware computing power, architecture design, and software development, new features are consistently being incorporated into the cockpit domain. Smart cockpits are progressing from individual domains to domain fusion structure, which speeds up the incorporation of cockpit, driving and parking solutions. By combining and enhancing different functional modules inside vehicles, improved cooperation can be attained. The integration of parking solutions with the smart cockpit has simplified and optimized the parking experience. Advanced parking assist systems, coupled with in-cabin visual and auditory feedback, allow for more precise and effortless parking maneuvers, reducing the stress and uncertainty associated with parking in tight spaces. Moreover, enabling interaction among vehicle, human and environment while combining content in smart cockpits with intelligent driving and automatic parking functions significantly enhance the intelligent driving experience for drivers.

Vehicle cloud computing

- By integrating a range of smart devices, sensors, and network connection, smart cockpits can provide improved connectivity, deliver real-time updates, and offer personalized user interactions. This integration enables the platform to provides diverse functions and services and meet diverse user needs. The integration of cloud opens up opportunities for continuous improvement and expansion of smart cockpit features without requiring extensive hardware upgrades. It enhances the swift and cost-effective implementation of extensive services without requiring users to download and install dedicated vehicle applications.
- With the integration of cloud, smart cockpits can interact with smartphones, watches, home devices etc., allowing personal data sharing and intelligent control. In addition, smart cockpits can connect with surrounding traffic infrastructure and city management systems to provide more efficient transportation services.

Source: China Insights Consultancy

Definition and Classification of China's Smart Cockpit Solution Providers

- China's smart cockpit solution providers for passenger vehicle can be divided into three types: emerging technology service providers, traditional Tier-1 providers as well as automotive OEMs and their subsidiaries. The Company is one of the leading smart cockpit technology companies that possesses the comprehensive capability of integrated hardware-software-cloud smart cockpit solution.

Definition and classification of China's smart cockpit solution providers

Classification	Definition	Advantages and disadvantages of the smart cockpit solution capabilities	Major Players
1 Emerging technology service providers	• Companies that focus on the field of smart cockpit technology and are dedicated to the innovation and breakthrough advancements of smart cockpit products and solutions.	• Professionally focus on the R&D and application of smart cockpit solution • High flexibility and innovation • Ability to meet the needs of different OEMs.	Megatronix, 远峰科技 YF TECH, Autolink, PATEO
2 Traditional Tier1 providers	• Companies that supply various automotive electronic components directly to automotive OEMs, with smart cockpit products constituting a part of their diversified product portfolio.	• Mature technology and reliable quality • Close cooperation with the OEMs • Lack of innovation • Respond slowly to market changes • Relatively slow technological upgrades	BOSCH, DENSO, APTIV, DESAY SV automotive, Continental, Neusoft
3 Automotive OEMs and their subsidiaries	• Since OEMs can achieve efficient integration of software and hardware, they have begun to develop their own smart cockpit solutions.	• Deep insights of the consumer demands • Strong integration capabilities • Lack of professionalism compared to specialized suppliers • High R&D costs	TESLA, 理想, NIO 蔚来, 小鹏, ecarx

• The Company is one of the leading smart cockpit technology companies that possesses the comprehensive capability of integrated hardware-software-cloud smart cockpit solution.

- In addition, based on the solution type offered, the passenger vehicle smart cockpit solution industry consists of three types of suppliers: software-hardware integrated solution suppliers, software component suppliers and hardware component suppliers. The software-hardware integrated passenger vehicle smart cockpit solution suppliers refer to those who possess the capability to integrate both software and hardware components to offer a comprehensive smart cockpit solution, that are designed to meet the modern consumer's expectations for seamless human-machine interaction and connectivity. The typical example of such comprehensive smart cockpit solution include domain control unit solution, which integrate various of vehicle functions through a consolidated hardware platform to enable intelligent controlling, and automotive display systems, which offer abundant information interaction through automotive displays.

Source: China Insights Consultancy

Competitive Landscape of China's Passenger Vehicle Smart Cockpit Solution Industry (1/2)

- The competitive landscape of China's passenger vehicle smart cockpit solution industry is relatively fragmented, with the top 5 manufacturers taking up an aggregated market share of 31.8% in terms of revenue in 2024.

- There are hundreds of market players being engaged in China's passenger vehicle smart cockpit solution industry, and the competitive landscape of China's passenger vehicle smart cockpit solution industry is relatively fragmented, with the top five manufacturers taking up an aggregated market share of 31.8% in terms of revenue in 2024, and the corresponding revenue of the Company amounted to RMB2,441 million, ranking 11th in the industry, and accounted for 1.9% of the total market in terms of revenue in 2024.

Ranking of top 10 passenger vehicle smart cockpit solution suppliers in China, in terms of revenue, 2024

Ranking	Company		Type of supplier	Revenue[1] (RMB million, 2024)	Market Share[2] (%)
1	Desay SV	DESAY SV automotive	Domestic supplier	18,230	14.1%
2	Visteon[3]	Visteon	International supplier	7,500	5.8%
3	Foryou	ADAYO	Domestic supplier	6,496	5.0%
4	JOYNEXT	JOYNEXT	Domestic supplier	4,923	3.8%
5	HSAE	HSAE	Domestic supplier	4,000	3.1%
			Subtotal (Top five)	41,149	31.8%
6	Continental[4]	Continental	International supplier	3,335	2.6%
7	Faurecia	FORVIA Faurecia	International supplier	3,189	2.5%
8	Autolink	Autolink	Domestic supplier	2,800	2.2%
9	Ecarx	ecarx	Domestic supplier	2,639	2.0%
10	BOSCH	BOSCH	International supplier	2,518	2.0%
			Top 10	55,630	43.1%
			Others	73,361	56.9%
			Total	**128,991**	**100.0%**

Notes:
(1) The revenue includes sales from smart cockpit solutions for passenger vehicle in China.
(2) Revenue from passenger vehicle smart cockpit solution in China as a percentage of the total market size of China's passenger vehicle smart cockpit solution industry in 2024.
(3) A company founded in 2000 and listed on the NASDAQ, primarily offering vehicle cockpit electronics products, including digital cockpit solutions, advanced displays, battery management systems, and power electronics for EVs, among others.
(4) A company founded in 1871 and listed on the Frankfurt Stock Exchange, with business covering automotive electronics (including smart cockpit, intelligent driving, and intelligent information and communication technology associated with the mobility services), and tires, among others.

Source: Annual Reports, China Insights Consultancy

Competitive Landscape of China's Passenger Vehicle Smart Cockpit Solution Industry (2/2)

- The top ten domestic manufacturers taking up an aggregated market share of 36.5% in terms of revenue in 2024.

- The domestic manufacturers of passenger vehicle smart cockpit solution achieved a market share of more than 50% in China's passenger vehicle smart cockpit solution market as of 2024, so they play an important role in the industry. Moreover, the top 10 domestic manufacturers took up an aggregated market share of 36.5% in terms of revenue in 2024. The revenue from the Company's passenger vehicle smart cockpit solution segment amounted to approximately RMB2,441 million, ranking 7th in the industry, and accounting for 1.9% of the total market in terms of revenue in 2024.

Ranking of top 10 domestic passenger vehicle smart cockpit solution suppliers in China, in terms of revenue, 2024

Ranking	Company	Type of supplier	Revenue[1] (RMB million, 2024)	Market Share[2] (%)
1	Desay SV	Domestic supplier	18,230	14.1%
2	Foryou[3]	Domestic supplier	6,496	5.0%
3	JOYNEXT	Domestic supplier	4,923	3.8%
4	HSAE[4]	Domestic supplier	4,000	3.1%
5	Autolink	Domestic supplier	2,800	2.2%
6	Ecarx	Domestic supplier	2,639	2.0%
7	**The Company**	**Domestic supplier**	**2,441**	**1.9%**
8	BICV	Domestic supplier	2,300	1.8%
9	Neusoft	Domestic supplier	2,106	1.6%
10	YF TECH	Domestic supplier	1,300	1.0%
		Subtotal	47,235	36.5%
		Others	81,756	63.5%
		Total	**128,991**	**100.0%**

Notes:
(1) The revenue includes sales from smart cockpit solutions for passenger vehicle in China.
(2) Revenue from passenger vehicle smart cockpit solution in China as a percentage of the total market size of China's passenger vehicle smart cockpit solution industry in 2024.
(3) A company founded in 1993 and listed on the Shenzhen Stock Exchange, with business covering automotive electronics (including smart cockpit, intelligent driving, and intelligent vehicle connectivity products), precision die-casting, precision electronic components, and LED lighting, among others.
(4) A non-listed company founded in1993, providing a comprehensive product portfolio encompassing solutions for smart cockpit, intelligent driving, intelligent connectivity and software service

Source: Annual Reports, China Insights Consultancy

Updated

Competitive Landscape of China's Smart Cockpit Domain Controller Solution Industry (1/2)

- The competitive landscape of China's smart cockpit domain controller solution is relatively concentrated, and the corresponding shipment volume of the Company amounted to 915.2 thousand, ranking 3nd in the industry.

- The domain controller solution is a core component of smart cockpit solutions, and the competitive landscape of China's smart cockpit domain controller solution industry is relatively concentrated, with the top five providers taking up an aggregated market share of 53.3% in terms of shipment volume of smart cockpit domain controllers in 2024, and the corresponding shipment volume of the Company amounted to 915.2 thousand, ranking third in the industry, and accounted for 7.3% of the total market

Ranking of top five providers(1) of smart cockpit domain controller solutions for in China, in terms of shipment volume (2), 2024

Ranking	Company	Description	Shipment volume (thousand)	Market Share(3) (%)
1	Desay SV	• A listed company founded in 1986, primarily engaged in smart cockpit, intelligent driving, and intelligent connectivity services, and offering comprehensive smart cockpit solutions, including domain control unit and information interaction systems.	~2,700	21.7%
2	JOYNEXT	• A non-listed company founded in2016. It is a subsidiary of a company listed on the Shanghai Stock Exchange, primarily engaged in smart cockpit domain controller solution and intelligent vehicle connectivity service.	~1,300	10.4%
3	**The Company**	• **A company founded in 2009, one of the few domestic smart cockpit solution providers with comprehensive capabilities in software-hardware-cloud integration.**	**915.2**	**7.3%**
4	Autolink	• A non-listed company founded in 2014, with a focus on developing vehicle domain controllers, intelligent connectivity software, and operational service products.	~870	7.0%
5	Aptiv	• A company founded in 1994 and listed on the New York Stock Exchange, with business covering solutions that take into account the vehicle's software, hardware and electrical/electronic architecture.	~860	6.9%
		Total	**6,645.2**	**53.3%**

Notes:

(1) Exclude the pure manufacturing service suppliers and suppliers without their own factories

(2) Only include the passenger vehicles produced in China in 2024. And it is a common practice in the smart cockpit industry and the automotive industry to use product shipment volume in units as an indicator to evaluate, compare and rank the market positions of smart cockpit product providers. The number of shipment volume usually reflects the acceptance and popularity of smart cockpit provider's products and further implies the product performance and quality of a certain provider, according to the same source.

(3) Shipment volume of smart cockpit domain controller solutions in China as a percentage of the total shipment volume of China's smart cockpit domain controller solution industry in 2024.

Source: Annual Reports, China Insights Consultancy

New

Competitive Landscape of China's Smart Cockpit Domain Controller Solution Industry (2/2)

- The competitive landscape of China's smart cockpit domain controller solution is relatively concentrated in terms of revenue, and the corresponding revenue of the Company amounted to RMB1,959 million, ranking fourth in the industry.

- The competitive landscape of China's smart cockpit domain controller solution industry is relatively concentrated in terms of revenue of smart cockpit domain controller solutions, with the top five providers taking up an aggregated market share of 48.2% in 2024, and the corresponding revenue of the Company amounted to RMB1,959 million, ranking fourth in the industry, and accounted for 6.3% of the total market in terms of revenue of smart cockpit domain controller solutions in 2024.

Ranking of top five providers(1) of smart cockpit domain controller solutions for in China, in terms of revenue(2), 2024

Ranking	Company	Description	Revenue (RMB million)	Market Share (%)
1	Desay SV	• A listed company founded in 1986, primarily engaged in smart cockpit, intelligent driving, and intelligent connectivity services, and offering comprehensive smart cockpit solutions, including domain control unit and information interaction systems.	~6,400	20.5%
2	JOYNEXT	• A non-listed company founded in2016. It is a subsidiary of a company listed on the Shanghai Stock Exchange, primarily engaged in smart cockpit domain controller solution and intelligent vehicle connectivity service.	~2,700	8.6%
3	Aptiv	• A company founded in 1994 and listed on the New York Stock Exchange, with business covering solutions that take into account the vehicle's software, hardware and electrical/electronic architecture.	~2,100	6.7%
4	**The Company**	• **A company founded in 2009, one of the few domestic smart cockpit solution providers with comprehensive capabilities in software-hardware-cloud integration.**	**1,959**	**6.3%**
5	Autolink	• A non-listed company founded in 2014, with a focus on developing vehicle domain controllers, intelligent connectivity software, and operational service products.	~1,900	6.1%
		Total	**15,059**	**48.2%**

Notes:
(1) The revenue includes sales from smart cockpit domain controller solutions in China.
(2) Revenue from smart cockpit domain controller solutions in China as a percentage of the total market size of China's smart cockpit domain controller solution industry in 2024.

Source: Annual Reports, China Insights Consultancy

Competitive Landscape of China's Smart Cockpit Domain Controller Solution Industry for NEVs

- The competitive landscape of China's smart cockpit domain controller solution industry for NEVs is relatively concentrated, and the corresponding shipment volume of the Company amounted to 706.3 thousand, ranking 2nd in the industry.

- China was the world's largest NEV market and the world's largest manufacturing country of NEVs, with a sales volume of 12.6 million in 2024, and the penetration rate of NEVs has grown from 5.8% in 2020 to 44.4% in 2024 and is expected to be 82.0% in 2029. The rising adoption of NEVs in China also contributes to rising automotive intelligence in the country. Compared to ICEs with relatively more complex structures, NEVs have a quicker evolution towards intelligence in vehicle structure, power systems and control systems. As a result, China's NEV market is a very important application segment for smart cockpit domain controllers.
- The competitive landscape of China's smart cockpit domain controller solution industry for NEVs is relatively concentrated, with the top five providers taking up an aggregated market share of 47.5% in terms of shipment volume of smart cockpit domain controller solutions for NEVs in 2024, and the corresponding shipment volume of the Company amounted to 706.3 thousand, ranking 2nd in the industry, and accounted for 11.9% of the total market in terms of shipment volume of smart cockpit domain controller solutions for NEVs in 2024.

