

The evolution of displays in the automotive cockpit

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Automotive displays becoming a key aspect of the in-car user experience

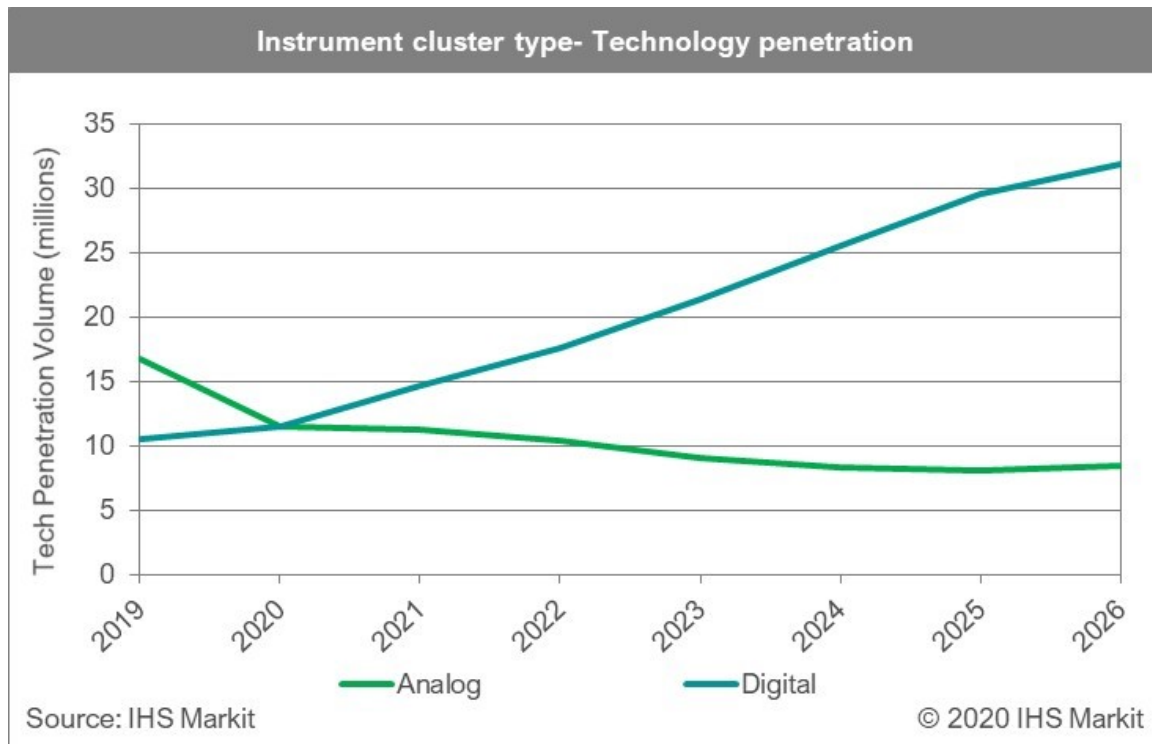
The size of automotive displays has increased over the past few years, as has the number of displays in the vehicle. The rapid growth in display-based instrument clusters; heat, ventilation, and air-conditioning (HVAC) control displays; digital display mirrors (both rear and side view); passenger displays; and displays covering virtually every surface has turned the in-cabin user experience into an immersive digital experience with a focus on delivering meaningful information to the driver and entertainment content to the passenger(s).

Looking only at current production vehicles, and not counting rear seat technologies, the Porsche Taycan currently leads the market for cumulative diagonal measured display real estate with a total of 47 inches, which includes a massive 16.8” curved digital instrument cluster, dual 10.9” center stack and passenger displays, and an 8.4” touch panel HVAC display. While Porsche has taken the approach to create a display-heavy experience through the deployment of multiple displays, there are several emerging trends currently evolving in the automotive landscape.

Modernizing the instrument cluster

One of the most common applications of in-cabin displays is the evolution of the more “traditional” configuration of the cockpit, represented by a digital instrument cluster and a dedicated center stack display. For an automotive manufacturer, this strategy is a cost-efficient way to give the customer a more digital experience while maintaining a more traditional, and arguably less distracting, distribution of information for the driver. This solution is also one that is generally easier to execute as automakers can replace traditional analog gauge clusters with digital displays across trim levels of the same model.

