



## **Making Connections - Adding Electronics in the Automotive Interior Space**

The electric drivetrain gets a lot of attention for obvious reasons: changing from an internal combustion engine to a battery is a huge paradigm shift. But just as electric features and electronics have made other significant changes to vehicles beyond the drivetrain (consider anti-lock brakes and traction control, to name just two), they have also enabled significant advances in the vehicle interior – and these changes are largely independent of whether the car itself is electric. This article will discuss some of the major trends for adding and changing electronics in the automotive interior space.

### **Infotainment**

Broadcast radio was king for a long time and is still available, but alternative options went through cassettes and CDs to MP3 players and now have come almost full circle with satellite and internet radio. Similarly, while the initial step was to connect a smartphone to the car for audio but still use the phone screen for viewing, the next step was to put phone content on vehicle display screens. OEMs are now using their design and safety expertise to install displays in spaces that both maximize visibility and minimize distraction for the driver while keeping safety in mind.

Displays-need to be visible from all seats, which for now means separate screens for at least the front and back seat passengers, if not individual displays for each seat. While the driver controls the car the displays in that space will still be used for data or maps, but a truly autonomous car might also allow these displays to be used for different purposes. We could even see the windshield becoming a movie screen or extended laptop computer display using the same technology used for head-up displays.

Acoustics are an important subset of infotainment considerations. Talking on a smartphone, listening to a broadcast/podcast and conversing with other passengers are all slightly different experiences, and vehicle designs need to accommodate all of these while reducing noise coming in from outside. Designers will need to incorporate a combination of speaker locations and acoustic insulation to make all these options meet customer expectations.

### **Connected to the Web**

Infotainment access ties in directly with connectivity, and upgrades to internet access are already underway. Many car models already connect the vehicle to a smartphone which is connected to the internet. Fully connecting the vehicle itself to the internet allows designers to position displays and plan alerts with rider safety and utility fully in mind. However, this also requires designers to consider other possibilities and challenges such as managing vehicle features when driving through areas where internet access is spotty or nonexistent. Full internet access also allows the vehicle to become a workspace during commutes – even for the driver – when autonomous technology fully develops. At the

same time the vehicle should stay synched with both smartphone and home systems so that the user has a seamless experience moving between them.

### Sharing the Road

Connecting the car to other vehicles and to the road itself to make trips go more smoothly is a key focus for automakers. An early version of this technology is sensors for adaptive cruise control and lane keeping systems that notice and give warning if the vehicle is drifting too close to the edge of a lane or another vehicle. A future step is for the car to be connected with data arrays in other vehicles in the immediate vicinity or even the road itself. This would enable the car to 'know' and give warning that there's someone in a blind spot, or that the third car ahead has started braking even though the driver's view of it is obscured by the vehicles in between. This capability and existing GPS technologies are just the tip of the iceberg: a connected car could similarly integrate other driver-assistance features which are currently accessed through a phone such as maps, weather alerts, restaurants, parking availability and more.

Not only will cars communicate with each other in the future, but they'll also communicate with the road infrastructure. 3M is working on [advanced road marking materials and smart signs](#) that will convey information visually to drivers and electronically to vehicles at the same time. Some of these technologies will work through the car's sensors and others will be communicated wirelessly. And, of course, the connected car feeds its own data back into the same electronic infrastructure.

### Display Technology

The earliest video screens in vehicles were largely view-only, used to keep back seat passengers entertained, but as cars become more and more advanced their displays become more complex. A connected car provides internet access and requires a display to go with it, and smartphones have trained users to expect touch screens for interactive access. Displays can also convey information from outside sensors such as proximity or pedestrian detection.

Adding a display involves many considerations. It has to be crashworthy, so it can't shatter or be an injury hazard itself. It has to be located where the user can see it easily, but not impede safety equipment such as air bags. The wires should be out of sight and, like all wiring, should not contribute NVH problems.

Head-up displays (HUDs) are an option, allowing the windshield to become the screen to convey information while the driver's eyes stay on the road. HUDs are seeing more market penetration, and as more external sensors are added to a vehicle there is much more information to convey. In this case projectors rather than a screen need to be designed into the vehicle, and consideration needs to be given to package space, reflections, variable light levels and backgrounds.

### Autonomous

For most of the vehicle interior space, whether the car is autonomous doesn't change much about the experience – passengers are riders either way. But turning the driver into a passenger opens up options for automotive interior designers. The driver may choose to relax, or may want to use the ride time for work or other tasks. Displays in the driver space can convert from conveying sensor information to entertainment or work functions, and the driver space itself could completely change. GM has

announced a production model without a steering wheel for 2019, which not only opens up space in the cockpit, but also frees up package space in the instrument panel areas devoted to gauges and sensor displays. If the driver space no longer has to face forward to control the vehicle, a seat that swivels could be an option, allowing designers to put screens in different spaces than they do today. Designing a back seat that folds away or changes to a desk could also present new locations for display screens.

### 3M is Developing Solutions for the Road Ahead

In addition to all of our tapes and adhesives that go into putting electronic products together 3M has several families of products to help you bond and join electronics into your designs. We have a portfolio that allows you to reflect and disperse heat, bond different materials, attach sensors, manage NVH issues and more.

Additionally, 3M™ Thinsulate™ Acoustic Insulation can be shaped to help keep outside noises out while focusing interior sounds where you want them. We also make films that help reduce glare on displays, including for HUDs. And some of the newest technologies we're developing include materials, road markings and smart signs that can be read by both people and machines.

Not only do we have a portfolio of products to help you build your vehicle, we also have a worldwide network of application engineers who can help you make your designs a reality as you incorporate these industry trends into your designs.

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