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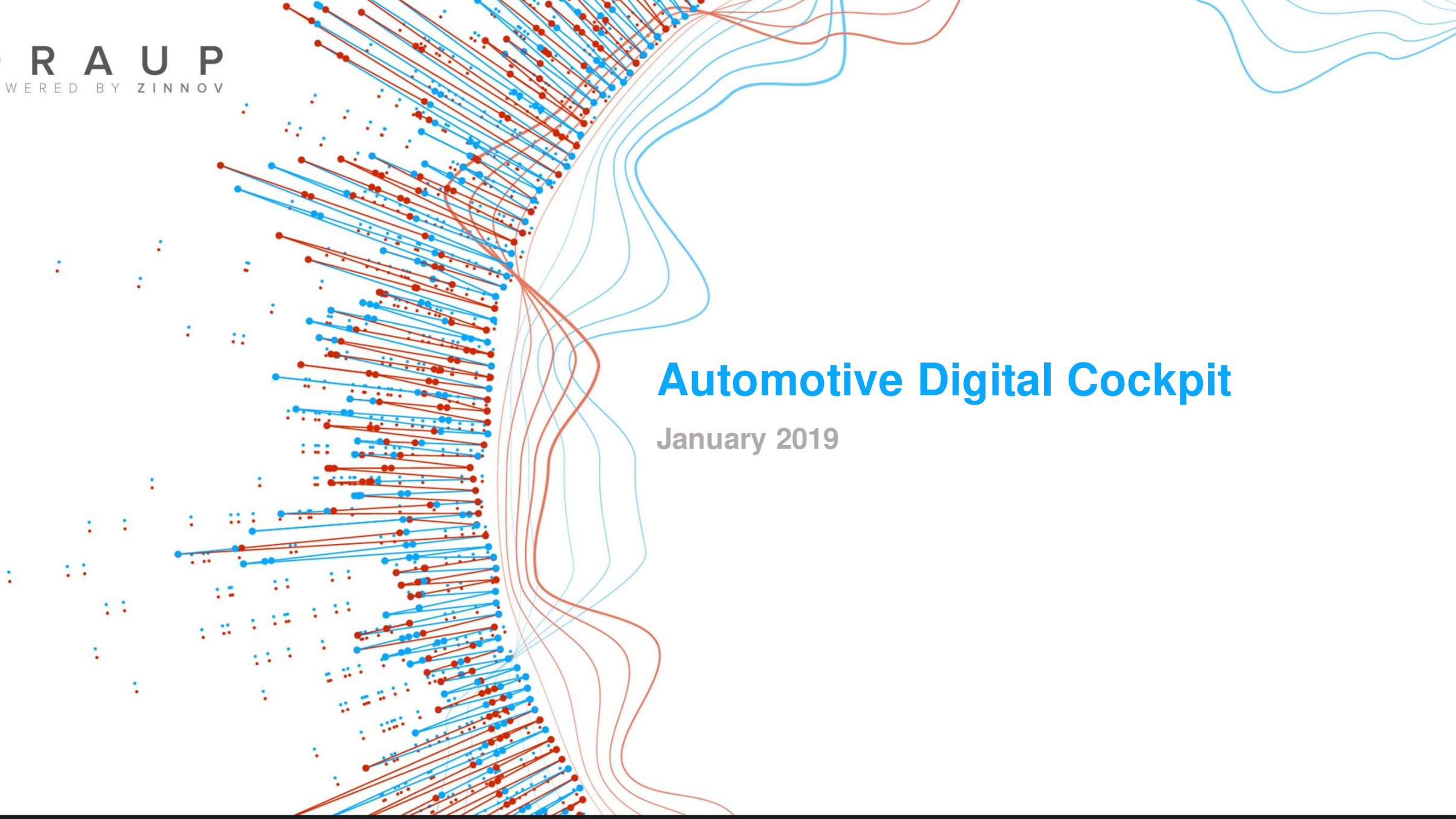

Automotive Digital Cockpit

January 2019

AGENDA

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01	Digital Cockpit- Overview
02	Automotive Digital Cockpit Landscape
03	Cross Industry Collaborations
04	Service Providers Opportunities

Overview: Auto electronics vendors are redefining their HMI offerings with the increasing penetration of digital cockpits