Ranking of top five providers(1) of smart cockpit domain controller solutions for NEVs (2) in China, in terms of shipment volume (3), 2024

Ranking	Company	Description	Shipment volume (thousand)	Market Share (%)
1	Desay SV	• A listed company founded in 1986, primarily engaged in smart cockpit, intelligent driving, and intelligent connectivity services, and offering comprehensive smart cockpit solutions, including domain control unit and information interaction systems.	~1,350	22.8%
2	**The Company**	• **A company founded in 2009, one of the few domestic smart cockpit solution providers with comprehensive capabilities in software-hardware-cloud integration.**	**706.3**	**11.9%**
3	Autolink	• A non-listed company founded in 2014, with a focus on developing vehicle domain controllers, intelligent connectivity software, and operational service products.	~280	4.7%
4	Ecarx	• A listed company founded in 2017 and listed on NASDAQ, primarily engaged in core software and hardware solutions for vehicle connectivity, automation and electric mobility.	~250	4.2%
5	LG	• A listed company founded in 1958 and listed on the Korea Stock Exchange, primarily engaged in the field of vehicle mobility, home appliance & air solution and home entertainment, among others.	~230	3.9%
		Subtotal	2,816.3	47.5%
		Others	3,106.1	52.5%
		Total	**5,922.4**	**100.0%**

Notes:

(1) Exclude the pure manufacturing service providers and providers without their own factories;

(2) Only include the new energy passenger vehicles produced in China in 2024.

(3) It is a common practice in the smart cockpit industry and the automotive industry to use product shipment volume in units as an indicator to evaluate, compare and rank the market positions of smart cockpit product providers. The number of shipment volume usually reflects the acceptance and popularity of smart cockpit provider's products and further implies the product performance and quality of a certain provider, according to the same source.

Source: Annual Reports, China Insights Consultancy

Entry Barriers of Passenger Vehicle Smart Cockpit Solution Industry

- Entry barriers of passenger vehicle smart cockpit solution industry include technological barriers, client resource barriers, supply chain management barriers and capital investment barriers.

Entry barriers to China's passenger vehicle smart cockpit solution industry

Technological barriers

- Developing comprehensive capability of integrated hardware-software-cloud smart cockpit solution is complex, smart cockpit solution suppliers need to have extensive knowledge in algorithms for smart cockpit systems, domain controllers, sensors, etc. and necessitate collaborative research and development with OEMs and chip suppliers owing to highly specialized requirements. It can be particularly difficult for new market players to **assemble a comprehensive R&D team** and **acquire the necessary knowledge and technology** within a limited timeframe.

Client resource barriers

- Smart cockpit solutions reflect intelligence level of vehicles and require high reliability and stability. Therefore, OEMs have **strict entry requirements** for smart cockpit solution suppliers, including **long-term and rigorous product validation**. New entrants to the industry may not have the ability to **obtain certifications** from OEMs quickly and enter the market within a short timeframe.

Supply chain management barriers

- The smart cockpit solution system involves a large number of hardware devices, including displays, sensors, electronic control units, etc. These devices require a high level of integration and standardization in order to facilitate large-scale production and assembly. Meanwhile, large-scale production can reduce manufacturing costs and improve production efficiency, which increases the enterprise's competitiveness.
- Supply chain optimization management is also one of the entry barriers. Smart cockpit solution suppliers need to establish close cooperation with suppliers to ensure a stable supply of parts and controllable quality.

Capital investment barriers

- **Dedicated and extensive research and development investment** are essential for smart cockpit solution suppliers to remain competitive in the industry. Therefore, whether there is sufficient initial capital investment in equipment, technology and innovation is one of the main issues restricting the development of new entrants in the industry.

Source: China Insights Consultancy

Key success Factors of Passenger Vehicle Smart Cockpit Solution Industry

- Success factors of passenger vehicle smart cockpit solution industry include comprehensive technology capabilities across software, hardware and cloud-based telematics services, long-term relationships with top-tier customers and partners, ability to develop platforms for high-computing power chips and large-scale production and supply chain management capabilities.

Success factors of passenger vehicle smart cockpit solution industry

Comprehensive technology capabilities across software, hardware and cloud-based telematics services	• Development of smart cockpit solutions necessitate deep technical expertise of the providers in multiple areas such as smart cockpit system software algorithms, domain controllers, and sensors. Integrated smart cockpit solutions require providers to possess not only strong hardware design and manufacturing capabilities but also robust software development and cloud-based telematics service abilities. Such integrated solutions also put forward higher requirements for the stability, reliability and security of the system. Solution providers with strong technology capabilities, solid R&D and innovation capacity, and in-depth understanding and experience in the industry can successfully develop high-performance, high-reliability integrated smart cockpit solutions.
Long-term relationships with top-tier customers and partners	• OEMs have stringent entry requirements for smart cockpit solution providers with lengthy and complex validation processes, and they generally do not easily switch their cockpit suppliers during the lifecycle of a vehicle model, which is usually 2-5years. The smart cockpit solution providers that have long-term and stable partnerships with top-tier OEMs can achieve mass production across multiple vehicle models and obtain the opportunity to participate in joint system development. Recognition of these providers' technical strength by OEMs during the collaboration process ensures their continuous and stable development. OEMs provide valuable market feedback and customer demand information to these smart cockpit solution providers, helping them optimize their product design to better satisfy market needs. In addition, the smart cockpit solution provider's cooperation with strategic partners along the value chain of the automotive industry, such as on technology and resources, enables the collaborating parties to better utilize their resources to expand the market and enhance automotive consumers' driving experience.
Ability to develop platforms for high-computing power chips	• Self-built proprietary high-computing power chip platforms are a crucial trend in the smart cockpit solution industry. Smart cockpit chip platforms must meet the automotive industry's rigorous requirements for reliability, durability, and real-time performance. The ability to develop high-performance chip platforms enables solution providers to better develop and utilize chips, harnessing the high computing power to adapt and support various smart cockpit functions. High-computing power chip platforms can also improve the flexibility of product development and realize complex human-machine interaction, further enhancing product competitiveness.
Large-scale production and supply chain management capabilities	• Smart cockpit systems involve a large number of hardware devices, including displays, sensors, and electronic control units, which require a high degree of integration and standardization. Mass production can reduce production costs and increase production efficiency, thereby increasing the market competitiveness of the smart cockpit products. Moreover, smart cockpit solution providers need to establish close partnerships with suppliers to ensure stable supply and quality control of components.

Source: China Insights Consultancy

Overview of Automotive-grade Chips

- Automotive-grade chips are one of the most important raw materials in the upstream of value chain of smart cockpit solution industry. SoC modules are the mainstream form of chips for smart cockpit solution, and it can be classified into high-end/mid-end/low-end SoC modules based on the level of CPU computing power.

Definition and classification of automotive-grade chips

- Automotive-grade chips are one of the most important raw materials in the upstream of value chain of smart cockpit solution industry. Specifically, chips can be applied in various in-vehicle modules and systems including vehicle control modules, in-vehicle infotainment, integrated control systems for power transmission and active-safety systems. Designed to meet the requirements of the automotive industry, such as operating temperature range, extended lifespan, and advanced reliability, chips are capable of achieving various rigorous functional requirements. Based on the application areas within a vehicle, automotive-grade chips can be divided into several categories, including chips for smart cockpit solutions, chips for intelligent driving solutions, vehicle control and safety chips, and communication chips, among others.

Category	Description
Chips for smart cockpit solution	• used in smart cockpit domain controllers to control, and process data from, various sensors, actuators, screens, and other devices within the cockpit.
Chips for intelligent driving solution	• responsible for processing data from a variety of sensors, including cameras, radar and LiDAR, in order to perceive the vehicle's surrounding environment and make complex decisions to assist or ultimately take control of the driving tasks.
Vehicle control and safety chips	• responsible for handling mission-critical functions, such as engine management, braking, stability control, and airbag deployment, with an extremely high degree of reliability and fail-safe mechanisms.
Communication chips	• enable seamless connectivity for infotainment, telematics, OTA updates, and V2V (Vehicle-to-vehicle) communication, including Wi-Fi, Bluetooth, Cellular (4G/5G), and V2X (Vehicle-to-everything) communication chips.

- SoC (System-on-Chip) modules, the mainstream form of chips for smart cockpit solutions, are responsible for integrating most or all components of a cockpit. Chips for smart cockpit solutions are responsible for processing and controlling various sensors, actuators, displays, and other devices within the cockpit. These SoC modules are able to streamline the integration of functions within the smart cockpit, which help enhance performance and efficiency, and support connectivity and security needs of drivers and passengers.
- The performance of SoC modules for smart cockpit solutions is usually determined by some key parameters, including central processing unit (CPU) computing power, graphics processing unit (GPU) computing power, manufacturing process technology, and neural network processing unit (NPU) computing power, among others. The CPU computing power is one of the most important parameters for a processor as it determines the smoothness, diversity, and complexity of functional configurations that can be achieved, and thus enhancing the overall performance and user experience of vehicles. CPU computing power is measured by a performance indicator called Dhrystone Million Instructions Per Second (DMIPS), which refers to the average number of instructions (expressed in millions) executed within a single second by using the Dhrystone program, a general-purpose CPU performance testing tool. Higher CPU computing power enables processors to handle more complex tasks and larger datasets, as well as to support a wider variety of software applications.
- In recent years, along with the continuous development and iteration of chip technologies, the industry standards of "High-end/Mid-end/Low-end SoC modules" in terms of CPU computing power are gradually improving, and current high-end SoC modules might become mid-end SoC modules in the near future. According to CIC, the current description of "High-end/Mid-end/Low-end SoC modules" for smart cockpit solutions are as follows:
  - ✓ High-end SoC modules typically include Qualcomm's fourth generation Snapdragon 8295 chipset and Kirin 9610A, among others. Their corresponding CPU computing power mostly exceeds 150k DMIPS.
  - ✓ Mid-end SoC modules typically include Qualcomm's SA8155P and MT8675, among others. Their corresponding CPU computing power mostly ranges from 80k to 150k DMIPS.
  - ✓ Low-end SoC modules typically include Qualcomm's SC60 and Qualcomm's QCM6125, among others. Their corresponding CPU computing power is mostly under 80k DMIPS.

Source: China Insights Consultancy

Global Leading Suppliers for Automotive-grade Chips

- At present, the global automotive chip market is dominated by giant companies in the U.S., Europe, Japan and other regions.

Ranking of top five SoC module suppliers for smart cockpit solution in China, in terms of sales volume of vehicles, 2024

Chips suppliers	*Background*	*Market share(1), 2024*	*Its main SoC modules for smart cockpit solution*
Qualcomm	A listed company primarily engaging in the design and development of wireless telecommunication products and services, and offering integrated circuits and system software for mobile devices and other wireless products, which is founded in 1985 and headquartered in the U.S.	~68%	SA 8295, SA 8155
AMD	A listed company primarily engaging in semiconductor products for the data center, embedded, gaming and PC markets, which is founded in 1969 and headquartered in the U.S.	~11%	AMD Ryzen
Renesas	A listed company primarily engaging in the research, development, design, manufacture, sales, and services of semiconductor products in automotive, healthcare, computer peripheral, connectivity, home appliance, and industrial end markets, which is founded in 2002 and headquartered in Japan.	~8%	R-CarV3H, R-CarH3
Huawei	A non-listed company primarily engaging in providing information and communications technology (ICT) infrastructure and smart devices, which is founded in 1987 and headquartered in China.	~4%	Kirin 990, Kirin 9610A
Samsung Electronics	A listed company primarily engaging in manufacturing and sales of smartphones, semiconductor chips, printers, home appliances, medical equipment, and telecom network equipment, which is founded in 1969 and headquartered in Korea.	~3%	Exynos Auto v9

Note:

(1) calculated by the sales volume of vehicles equipped with respective supplier's SoC module for smart cockpit solution in China by the total sales volume of vehicles equipped with SoC module for smart cockpit solution in China in 2024.

Source: China Insights Consultancy

Alternative Domestic Suppliers of Qualcomm's SoCs

- There are readily available alternative domestic suppliers that can supply SoCs that are comparable to Qualcomm's SoCs at comparable costs.

Available alternative domestic suppliers that can supply SoCs that are comparable to Qualcomm's 8155 processors

Chips suppliers	SoC module for smart cockpit solution	Computing power of CPU (k DMIPS)	Market share* (%)
Qualcomm	SA 8155P	98-105	~48%
MediaTek	MT2715	~110	/
	MT8675	~88	~0%
Huawei	Kirin 990	~90	~0.1%
SemiDrive	X9U	~100	~1%
	X9SP	~100	
Siengine	SE1000	~95	~3%
Unisoc	UIS7870	~93	/
Rockchip	RK3588	~93	/

**Note: calculated by the sales volume of vehicles equipped with respective SoC module for smart cockpit solution in China by the total sales volume of vehicles equipped with SoC module for smart cockpit solution in China in 2024.*

Available alternative domestic suppliers that can supply SoCs that are comparable to Qualcomm's Snapdragon 8295 chipset

Chips suppliers	SoC module for smart cockpit solution	Computing power of CPU (k DMIPS)	Market share* (%)
Qualcomm	SA 8295	~220	~19%
MediaTek	MT8678	~280+	/
	MT8676	~170	/
Huawei	Kirin 9610A	~200	~3%
CIX Tech	CA8180	~240	/

Despite domestic chip suppliers have made significant technological advancements in recent years, Qualcomm's first-mover advantage in the smart cockpit SoC market, coupled with its rapid iteration of chip platform and technology, have resulted in a relatively strong brand effect. Qualcomm has also established long-term and stable partnerships with numerous OEMs and smart cockpit Tier-1 suppliers. Furthermore, OEMs typically are reluctant to easily change the chip supplier during the lifecycle of a vehicle model. Consequently, domestic chip suppliers need some time to continuously improve their technological capabilities, chip performance and reliability in order to gain greater recognition from more OEMs and smart cockpit Tier-1 suppliers in China, and thus further expanding their market share in China's smart cockpit SoC market.

Source: China Insights Consultancy

Historical Price Trends of Chips for China's Passenger Vehicle Smart Cockpit Solution Industry

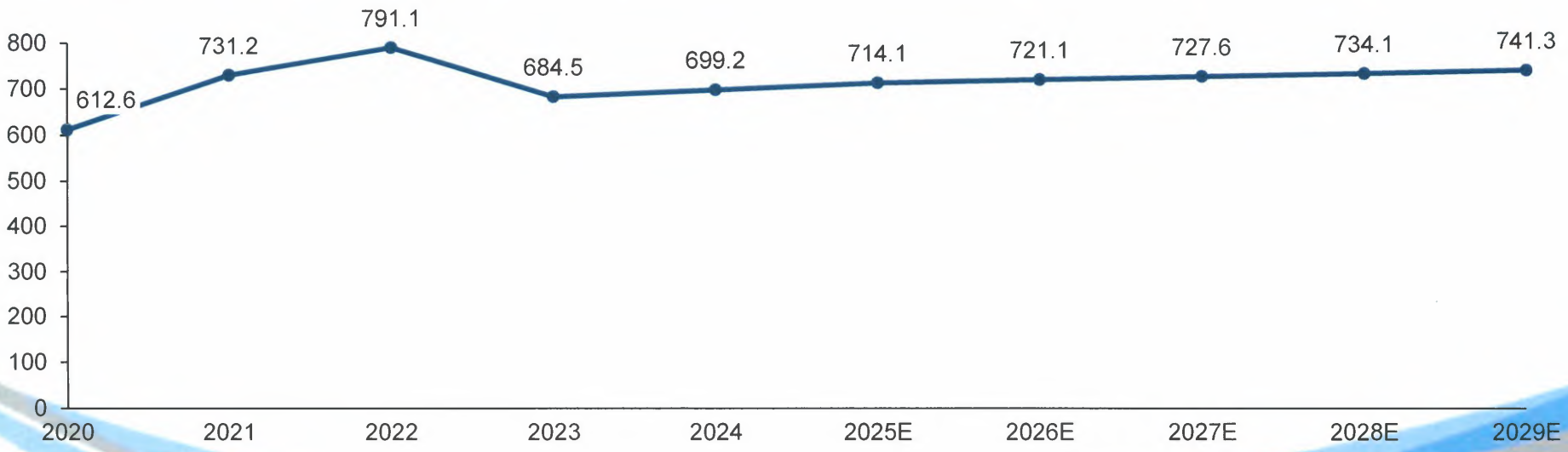
- The chips are one of the most important raw materials for passenger vehicle smart cockpit solutions industry, with their costs accounting for 20% to 35% of the overall cost of smart cockpit domain controllers.

