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Chapter 6: In-vehicle connectivity

Cloud-based solutions proving attractive

In-vehicle connectivity gathers momentum across the automotive industry

The question of embedded or brought-in connectivity has not gone away

Vehicle manufacturers adopt a variety of technologies

Cloud-based solutions proving attractive

Case Study: Volvo Cars’ Cloud solution offers total connectivity

Investing in Cloud-based solutions

Chapter 7: Autonomous vehicles

Advances in Advanced Driver Assistance Systems (ADAS) have paved the way towards autonomous driving

Autonomous vehicle technology is already available

Google opts to build its own driverless vehicles

Multi-modal transport solutions will be required to address the demands of personal mobility in megacities

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Chapter 4: HMI – Trends in emerging and advanced HMI

Trends in HMI and the path towards autonomous driving

One of the major trends in the automotive industry in recent years has been the introduction of HMI technologies designed to manage the cognitive overload associated with the increase in in-vehicle connectivity, Advanced Driver Assistance Systems (ADAS), and ultimately associated with semi-autonomous and fully autonomous driving.

According to IHS Automotive, which has performed research into emerging and new automotive HMI trends, the vehicle manufacturers are focused on advanced electronics deployment and integration of advanced HMI interfaces such as proximity and gesture recognition, advanced augmented reality displays and eye tracking. A summary of these technologies is provided later in this section. However, there have also been developments in current HMI technology such as touch-screens and haptic rotary controllers which are also noteworthy and contribute to the HMI strategy for the vehicle as a whole.

Touch–screens replacing button or knob controllers

Since the previous report we have seen a marked trend among vehicle manufacturers to replace mechanical knobs and button controls in the cockpit with touch-screen technology. At the same time we are witnessing a move away from the traditional touch-screen towards capacitive ones.

Nowhere is the move away from mechanical controls more marked than in the offerings from German vehicle manufacturers. This is evident in their recent new model introductions and most notably in their concept vehicles.

Historically there has been a marked regional difference in terms of car manufacturer preference in this area, with the North American producers preferring touch-screens whereas European manufacturers, and the Germans in particular, preferring direct control through mechanical knobs and buttons. In part this reflects driving conditions, with European driving tending to be a harder drive than in North America. However attitudes are changing and we are now seeing a transition in Europe towards touch-screen technology. Initially this is likely to be implemented as part of a hybrid system that combines both mechanical and touch-screen solutions with varying degrees of haptic feedback. Over time we expect to see the use of mechanical knobs and buttons disappear from the cockpit altogether.

Dual screens, as first seen on the Tesla, are expected to become more popular. Two screens offer the vehicle manufacturers greater flexibility particularly when it comes to the display of navigation and audio and other information important to the driver, such as safety and advanced driver assistance systems.

Low cost alternative to head-up displays

Developments in Head-up Displays (HUD) are discussed in Chapter 5 of this report. However, it is worth mentioning that a low cost alternative is being mooted that runs in conjunction with Google Glass. Harman International, one of the leading in-vehicle infotainment specialists, is researching an app that uses Google Glass to display collision warnings. Users would not have to take their eyes off the road to use the system, which Harman believes could offer a low cost alternative to the more costly and sophisticated HMI available. A solution like this could be offered as original equipment by the vehicle manufacturers or it could, in time, be sold as an aftermarket product.

Age Related HMI

As the world’s ageing population continues to increase, meeting the needs of this fast growing demographic is posing a whole raft of different challenges for vehicle manufacturers. Not only do they have to take into account issues such as health and driving, but the increasing complexity of vehicle systems and architectures makes managing the cognitive load and the ever changing array of technology inside the vehicle ever more important.
With ageing comes poorer vision, a slowing in reaction times and even deterioration in health. All these factors have to be taken into account when designing HMI within the vehicle. Furthermore, vehicle manufacturers are researching the behaviour and personal interests/hobbies of the older generation in an attempt to tailor in-vehicles services to suit these needs. Determining the way in which these can be accessed is crucial. Managing the HMI has to be easy, comfortable and intuitive. The key to addressing a wide range of user segments will be building in enough flexibility into the connectivity system, and the services offered to allow those that appeal to individual user segments to be selected, while those services targeted at other user groups are maintained in the background. Displays and their controls as well as the features on offer all need to be taken into account and be tailored to diverse user groups.

New automotive HMI Trends

A number of trends are emerging with regard to future HMI and which, according to IHS research, are likely to be implemented in vehicles between 2015 and 2023. These include proximity and gesture recognition systems, augmented reality and eye tracking. The timeline for implementation of these systems in vehicles is shown in the diagram below.

The IHS definitions used for the purposes of the diagram above are as follows:

- **Gesture recognition**: The use of cameras or sensors to track and convert a user’s movements into inputs for the infotainment system without any physical touch input. Multi-touch movements like swipe and flick are not gestures. Gesture controls can be found in today’s concept vehicles such as the Land Rover, Discovery Vision Concept described later in this section.

- **Proximity sensing**: The use of smaller, less expensive proximity sensors, typically infrared technology, to detect the user’s hand or another object approaching the display or control knob. This technology may or may not understand gesture, but rather the presence of the hand or object in proximity. The Cadillac CUE was the first to offer proximity sensing in a series production vehicle, and Volkswagen is following suit with the system in the new Golf range starting 2015.

- **Augmented Reality (AR)**: A system or content stream projected through a HUD system that would change/or augment the driver’s perception of the road or points of interest ahead. IHS specifically excludes any AR content seen on a traditional centre stack or instrument cluster because IHS Automotive believes most, if not all, production AR systems will be delivered through HUD technologies in the car. HUD technology is discussed in Chapter 5 of this report.