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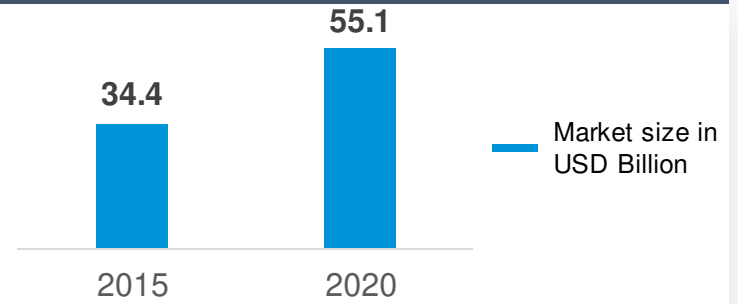
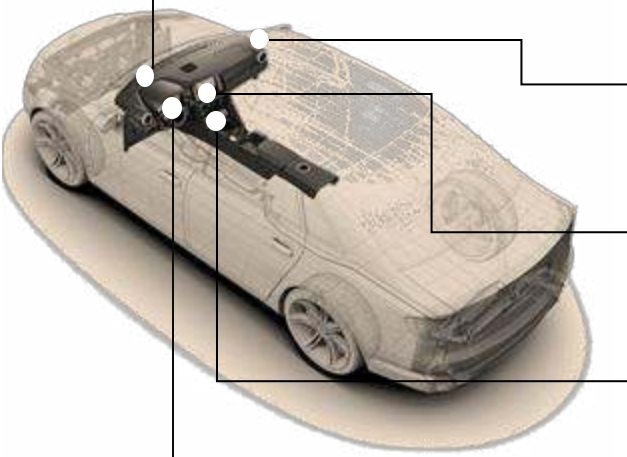
Automotive Digital Cockpit

A digital cockpit is a digital screen in place of a traditional instrument cluster providing a digital experience within a car covering multiple screens, digital assistants and different means of input.

The digital cockpit makes the driving experience safer as it provides a platform where the front, rear and side cameras and sensors (used when changing lanes, parking or reversing) can warn drivers of any hazards.

Global Automotive Cockpit Electronics Market





Heads Up Display
A computer-augmented transparent display to present information, data or other visual elements to a user's focal viewpoint.

Mirror Replacement Vision System
Provide a front/back HD camera and display system instead of physical side and rear-view mirrors

Infotainment & Head Unit
In-car entertainment or in-vehicle infotainment is a collection of hardware and software in automobiles to provide audio or video entertainment.

Control Display
Enables control of other features such as air conditioning.

Digital Cluster
Set of instrumentation including speedometer that is displayed with a digital readout gauge.

Key Players

BOSCH, NVIDIA, Continental, Panasonic, Visteon, Parrot Automotive faurecia, HARMAN A SAMSUNG COMPANY, DENSO Crafting the Core, MAGNETI MARELLI

NOTE: These key players occupies more than **50%** of the total market share

Note: Analysis is based on the DRAUP's proprietary database, updated in Jan, 2019

Source : DRAUP

Evolution of Digital Cockpit: Automotive Digital Cockpit has moved beyond experiments and has been maturing over the years to accelerate through a pro-innovative ecosystem

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Evolution of Segments

	Accomplished	Commenced	Down the Road
Head Up Display	• Tachometer-Showing speed • Basic readings from the dashboard	• Holographic technologies • AR systems • Integrated GPS systems	• Infrared cameras • Mobile Apps • Rear projection capabilities on smartphones & displays
Digital Cluster	• Speedometer	• Partly configurable LCD Cluster • LCD Cluster	• 12.3" Fully configurable clusters • Driver info integrated into central touch screen
Infotainment & Head Unit	• Dual FM / AM Receiver • 4 Channel Amplifier • CD Drive • SDARS drive	• 3G/LTE • Cloud • Native App • Bluetooth Hands Free	• Car Play/ Android Auto/ Car life • Virtual Assistant • AI/AR
Control Display	• Knob, Mechanical Switches, Button for climate control and volume and in screen navigation.	• Touch screens controls	• Customizable knobs. • Curved OLED display.
Mirror Replacement Vision System	• Outside rear view mirrors (ORVMs)	• Thumb-size video on the exterior • 7.7-inch AMOLED display	• Mirrors with video cameras can recognize and gauge the speed of objects around the car

Major Players

BMW, Renault, Škoda, Hyundai, Tesla, Parrot Automotive Faurecia, Volvo, Denso, Texas Instruments, Qualcomm, Verizon, BlackBerry, LG Electronics, Sharp, Mitsubishi Electric, Yazaki, Flex, Clarion, Alps, Aisin, Desay SV

Note: Analysis is based on the DRAUP's proprietary database, updated in Jan 2019
Note: The above insights are curated from news articles, journals and other similar sources

Key Trends: Haptic feedback and speech recognition are highly focused features that are being integrated into first gen Digital cockpit

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Current Technology

- Samsung's (SSNLF) Harman unit unveils a **dual-display system** that personalize its settings with the help of a paired smartphone.
- Samsung's Digital cockpit platform combines **5G technology and an IoT platform** to support a connected lifestyle without compromising safety or performance while on-the-go
- Qualcomm demoed an LG Electronics system to put the instrument cluster and main infotainment system on a common 30-inch display, while also delivering content to rear displays built into a car's seats
- Volkswagen and Cinemo via Volkswagen's **media control app** for iOS or Android to integrate new infotainment content and features into the latest Touareg

Infotainment and Navigation
- Expected CAGR (2014 to 2020) - 12.0%
- Expected estimated value (2020) - USD 61.5 billion.