- The main raw materials for passenger vehicle smart cockpit solutions in China include, among others, chips, modules and display panels. Notably, chips are one of the most important raw materials, with their costs accounting for 20% to 35% of the overall cost of smart cockpit domain controllers. However, since the outbreak of the COVID-19 pandemic at the beginning of 2020, insufficient production of automotive-grade chips caused a global chip shortage starting in late 2020. Simultaneously, concerns about geopolitical factors and supply chain stability prompted companies within the Chinese automotive industry started stockpiling, further exacerbating the chip shortage and leading to a sharp increase of chip prices in both 2021 and 2022 in China. Since 2023, chip supply has stabilized and prices have returned to normal levels. In 2024, the average price of mainstream SoCs for passenger vehicle smart cockpit solutions in China reached RMB699.2 per unit. Advancements by domestic chip manufacturers in technology and production capacity are expected to enhance localization of chips, reducing the shortage risks and stabilizing prices. Moreover, with the upgrade and iteration of the chips, and the increasing market demand for chips with higher performance and higher computing power, the average price of mainstream SoCs for passenger vehicle smart cockpit solutions in China is expected to moderately increase with a CAGR of 1.2% from 2024 to 2029.

Average price of passenger vehicle smart cockpit SoCs in China, 2020-2029E

Unit: RMB per unit

	CAGR	
	2020-2024	2024-2029E
Average price of mainstream passenger vehicle smart cockpit SoCs	3.4%	1.2%

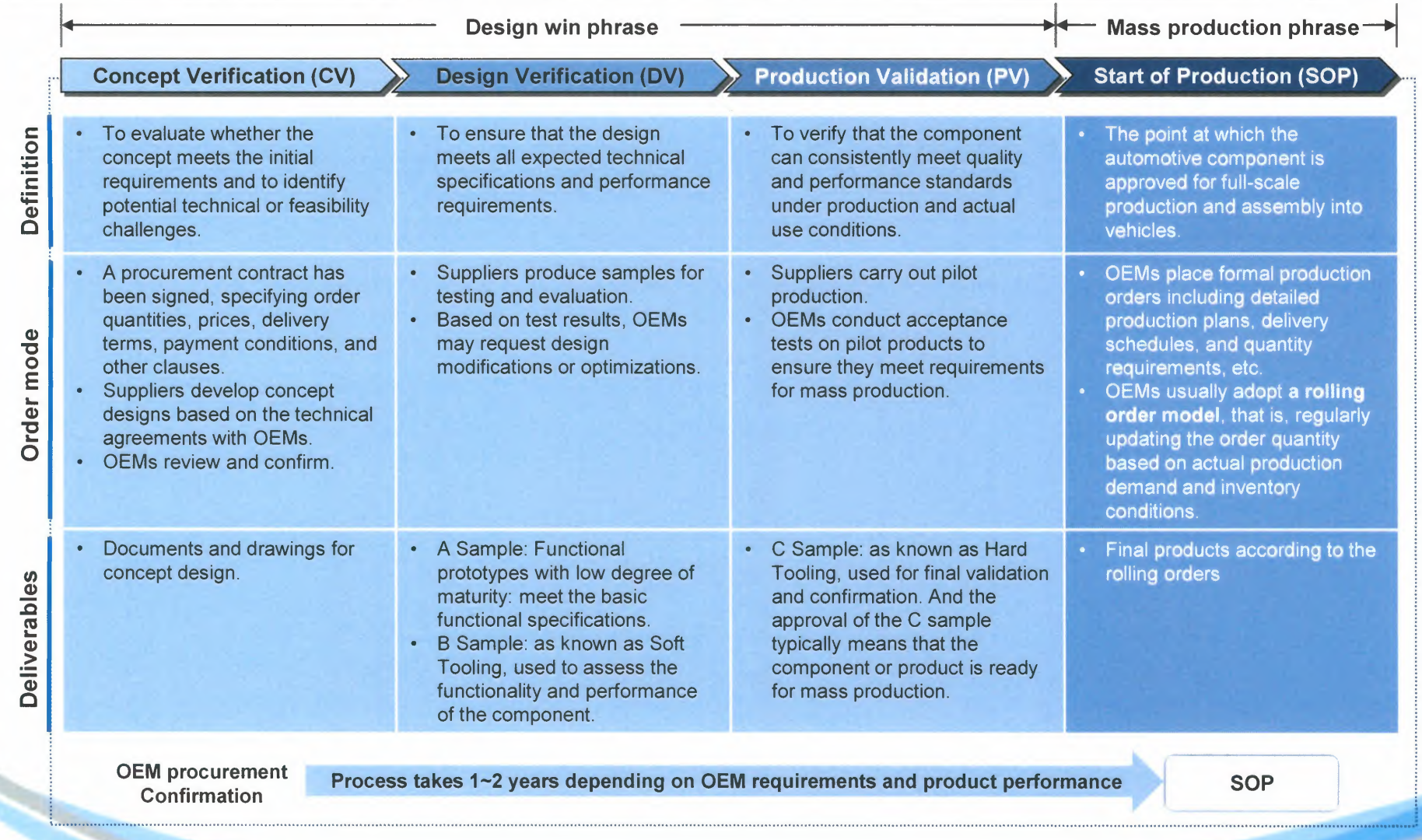


Source: Annual Reports, China Insights Consultancy

Order Mode between Suppliers and OEMs for Automotive Components

- During the design win phrase, the OEM usually requires the suppliers to provide multiple batches of samples for performance verification. After the final approval, the OEM will place a formal rolling production order to the suppliers based on actual production demand and inventory conditions.

Development process of automotive components and order mode between suppliers and OEMs



Source: China Insights Consultancy

4. Analysis of Global and China's Intelligent Vehicle Connectivity Industry

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Overview of Intelligent Vehicle Connectivity Technology for Passenger Vehicle

- The intelligent vehicle connectivity technology harnesses the power of the internet and advanced communication systems to connect vehicles with other vehicles, pedestrians, infrastructure, cloud platforms, and various other networks and devices to engage in real-time data exchange, information sharing, remote control and monitoring, and enhanced functionality within other entities.

Definition of intelligent vehicle connectivity technology

- The intelligent vehicle connectivity technology harnesses the power of the internet and advanced communication systems to connect vehicles with other vehicles, pedestrians, infrastructure, cloud platforms, and various other networks and devices. This enables vehicles to engage in real-time data exchange, information sharing, remote control and monitoring, and enhanced functionality within the vehicle and between the vehicle and its surroundings. By facilitating seamless connectivity and coordination, intelligent vehicle connectivity technology contributes to enhancing traffic efficiency and safety on the roads.
- Additionally, it can provide drivers and passengers with various in-cabin services and personalized experiences such as real-time navigation, remote diagnostics, vehicle tracking, emergency call and subscription service of automotive applications etc.

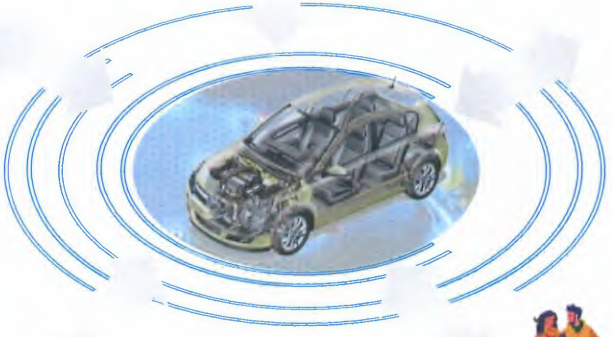
The ecosystem of intelligent vehicle connectivity technology - V2X

Vehicle to cloud service platforms

It is the business data carrier of the Internet of Vehicles service ecosystem, dedicated to improving users' driving experience.

Vehicle to other devices

The applications of mobile phones and other smart home devices can be operated in-cabin



Vehicle-to-Vehicle (V2V)

Can obtain the driving status of other vehicles, like speed and braking, etc.

Vehicle-to-Infrastructure (V2I)

Can realize the informatization of traffic and road, e.g. the rest of time for traffic signal ahead turning red

Vehicle-to-Pedestrian (V2P)

Pedestrians are users of Internet of Vehicles services and participants in the road environment.

Source: China Insights Consultancy

Pain Points That Intelligent Vehicle Connectivity Technology Can Address

- Intelligent vehicle connectivity technology can address many pain points in the automotive industry and transportation fields, and can help improve the traffic quality, energy efficiency, ride experience and then reduce the vehicle management and maintenance cost.

- The application of intelligent vehicle connectivity technology will profoundly change the automotive industry landscape and make the vehicles become more and more intelligent, interconnected, autonomous and shared.
- Intelligent vehicle connectivity technology can address many pain points in the automotive industry and transportation fields, and can help improve the traffic quality, energy efficiency, ride experience and then reduce the vehicle management and maintenance cost.

Pain points that intelligent vehicle connectivity technology can address

1 Traffic congestion and safety issues

- Intelligent vehicle connectivity technology enables real-time communication and collaborative driving between vehicles, which can reduce traffic congestion, improve road utilization efficiency, and enhance safety through traffic flow optimization, intelligent navigation, etc.

2 Environmental pollution and energy consumption issues

- Intelligent vehicle connectivity technology can optimize the travel routes and speeds of vehicles through intelligent driving and dynamic dispatching, thus reducing energy consumption and minimizing the environmental impact.

3 Ride experience and in-cabin service issues

- Intelligent vehicle connectivity technology can offer a wider range of personalized in-cabin services, such as intelligent navigation, remote control, entertainment, and Internet access to enhance the ride experience for both drivers and passengers.

4 Vehicle management and maintenance cost issues

- Intelligent vehicle connectivity technology enables remote monitoring and diagnostics of vehicles, and the continuously monitoring of vehicle status and prediction of potential issues can help reduce vehicle management and maintenance costs.

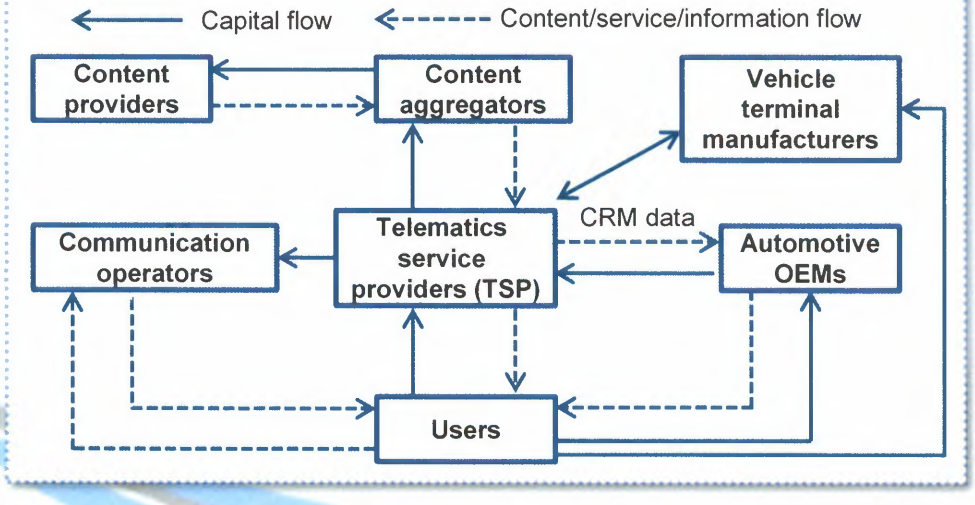
Source: China Insights Consultancy

Overview of Intelligent Vehicle Connectivity Industry

- Intelligent vehicle connectivity services serve as a crucial application of intelligent vehicle connectivity technologies, primarily including R&D and maintenance for vehicle connectivity platforms and systems and user support services enhancing car owner engagement to vehicle connectivity functions, among others.

- Intelligent vehicle connectivity services serve as a crucial application of intelligent vehicle connectivity technologies. These services primarily encompass, among others, R&D and maintenance services for vehicle connectivity platforms and systems and user support services enhancing car owner engagement to vehicle connectivity functions.
- Telematics Service Provider (TSP) is a crucial role in the intelligent vehicle connectivity service market between the vehicles and their owners. It serves as a core link in the value chain of Internet of Vehicles, and is responsible for the integration and management of software and hardware applications, Internet services, communication services, and other content provided by various parties in the value chain before presenting them to users.

The value chain of Internet of Vehicles system with the TSP as the curial role



Introduction of main intelligent vehicle connectivity services

1 User Support Services

- User support services, in particular, include a variety of customer-focused activities, such as user support, vehicle owner relationship management services and application ecosystem management services, which are designed to enhance the interaction and engagement between automotive brands and their customers. These services can help OEMs bolster their core competitiveness and achieve sustainable success.

