DVN-I
Automotive Interior

Thu, 21 May 2020 Weekly Newsletter **NEWSLETTER #28**

Editorial

HMI, Lighting To Support Demand Rebound

The pandemic has dealt the automotive industry a triple blow: factory closures, supply chain disruption, and a collapse in demand. Automaker associations in the world's three major markets—China, the U.S., and Europe—have reported overall production loss of around seven million cars as of 10 May.

China, the first country to go through the series of events, showed growth in April for the first time in nearly two years. This was mostly driven by commercial vehicles and smaller models, suggesting some families are buying second cars, as private driving feels safer than public transport. Government incentives will probably influence towards EVs, though policies so far have been more successful in growing supply than in generating demand. Another positive sign is that an auto show happened the end of April in Changsha, Hunan Province, in south central China—you'll find more about that in this week's DVN-I Newsletter.

In that context, let's imagine the rest of the world will follow, recreating demand through government incentives as well as product affordability and attractiveness.

As we see here, with our in-depth on interior lighting simulation, how new technologies and techniques are helping to bring quicker and smarter solutions and boost perceived quality. And in this week's Design Lounge, we bring you part 3 of our look at the center console/floor console space. That's a centroid of new technology transforming the traditional car cockpit to suit a digital geek world.

We hope you'll enjoy this week's Newsletter. Remember, if you've not yet registered for our 1st DVN Interior Workshop in Darmstadt on 23-24 September, you may **do so here.**

Sincerely yours,

Philippe Aumont
General Editor, DVN-Interior

In Depth Interior Technology

Optical Simulation for Auto Interiors

Today's optical engineering challenge is to deliver extreme innovation quickly, while keeping costs low and providing high reliability. In demanding automotive applications, as in aerospace and general lighting segments, there is little time or budget for repetitive physical testing and iterative prototypes. Instead, lighting design and verification increasingly is expected to take place in a virtual engineering space that supports risk-taking, while facilitating speed and accuracy so there are no surprises when designs go into production.

One technical solution is SPEOS, a software suite that enables optical engineers to fine-tune critical factors such as propagation, reflection, visibility, and legibility while identifying problems such as glare and hot spots. Its maker, Ansys, is based in Canonsburg, Pennsylvania. In a broad range of applications, SPEOS cuts significant time and expense from the design cycle, while supporting the high degree of innovation needed to support advanced applications such as head-up displays and autonomous vehicle sensors.

SPEOS REPLICATION OF HUMAN VISION

For decades, optical engineers have relied on CAD tools to develop innovative optics such as control panels and displays. One of the most important consideration is the development of a visual signature, visual impact and aesthetics that are pleasing to the eye, easy to read, and simple to understand. Historically, engineers had to build a physical prototype to be able to answer the question, "What will this look like to the human eye?". SPEOS makes it possible to answer this question in a virtual design space, by replicating human vision under a wide range of environmental conditions and ambient lighting levels. Enabled by a proprietary algorithm, it saves time and costs by predicting the legibility of displays and other optics at a very early design stage.

There's a constant push-pull, though, as increasing factors make the design task more challenging:

Optics technology supports emerging new areas like sensors, AI and autonomy.

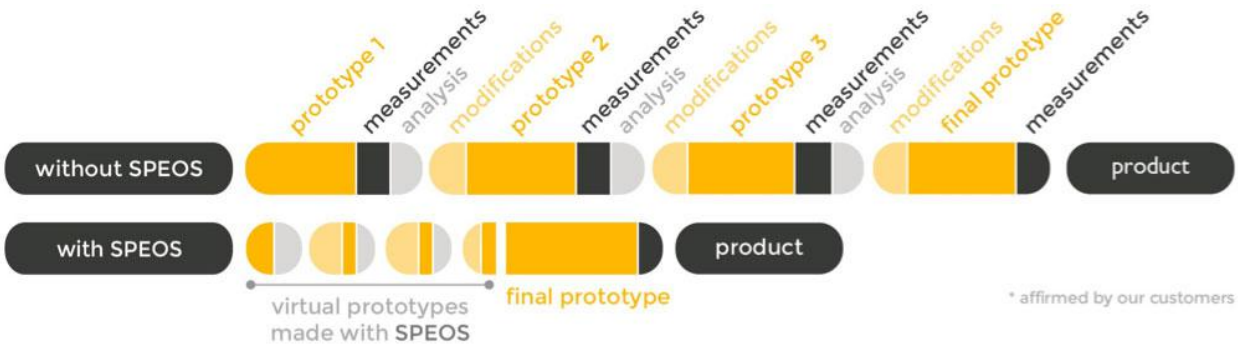
Driverless cars, head-up displays, and other futuristic product like remotely-controlled drones rely heavily on optical engineers. In these applications, optics components must deliver innovative performance with easy legibility under a variety of conditions, and enable easy control and adjustment by human operators.