Heads - up display
- Expected market value (2023) - USD 4.71 billion
- Expected CAGR (2023) - 29.91%

Digital Cluster
- Expected Market value (2025) - USD 6.60 Billion

Future Focus

- Introduction of electronically controlled vehicle mechanism
- Reducing tailpipe emissions
- Improving functionality of the braking system, steering control, and throttle control.
- Cloud Computing for cars
- Digital Cockpit platform with 5G technology and an IoT platform to support a connected lifestyle
- Next five years will see a lot of action in the human machine interface and creation of services platform in cloud

Automotive Cockpit Electronics Market Key Countries

- APAC - 34% of the total market share in 2017
- Projected - CAGR of over 8% during the forecast period
- China - largest contributor in the APAC market

Market Trends

- Increasing introduction of **holographic display**
- Inclusion of **haptic feedback systems** within vehicle infotainment system
- **Digitalization** - an enhancement to the vehicle interiors and a USP for OEMs
- Connected vehicle technology & IoT

Key Driving Factors

- Increasing demand for connected vehicles
- Increase in awareness about passenger and vehicle safety
- Rapid electrification of vehicles
- Falling prices of LCD/TFT Display will gives economy of scale benefits
- Rapid Rise In Automotive Industry

Note: Analysis is based on the DRAUP's proprietary database, updated in Jan 2019
Note: The above insights are curated from news articles, journals and other similar sources

Automotive Digital Cockpit Landscape

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OEM

BMW, Volkswagen, Renault (Passion for life), Škoda, Mercedes-Benz, Ford, Audi, Volvo, Hyundai, Tesla, GM

Tier 1

Continental (The Future in Motion), Bosch (Technik fürs Leben), Visteon, Harman (A Samsung Company), Magneti Marelli, Parrot Automotive Faurecia, Panasonic, NVIDIA, Denso (Crafting the Core)

Cross Industry Players

Texas Instruments, Renesas, Verizon, Broadcom, BlackBerry, Qualcomm, intel, tieto, Greenhill, GENIVI

Tech Giants

Microsoft, intel, Apple, Google, amazon

Suppliers

LG Electronics, SHARP, Mitsubishi Electric (Changes for the Better), Yazaki, flex, Clarion, AISIN, ALPS (Perfecting the Art of Electronics), DESAY SV, TomTom, APTIV, FICOSA, Pioneer, Laird, NIPPON SEIKI, GARMIN, Valeo

Start–ups

gestigon, DRUST, HUDWAY, WAYRAY, CAPIO, embitel, nexar, Sober Steering, Mapillary, RIGHTWARE, immersion, MOTION INTELLIGENCE, Synaptics, Civil Maps

Service Providers

LUXOFT, ALTRAN, Tech Mahindra, wipro, HCL, TATA, TATA CONSULTANCY SERVICES, KPIT, covisint, Elektrobit, TATA ELXSI, P3, bertrandt, Capgemini, GLOBAL EDGE (ALTRAN GROUP), assystem, RUETZ SYSTEM SOLUTIONS, iav, Aricent, L&T Technology Services

Note: The illustrated list of companies is not exhaustive;
The above analysis is based on the DRAUP's proprietary database and insights from industry stakeholders, updated as on Jan, 2019

OEM Collaborations: NVIDIA and Bosch are major go-to market partners for deploying digital cockpit solutions

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Services:
- BMW Operating System 7.0 display
- Replacement of BMW iDrive Controller
- Advanced touch and audio gesture control

Models
- BMW 8 Series, BMW X5

Key Partners : NVIDIA

Services:
- Generation of driver-assistance technology(ADAS)

Models
- Volkswagen Jetta
- Volkswagen Golf R

Mercedes-Benz

Key Partners : NVIDIA

Services:
- Formation of next-gen digital dashboards

Models
- Mercedes-Benz A-Class
- Mercedes-Benz E-Class

Key Partners : NVIDIA BOSCH

Services:
- MMI infotainment system replaces the instrument cluster that can display everything from a digital speedometer to Google Maps satellite images.