Originating in higher-priced models and trim levels, this display trend is already trickling down to the mid- and standard-priced vehicles. One example of this in practice is the Volkswagen (VW) 12.3” Digital Cockpit (instrument cluster display), currently available across the company’s US (and European) model range, including the Golf, Jetta, Tiguan, Passat, Arteon, and Atlas. In Europe, an 11.7” version of this display can be found on models such as the Polo and T-Roc. Between 2020 and 2026, IHS Markit forecasts that the installation rate of digital instrument clusters will grow from 11.5 million units to 31.9 million units, or an increase from 16.5% of the passenger light vehicle market to 34.1%.



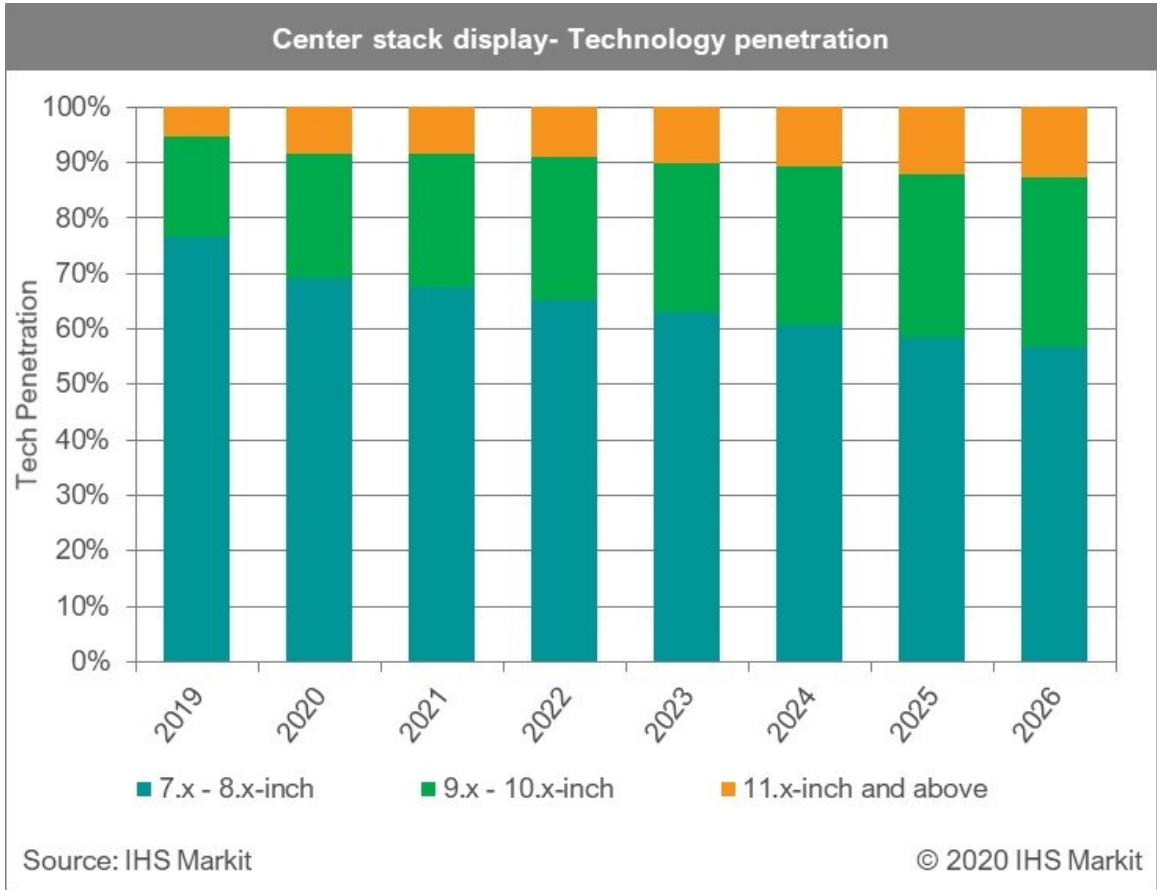
Oversized displays (or combined displays)