Lighting design influences the purchasing decision for many consumer products.

As an important component of product design, lighting affects the emotional responses that influence consumer purchasing decision. Light has an impact on perceived quality of the product and enables engineers to create a brand's signature as a critical element of the product design. Lighting can make products succeed or fail.

While optical innovation and the right look-and-feel are key, they can't hold back the larger product launch schedule of OEMs who are racing to market with the latest and greatest design. In this environment, optical engineers' old ways of working, characterized by guesswork and repetitive physical testing, will no longer do; a new approach is needed.

One answer is optical simulation. By designing, engineering, and verifying their lighting systems in a risk-free virtual design space, optical engineers can work faster and reduce development costs. Even more important in today's fast-paced, increasingly digital world, simulation supports a high level of innovation. By relying on a safe virtual design space, optical engineers can test new ideas along the path to final product designs. Some examples are new applications for LEDs, increased levels of optical energy efficiency, better lighting appearance and illumination, improved sensing and smart functionality such as on/off controls based on motion detection. Optical engineers can develop a look-and-feel that is in keeping with their company's visual signature, while also meeting tough safety standards. They can virtually see and try out their designs at a very early stage of development, without having to rely on human subjects and costly and time-consuming prototypes. Ansys SPEOS is a light simulation platform and a physics-based tool that simulates light propagation considering material and surface optical properties like reflection, transmission, absorption and diffusion. Here's Ansys' graphical comparison of development with and without SPEOS:



Optical engineers juggle myriad options including materials selection, light sources, and lens characteristics. To make it easier and faster for engineers to make essential choices, SPEOS includes an extensive library with over 4,500 options in lights, materials, and optical tools so engineers can simulate their finished product, making changes along the way that optimize performance. The SPEOS online library includes:

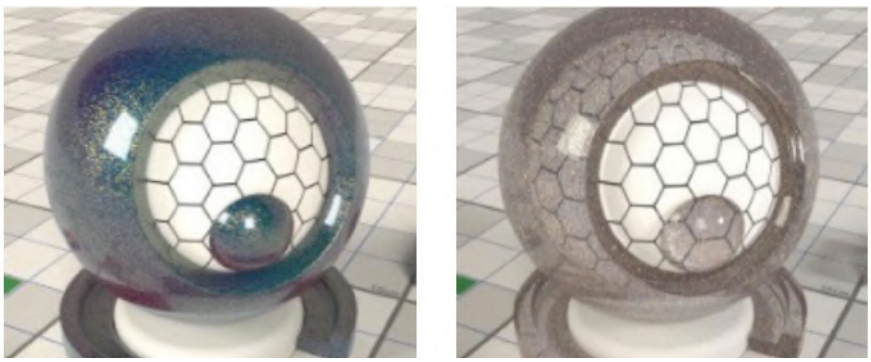
• Materials to create virtually any surface, texture, and color. A dedicated optical measurement device captures material properties so engineers can easily manage predefined material samples virtually, enabling multiple color and trim options and variations. This is the sort of thing that could bring more creativity to the IP color, for example, long limited by practical usability concerns (windshield and IP cover lens glare due to exterior light reflection on light-color IP finishes).

• Light sourcessuch as LEDs, fluorescents, incandescent and HID bulbs, and OLEDs.

• Cameras and lenseswith the latest optical technologies, enabling the creation of new optical systems.

• Automotive standards that help verify the compliance of virtual product designs with the world's various official regulations and standards.

• Predefined optical tools including sensor designs, common environments and typical photometric or color measurement tools.



OPTICAL ENGINEERS CAN USE SPEOS TO TEST DIFFERENT GEOMETRIES, SURFACE FINISHES AND MATERIALS TO ENSURE THE RIGHT PERFORMANCE AND AESTHETIC CHARACTERISTICS FOR THEIR FINISHED DESIGNS.

Typical workflow with Ansys SPEOS:

1. **Virtual Samples and Material Application**

From the web page or from measure of all car interior materials with a handheld or lab optical measurement device. These measurements are used as inputs for virtual material models and provide physical data for light propagation and distribution which is applied to the CAD geometries of the vehicle.

- **Interior Light Source Definition and Position**

Define light sources' distribution, intensity, and spectrum from specifications and place them at the right location into the virtual prototype vehicle.