2 R&D and maintenance service

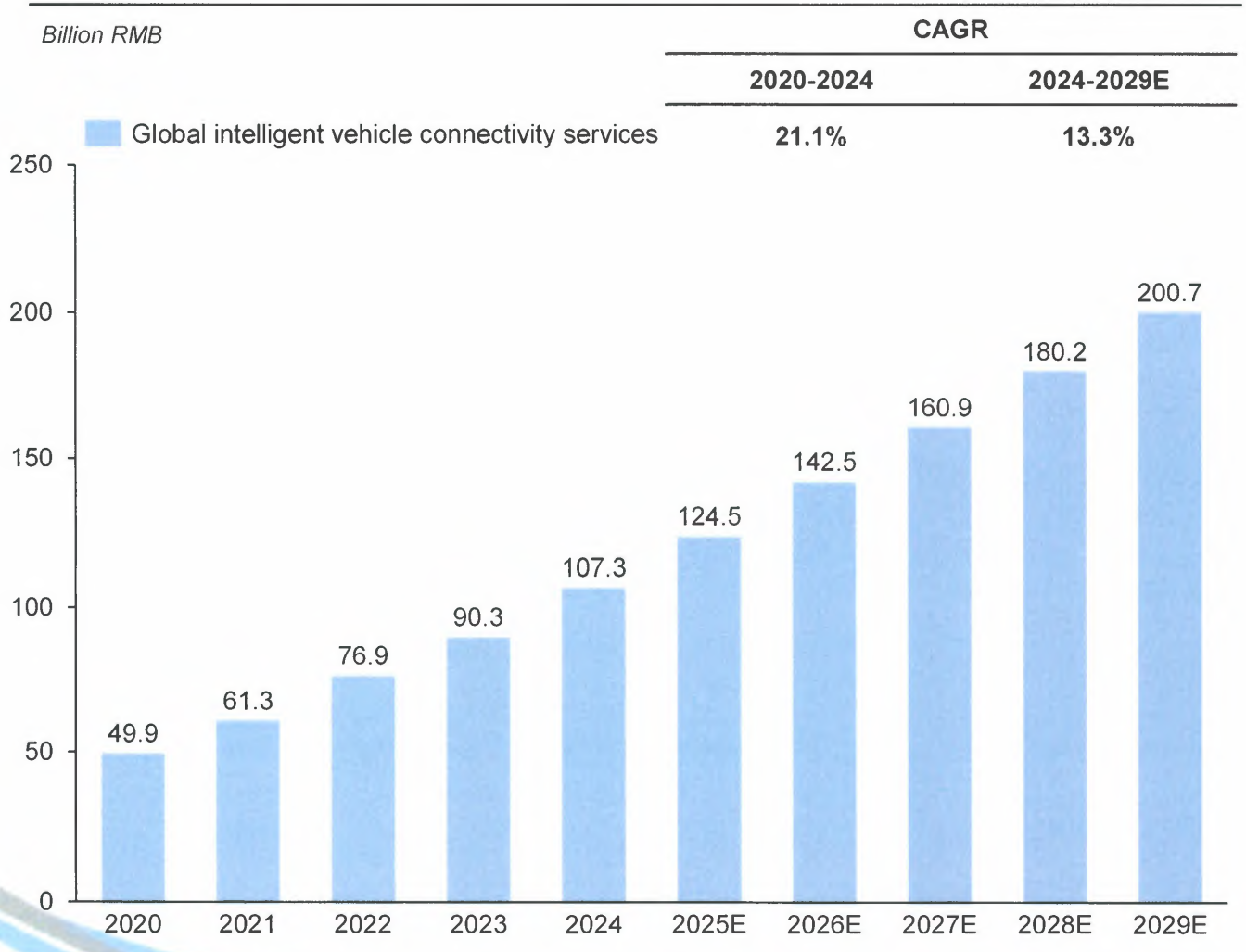
- The continuous development and maintenance of vehicle connectivity platforms and systems is crucial for ensuring seamless connectivity and efficient communication between vehicles, infrastructure, and the cloud platform.
- This includes R&D of new systems, upgrade and maintenance of original systems to ensure the stability and security.

Source: China Insights Consultancy

Market Size of Global Intelligent Vehicle Connectivity Industry

- The market size of global intelligent vehicle connectivity industry has been rapidly expanding from RMB49.9 billion in 2020 to RMB107.3 billion in 2024, representing a CAGR of 21.1% during the period.

Market size of global intelligent vehicle connectivity industry, in terms of revenue, 2020-2029E



Key analysis

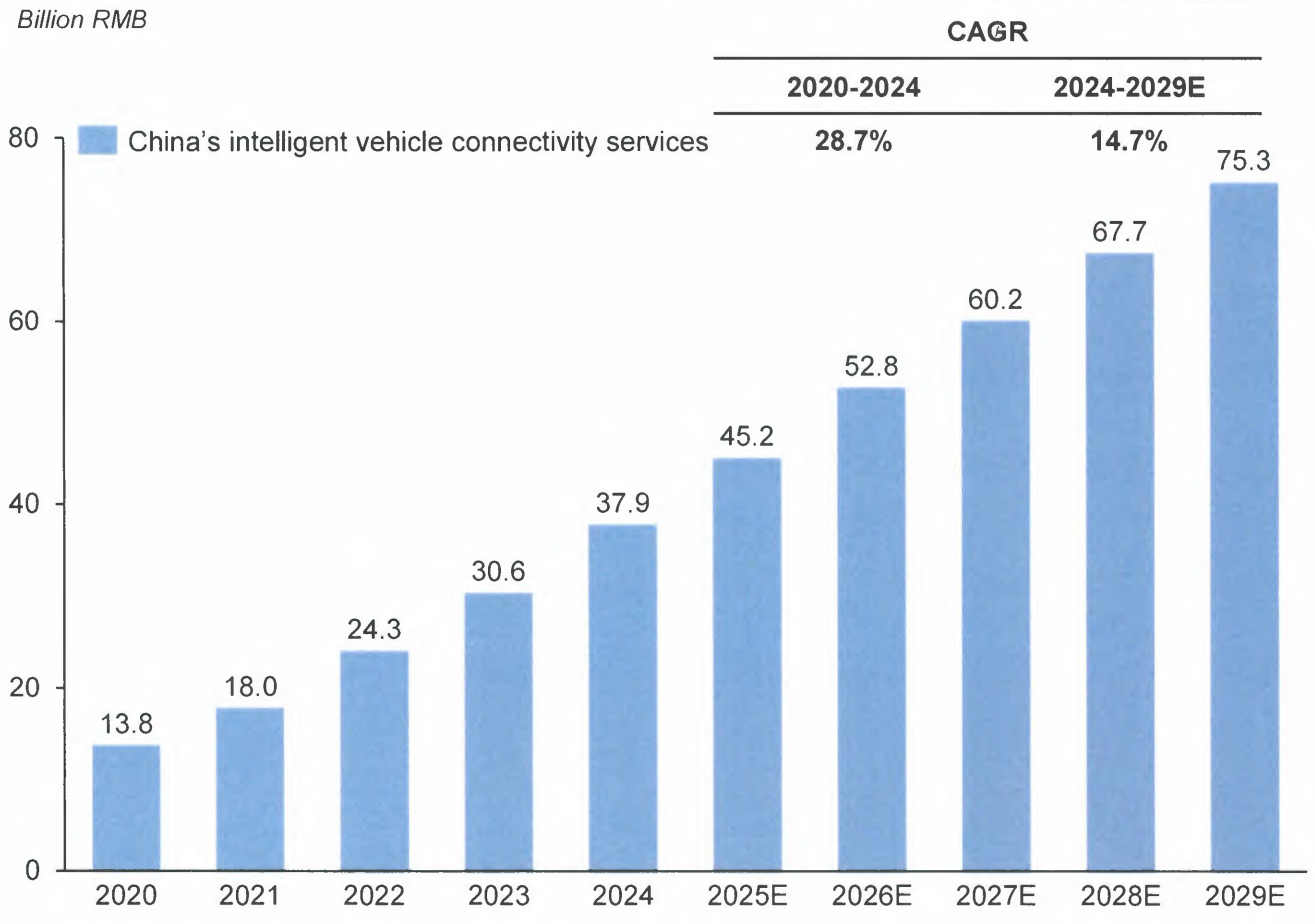
- As intelligent technology and the internet continue to converge, the connection between vehicles and the internet is becoming increasingly close, leading to a surge in innovative services and the thriving development of the intelligent vehicle connectivity industry. And the market size of global intelligent vehicle connectivity industry has been rapidly expanding from RMB49.9 billion in 2020 to RMB107.3 billion in 2024, representing a CAGR of 21.1% during the period.
- Meanwhile, with the increasing adoption of automotive intelligent and connected technologies, the demand for operation services is expected to surge. The integration of telematics service providers and the development of advanced ecosystem platforms are driving the expansion of this market. As a result, the market size of global intelligent vehicle connectivity industry, in terms of revenue, is expected to reach RMB200.7 billion in 2029, at a CAGR of 13.3% from 2024 to 2029.

Source: CPCA, China Insights Consultancy

Market Size of China's Intelligent Vehicle Connectivity Industry

- The market size of China's intelligent vehicle connectivity industry has witnessed significant growth from RMB13.8 billion in 2020 to RMB37.9 billion in 2024, representing a CAGR of 28.7% during the period.

Market size of China's intelligent vehicle connectivity industry, in terms of revenue, 2020-2029E



China's market size as % of global market size

Key analysis

- Driven by intelligent transportation systems, data-driven economy, and policy support, the market size of China's intelligent vehicle connectivity industry has witnessed significant growth from RMB13.8 billion in 2020 to RMB37.9 billion in 2024, representing a CAGR of 28.7% during the period. And the market size of China's intelligent vehicle connectivity industry accounted for approximately 35.4% of the global market in 2024.
- Furthermore, the market size of China's intelligent vehicle connectivity industry is expected to continue its expansion and reach RMB75.3 billion in 2029, at a CAGR of 14.7% from 2024 to 2029.
- Under the trend of ecosystem construction and cross-industry integration of different companies in the automotive industry, the intelligent connectivity industry continues to expand application scenarios and comprehensively enhance the user experience, leading to rapid growing customer demand for intelligent vehicle connectivity services.

Source: CPCA, China Insights Consultancy

Drivers of Intelligent Vehicle Connectivity Industry

- Drivers of intelligent vehicle connectivity industry include development of intelligent transportation systems, increasing demand for safety and in-vehicle infotainment, and supportive governmental policies.

Drivers of intelligent vehicle connectivity industry

Development of intelligent transportation systems

- Intelligent transportation systems that employ advanced information and communication technologies enable vehicles to obtain real-time information on traffic and road conditions, offer different mobility solutions, and optimize the utilization of transportation resources. As the development of intelligent transportation systems progresses, OEMs and telematics technology providers integrate intelligent vehicle technologies into a broader transportation ecosystem, driving the rapid growth of the intelligent vehicle connectivity industry.

Increasing demand for safety and in-vehicle infotainment

- As consumers seek greater convenience, safety and efficiency in their driving experiences and better vehicle services, there is a growing need for the intelligent vehicle connectivity industry that can offer real-time data, predictive maintenance, and enhanced interaction between vehicles, infrastructure and drivers. Consumers are placing greater emphasis on driving safety. Intelligent vehicle connectivity can provide safety assurances such as rescue services, satisfying consumers' needs for a secure driving experience. Also, consumers' demand for diverse in-vehicle infotainment continuously promotes the development of in-vehicle application platforms, accelerating the development of the intelligent vehicle connectivity industry.

Supportive governmental policies

- Some Chinese government authorities have jointly released the "Guidelines for the Construction of the National Vehicles Connectivity Standard System (2023 Edition)"(《国家车联网产业标准体系建设指南（智能网联汽车）（2023版）》), and the "Notice on Carrying out Pilot Projects for Access and On-road Operation of Intelligent and Connected Vehicles," (《关于开展智能网联汽车准入和上路通行试点工作的通知》) to provide guidance on the development of the intelligent vehicle connectivity ecosystem and accelerate the growth of this industry.

Source: China Insights Consultancy

Trends of Intelligent Vehicle Connectivity Industry

- Trends of intelligent vehicle connectivity industry include OEMs' increasing R&D investments in intelligent vehicle connectivity, accelerating cross-industry cooperation and more intelligent and automated operation models.

Trends of intelligent vehicle connectivity industry

OEMs' increasing R&D investments in intelligent vehicle connectivity

- With the growing consumer demand for automotive intelligence and connectivity, intelligent vehicle connectivity industry have become a crucial component of the competitive advantage of vehicles. By connecting vehicles with the cloud, OEMs can provide better intelligent services and functions, thereby enhancing the market competitiveness of their vehicle models. Moreover, through intelligent vehicle connectivity services, OEMs can better maintain their user base and introduce value-added services such as software subscriptions and call centers, expanding their profit margins.

Accelerating cross-industry collaboration

- Providers of intelligent vehicle connectivity industry are actively engaging in cross-industry collaborations to offer more diverse and personalized services. With the development of intelligent connected vehicles, automotive industry can integrate with various industries and form a vast ecosystem. OEMs, intelligent vehicle connectivity service providers, software developers, internet companies, and players in other industries are accelerating their involvement in the intelligent vehicle connectivity, collaborating in numerous areas such as technology sharing, data exchange, and standard formulation, promoting industry innovation and progress.

More intelligent and automated operation models

- Key technologies applied in intelligent vehicle connectivity, such as big data intelligent analysis and visualization, enable real-time processing and efficient analysis of massive data, providing strong data support for decision-makers of OEMs. Additionally, combined with the development of virtual and remote technologies, intelligent vehicle connectivity service will achieve a higher degree of automation and intelligence, greatly improving operational efficiency.

Source: China Insights Consultancy

Competitive Landscape of Intelligent Vehicle Connectivity Industry in China

- In the intelligent vehicle connectivity industry, independent suppliers who provide OEMs with vehicle connectivity services account for approximately 20% of the total market in terms of revenue. And the competitive landscape among independent intelligent vehicle connectivity service suppliers is highly fragmented, and there are currently no dominant market participants in this market.

- In the intelligent vehicle connectivity industry, the major players consist of automotive OEMs who develop their own vehicle connectivity solutions and independent suppliers who provide OEMs with vehicle connectivity services, with approximately 80% and 20% of the total market in terms of revenue, respectively.
- The competitive landscape among independent intelligent vehicle connectivity service suppliers is highly fragmented, and there are currently no dominant market participants in this market. Moreover, independent service suppliers provide a myriad of services, in standardized or customized solution type, including R&D and maintenance services for vehicle connectivity platforms and systems, user support services enhancing car owner engagement to vehicle connectivity functions. User support services typically consist of user support services, vehicle owner relationship management services and application ecosystem management services, among others. The Company's revenue from intelligent vehicle connectivity services reached approximately RMB110.2 million in 2024, representing a market share of 0.3% in the intelligent vehicle connectivity industry.

Definition and classification of China's intelligent vehicle connectivity service suppliers

Classification	Definition	Advantages and disadvantages of the smart cockpit solution capabilities	Major Players
1 Independent suppliers	• These providers suppliers provide a myriad of services, in standardized or customized solution type.	• High flexibility, can quickly adapt to the changes of customers' needs; • Strong technological foundation of software and hardware, capable to provide professional automotive cloud operation services; • Difficult to integrate ecosystem resources	DESAY SV automotive, China Unicom, CUSC, BICV, PATEO
2 Automotive OEMs and their subsidiaries	• These providers have close relationship with automotive manufacturers and focuses on providing Internet of Vehicles services.	• Core operation data is mastered by automotive OEMs themselves • Have a good understanding of automotive customers' needs • High technological R&D costs	ecarx, Hynex 海纳新思, 仙豆智能 BEANTECH, OnStar

Source: China Insights Consultancy

Entry Barriers of Intelligent Vehicle Connectivity Industry (1/2)

- Entry barriers of intelligent vehicle connectivity industry include required qualifications, long-term cooperation experience with OEMs, technological barriers, data security barriers, brand barriers and large-scale production barriers.

Entry barriers of intelligent vehicle connectivity industry

Required qualifications

- Intelligent vehicle connectivity service providers are required to obtain relevant qualifications, including the value-added telecommunications services business license for internet information services, also known as ICP License. New entrants have to invest a significant amount of time and gradually accumulate advanced technology to obtain such qualifications related to intelligent vehicle connectivity services.

Long-term cooperation experience with OEMs

- Intelligent vehicle connectivity service providers, through long-term stable cooperation with OEMs, have accumulated rich experience and resources, established solid cooperative relationships and reputation, and gained a foothold in the market. New entrants need to spend considerable time and resources building their brand influence and striving for cooperation opportunities with top-tier customers. This is a long-term and challenging process, making new entrants face greater pressure from competition.

