Cooperative Vehicle Infrastructure System (CVIS) and Vehicle to Everything (V2X) Industry Report, 2018

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STUDY GOAL AND OBJECTIVES

This report provides the industry executives with strategically significant competitor information, analysis, insight and projection on the competitive pattern and key companies in the industry, crucial to the development and implementation of effective business, marketing and R&D programs.

REPORT OBJECTIVES

- To establish a comprehensive, factual, annually updated and cost-effective information base on market size, competition patterns, market segments, goals and strategies of the leading players in the market, reviews and forecasts.
- To assist potential market entrants in evaluating prospective acquisition and joint venture candidates.
- To complement the organizations' internal competitor information gathering efforts with strategic analysis, data interpretation and insight.
- To suggest for concerned investors in line with the current development of this industry as well as the development tendency.
- To help company to succeed in a competitive market, and

METHODOLOGY

Both primary and secondary research methodologies were used in preparing this study. Initially, a comprehensive and exhaustive search of the literature on this industry was conducted. These sources included related books and journals, trade literature, marketing literature, other product/promotional literature, annual reports, security analyst reports, and other publications. Subsequently, telephone interviews or email correspondence was conducted with marketing executives etc. Other sources included related magazines, academics, and consulting companies.

INFORMATION SOURCES

The primary information sources include Company Reports, and National Bureau of Statistics of China etc.

Room 801, B1, Changyuan Tiandi Building, No. 18, Suzhou Street, Haidian District, Beijing, China 100080
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Abstract

Autonomous driving fuses emerging technologies in many industries, and springs up with combinations of new technologies, solutions and products. Cellular vehicle-to-everything (C-V2X) and cooperative vehicle infrastructure system (CVIS) as the two most valued technologies expectedly boomed last year.

Preparing the report brings us back to the development course of personal digital assistant (PDA) and cellphone industry as we are a research institution experiencing how cellphones become intelligent.

There was a melee between PDA and PDA cellphone before iPhone. Palm was the first one sought after by numerous PDA-fanciers who voluntarily wrote evaluation reports and organized fan exchange clubs for the firm, an echo to today's Tesla.

Many independent operating system developers and open API-based PDA and cellphone vendors (like Nokia) which were active players in the market, then disappeared. These days some OEMs are either developing operating systems by themselves or open software/hardware interfaces. Emerging car manufacturing forces mushroom as herds of cellphone knockoffs did in those years. History does often rhyme.
Without doubt, car manufacturing differs a lot from cellphone industry for its industry scale and complexity more than ten times larger, so it is not quite right to draw a full analogy between them.

Apple's APPSTORE model, the built 2.5G/3G/4G wireless data networks and the unified smartphone operating systems (with developers reduced to 2 or 3 from dozens) served as a premise of the subsequent prosperity, application and service expansion of mobile internet. Intelligent vehicle industry is probable to follow suit.

IT firms that foray into car manufacturing initially made fun of automakers by saying they still lived in "primitive society" in applying IT and they followed the beaten track with so low efficiency -- even the most intelligent vehicle still lagged behind smartphone by generations in terms of connectivity.

The truth is that chip computing, network transmission and infrastructure still fall short of basic requirements of automobile industry, and intelligent and connected trends of cars still have not been pushed ahead on a gigantic scale.

Connected car alone is little more than a "top student" with high IQs but low EQs.

Connected cars that can only predict intentions of other road users without communicating with surroundings, just act like a "straight-A student" who is a low EQ intellectual performing well on campus (simple traffic scene) but probably falling flat in society (complicated traffic scene).

Human drivers can communicate with pedestrians by expression in their eyes and gestures when crossing an intersection with no traffic signals, through which both drivers and pedestrians can know who will go first. Automated vehicles are however incapable of intentional communication in spite of sensors.