- **Virtual Environment**

Define ambient lighting corresponding to the environment where the car is in reality. Place a virtual camera sensor where the LMK or similar luminance camera or the human observer is, to provide the same point of view to reproduce the same view as a driver, passenger or any other desired observer would have.

- **Simulation**

Once done with data preparation, launch the simulation and analyze the results.

In the area of automotive interior lighting this translates into several topics:
Color and material choices and uniformity, human-machine interface development,

interior lighting, HUD (head-up display), etc. Also crucial to interior development: human factors, material & veiling glare, trim selection, driver perception and HDRI (high dynamic range image) scenes.

Here we see an example simulation of a dashboard under different sun positions, with the car in front of a tunnel. The simulation shows that the reflections of the used materials and colors in the windshield prevent the driver seeing the tunnel under certain sun positions. In the simulation you can improve in real time the reflections and visibility by choosing materials and colors.

Another tool from Ansys, the VRXPERINCE light simulation combines the SPEOS lighting simulation with Autodesk VRED for physically accurate interior and exterior lighting simulation. It preserves the original design intent while enhancing design, visualization, and simulation workflows.

Interior News

HD Mapping and Mobility for All

Accurate and affordable HD Mapping is a must to build the mobility-for-all future. In a Reuters webinar last week, key leaders from Toyota, Renault-Nissan-Mitsubishi, and the World Economic Forum shared their latest HD Mapping strategies, open software platforms, mobility for all, COVID-19 impacts on the future of AVs, and more.

Once decision-making moves from the driver to the vehicle, HD maps and sensors take over. Regardless of location, weather, traffic, or road conditions, HD maps confirm what the sensors see to keep passengers safe and on the move. So, HD maps are crucial to the autonomous driving equation. They improve a human or robot driver's field of view through an accurate representation of the road ahead and the neighboring environment.

All webinar participants expressed the need for a standardized HD mapping system, to allow safe interaction among different cars (autonomous or not) from different makers, different countries, and different mobility providers. Two approaching vehicles must have the same understanding of the same environment, at the same cm accuracy level. As autonomous driving development progresses from L2 upward, such commonality is becoming even more important to keep control over developmental and deployment complexity and cost.

Construction of HD maps started with many vehicles collecting data, then simulation tools generated many use cases, but it was not enough datapoints to get the appropriate accuracy. Next steps will use micro-satellite constellations to picture the

whole planet at the appropriate detail level. The system should be built around an open common platform, with brand differentiation as an overlay. This open platform must be driven by government bodies, to make sure it leverages cost, data (including city sources), updates, cybersecurity, and so on, eventually up to certifying the vehicle with the equivalent of a driving license.

Audi Stops (Pauses?) Full Autonomy

Despite all the hype about high levels of vehicle autonomy, drivers always need to keep their hands on the wheel. Audi had planned to be first to introduce L3 autonomy. But with combination of legislative uncertainties, multitude of technology options, and costs far beyond plan, they have hit the brakes on self-driving plans for the next A8.

After a System Plus analysis (electronic cost consulting), they realized 60% of the cost for the A8's Traffic Jam Pilot system was the cost of semiconductors. System Plus pointed out use of four different processors in Audi system. The Nvidia Tegra K1 is used for traffic signal recognition, pedestrian detection, collision warning, light detection, and lane recognition. Mobileye's EyeQ3 is responsible for image processing. Altera Cyclone and Infineon Aurix Tricore units perform other processing duties.