Technological barriers

- The development of intelligent vehicle connectivity industry relies on breakthroughs in core technologies, including vehicle connectivity, artificial intelligence, communication technology, etc., which requires enterprises to have a large amount of industry know-how and long-term technology R&D to achieve excellent data processing and algorithm optimization capabilities.
- The development of intelligent vehicle connectivity industry need to follow a series of technical standards and regulations. New entrants may lack the experience and resources to meet the established standards, which may also constitute certain technical barriers.

Source: China Insights Consultancy

Entry Barriers of Intelligent Vehicle Connectivity Industry (2/2)

- Entry barriers of intelligent vehicle connectivity industry include required qualifications, long-term cooperation experience with OEMs, technological barriers, data security barriers, brand barriers and large-scale production barriers.

Entry barriers of intelligent vehicle connectivity industry

Data security barriers

- The intelligent vehicle connectivity industry faces serious challenges in terms of data security and network security. How to ensure the safe operation of vehicles in various complex environments and prevent malicious attacks and data leaks is a challenge that all companies in the industry need to face. For new entrants, the lack of relevant data security technology and know-how may become a major obstacle to their development.

Brand barriers

- The promotion and popularization of intelligent vehicle connectivity industry require brand awareness and brand recognition. Long-term brand image building and unique value propositions bring competitive advantages to the brand. New market entrants need to invest a lot to improve consumers' recognition and trust of the brand.

Large-scale production barriers

- The intelligent vehicle connectivity industry need to rely on comprehensive collaboration across the value chain, including parts suppliers, software developers, service providers, etc. Moreover, the intelligent vehicle connectivity industry has a long value chain, involving many fields such as automotive manufacturing, software development, communication technology, map services, and cloud computing, etc. Enterprises of intelligent vehicle connectivity industry need to establish close cooperative relationships with partners in all aspects to ensure the smooth operation of the entire ecosystem, which poses challenges to the resource integration and management capabilities of enterprises in intelligent vehicle connectivity industry.

Source: China Insights Consultancy

Success Factors of Intelligent Vehicle Connectivity Industry (1/2)

- Success factors to intelligent vehicle connectivity industry include advanced R&D capabilities, broad collaboration with in-vehicle applications and effective marketing strategy and high service quality.

Success factors of intelligent vehicle connectivity industry

Advanced R&D capabilities

- Intelligent vehicle connectivity services require strong technology capabilities in vehicle-to-everything communication, artificial intelligence, and smart cockpit solutions. Consequently, only service providers that have extensive industry know-how, long-term inhouse R&D experience, qualified data processing and algorithm optimization capabilities can effectively compete in the industry. Advanced technologies bring more efficient development potential to intelligent vehicle connectivity industry.

Broad collaboration with in-vehicle applications

- Intelligent vehicle connectivity service providers need to build a complete ecosystem, providing more diverse and differentiated content applications to attract a broader user base. Meanwhile, a large number of ecosystem partners enables resource sharing and business model creation, enhancing the service capabilities and competitiveness.

Effective marketing strategy and high service quality

- An effective market promotion strategy is crucial for expanding consumer base, increasing brand awareness, and boosting sales. The enterprises in the intelligent vehicle connectivity industry use a variety of promotion methods, such as media reports, online and offline activities, etc., to attract user attention and increase brand exposure. Meanwhile, providing high service quality is the key to retain users and build reputation. The enterprise focuses on optimizing service processes and improving service levels from the user's perspective, including pre-sales consultation, purchase experience, after-sales service, etc. This ultimately improves customers' satisfaction and loyalty.

Source: China Insights Consultancy

Success Factors of Intelligent Vehicle Connectivity Industry (2/2)

- Success factors to intelligent vehicle connectivity industry include comprehensive data security and privacy protection system, capital investment and value chain integration capabilities.

Success factors of intelligent vehicle connectivity industry

Comprehensive data security and privacy protection system

- The intelligent vehicle connectivity industry provide personalized services, optimize operational efficiency, and improve user experience by analyzing a large amount of data such as vehicle status, location information, driving trajectories, etc. A comprehensive data security system can ensure that the vehicle and user data are protected from unauthorized access and tampering. The enterprises in the intelligent vehicle connectivity industry need to take multi-level security measures, including encrypted transmission, access control and vulnerability patching to ensure the security of data during transmission, storage and processing.

Capital investment and value chain integration capabilities

- The intelligent vehicle connectivity industry requires high R&D costs, infrastructure construction investment and marketing expenses. Only with sufficient financial support can the enterprises of intelligent vehicle connectivity industry continue to carry out business and maintain long-term competitive advantages. Meanwhile, value chain integration capabilities are the key to realize intelligent vehicle connectivity industry. The industry involves many stakeholders, including automotive manufacturing, software development, cloud computing, communication technology, etc. By establishing a comprehensive supply chain system, the enterprises of intelligent vehicle connectivity industry can ensure efficient operation. Only by integrating the upstream and downstream resources of the value chain can the enterprise gain an advantage in market competition.

Source: China Insights Consultancy

5. Appendix

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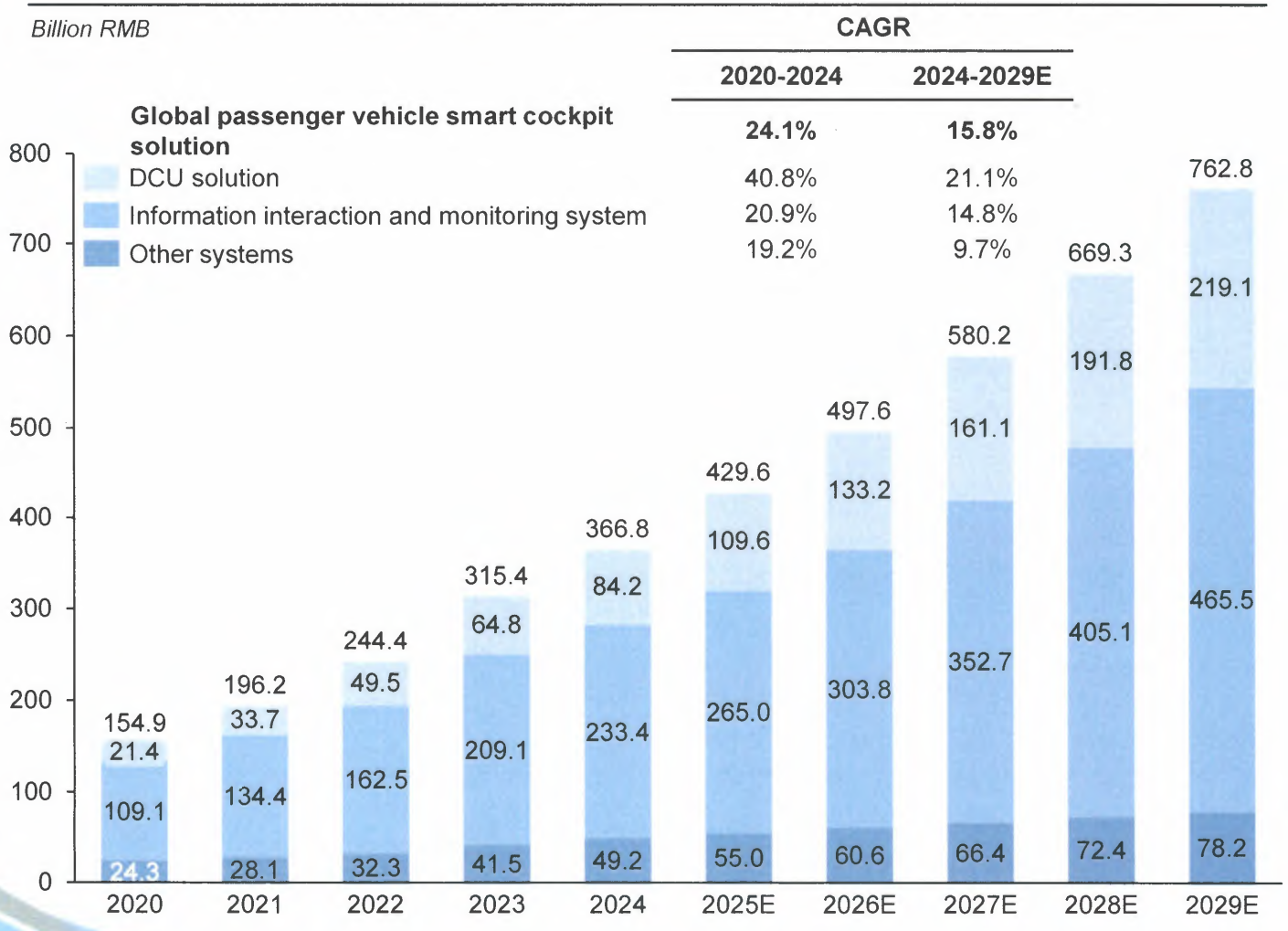
Market Size of Global Passenger Vehicle Smart Cockpit Solution Industry

- Smart cockpit is one of the main development directions of intelligence in the global automobile and transportation field, the market size in terms of revenue of global passenger vehicle smart cockpit solution industry reached RMB366.8 billion in 2024 and is expected to reach RMB762.8 billion in 2029.

Market size of global passenger vehicle smart cockpit solution industry, in terms of revenue, 2020-2029E



Note: Other systems mainly include T-box and voice system.

Key analysis

- Smart cockpit is one of the main development directions of intelligence in the global automobile and transportation field and has become a strategic emerging industry that countries compete for. And the market size of global passenger vehicle smart cockpit solution industry, in terms of revenue, has increased rapidly from RMB154.9 billion in 2020 to RMB366.8 billion in 2024, with a CAGR of 24.1%.
- Driven by the accelerating deployment of automotive intelligence by OEMs, increasing demand for personalized features of passenger vehicles, innovation of software and hardware technology and supportive policies and regulations, the market size of global passenger vehicle smart cockpit solution industry, in terms of revenue, is projected to experience significant growth, and reach RMB762.8 billion in 2029, at a CAGR of 15.8% from 2024 to 2029.

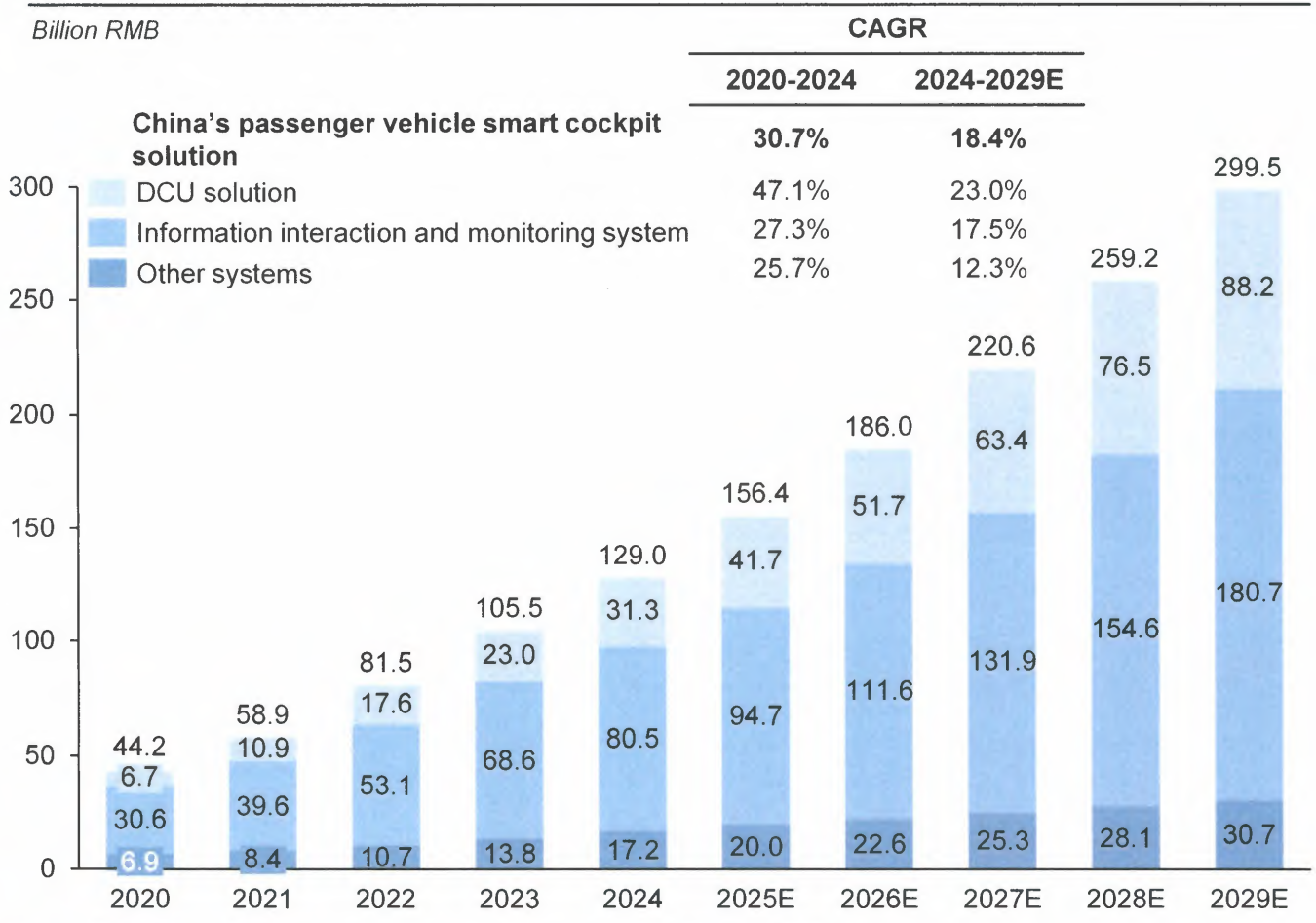
Source: CPCA, China Insights Consultancy

Market size version 2

Market Size of China's Passenger Vehicle Smart Cockpit Solution Industry

- As the demand for intelligent, connected, and immersive vehicle experiences continues to grow in China, the market size in terms of revenue of China's passenger vehicle smart cockpit solution industry reached RMB129.0 billion in 2024 and is expected to reach RMB299.5 billion in 2029.

Market size of China's passenger vehicle smart cockpit solution industry, in terms of revenue, 2020-2029E



The value of smart cockpit solution per vehicle[1] in China, RMB

2,129.3 → 4,559.8 → 8,726.3

Notes: 1 Calculated by dividing the market size of smart cockpit solution by the sales volume of passenger vehicles.
2 Other systems mainly include T-box and voice system

Key analysis

- China being the world's largest passenger vehicle market and the leading manufacturer of NEV, is playing a significant role in driving the growth of passenger vehicle smart cockpit solution industry. The market size of China's passenger vehicle smart cockpit solution industry, in terms of revenue, has increased from RMB44.2 billion in 2020 to RMB129.0 billion in 2024, with a CAGR of 30.7%. Meanwhile, the value of smart cockpit solution per vehicle in China amounted to approximately RMB4,560.
- As the demand for intelligent, connected, and immersive vehicle experiences continues to grow in China, the smart cockpit solution market is poised for substantial development, and the market size of China's passenger vehicle smart cockpit solution industry, in terms of revenue, is expected to grow at a CAGR of 18.4% from 2024 to 2029, and reaching RMB299.5 billion in 2029. and the value of smart cockpit solution per vehicle in China is expected to rise to approximately RMB8,726 by 2028.
- In the context of the development of multimodal HMI and the trend towards integrated E/E architectures, the smart cockpit domain will further integrate with other domains to realize shared computing resources and seamless collaboration, thus enhancing overall vehicle intelligence.