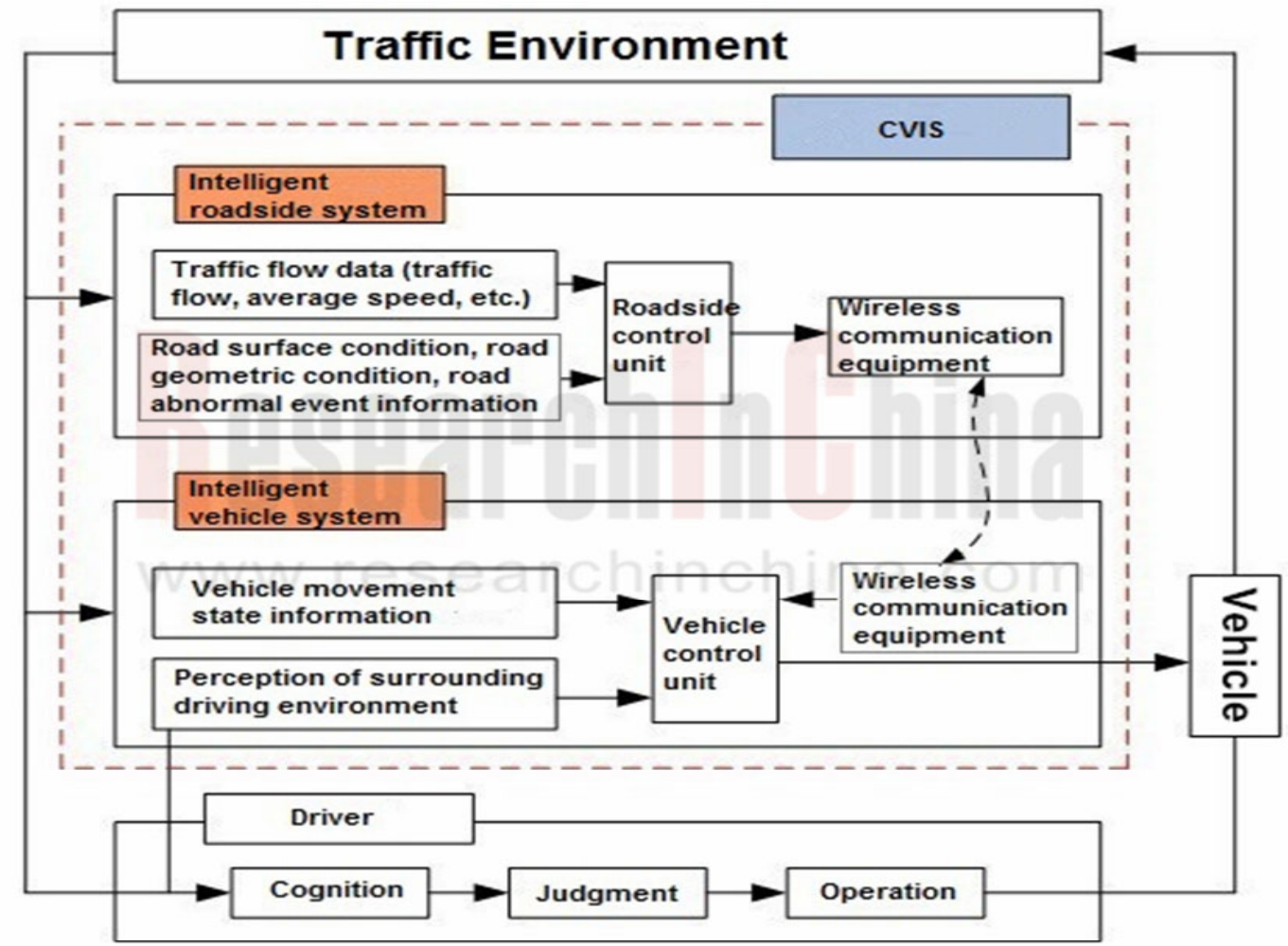
Traffic environment is quite complex and changeable, especially in China where several traffic scenes co-exist under mixed traffic flow. Current automated vehicles have yet to experience so many scenes to travel safely that commercialization of connected cars is faced with high risks.
If wanting to well know intentions of other traffic participants, connected cars undoubtedly need to communicate with them and surroundings. CVIS and V2X then play a key part.

Advantages of CVIS

Cooperative vehicle-infrastructure system (CVIS) can acquire vehicle and road information by use of wireless communication and sensor detection technologies, allowing interaction and data sharing between vehicles, between vehicles and infrastructures. The system is a good solution to intelligent communication and coordination between vehicles and infrastructures, making system resources used in a more efficient way, enabling safer road traffic and reducing traffic jams. CVIS is a new trend for intelligent transportation system (ITS).

CVIS is an interaction that interprets the intentions of traffic participants with great precision. It not only guesses what the car is going to do, but also perceives the situation accurately, so that it can make correct judgments.