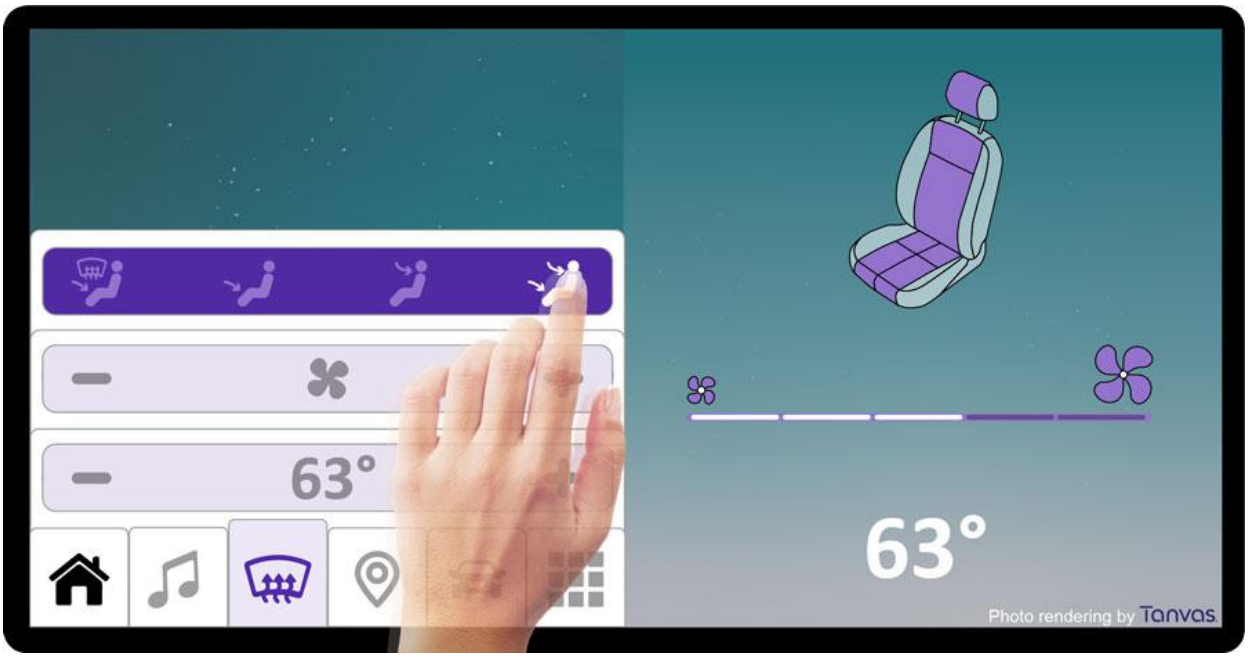
Technology aside, the central challenge, according to Audi, is the human-machine challenge of handing control back to an inattentive driver when the automated system can't handle a specific roadway situation.

Meanwhile, BMW still continues L3 or higher autonomy development for the iNEXT, due next year. This past February, BMW released a video showing a driver applying makeup and not paying any heed to the road. The automaker says the system they're designing makes passing controls back to the driver seem as simple as pressing a button.

Volvo, on the other hand, considers L3 to be unsafe for now, and company said they will "skip this level of autonomous driving." Is Tesla better off incurring the high cost of chip designs as they manage their value chain, through the investment in 2019 in home-grown chips for their self-driving computer…?

New Vibration-Free Haptic from Tanvas

Tanvas, a startup based in Chicago, Illinois, presents a different haptic approach without actuators; they say it allows designers to give feedback on much thinner screens. More specifically, they say the problem with actuators is not just the space required but also that they introduce vibration. "And vibration is just what you don't need in a car," Tanvas CEO Phill LoPresti says. Instead, Tanvas' system uses electro-adhesion that applies voltage to the back of the glass panel to create an attraction between the positively-charged glass and the user's negatively-charged finger. It's a smaller, lighter solution for in-car screens and allows for texturing on the glass; different textures can be achieved from rough grain to fine grain and ridged, allowing drivers to navigate a screen without needing to look. The technology can be incorporated into curved glass screens, or used under material to hide switches or sliders.



What makes this innovation unique is how the technology modulates friction, the ability to both sense finger position and provide haptics simultaneously, and the haptic renderings that produce lifelike effects. And that, in turn, allows designers to create the mobile living room feeling carmakers are striving for as autonomy creeps ever closer. "Life in the car won't be so different from home," BMW's Frolich has said. "It creates the feeling of having already arrived."

Ultrafabrics' Innovative Interior Surface Material

Veganism may get an additional push in the post-COVID world, as any animal origin may create suspicion. So synthetic surface materials may get more attention, especially for leather. Ultrafabrics® is a specialist in polyurethane synthetic leather for applications that require the look and feel of leather, but need a more durable and practical alternative. PVC-free and designed for longevity, Ultraleather is ideal for a variety of uses including high wear applications, while offering a soft and supple hand feel.

A broad portfolio of touch & feel & color facilitates the job of interior designers and engineers with benefits including:

- Weight reduction: 1/3 less than leather and 1/2 of PVC
- Climate resilience: no cold cracking at -40°
- OEM standards of abrasion resistance, strength, and VOC compliance
- Solar endurance: high resistance to UV light
- 100% free of PVC, HFRs, and plasticizers, with no off gassing
- Anti-squeak properties

These PU materials are designed for seating, instrument panels, door panels, and other interior surfaces. A proprietary backing cloth layer boosts durability, dimensional stability, and recovery.