Source: CPCA, China Insights Consultancy

Other supplemental information (1/18)

- The Company is a pioneer in China's automotive intelligence industry, one of the few domestic providers of both smart cockpit and intelligent vehicle connectivity solutions, and the Company is a leading independent domestic provider of smart cockpit solutions for Chinese OEMs.
- The Company unveiled China's first 3G vehicle connectivity system in 2010, making it one of the first entrants in China's intelligent vehicle connectivity market.
- The Company stands among the few enterprises that first developed smart cockpit solutions, ahead of most of its peers.
- Smart cockpits are an essential component in the automotive industry's intelligent transformation, providing users with the most tangible and perceivable benefits from automotive intelligence technologies.
- Consumers of high-end and emerging automotive brands are increasingly seeking enhanced in-vehicle experience. This growing demand is propelling the intelligent transformation of the automotive industry, consequently raising the value of smart cockpits.
- Chinese OEMs are increasingly capturing a higher market share in China's automotive industry, and are moving towards developing high-end vehicles with advanced automotive intelligence features.
- The Company is the second-largest provider of smart cockpit domain controller solutions for NEVs produced in China in terms of shipment volume in 2024 with a market share of 11.9%, ranking after a player with a market share of 22.8%.
- In 2023, the Company became one of the first companies to offer smart cockpit solutions powered by Qualcomm's fourth generation Snapdragon 8295 chipset in China, which is among the mainstream automotive-grade chips for smart cockpit solutions with the highest computing power.
- As of December 31, 2024, the Company ranked first among Chinese smart cockpit solution providers in terms of the number of design wins for high-end smart cockpit solutions equipped with Qualcomm's 8295 chipset.
- The smart cockpit and intelligent vehicle connectivity solutions of the Company have been deployed by three of the top five Chinese OEMs and two of the top five emerging premium Chinese NEV brands in terms of sales volume in 2024.
- The Company is a key contributor to the automotive industry's intelligent transformation, consistently advancing innovation.
- In 2013, the Company introduced the first ever automotive-grade operating system developed by a private-owned enterprise in China.
- The Company has established itself as a significant hub of intellectual property within the industry. The Company ranked first in terms of the number of registered invention patents among domestic smart cockpit and intelligent vehicle connectivity solution providers as of December 31, 2024.
- The average price of mainstream SoCs for passenger vehicle smart cockpit solutions was RMB791.1 per unit, RMB684.5 per unit and RMB699.2 per unit in 2022, 2023 and 2024, respectively. The average price of mainstream automotive-grade chips for passenger vehicle smart cockpit solutions is expected to increase at a moderate rate in the near future.

Source: China Insights Consultancy

Other supplemental information (2/18)

- As technology progresses and consumer demands shift, the integration of intelligence has emerged as a crucial trend in the automotive industry.
- The Company's opportunities in the smart cockpit solution industry will not be significantly affected by OEMs' in-house development efforts, due to that OEMs' in-house research and development efforts could face cost and efficiency challenges, often requiring substantial initial investment and resulting in longer iteration cycles compared to platforms of the Company.
- It's common for chip suppliers to enter into project-by-project chip procurement agreements with terms less than two years. Upon expiration, it is industry norm to renew such agreements based on actual demands.
- The industry average unit price for smart cockpit powered by mid-ends SoCs (such as Qualcomm's 8155 processors) ranged from RMB1,500 to RMB2,500 during the Track Record Period.
- In 2021, the Company became the industry's first to support real-time switch between multiple screens within a vehicle using scrolling or gesture recognition and various visual interactions such as face, gesture and fatigue recognition, along with augmented reality navigation.
- The Company began collaborating with Dongfeng Group in 2018 with a focus on telematics services, and jointly developed the first Dongfeng Aeolus WindLink 3.0 intelligent vehicle connectivity system in the same year. This system stands as the industry's pioneering integration that utilizes natural voice for interacting with quick applications.
- In 2021, the Company developed the world's first intelligent solid-state audio system using a vehicle's surrounding body panel to produce and receive high-quality sound.
- The Company have consistently achieved "first-in-class" milestones in technologies and solutions:
    - one of the few Chinese domestic providers of smart cockpit solutions powered by Qualcomm's 8295 chipset, which is currently the most representative high-end SoC chips for smart cockpits, accounting for over 50% of the installed volume among high-end SoC chips used in large-scale deployments of smart cockpits in 2024;
    - one of the few providers offering smart cockpit solutions based on Kirin 9610A processors, being the only domestically produced high-end SoC chip for smart cockpits that has achieved large-scale deployment, and HarmonyOS operating system;
    - the first among private-owned Chinese companies to introduce self-built automotive-grade operating system;
    - the first to launch intelligent vehicle connectivity solutions in China that use mobile phones' computing power;
    - the one who developed China's first in-vehicle voice system based on natural language processing and the world's first intelligent solid-state audio system using a vehicle's body panel to produce and receive sound;
    - the one who launched the industry's first in-vehicle congestion avoidance navigation system; and
    - the first to introduce a cloud-based vehicle connectivity platform which can provide telematics services through mobile phones, laptops and telematics-boxes and offer remote security and voice control functions for passenger vehicles; this platform is the first of its kind, built with a service-oriented architecture and applies NGTP2.0 (Next Generation Telematics Patterns) protocols.

Source: China Insights Consultancy

Other supplemental information (3/18)

- In 2023, the Company secured an agreement to supply smart cockpits powered by Qualcomm's 8295 chipset for two Hyundai car models to be sold globally. This made the Company one of the first Chinese companies that supply global OEMs with smart cockpits powered by these processors for car models to be sold globally.
- The Company has a strategic partnership with Qualcomm and was among the first to develop smart cockpit solutions using its fourth generation Snapdragon 8295 chipset. These solutions have secured design wins for mainstream models from Zeekr, Hyundai and other brands. The Company has serviced Zeekr's Model 009 series, which are scheduled for mass production in the latter half of 2024 and will be one of the first mass-manufactured cars equipped with smart cockpit solutions powered by Qualcomm's 8295 chipset.
- The Company's insurance coverage is in line with the market practice.
- In various in-vehicle scenarios, the Company's solutions demonstrate outstanding capabilities in voice wake-up, speech recognition, and speaker identification. Major activation words achieve an activation rate of over 95%, with an average response time of less than 350 milliseconds, placing the Company at an industry-leading level.
- The Company is one of the first Chinese smart cockpit solution providers to expand business footprint into the upstream automotive-grade chip domain.
- Given OEMs in the automotive industry usually deliver more of their vehicle models towards the year end, it can impact the delivery of the Company's solutions in the fourth quarter of each year. The delivery of solutions of the Company typically increase in the second half of the year, which is generally in line with the trend of sales volume of passenger vehicles in China.
- It is common for leading enterprises in the automotive intelligence industry to operate across multiple segments across the entire value chain, and it is a norm in the automotive intelligence industry that upstream and downstream enterprises along the value chain transact with each other as suppliers and customers.
- Generally, as the competition of intelligent driving industry is more intense compared with smart cockpit and intelligent vehicle connectivity industries, the gross profit margin of intelligent driving businesses is relatively lower than the gross profit margin of smart cockpit businesses and intelligent vehicle connectivity businesses.
- The high concentration rate of major customers is the industry norm of the automotive intelligence industry, because of the strong demand for specific products and solutions, such as smart cockpits and intelligent vehicle connectivity solutions, from certain vehicle models.
- Wireless communication is a pivotal future trend for automotive intelligence, enabling enhanced integration of devices and systems, real-time data exchange, remote control functionalities, and improved user experience.
- The Company has built a strong brand name and garnered significant industry recognition.

Source: China Insights Consultancy

Other supplemental information (4/18)

- Cockpit domain control technology stands as a pivotal point within the realm of vehicle domain control. The emergence of this technology significantly streamlined the domain control of the overall vehicle, providing a crucial E/E architecture for the development of next-generation software-defined intelligent vehicles.
- Conventional speakers encounter challenges when projecting sound externally, including space limitations, installation constraints, suboptimal water, dust, and corrosion resistance, high power consumption, as well as lack of support for external surround sound.
- The central computing platform (CCP) typically integrates flagship cockpit features, advanced driver assistance systems, body control functionalities, gateways, 5G connectivity, and V2X capabilities, which serves as the backbone for next-generation, software-defined intelligent vehicles and redefines automotive technology with its exceptional integration, performance, security, and adaptability across diverse scenarios.
- As a leader in the automotive intelligence industry, the Company has forged strong partnerships across the industry value chain, which play a pivotal role in shaping the industry presence and innovation trajectory.
- The Company has a strategic partnership with Qualcomm and was among the first to develop smart cockpit solutions using its fourth generation Snapdragon 8295 chipset.
- The Xiamen Manufacturing Center of the Company possesses industry-leading intelligent manufacturing capabilities, a full-process laboratory management system, advanced supply chain management capabilities, as well as comprehensive qualification certification and process management abilities.
- The automotive industry adheres to stringent quality standards, and automotive OEMs implement rigorous validation processes to ensure product reliability, performance and compliance with high industry standards.
- Smart cockpits are an essential component in the automotive industry's intelligent transformation, providing users with the most tangible and perceivable benefits from automotive intelligence technologies.
- The markets in which the Company operates are in their early stage of development and are intensely competitive. The markets are characterized by rapid changes in technology, shifting customer demands and frequent introduction of new services and products. The competition is expected to continue, both from current competitors, who may be well-established and enjoy greater resources or other strategic advantages, as well as from new entrants into the market, some of which may become significant players in the future.
- There are adequate acquisition targets meeting the criteria of the Company in the market.
- Two of the Company's proprietary technological innovations related to smart cockpit solutions and intelligent vehicle connectivity solutions were acknowledged as internationally leading technologies by the National New Energy Vehicle Technology Innovation Center of China (國家新能源汽車技術創新中心) ("NEVC").

Source: China Insights Consultancy

Other supplemental information (5/18)

- With the international expansion of Chinese OEMs, the Company partners with them to design and deliver products tailored to their overseas vehicle model.
- The escalating OEM interest can be attributed to the transition towards intelligence in automotive industry, promoting their delivery of vehicle models equipped with smart cockpits featuring high-end automotive-grade chips. This growing trend has driven OEMs to integrate smart cockpits into their vehicles, as one of the most significant differentiators to maintain a competitive position. Furthermore, some of the high-end Chinese OEM brands the Company collaborated with have witnessed an increase in the average sales volume from 0.05 million in 2022 to 0.14 million in 2023.
- The average price of mainstream SoCs for passenger vehicle smart cockpit solutions was RMB791.1 per unit, RMB684.5 per unit and RMB699.2 per unit in 2022, 2023 and 2024. Despite the stabilization of chip prices since 2023, the Company remain exposed to the risk of potential shortages or supply disruptions.
- In recent years, OEMs have also been attempting through in-house efforts to develop their own smart cockpit solutions to keep pace with the automotive intelligence trend.
- As a key participant in the automotive intelligence industry, the Company has forged mutually beneficial partnerships across the industry value chain.
- The modern automotive electrical/electronic(E/E) architecture is typically divided into five functional domains: cockpit, powertrain, body, chassis and autonomous driving. The domain controllers, as the "brain" of an intelligent vehicle, integrate smart cockpits with the other vehicle systems, playing a crucial role in enhancing driver experience and vehicle functionality.
- It is common for OEMs to engage multiple suppliers for cockpit solutions for the same vehicle model or series in the automotive industry to manage supply chain risks. A typical customer engagement process for the Company's solutions and products can be divided into three stages: project acquisition, project development, and project validation.
- As a newcomer in the smart cockpit and intelligent connectivity solution industry. The Company has adopted a prudent pricing strategy to expand the Company's customer base and navigate the intense competition. The Company is also new to hardware manufacturing compared to other early competitors in the smart cockpit industry.
- The escalating OEM interest in delivery of vehicle models equipped with smart cockpits featuring high-end automotive-grade chips, which can be attributed to the transition towards intelligence in automotive industry.
- As a key member of the SparkLink Alliance — an industrial alliance committed to promoting innovation in next-generation wireless short-range communication technology — the Company are at the forefront of developing advanced smart cockpits that adhere to SparkLink's cutting-edge wireless communication standards. The Company has taken a leading role in formulating four key groups of standards for the SparkLink Alliance, playing a crucial part in shaping and releasing industry standards.

Source: China Insights Consultancy

Other supplemental information (6/18)

- The company's customers include OEM customers, Tier-1 customers and other automotive ecosystem companies.
- Other automotive ecosystem companies include automotive technology service providers, automotive finance service providers, and other service providers related to the automotive field. These companies are committed to delivering comprehensive technical services and solutions for the automotive industry and its derivative areas, including R&D services for V2X, financial services, automotive aftermarket and emerging mobility services, among others.
- The Company's gross profit margin was lower than that of certain industry participants with mature production and operations in smart cockpit sector, primarily because the Company is still in the stage of ramping up its production.
- It is common for an OEM to engage multiple suppliers for cockpit solutions within the same vehicle model or series in the automotive industry for the following reasons:(i) Supply chain optimization. Using multiple suppliers gives OEMs flexibility to manage inventory efficiently, keeping production lines running smoothly and minimizing delays due to inventory issues. It also allows them to adjust procurement strategies based on market changes, product demand, and supplier performance. (ii) Risk management. Relying on a single supplier poses risks like production interruptions, quality problems, delivery delays, or financial instability. Having multiple suppliers mitigates these risks, ensuring a more stable and reliable supply chain. (iii) Cost and quality competition. Competition between suppliers helps OEMs secure better pricing and allows for comparison of product quality, performance, and reliability, enabling them to select the best option for their needs.
- OEMs generally do not easily switch their cockpit suppliers during a product's lifecycle for the following reasons: (i) Strict automotive-grade audit. Automotive products must meet rigorous audit standards, passing numerous reliability tests. Once a supplier successfully clears these tests, they are rarely replaced due to the strict approval process. (ii) Long certification process. Automobiles and related automotive-grade components must undergo extensive testing and certification processes before they can be introduced to the market. The certification process often takes one to two years. This long certification cycle makes OEMs reluctant to switch suppliers once approved. (iii) High cost for OEMs. Changing suppliers may require renegotiating contracts, relating to supply quantities delivery schedules, quality standards, and pricing. The changes in these terms may interrupt the delivery schedules and quality of the product, increasing the costs for OEMs in the short term. (iv) Technical integration challenge. Cockpit systems are often deeply integrated with other electronic systems of the vehicle. Switching suppliers may require redesigning and testing to ensure compatibility, performance, and overall vehicle quality, making the transition more complex.
- Major OEMs are spread throughout China, with concentrated industry clusters in the eastern, southern and northern regions.