In addition to interactive capabilities, CVIS can substantially improve perception of autonomous vehicles. Vision, radar, LiDAR and other sensors can be mounted on cars and street light poles which evolve into all-in-one signal poles, all-in-one traffic poles, and all-in-one electric alarm poles. The simultaneous perception of cars and road terminals can minimize blind zones and notify the collision out of sight in advance.



(Source: Southwest Jiaotong University)

Road terminals deliver enough instructions and suffice the decision-making of autonomous vehicles whose complexity will be reduced remarkably and costs will get much lowered because they need not go through all scenarios. Accordingly, autonomous driving will be earlier commercialized than expected.

In addition to the perception and communication facilities at cars and roads, Ministry of Transport of the People's Republic of China (MOT) is planning to transform roads into intelligent ones and suit them for autonomous driving.

In February 2018, Ministry of Transport issued Notice of MOT's General Office on Accelerating the Next-Generation National Traffic Control Network and Smart Highway Pilots, proposing to focus on traffic control network and smart roads, involving: (1) digitalization of infrastructure, (2) integrated road transport CVIS, (3) synthetic application of Beidou high-precision positioning, (4) integrated management of road network based on big data, (5) "Internet +" road network integrated services, (6) the new generation of national traffic control network. It is decided in the Notice that smart road trials will accelerate to be carried out in provinces including Beijing, Hebei, Jilin, Jiangsu, Zhejiang, Fujian, Jiangxi, Henan, and Guangdong.

CVIS has just emerged, while the race in autonomous driving enters the second half.

Intelligent Transportation Systems (ITS) has been developing for many years. As the advanced stage of ITS, CVIS deals with technologies such as intelligent onboard system technology, intelligent road test technology, and V2X.

Intelligent onboard system technology and automotive intelligent technology have great common ground, but the perception of the road surface partly depends on the road test unit.

In short, the "smart cars + intelligent roads + CVIS" eligible for fully autonomous driving has just begun. Despite the automotive intelligence of giants like Waymo and Tesla grows mature, it is still far away from fully autonomous driving. The competition in autonomous driving is ushering in the second half when infrastructure will get improved and the market space for car manufacturing will be narrowing, while the market of operations, applications and services will be developing apace.

Key technology of intelligent onboard system	Key intelligent roadside technology system	V2X
Technologies for precise positioning of vehicle and highly reliable communication	**Multi-channel traffic information collection technology:** traffic flow, average driving speed, vehicle positioning, driving time, etc.	**DSRC** (Dedicated Short-Range Communication)
Vehicle safety status and environment sensing technology	**Multi-channel road information acquisition technology:** road surface conditions (water, ice, snow, etc.); road geometry (lane width, curvature, slope, etc.); abnormal events (illegal vehicles, meeting, collision, obstacles occupying lanes illegally)	**Beacon-based directional wireless communication technology:** Japan mainly uses two directional wireless communication beacons: Radio Wave Beacon and Infrared Beacon.
Multi-channel road information acquisition technology: processing and fusion technology based on data of sensors of the vehicle, adjacent vehicles, and roadside or control centers; information communication and data sharing technology based on in-vehicle integrated terminals and vehicle bus.	**Integrated roadside equipment technology:** intelligent road infrastructure involves road condition sensing devices, road sign electronic devices, road-based vehicle infrastructure coordination devices, information transmission terminals	**C-V2X** (Cellular Vehicle-to-Everything or Cellular-V2X) developed within the 3rd Generation Partnership Project (3GPP) is an IEEE standard describing a technology to achieve the V2X requirements. C-V2X is an alternative to V2V communications, including direct communication and network-based communication

Competitiveness will be increasingly shown from such technical capabilities as chassis control, sensing systems, chips, power batteries, communication systems, artificial intelligence, intelligent roads, CVIS, big data, cloud computing, etc., and cross-industry competition and cooperation will be an forever subject.

In the second half, most small- and medium-sized enterprises will have to give in to giants (such as Velodyne) with strong core competencies. It is crucial to choose a reliable technical route, because a variety of embedded LINUXs in the early stage of smart phones vanished long ago; it is very important to define the appropriate product positioning, because core parts suppliers outlive vendors of complete machines; it is vital to keep abreast of the developments in the industry since the complexity and scope of the autonomous driving industry is far beyond imagination and new competitors flock to the industry all the time.

As abovementioned, Tesla, who temporarily goes ahead of others, may not be able to take the lead for a long time. Powerful Huawei, Apple and other giants have not yet exerted themselves utterly, which means the second half of autonomous driving contest has just kicked off.

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