Toyota's New Yaris Cross Compact SUV

The Toyota Yaris Cross was originally planned to be unveiled at the 2020 Geneva Motor Show; first pictures and specifications were finally published end of April 2020. It's a subcompact crossover SUV, using the Yaris nameplate, primarily for Japanese and European markets. The design process brought together a wide team from studios in both Europe (ED2 studio, Sophia-Antipolis, near Nice, France) and Japan.

It is built on Toyota's GA-B TNGA platform, like the XP210 series Yaris, and positioned between the Raize and C-HR in Toyota's crossover range. It directly replaces the Ist/Urban Cruiser, and will be manufactured in the same plant as the standard Yaris in Japan at Toyota Motor East Japan and France at Toyota Motor Manufacturing France in Onnaing, near Valenciennes.

Wheelbase is 2.56 m—same as the European-market Yaris—but the vehicle is 20 cm longer. It means that interior roominess shouldn't be larger, except maybe in the trunk.

Inside, design is "robust and minimalistic", as described by Toyota design spokes persons. The layout is classic with a large multimedia screen above the console, and rather dark harmonies. The rear seat is largely foldable and allows the capacity offered to be used wisely when the electrically operated tailgate is raised with the foot control. The trunk is also equipped with a new flex belt system to secure items and stop them shifting during driving.

Elon Musk Teases Tesla Game-While-Driving

It's not just trucks that will float—Elon Musk mused in a Twitter tweet about developing a game for Tesla cars using augmented reality.

For the last two years, Tesla has been using some resources to integrate video games into their user experience. They plan to do more of that in the future, as Musk says Tesla's goal is to increase owners' happiness and make the driving experience more fun.

In 2018 Tesla introduced Teslatari, an emulator of Atari games from the 1970s and '80s that runs on Tesla vehicle computers, in 2018. They started with a few games, like Asteroids and Pole Position, but Musk said it was only the beginning of the automaker's venture into in-vehicle gaming. They want to add more Atari games to the emulator, but Musk has also made it clear they plan to add games from other companies as well. Last year he said they're working on porting the Unity and Unreal video game engines to Tesla vehicles.

Later last year, the automaker launched Tesla Arcade, a new app within Tesla's in-car system to launch several new video games. Now it sounds like Musk wants to boost Tesla Arcade with more advanced games, including augmented reality games and online Minecraft.

It sounds somewhere between weird and foolhardy to play video games while driving, but last month Musk tweeted, "Anyone think they can get a good multiplayer Minecraft working on Teslas? Or maybe create a game that interacts virtually with reality like Pokémon Go while driving safely? Like a complex version of Pac-man or Mario Kart?"

Huawei 5G in 120 Car Models

Huawei's 5G-based HiCar technology is more than an auto infotainment system, it's an interface to the car's core operating system and a vehicle-to-X comms channel. HiCar will first appear on the BYD Han EV next month, before arriving in more models from about 30 different auto brands.

Analysts view 5G adoption in cars (and road system) as the new generation communications backbone to autonomous vehicles, smart cities, and the internet of things. It also provides in-vehicle features such as controlling windows, locks, AC, light, audio, and streaming media.

Huawei has signed up about 18 different automakers to use HiCar. In January, they signed up with Dutch Sat Nav provider TomTom to pull away from Google systems. BYD, China's largest EV maker, will use Huawei's HiCar technology in the upgraded Han electric sedan with a starting price of about $40,000 — similar to the cost of a Tesla Model 3 in China.

According to the Ministry of Industry and Information Technology, China has deployed nearly 200,000 5G base stations across the country. About 500,000 5G base stations are expected to be deployed nationwide by the end of this year. Installing hundreds of

thousands of connected EV charging stations is part of the same Internet of Cars initiative.

A question remains: what is the value of 5G to the industry? If it is only facilitating commerce efficiency of a daily commute, it's probably questionable!

News Mobility

World Economic Forum Shaping the Future of Mobility

The Automotive and Autonomous Mobility activities of the World Economic Forum (WEF) center around accelerating the transformation of the automotive industry and autonomous mobility towards safer, cleaner, and more inclusive. Activities include overseeing a team dedicated to forming multi-stakeholder communities to co-develop solutions, pilot policies, and scaling results globally. They identify, engage with, and coordinate public and private partners from industry, government, academia, international organizations and civil society in the initiation, leadership and management of policy projects.