Models
- Audi A4,Audi A3

RENAULT
Passion for life

Services:
- Infinity instrument cluster
- Touchscreen Infotainment system

Models
- Renault Captur

ŠKODA

Key Partners : NVIDIA

Services:
- Virtual Cockpit of programmable and digital instrument panel along with high-definition electronic display

Models
- Skoda Octavia
- Skoda Superb & Kodiaq

Ford

Services:
- Digital Instrument Cluster configurable layout with multiple styles of displays

Models
- Ford Mustang

TESLA

Key Partners : NVIDIA

Services:
- Infinity instrument cluster
- Touchscreen Infotainment system

Models
- Tesla Model S
- Tesla Model X

HYUNDAI

Key Partners : SoundHound

Services:
- Intelligent Personal Cockpit - voice recognition, audio control via an artificial intelligence system, and Internet of Things

VOLVO

Key Partners : Google

Services:
- Glass Cockpit System
- Interfacing navigation displays with alarms and options such as Autopilot and Joystick Driving

Models
- Volvo XC90

GM

Key Partners : HONDA

Services:
- Android-based Auto infotainment system
- Apple's rival product, CarPlay

Models
- Chevrolet Malibu

Note: Analysis is based on the DRAUP's proprietary database, updated in Jan, 2019

As vehicle dashboards are crowded with more digital Electronic Control Units or ECUs, OEMs will partner with specific cockpit solution providers for each model to offer unique solutions

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Focus Segments

NVIDIA

- Developed Infotainment system - **MBUX**
- NVIDIA DRIVE CX is a hardware and software solution that enables advanced graphics and computer vision for navigation, infotainment, digital instrument clusters, and driver monitoring.

Visteon

Development of
- **SmartCore Cockpit Domain** Controller.
- **Phoenix Infotainment** system.
- Augmented Reality Head-Up Display

BOSCH Technik fürs Leben

- Launched **Curved instrument cluster.**

Continental The Future in Motion

- Continental created **AR-Head-up Display technology**
- Hybrid Instrument Cluster.
- MultiViu Professional 12 TFT display.

Panasonic

- Panasonic launched **SPYDR 2.0** a single brain cockpit domain controller solution featuring a **Driver Monitoring System (DMS)** with **Head-Up Display** (HUD) Integration.
- Features **3D Touch panel** that combines multi touch panel with **gesture recognition** over the touch panel.
- Panasonics **smart mirror technology** adjusts the image according to the mirror tilting.

HARMAN A SAMSUNG COMPANY

- **Samsung's Bixby voice assistant** - control functions for moving the **QLED display** control each and every feature of the cockpit by a set of recognizable voice commands.
- Center displays and infotainment.
- **Advanced driver assist systems** (ADAS)

MAGNETI MARELLI

- Design **Holistic human machine interface** (HMI) technology and cameras.

Parrot AUTOMOTIVE **faurecia**

- The digital cockpit enables a highly immersive digital driver experience by designing - **HMI for digital instrument**, **IVI** (in-vehicle infotainment and **rear-seat** entertainment systems.

DENSO Crafting the Core

- DENSO developed various HMI products, such as instrument clusters, **car navigation systems** and **head-up displays** that contribute to the **safety** and the **convenience of automobiles**.
- DENSO and Intel provide a highly functional**, virtual cockpit** including a **safety-certified digital instrument cluster** that will be the new gold standard in the automotive industry.

OEM

Volkswagen, BMW, Mercedes-Benz, Audi, ŠKODA, Ford, MINI, GM, Porsche, Tesla, Renault

Note: Analysis is based on the DRAUP's proprietary database, updated in Jan, 2019

Cross Industry collaborations: Semiconductor and Telecom vertical players have been playing a major role in the integration of digital cockpits

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Semiconductor

- To deliver a concurrent implementation of next-generation high-resolution digital instrument clusters, & high-resolution edge graphics
- Developing the first integrated HMI platform that coordinates display and sound inside the automobile cockpit
- Advanced automotive processors involves in user interface and communications functions for head unit, digital instrument cluster, heads-up display, rear-seat entertainment
- To deliver High-End 3D Graphics for Large-Scale Display used for automotive instrument clusters

Communication

- Development of virtualization for the first integrated Human Machine Interface platform
- To develop camera endpoint microcontroller (MCU) device designed for automotive vision-based applications including rear-view and side-view cameras
- For the improvement of asset tracking portfolio with a new device for trailers and other assets that provides near real-time location alerts
- To provide access to the Android-based applications such as Google Maps and Google Play Music