Merging the real estate occupied by the traditional instrument cluster and center stack displays into one large display serves to easily differentiate a brand or nameplate from competitors. In the premium vehicle market, technological innovation is often an extremely important factor in the consumer's purchasing decision. Daimler has been a trailblazer in this area by mounting dual 12.3" displays under a single piece of glass across the S-Class (2020) instrument panel, creating the effect of a single, large display. This display strategy has also made its way into the E-Class for 2021. Taking this approach one step further, electric vehicle (EV) start-up Byton has developed a massive 48" A-pillar-to-A-pillar display in its concept car, the M-Byte. The M-Byte's giant 48" display, along with a 7" steering wheel display and 8" center console display, could soon outpace the Porsche Taycan with 63 inches of diagonal screen real estate should it make it to production.

Manufacturers have also taken a different approach when it comes to the user experience of combined instrument cluster and center stack displays. Unlike Daimler and the new-to-market Cadillac Escalade, Tesla has chosen to implement a single, landscape-oriented display in the midline of the Model 3 and Model Y vehicles. While this serves to open the line of sight for the driver in front of the vehicle, it also pulls his/her eyes away from the road when checking information such as vehicle speed or advanced driver assistance systems (ADAS) feature status. It is also worth noting that there are substantial cost benefits associated with this strategy in both display hardware and other related hardware/software efficiencies.

The growth in automotive displays is not reserved only for premium segment vehicles. Models such as the 2021 Kia Soul and Telluride (10.25"), 2021 Toyota Prius (11.6"), 2021 Subaru Outback and Legacy (11.6"), and 2021 Ford Edge (12.0") have all been positioned to attract "technology conscious" buyers, luring them with some of the largest center stack displays in the automotive market. To put this evolution into perspective, in 2020, 7–8" center stack displays make up 61% of the automotive central stack display market. Nine-inch and larger displays account for just over 27% of the market. By 2026, 9" and larger displays, at nearly 34 million units, should account for 41% of the central stack display market. Over this same time frame, 15" display volume is expected

to triple, reaching 1.5 million units by 2026.



Display immersion

Finally, the role of the battery electric vehicle has often been at the forefront of the digital transformation in the automotive cabin. The Porsche Taycan with four displays, the Byton M-Byte with five displays, and the Audi e-tron with five displays have set the stage to define what an information-immersive experience will look like in an era where technology is becoming an ever-present aspect of all facets of life. From the A-pillar side-view display mirrors to the emergence of the dedicated passenger display, these vehicles are used to showcase the pinnacle of what displays are capable of in the vehicle, especially when cost is less of a factor.

The increased production of displays for all industries is quickly improving the accessibility for such technologies in more affordable automotive applications as well. In 2019, Honda announced the budget-minded, urban mobility-focused Honda e (Image 1). With five displays tethered across the dashboard and a digital rearview mirror, this vehicle serves as a prime example of display applications trending throughout a model lineup. As new or refreshed vehicles are introduced over the coming years, this increase of in-vehicle display count is expected to follow suit, often starting with dedicated HVAC displays and digital rearview mirrors.



Honda e interiors

Source: Honda—photo taken by Naoki Kimura, IHS Markit, at a private event organised by Honda in Japan in September 2020

Conclusion

Regardless of the powertrain technology, the number of pixels in our vehicles has increased considerably over the past few years and is expected to continue its upward trend. This is attributed to both a shift toward larger displays and a significant increase in the number of displays in the vehicle. Today, displays can be found across the instrument panel; in the rearview mirror; embedded in the A-pillars; in the front, rear, and overhead consoles; in front seatbacks for rear-seat passengers; projected on the windscreen; and even on the steering wheel. Automotive designers are finding ways to embed display panels on nearly every interior surface of the vehicle, and this will surely have profound effects on how consumers will experience the vehicle of tomorrow.

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