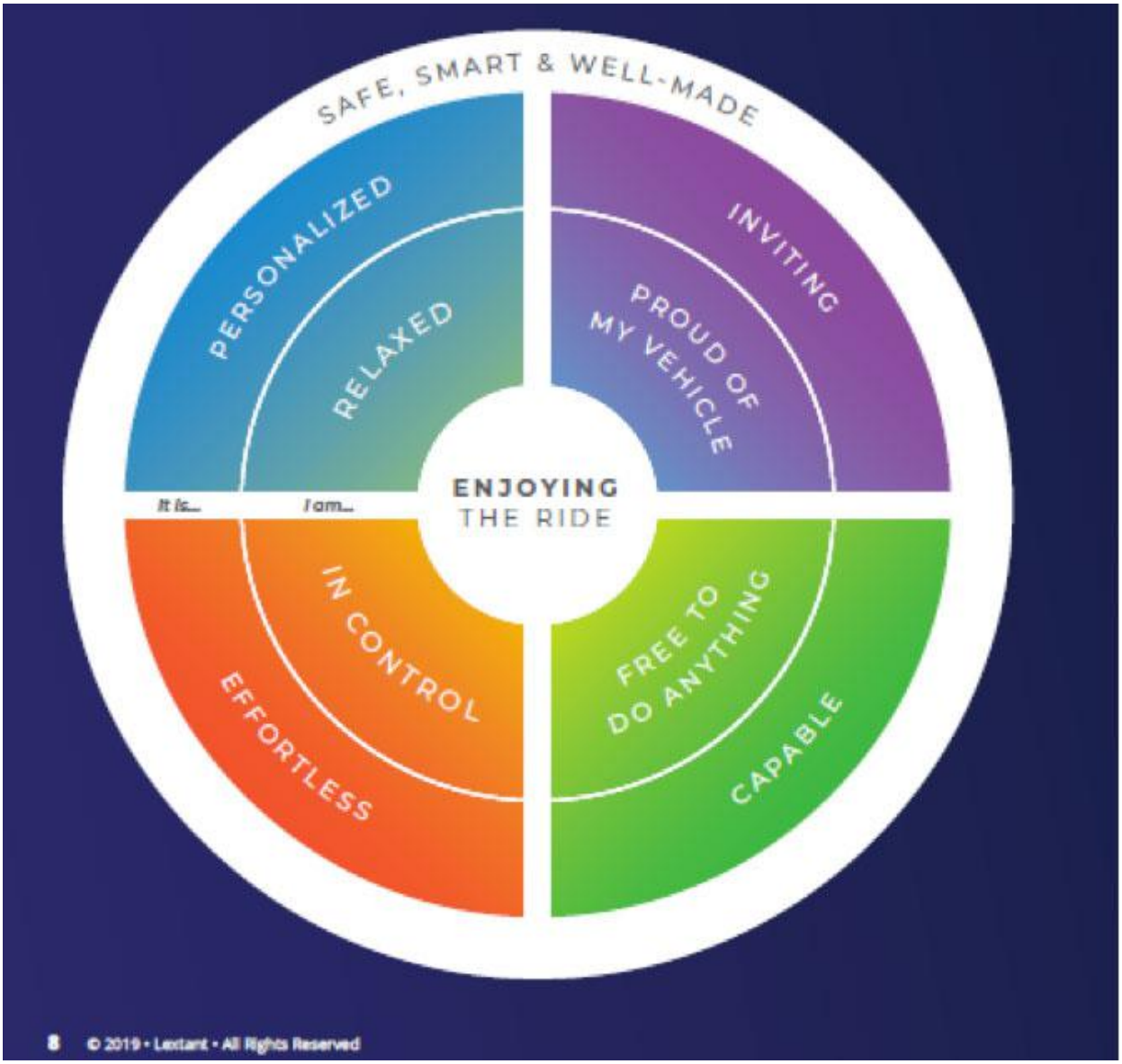
The Global New Mobility Coalition (GNMC) is curated by the WEF. It is an active and diverse community of over 150 globally renowned experts, NGOs, and companies for accelerating the shift toward CASE mobility system that provides for healthier cities, reduces carbon emissions by 95%, improves mobility efficiency by 70%, and decreases commuting costs by 40%, while tapping into a 600-billion-dollar business. The GNMC publicly communicates a sustainable mobility vision to civic, public and private stakeholder to catalyze supply and demand for a carbon-neutral mobility ecosystem by 2050.

Most of the world supported, in the last decade, new-vehicle incentive programs similar to the U.S. "cash for clunkers" old-vehicle scrappage program during the Obama administration. Now, as the concept of bio-safety is growing (air, health, virus, stress,), covering multi-modal mobility we could imagine incentive systems to support

consumer shifting from a combustion car on total travel to multimodal clean transport: BEVs, HEVs, public transport, bicycling, walking.

