HARMAN | Life-enhancing Intelligent Vehicle Solutions

FACT SHEET

User Experience

ADVANCED DISPLAYS AND INTELLIGENT USER CENTERED DESIGN

Is your user experiencing the future?

The future of the car and the human relationship with it is evolving quickly and will continue to do so as autonomous cars and alternate ownership models become commonplace. Towards this end, HARMAN is enabling our customers to re-define the future in-vehicle user experience which will be driven by an integrated cockpit that is contextual and intuitive.

DESIGN: The core of the connected car experience

By 2020, an estimated 69 million cars annually will be shipped with connectivity and multiple interaction screens. HARMAN has a vision to find the perfect balance of data consumption in the vehicle to help simplify complex interactions.

HARMAN designs, develops and productizes holistic digital in-vehicle experiences optimized for efficiency and simplicity. HARMAN focuses on three main tenets that we believe drive the automotive in-cabin/cockpit experience: displays and optical systems, user-focused interaction and visual design, and a personalized portable integration.

HARMAN develops optical components/modules including LCDs and heads-up displays, cluster/cockpit displays, advanced interfaces such as eye tracking & gestures, haptics & touch, voice recognition and natural language understanding with complete integration support and component responsibility. HARMAN delivers detailed HMI design including visual (2D and 3D graphics) and interaction design requirements and documentation for the software development community. HARMAN's user-centered design and research process is characterized by continuous learning (prototyping, usability & user testing, analytics) and continuous deployment (over-the-air updates).

As automotive UX designers and engineers at HARMAN, we remain flexible, informed, inspired and embrace challenges to create a world-class experience for our consumers – an intelligent, seamless connection of data and devices.

Key highlights

- Enable seamless data output across multiple coordinated displays
- Integrate driver assistance features, laying the foundation for autonomy
- Leverage natural language understanding (NLU) and artificial intelligence (AI) to deliver contextual information
- Simplify interactions, maximize attention, embrace the familiar and maintain consistency

HARMAN LIVS

HARMAN's Life-Enhancing Intelligent Vehicle Solutions (LIVS) use an end-to-end approach by integrating the in-car computing platform with the cloud platform for a new level of user experience.

SCALABLE | Compute Platforms

Tailor-made for the needs of automakers and vehicle segments

CONNECTED | Modular Connectivity

Ready for delivering connected services – enhancing efficiency, productivity, and entertainment

SAFE | ADAS & E-Horizon

Monitoring and assessing the surroundings of the entire vehicle and beyond line of sight

SECURE | 5+1 Security Architecture

Full protection for the driver and the vehicle, OTA (over-the-air) updateable

INTUITIVE | Displays & User Experience

User Centered Design with seamless interaction across multiple coordinated displays

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Features and benefits

'ALiVE' High Gamut Displays	• Quantum Dot LCD displays with >100% NTSC • RG Phosphor LEDs, with enhanced Color Filter stack • OLED curved displays
Full-Windshield Heads-Up Display (HUD)	• On-Windshield HUD using photo-luminescence nano-materials embedded in film • Through-Windshield HUD using holographic film based augmented reality
Digital Cockpit Cluster	• UI design consolidation providing a holistic user experience • Richer experience using 2D and 3D graphics • Improved interaction between cluster and infotainment including swiping graphics between multiple screens.
HARMAN 'Cool Touch'	• Innovative Backlight design reduces "hot finger" effect and thermal stress on display components. • Touch surface temperature decreases by 5°C to 15°C. • Reduced thermal stress for driver ICs (>15°C) and polarizer (~10°C) leads to higher reliability and life time.
Near Field Gesture Recognition	• Novel control method for infotainment, independent from visible dashboard components • E-Field distortion translated into 3D position and movements into gestures • Optical sensor detects reflected IR light • High resolution positioning (virtual touch pad) • Integration of various technologies (including touch) appears to have a seamless UX.
Highly Automated Driving (HAD) UX and UI Design	• HAD HMI coordination for driver mode transition • Driver situation awareness during manual and autonomous modes – eye tracking, facial recognition
Intelligent Personalization	• Conversational voice (Digital Assistant) that simplifies complex interactions and learns to support the user habits • Cloud-based deep learning routine that allows portability of identity across various environments- car, home, office, mobile • Contextualization software with comprehensive library of "if-then" logic cases, developed from user behavior analysis, testing and feedback
Next-Gen HMI	• Electric Vehicle UI Design • Fleet management system UI • Ride sharing integration / interface • Companion Mobile App UI

An industry expert as partner

HARMAN is the market leader in connected car solutions for the world's automakers. HARMAN's innovative and highly integrated infotainment technologies offer automakers the most extensive solutions for advanced navigation, intuitive user interfaces, integrated audio, device connectivity, cyber security, and connected safety, just to name a few. From Boston to Berlin to Bangalore, HARMAN is delivering a dynamic in-car experience for an increasingly connected world.

Visit our website at **www.harman.com**

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