Source: China Insights Consultancy

Other supplemental information (7/18)

- The global automotive chip market is dominated by giant companies. The Company recognizes that fostering long-term strategic collaborations with chip suppliers is pivotal to securing a reliable supply of high-quality chips, and the Company has established such long-term strategic relationship with Qualcomm, the global leading high-quality chip supplier. The Company was among the first to develop smart cockpit solutions using its fourth generation Snapdragon 8295 chipset and delivered smart cockpit units powered by Qualcomm's Snapdragon 8295 chipset to one of the top five Chinese premium emerging NEV brands in terms of sales volume in 2024 during the Trach Record Period.
- The ratio between OEMs' procurement of full-stack smart cockpit solutions and individual components is not publicly available information. Such data is often considered proprietary and sensitive to OEMs, as it can reveal OEMs' strategic decisions and competitive advantages.
- The Company is "a pioneer in China's automotive intelligence industry," "pioneer in China's automotive intelligence transformation, leading with innovative solutions" as it has consistently achieved "first-in-class" milestones in automotive intelligence technologies and solutions, including unveiling "China's first 3G vehicle connectivity system in 2010," "one of the first entrants in China's intelligent vehicle connectivity market," "the few enterprises that first developed smart cockpit solutions, ahead of most of the Company's peers," and "the first ever automotive-grade operating system developed by a private-owned enterprise in China."
- The Company is a leading independent domestic provider of smart cockpit solutions for Chinese OEMs.
- There are currently no industry-wide regulations or standards for classifying "High-end/Mid-end/Low-end SoC modules". This classification is summarized by CIC based on communication with industry experts as well as desk research, which also reflects a general consensus among professionals in the industry.
- "Software-hardware integrated smart cockpit solution" market is a meaningful and reasonable sub-segment of the industry. In addition, the sales volume of domestic automotive brands in China has seen a significant increase, rising from 35.6% in 2020 to 63.3% in 2024. This upward trend is expected to continue, with projections indicating a growth to 75.0% by 2029. As a result, these brands have emerged as key customers for smart cockpit solution providers. Meanwhile, domestic providers of smart cockpit solutions for passenger vehicle are increasingly gaining prominence in the market. They have managed to carve out a niche for themselves by offering flexible cooperation services and cost-effective products, which is proven to be successful, as evidenced by their achievement of a market share of more than 50% in China's passenger vehicle smart cockpit solution market as of 2024. As a result, this development has led to a shift in the preferences of Chinese domestic OEMs. They are now increasingly favouring partnerships with these domestic smart cockpit solution providers. This trend underscores the significant potential for domestic substitution within China's smart cockpit solution industry.

Source: China Insights Consultancy

Other supplemental information (8/18)

- In the recent years, several nations and regions have levied tariffs on Chinese battery electric vehicles (the "BEVs"). The European Union has agreed to impose high anti-subsidy tariffs on Chinese-made BEVs for five years, with additional rates reaching up to 35.3% on top of the existing 10% tariff, varying by OEMs. Both Chinese OEMs and foreign OEMs producing in China will be impacted. In the United States, an additional 100% tariff was imposed on Chinese-imported BEVs since September 27, 2024, resulting in a total tariff of 102.5% without a defined expiration date. Canada implemented a similar tariff policy on October 1, 2024, with a total tariff rate of 106.1%. These tariffs are expected to primarily impact OEMs by increasing export costs and reducing sales volumes for OEMs.
- However, for the smart cockpit solutions industry, which operates upstream of OEMs, these tariffs on NEVs are unlikely to have a significant impact on smart cockpit solution industry, for the following reasons: (1) Subject of the tariffs imposed. Smart cockpit solution providers serve as one of the upstream suppliers of automotive industry, and there is no tariffs imposed on smart cockpit solutions or products. Therefore, the tariffs on Chinese new electric vehicles are not expected to have a direct and immediate impact on smart cockpit solution industry. (2) Application scenarios. Smart cockpit solutions can be integrated into vehicles of all energy types, not solely NEVs. In addition, the overall automotive industry is transforming towards intelligence and connectivity, which is expected to further drive the demand for smart cockpit solutions and the adoption of higher-value smart cockpit solutions. (3) Technological innovation and product upgrades. The smart cockpit system serves as a pivotal interface for users to experience vehicle intelligence, and it is one of key factors in strengthening the competitiveness of vehicles. Chinese OEMs are expected to adopt smart cockpits solutions with improved functionalities and user experience to increase the appeal of their vehicle models in overseas markets, thereby offsetting the impact of higher tarriffs on product competitiveness. This dynamic is anticipated to promote technological innovation and product upgrades within the smart cockpit solution industry, ultimately fostering the development of the industry. (4) Limited contribution of NEV exports. According to the China Passenger Car Association (the "CPCA"), China's NEV export volume reached 1.95 million units in 2024, representing only 6.9% of China's passenger vehicle sales volume. Given this relatively small portion, tariffs imposed on NEVs are not expected to significantly impact on China's automobile industry and smart cockpit solution industry. (2) Tariff scope. The recently imposed tariffs by the U.S. and E.U. specifically target NEVs produced by Chinese OEMs. According to the CPCA, China's exports of NEVs to the European market in 2024 accounted for approximately 26.3% of China's automobile exports to Europe. Similarly, exports of NEVs made up approximately 27.7% of China's automobile exports to the U.S. during the same periods. Given that NEV exports only account for a relatively small portion of automotive exports to both markets, the tariffs targeting only NEVs are unlikely to have a significant impact on China's entire automobile industry. Furthermore, China's OEMs have implemented strategic measures such as setting up manufacturing facilities overseas to counteract the tariffs' impact. These initiatives are expected to further mitigate the impact of tariffs on Chinese vehicles. (3) Emerging Southeast Asian markets. In the recent years, Southeast Asia has provided strong support for China's NEV OEMs through favourable policies. Additionally, the region has seen significant growth in purchasing power of consumers and rapid expansion of NEV sector. Consequently, NEV export volume from China to Southeast Asia increased from 74.0 thousand units in 2023 to 114.0 thousand units in 2024, representing a growth rate of 54.1%. As a result, Southeast Asia became an emerging market for China's OEMs, complementing the U.S. and E.U, markets. Therefore, it is expected that rapid development of Southeast Asian NEVs market would create strong demands for smart cockpit solutions, driving the continuous advancement and development of China's smart cockpit solution industry. In conclusion, tariffs recently imposed on China's NEVs will not have material and adverse effects on China's automobile industry and smart cockpit solution industry.

Source: China Insights Consultancy

Other supplemental information (9/18)

- Methodology adopted by the industry expert in determining the overall market size of the industry in which the Group operates: It is respectfully submitted that the industry expert (CIC) undertook both primary and secondary research using various resources to determine the overall market size of the industry in which the Group operates, number of market players in the industry and identify the top five market players. (a) For determining the overall market size of the industry in which the Group operates, CIC analyzed data from various publicly available data sources, including OICA (International Organization of Motor Vehicle Manufacturers), the National Bureau of Statistics of China and industry associations such as CPCA (China Passenger Car Association) and China SAE (China Society of Automotive Engineers), etc.; and interviewed key experts in the relevant industries to gather more specific insights into the market size of relevant industries.(b) For the number of market players and identification of top five players in that industry, CIC gathered the information through interviewing leading industry participants and the annual report of the listed companies in the relevant industries. The methodology adopted by CIC is based on information gathered from multiple resources, which allows for such information to be cross-referenced for reliability and accuracy. The Joint Sponsors have carried out the following due diligence work: (i) reviewed the business operations of the Group in terms of geographical coverage and were given to understand that the Group's principal operations were in the PRC; (ii) conducted an expert due diligence interview with CIC, the industry consultant of the Company, obtained and reviewed CIC's credentials, in particular its relevant experience in industry consultant services in companies similar to the Company; (iii) through the expert due diligence interview with CIC, noted that, among others, the methodology adopted by CIC in determining the overall market size of the industry in which the Group operates which is summarized above; (iv) reviewed the key assumptions adopted by CIC in the industry report include (1) the global social, economic and political environment generally remaining stable for the next ten years; (2) relevant key industry drivers continuing to promote the growth of the intelligent vehicle connectivity industry (such as further development on the intelligentization of OEM layouts, upgrading of user experience and personal customization, improvement in intelligent cockpit software and hardware technology, support from relevant industry laws and regulations); and (3) no force majeure events or industry regulations occurring that would have a significant or fundamental impact on market conditions;(v) reviewed the public disclosures of the comparable listed companies, historical information published by National Bureau of Statistics of China, Ministry of Industry and Information Technology and relevant industry establishments to understand the fragmented nature of the industry that the Company operates in; and (vi) conducted business and financial due diligence interviews with the management of the Company to understand, among others, the business scale and geographical coverage of the Group during the Track Record Period. Based on the due diligence steps conducted as described above, nothing has come to the Joint Sponsors' attention that would reasonably cause them to cast doubt on the validity of the disclosure of the Group's market position in any material respect.

Source: China Insights Consultancy

Other supplemental information (10/18)

- Despite the entry barriers in the smart cockpit industry, a significant number of market players continue to participate due to the following reasons: (i) Policy support. The Chinese government strongly supports the intelligent and electrified transformation of the automotive industry by offering favourable policies and financial support, attracting more enterprises to develop smart cockpit solutions. (ii) Growth of market demand. The ongoing trend of intelligence, electrification, and connectivity of automobiles, as well as the increasing consumer demand for in-vehicle information and entertainment interaction systems, has led to the continuous expansion of the smart cockpit market and brought opportunities for new entrants. (iii) Development of the entire industrial chain. Technological progress, mature industry chain models, and OEM's positive acceptance and open attitude towards innovative technological solutions have driven the rapid development of the entire industry chain and brought opportunities for new entrants. Although there are many players in the smart cockpit solution industry, most of them do not have full-stack capabilities or have weaker capabilities. Compared to enterprises with full-stack capabilities, the enterprises that do not have this ability face greater challenges: (i) Intense market competition. The smart cockpit market is highly competitive. Companies with weaker technological capabilities face difficulties in competing on functionality, performance, and cost, which can result in a loss of market share. (ii) High customer requirements. OEMs and consumers have high demands for the performance, reliability, and user experience of smart cockpits. Enterprises with weaker technological capabilities may find it difficult to meet these high standards. (iii) Poor supply chain stability. Participants lacking full-stack technology capabilities may be overly dependent on external suppliers, making them more sensitive to supply chain risks such as raw material price fluctuations and supplier capacity issues. (iv) Slow technological updates. The rapid development of smart cockpit technology requires continuous technological innovation and upgrades. Enterprises with weaker technological capabilities may find it difficult to keep up with the pace of industry development, leading to rapid product obsolescence. (v) Insufficient R&D investment. Full-stack technology covers all aspects from hardware to software, requiring significant R&D investment. Enterprises with weaker technological capabilities may lack sufficient funds and resources for R&D, which can affect product quality and competitiveness.
- It is respectfully submitted that the intelligent vehicle connectivity industry refers to the ecosystem of intelligent vehicle connectivity technologies and services that support the integration of intelligent vehicles with other vehicles, pedestrians, infrastructure, cloud platforms, and various other networks and devices. This integration aims to provide vehicle owners and passengers with more intelligent and diverse remote operation services, as well as to help improve the traffic quality, energy efficiency, ride experience, while reducing the vehicle management and maintenance cost. The services provided within intelligent vehicle connectivity industry primarily encompass, user engagement optimization services, vehicle connectivity platform services, and the R&D and maintenance for internet of vehicle systems, digital key services, telematics services, information and driving safety protection services, among others.

Source: China Insights Consultancy

Other supplemental information (11/18)

- There is currently no specific and unified definition of certification standards for smart cockpit systems internationally. However, there are some international certification components internationally, including, among others: ISO 80416-4:2005 Basic principles for graphical symbols for use on equipment — Part 4: Guidelines for the adaptation of graphical symbols for use on screens and displays (icons). This standard is mainly relating to the functions of the central control screen, visual data, and passive safety. ISO/IEC TS 20071-15:2017 Information technology — User interface component accessibility — Part 15: Guidance on scanning visual information for presentation as text in various modalities. This standard is mainly relating to human-machine interaction, visual data, and active safety. ISO/TR 22411:2021 Ergonomics data for use in the application of ISO/IEC Guide 71:201. This standard is mainly relating to human-machine interaction, visual data, tactile data, auditory data, and active safety. ISO/TR 16352:2005 Road vehicles — Ergonomic aspects of in vehicle presentation for transport information and control systems — Warning systems. This standard is mainly relating to human machine interaction, visual data, tactile data, auditory data, and active safety. IATF16949:2016 The automotive quality management system standard. This standard is mainly relating to key topics such as product safety, risk management and emergency plans, requirements for embedded software, change and warranty management, and management of secondary suppliers, among others. ISO 26262-1:2018 Road vehicles — Functional safety — Part 1: Vocabulary. This standard defines the safety related functions, processes, methods, and tools required to be met during the development of automotive electronic and electrical systems, in order to ensure that the automotive electronic and electrical systems achieve and maintain a sufficient level of safety throughout the entire lifecycle of the vehicle. Smart cockpit suppliers that have received certification from international standards have demonstrated their research and development capabilities and strengths at a global level. This recognition significantly enhances their competitiveness in the provision of smart cockpit solutions within the international automotive industry.
- The Company has become a pivotal leader in the automotive industry's intelligent transformation, consistently advancing innovation.
- The Company has successfully passed the rigorous validation processes of numerous major OEMs, showcasing the reliability, performance and adherence to the high-level industry standards of its solutions.
- The leadership of the Company in the industry has enabled a rapid market share growth and an increase in design wins.
- The Company is among the first Chinese smart cockpit and intelligent vehicle connectivity solution providers that have tapped into overseas markets.
- The Company has gained deep insights into user preferences and have developed the industry's first in-vehicle voice interaction system in Chinese.
- As a leading player in the passenger vehicle smart cockpit solution industry, the Company's performance is closely aligned with its industry's upward trend and the Company believe itself is well poised to fully capitalize on this market potential to achieve sustainable growth.
- With the international expansion of Chinese OEMs, the Company partner with them to design and deliver products tailored to their overseas vehicle model.