COVID-19 is the strongest stress test ever on mobility, but the climate crisis still remains in front of us—thus, mobility incentives should cover a new business model within an overall bio-safety perspective, including human benefits such as health and happiness.

Trust of Mobility Key for Post-COVID World



Car HMI USA is an international knowledge exchange platform bringing together all stakeholders leading the technical & design future of automotive HMIs & UX. In a meeting recently coordinated and held virtually on account of the pandemic, US human-experience firm Lextant presented their view of mobility in the post-COVID world.

Their circular graphic, shown here, maps out the ideal vehicle experience: feeling safe is now getting of much more importance as the pandemic is positioning trust in health and safety as a necessary condition to whatever activity, including mobility.

Trust comes in the mobility experience at different levels:

- Trust perception as you get into the vehicle

- Car trusts the driver when diving
- Driver trusts the car when autonomous
- Driver and Car trust during manual/automated transition.

COVID adds additional layers related to risk:

- Risk detection (air, surface, etc) and alerts
- Risk reduction (auto-clean, filtration, etc)
- Risk prevention (anticipation)

That's valid for passenger or cargo transport (deliveries must be delivered clean!), taking into account that the future will probably need more goods delivered to users, rather than people driving to shops.

The Design Lounge

The Center Console/Floor Console Space, Part 3

Find Part 1 and Part 2 in DVN-I Newsletters of April 23 and May 7

Today's installment of the center console and floor space odyssey involves a brief journey through the controls required in today's vehicles regarding HVAC, HMI/UX and of course, the shifter.

The increased content and interface experience required for today's vehicles have necessitated that these interfaces have a higher priority than the traditional shifter. Because of this, the 'real estate' required within the floor consoles was, until the recent touch screen developments, shared or even dominated with buttons, knobs and displays.

But how did we get here? And are touch screens the only solution for the future? Let's review our recent past and the interfaces required for screen interaction with UX/HMI.

Volvo was one of the first automakers to create a very thin and technical console that visually integrated the controls for HVAC, Radio/HMI, and the mechanical shifter.

VOLVO V60 SHIFTER AND CONTROLS

BMW IDRIVE GEN 1 AND SHIFTER

With the introduction of the iDrive by BMW, the floor console became cluttered as the UX/HMI became of equal priority to the shifter, with inclusion of an electronic parking brake and transmission controls. This allowed for better packaging and space utilization but at the expense of storage (cup holders, etc).

But, over time, more UX/HMI controls would be required for an increasingly complex screen and menu structure. Such as Audi's hand recognition pads and increasingly complex HVAC features.

AUDI TOUCH PAD GEN 1 AND SHIFTER

As the UX/HMI interface requirements increased, the traditional shifter also needed to evolve. From simple rotary knob solutions as seen in General Motors and JLR…

GMC SIERRA ROTARY-KNOB SHIFTER

JAGUAR I- PACE KNOB SHIFTER

…. to, the stubby and more jewel-like electronic shifter that was first used by BMW.

CADILLAC ESCALADE SHIFTER

VOLVO XC 80 'CRISTAL' SHIFTER

TOYOTA MIRAI SHIFTER

The introduction of screen and pad interfaces has now displaced the traditional shifter that once was so prominently displayed in the floor consoles.

MERCEDES A-KLASS SHIFTER AND TOUCH PAD

PORSCHE CAYENNE SHIFTER AND TOUCH SCREEN

The current trend has been to eliminate all of the complex buttons, knobs and controls by using touch screens that are now integrated into the floor consoles. This transition can be seen in Audi's transition from touch pads and buttons/knobs to touch screen technology:

AUDI TOUCH PAD GEN 2 AND SHIFTER

AUDI E-TRON TOUCH SCREEN AND SHIFTER

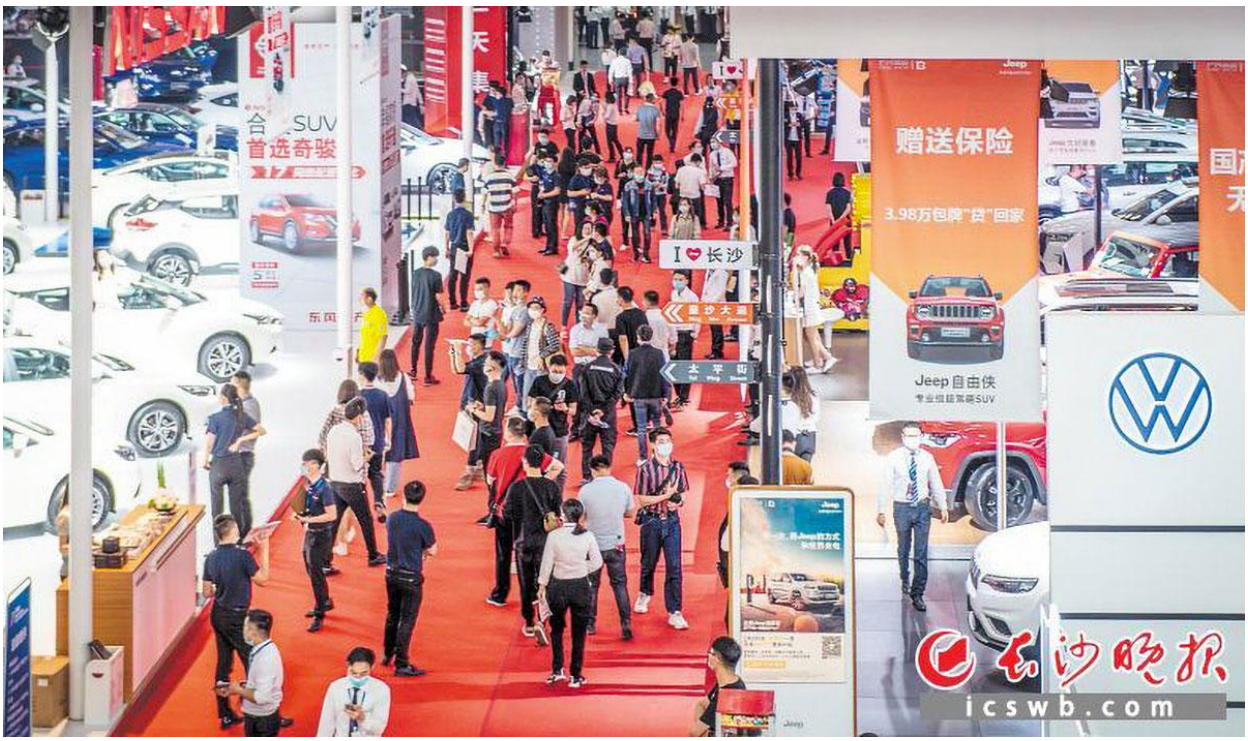
TESLA MODEL 3 SHIFTER HMI/UX

Tesla initiated the migration of these interfaces into a single screen that cleaned up the floor console architecture. This now symbolizes the 'high tech' approach to the UX/HMI of vehicles today.

But what of the future? Are touch screens the only acceptable solution? We will visit that topic in the next chapter of our look at the evolution of the floor console space.

General News

Hunan Auto Show Happens with Strict Health Control



The 2020 Hunan Auto Show opened in 30 April at the Hunan International Convention and Exhibition Centre, in the city of Changsha in south central China, and ran until 5 May. It is being seen as a first major large-scale exhibition to resume in China and a welcome green shoot for the wider return of tradeshows in the country and internationally.

As a low-risk city, Changsha has taken the lead in resuming convention and exhibition activity, and Chinese media analysts were predicting the show will provide a 'double victory' for epidemic prevention and control, on the one hand, and economic and social development on the other.

Over 90 car brands and 650 vehicles participated in the exhibition over an area of 60,000 m². 62,380 visitors attended the auto show, and 23,910 vehicles were sold.

During the five-day auto show, many eye-catching cars were on display including Koenigsegg, a, Nissan Leaf, as well as the Peugeot 908 Le Mans race car. Some world brands such as Porsche, Benz and were present as well, and the organizers say ten kinds of new energy cars were presented.

The organizers made clear they were adhering to the tough requirements of epidemic prevention and control, with all staff, volunteers, car dealer service personnel and visitors undergoing stringent checks. All participants in the exhibition were obliged to wear a mask throughout, and urged to wash hands frequently.

STAFF MEMBERS DISINFECT THE VENUE EVERY DAY DURING THE 2020 HUNAN AUTO SHOW

Intel Accelerate Robo-taxi with Moovit Buy

Intel—the only provider with a full silicon to mapping to services—recently spent almost USD $1bn to buy Moovit, focused on the service aspects of robo-taxis.

The Moovit business combines information from public transport operators with live, crowdsourced data to help travelers plan journeys. Moovit's product has more than 800 million users in 3,100 cities across 102 countries. It will be integrated into Intel's automotive technology company Mobileye but will retain its independent brand and existing partnerships.

Mobileye was acquired by Intel in 2017 and provides advanced driver-assistance systems deployed on nearly 60 million vehicles. They'll deliver fully autonomous robo-taxi services, starting with Tel Aviv, Israel, in 2022 and expanding from there

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