Source: China Insights Consultancy

Other supplemental information (12/18)

- OEMs typically prefer to purchase smart cockpit solutions directly from Tier-1 suppliers, as these suppliers offer distinct advantages tailored to the OEMs' specific requirements, including extensive industry expertise, cutting edge technological advancements, and cost efficiencies that reduce both smart cockpit solution costs and internal R&D expenses. In recent years, while more OEMs have made attempts to develop smart cockpit solutions with higher computing power and sophisticated human-machine interaction capabilities, many face challenges such as high initial investment and pressure of rapid technological iteration. Only a handful of OEMs have the in-house capabilities to develop their own smart cockpit solutions.
- Snapdragon 8295 and Kirin 9610A are currently the mainstream chips used in high-end smart cockpits, representing the advanced computing power in the smart cockpit industry. As one of the few smart cockpit solution providers able to provide smart cockpit solutions based on Snapdragon 8295 and Kirin 9610A, the Company maintain a competitive edge in the market.
- OEMs typically issue a statement of requirements (SOR), which specifies detailed expectations and criteria for both hardware and software development. This ensures that suppliers deliver smart cockpit solutions that meet these requirements with uniformity in terms of interface, response speed, functions and user experience. By providing SOR and HMI design to different suppliers, OEMs can achieve consistent functionality and user experience across the same vehicle model or series, even if different software is implemented.
- Among all chip types, the SoC is the core component in smart cockpit domain controllers, and powers essential systems such as navigation, infotainment, in-vehicle connectivity and multi-screen interactions.
- The COVID-19 pandemic adversely affected the worldwide supply chains and caused a global chip shortage starting in late 2020 which led to a sharp increase in chip prices until 2022. The chip shortage mainly resulted in delayed delivery and increased costs of the chips the Company purchased.
- Given that the concentration in the chip and module industry, especially for mid-end and high-end chips and modules, the Company can only source from single or limited suppliers.
- In recent years, OEMs have been making in-house efforts to develop their own smart cockpit solutions and vehicle connectivity solutions in response to the automotive intelligence trend, and certain OEMs have managed to develop their own solutions.
- The slow economic recoveries around the world and the high-inflation, high-interest environment have contributed to higher global volatility.
- The competitive and complex markets for smart cockpits and intelligent vehicle connectivity services require substantial upfront investments in technology innovation and talent recruitment. The Company believe that continually enhancing the Company's technological capabilities is critical to improving the Company's products and solutions, establishing and maintaining the Company's market leadership, and increasing revenue and achieving profitability.
- Although the average price of mainstream chips for passenger vehicle smart cockpit solutions in China decreased from RMB791.1 per unit in 2022 to RMB699.2 per unit in 2024.

Source: China Insights Consultancy

Other supplemental information (13/18)

- Driven by the evolving consumer demands, coupled with OEM's accelerating deployment of automotive intelligence, development of software and hardware technology as well as supportive policies and regulations, China's smart cockpit market has been evolving and is expected to continue its expansion. According to CIC, the market size of China's passenger vehicle smart cockpit solutions grew from RMB44.2 billion in 2020 to RMB129.0 billion in 2024, with a CAGR of 30.7%, and is expected to reach RMB299.5 billion in 2029, representing a CAGR of 18.4% from 2024 to 2029. In terms of revenue, the penetration rate of China's smart cockpit solution has increased from 53.4% in 2020 to 82.3% in 2024, and is expected to reach 96.5% in 2029.
- The Company plans to proactively introduce novel, higher-margin solutions to improve profitability. As such, the Company will continue to allocate resources to foster innovation and develop advanced technologies. This approach allows us to justify pricing level and stand out in the highly competitive market, ensuring long-term profitability.
- During the Track Record Period, the Company had witnessed fluctuations in raw material and component prices, especially for the chips, which had influenced the Company's cost of sales.
- The Company's strategic focus on developing and producing domain controllers equipped with high-end SoCs, catering to the increased consumer demand for vehicle models with higher level of intelligence and better performance of cockpit functions.
- The prices for domain controllers equipped with low-end SoCs decreased under the intensified market competition and such domain controllers accounted for a substantial portion of the Company's total domain controller shipment volume prior to 2024.
- Facts, forecasts and statistics in this prospectus relating to the PRC economy and the automotive intelligence industry in and outside China are obtained from various sources that the Company believes are reliable, including official government publications as well as a report prepared by the CIC that the Company commissioned.
- The size of China's passenger vehicle smart cockpit solutions industry in terms of revenue is expected to grow from RMB129.0 billion in 2024 to RMB299.5 billion in 2029, at a CAGR of 18.4%.
- The Company is the second-largest provider of smart cockpit domain controller solutions for NEVs produced in China in terms of shipment volume in 2024.
- The market size of China's passenger vehicle smart cockpit solution industry grew from RMB44.2 billion in 2020 to RMB129.0 billion in 2024, with a CAGR of 30.7%, according to CIC. As Chinese consumers' demand for intelligent, connected, and immersive driving experience continues to grow, the size of China's passenger vehicle smart cockpit solution market is expected to reach RMB299.5 billion in 2029, representing a CAGR of 18.4% from 2024 to 2029. Driven by intelligent transportation systems, a data-driven economy, and policy support, the China's market size for the intelligent vehicle connectivity industry increased from RMB13.8 billion in 2020 to RMB37.9 billion in 2024, which accounted for 35.4% of the global market in 2024, representing a CAGR of 28.7%. The China's market size for the intelligent vehicle connectivity industry is expected to reach RMB75.3 billion by 2029, with a CAGR of 14.7%.

Source: China Insights Consultancy

Other supplemental information (14/18)

- The passenger vehicle smart cockpit solution industry consists of three types of suppliers based on the solution types offered: software-hardware integrated solution suppliers, software component suppliers and hardware component suppliers. The software-hardware integrated solution suppliers refer to those who possess the capability to integrate both software and hardware components to offer a comprehensive smart cockpit solution, that are designed to meet the OEMs' expectations for seamless integration of smart cockpit systems. With the evolving demands of the automotive industry and the increasing adoption of smart cockpit solutions, software-hardware integrated smart cockpit solutions are becoming increasingly popular for passenger vehicle. The software-hardware integrated offering has emerged as one of the mainstream delivery methods for solution providers to the OEMs in China, with a market size of approximately RMB77.9 billion, accounting for 60.4% of the total China's smart cockpit solution market size, in terms of revenue in 2024.
- Software-hardware integrated smart cockpit solution suppliers have proven to be more competitive due to several key advantages they provide to automotive OEMs:(i) Cost optimization: Software-hardware integrated solutions from a single supplier are more cost-effective compared to traditional model of sourcing software and hardware components separately. By combining both components into a single package, OEMs can streamline procurement processes and reduce complexities and expenses involved in managing multiple suppliers. It also helps OEMs avoid compatibility issues that often arise when software and hardware components are sourced separately, further minimizing unexpected costs related to system integration and troubleshooting. (ii) Shortened product R&D cycle: Integrating software and hardware into a single solution significantly accelerates the R&D progress by reducing the time needed for communication and coordination with software and hardware components suppliers separately. This streamlined development process allows OEMs to bring new products to market more quickly, enabling them to adapt to evolving market demands faster while maintaining high-quality standards. (iii) Improved system performance: Seamlessly integrated software and hardware components enhance the efficiency and performance of the smart cockpit system. With both components designed to work in harmony, software-hardware integrated solutions offer optimized efficiency, faster response times and improved system stability, delivering a smoother and more reliable user experience.
- Meanwhile, as the Chinese OEMs have emerged as key customers for smart cockpit solution providers, the market size of China's software-hardware integrated smart cockpit solutions installed on passenger vehicles manufactured by Chinese OEMs reached approximately RMB50.6 billion, accounting for 39.2% of the total China's smart cockpit solution market size, in terms of revenue in 2024.

Source: China Insights Consultancy

Other supplemental information (15/18)

- It is respectfully submitted that the Joint Sponsors have discussed with CIC and noted that industry consultant typically analyzes the market drivers of an industry from three major perspectives:
  - Downstream demand: The core driver of an industry comes from the purchasing power and changes in preferences for products or services of the downstream market. Generally, an increase in downstream demand directly boosts the demand for upstream raw materials and components.
  - Relevant policies: Supportive industrial policies can provide solid support for industry development, such as reducing enterprise costs through fiscal subsidies and tax incentives, and thus stimulating industry expansion.
  - Technological innovation: Rapid innovation and iteration of technologies continuously enhance the performance of related products, thereby promoting the development of the industry itself.
- For the automotive intelligence industry and the smart cockpit solution industry, CIC also considers these three perspectives. For example, the drivers from the downstream demand side include evolving consumer demands for better driving experience and OEMs' accelerating deployment of automotive intelligence. The increasing demand for automotive intelligence from downstream OEMs and end customers will drive the development of the smart cockpit solution industry.
- From the perspective of policies, various countries around the world, including China, implemented a series of supportive policies, such as subsidies for electric vehicles, tax incentives for research and development in automotive technology, to promote the development of the automotive intelligence industry and the smart cockpit industry.
- From the perspective of technology, due to the continuous progress of software and hardware technologies, smart cockpits can achieve more complex functions, providing consumers with a more intelligent driving experience, and further promoting the development of the smart cockpit industry.
- In light of the aforementioned factors, it is concluded that the automotive intelligence industry and smart cockpit solution industries are poised for self-fulfilling growth. The interaction of these elements creates a reinforcing cycle that drives the market forward. Consequently, the market size of these industries is expected to achieve the forecasted levels in the future, supported by these market drivers.

- The Company is a leading smart cockpit solution provider in China, and is the third-largest provider of smart cockpit domain controller solutions for passenger vehicles in China by shipment volume in 2024, with a 7.3% market share — ranking after players with market share of 21.7% and 10.4%, and the second-largest provider for NEVs produced in China.
- Among the top five Chinese OEMs, based on the sales volume in 2024, three have deployed smart cockpit and two have deployed intelligent vehicle connectivity solutions of the Company.
- High-end SoCs typically offer CPU computing power exceeding 150k DMIPS, mid-end SoCs usually range from 80k to 150k DMIPS and low-end SoCs generally fall below 80k DMIPS.

Source: China Insights Consultancy

Other supplemental information (16/18)

- The Company respectfully seeks the Stock Exchange's permission not to remove the market ranking disclosures that are limited to NEVs throughout the Prospectus, the reasons are as following:
  - Higher penetration rate of domain controllers in NEVs compared to ICEs. Compared to ICEs with relatively more complex structures, NEVs have a quicker evolution towards intelligence in vehicle structure, power systems and control systems. NEVs use electric motors instead of internal combustion engines, which makes their electrical architecture relatively uncomplicated. This simplified architecture facilitates the integration and control of intelligent systems. Moreover, NEVs rely more on electronic control systems to manage various vehicle functions, the integration of these systems can offer greater control and monitoring capabilities of vehicles, thus accelerating the development of electric vehicles towards achieving greater intelligence for improved management. As a result, NEVs are poised to progress faster than ICEs in smart cockpit solution market. Furthermore, China's NEV market is the most important application segment for smart cockpit domain controller solutions, and the penetration rate of smart cockpit domain controller solutions in NEVs reached more than [50%] in 2024, while the penetration rate of smart cockpit domain controller solutions in ICEs was only approximately [30%] in 2024.
  - Huge growth potential of NEV market. China was the world's largest NEV market and the world's largest manufacturing country of NEVs, with a sales volume of 12.6 million in 2024, and the penetration rate of NEVs has grown from 5.8% in 2020 to 44.4% in 2024 and is expected to be 82.0% in 2029. This is attributed to favorable policies, the wider acceptance of NEVs by consumers, development of battery technology and the increasing accessibility of charging facilities for NEVs.
  - Faster product iteration speed of NEVs. Compared with ICEs, the iteration of NEV models is at a faster pace. This enables NEVs to introduce advanced smart cockpit technologies more quickly. Such rapid model iteration speed provides favorable conditions for the development of intelligent technologies in the NEV market. OEMs can continuously upgrade and optimize their NEV models to provide users with more intelligent experience.
- As a result, the NEV market is a meaningful and reasonable sub-segment of the industry.

- It is respectfully submitted that the revenue generated from cockpit components that totally developed by OEMs in-house (from software to hardware) are not covered in the overall revenue of relevant players in the ranking list.
- OEMs with the in-house development capabilities of smart cockpit solutions usually focus on developing software in-house while outsourcing hardware manufacturing to specialized suppliers. The percentage of vehicles equipped with smart cockpit infotainment software developed by OEMs in-house is approximately 34.0% in 2024.

Source: China Insights Consultancy

Updated

Other supplemental information (17/18)

- It is common for OEMs to engage multiple suppliers for cockpit solutions for the same vehicle model or series in the automotive industry to manage supply chain risks. Most OEMs adopt a multi-supplier model, sourcing the same type of product or service from multiple suppliers, to effectively manage supply chain, mitigate risks including production interruption, quality issues, delivery delays and financial instability, and compare price and product quality to select the best option for their needs. In terms of software for smart cockpit solutions, when an OEM selects suppliers to provide domain controllers equipped with an operating system developed by the suppliers, the OEM will specify requirements for cockpit functionality. Regardless of whether the supplier is a primary or alternative supplier, each will independently develop and implement the cockpit functions using their own software based on the OEM's specifications. Therefore, even if the user interface of the vehicle model appears to be same (as determined by the OEM), the software design and code of the operating system in the domain controllers provided by the primary and alternative suppliers will differ. In some cases, we are engaged to design and develop domain controllers and act as one of the designated suppliers for mass production. However, depending on specific project arrangements, there are instances where we design and develop domain controllers but are not involved in their mass production, or where we participate in the mass production of domain controllers that are designed by other parties. Our design and development capabilities are an important factor in securing projects from OEM customers, but the allocation of mass production may vary based on OEM customers' multi-sourcing strategies. Furthermore, OEMs are usually willing to engage Tier-1 suppliers specialized in smart cockpit solutions for R&D services to develop novel domain controller solutions equipped with newly launched SoCs based on their requirements. In contrast, for domain controller solutions equipped with SoCs which have been commonly used on smart cockpit domain controllers, OEMs will typically engage tier-1 suppliers for mass production of smart cockpit domain controllers and their contracts with tier-1 suppliers are based on the volume of final products delivered without separate R&D service fees.
- Since 2024, The Company has enhanced its collaboration with Chinese premium NEV brands which are currently leading the development trend of automotive intelligence in China and drive the overall growth in China's passenger vehicle market.
- Many OEMs bundle 24/7 customer support within their connectivity service packages (such as BMW ConnectedDrive, Mecedes-Benz MBUX) which often include remote assistant, technical support of troubleshooting connectivity issues such as WIFI and Bluetooth, and emergency & roadside support (SOS linked to vehicle's connectivity systems).
- Traditional ICE vehicle OEM customers who experienced declined sales volume and operating results due to the intensified industry competition and passed the pricing pressure onto their suppliers through price reduction
- Since 2015, as large central control screens became a standard feature in vehicles, with some vehicle models integrating the central screen and instrument panel, and innovations like HUD displays and streaming rearview mirrors being introduced, the smart cockpit has gradually become a crucial trend of intelligent vehicle development. To seize the opportunities in this evolving market and deepen our presence in the automotive industry, the Company shifted our focus in 2018 to smart cockpit solutions, integrating software, hardware and cloud-based vehicle connectivity.

Source: China Insights Consultancy

New

Other supplemental information (18/18)

- The Company typically receives sales estimations on an annual basis and receives actual purchase orders on a rolling basis, which is in line with the industry practice.
- The percentage of vehicles equipped with smart cockpit infotainment software developed by OEMs in-house is approximately 34% in 2024.
- Among all the passenger vehicles equipped with domain controllers, approximately 66% of them are equipped with domain controllers with the operating system and/or software developed by the suppliers, and approximately 34% of them are equipped with domain controllers with the operating system and software developed by OEMs.

Source: China Insights Consultancy