Other Sectors

- Development of Connected Cockpit Vehicle with a Dodge Ram truck.
- Build next generation infotainment platforms with Linux, Android, QNX, Adaptive Autosar operating systems.
- Advanced in-vehicle wireless connectivity for infotainment units.
- Application interoperability over Bluetooth, Wi-Fi and cellular.

intel, LUXOFT	To develop a solution for a new Automotive Reference Platform for a vehicle's instrument cluster, head unit display, cockpit occupant monitoring and driver assistance systems
RENESAS, BlackBerry	To deliver R-Car Based Development Environment Integrating Virtualization for high reliability and rich graphics functions required for integrated cockpit systems
RENESAS, OPENSYNERGY	The R-Car H3 Soc chip and OpenSynergy's COQOS Hypervisor SDK have been adopted on automotive safe multi-display by bringing safety and scalability to our front and rear infotainment systems
Qualcomm, Micron	Partnered to drive Innovation in Infotainment Systems for Next-Generation vehicles which supports high-resolution 3D graphic displays
RENESAS, Greenhill	Collaborated to develop Development of Connected Cockpit Vehicle with a Dodge Ram truck to integrate Multimedia, Navigation, Driver facial recognition
tieto, here	Collaborates to combine cutting edge technologies in 5G networks, smart cities, automotive solutions and the Internet of Things.
LUXOFT, LG Electronics	Partnered to develop digital cockpit that includes human-car interaction-centric & to accelerate the auto systems including ADAS, 5G connectivity, and in-vehicle entertainment systems.
VW, cinemo	Collaborated to allow a mobile user to control the head unit or Rear Seat Entertainment (RSE) directly from the device itself. To create a safer way of interacting with the cockpit using personal devices
Qualcomm, BlackBerry	Qualcomm hardware optimized for BlackBerry's QNX software for use virtual cockpit controllers, telematics, electronic control gateways and infotainment systems, over-the-air software.
DENSO Crafting the Core, BlackBerry	Partnered for development of information management HMI technology.

Note: Analysis is based on the DRAUP's proprietary database, updated in Jan, 2019

Tech-giants, Start-ups and Service providers – Overview

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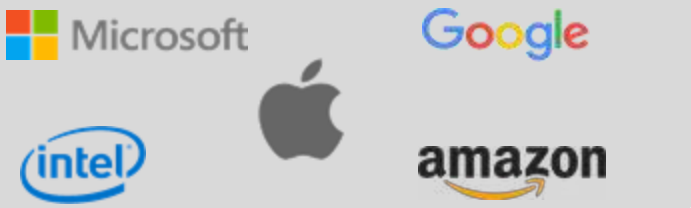
Tech Giants



- Intel manufactures specialized SoCs with optimized power efficient processing which supports all the latest Android Software Security features
- Google offers voice-controlled Google Assistant, Google Play Store, Google Maps and other Google services through its infotainment and connected solutions segment
- Microsoft through its cloud backed connected Vehicle Platform supports end user with personalized user experience inside the car along with the support of Cortana(Microsoft Assistant)
- The Car Play is a major contribution from Apple in the connected car space. Most of the car play features can be accessed using Siri (Apple's Digital assistant)
- The AWS Solutions offer OEM/Tier1 supplier a secure connection between Vehicle IoT to AWS cloud along with managing the underlying infrastructure operations

Key Start-ups

- Rightware offers tools and services for development of advanced digital user interfaces.
- HUDWAY offers application and accessories that helps drivers in navigation by looking at their windshield.
- Mapillary offers maps with street level imagery. It collects the map data through crowdsourcing.
- Drust offers a personalized user experience through a mobile app called AKOLYT. The community-based app features real-time guidance for improving driving skills and managing car condition.
- Gestigon offers software packages that interprets user gestures and behaviour while driving with a focus to enhance user experience in the connected car environment

Key Service Providers

- Heads-up display and Driver Information Systems
- Android based auto apps
- Reusable HMI frameworks
- ECU Hardware & Software Design
- Smartphone integration
- HMI/User interface
- Personalization
- Audio/ Video/ Speech multimedia codecs
- Tata Elxsi Open IVI Software Platform
- Middleware support
- Voice Recognition and acoustic technologies

Note: Analysis is based on the DRAUP's proprietary database, updated in Jan, 2019

Source : DRAUP

Tech-Giants: Integration of personalized settings, android features and voice enabled navigation are key solution that trigger partnerships

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Use-Cases	Partnership	Key Activities
Personalized Settings	Microsoft, LG	This Strategic partnership helps LG to utilize Microsoft 'Azure cloud and Artificial Intelligence (AI) technologies to grow its Autonomous Vehicle & Infotainment business. LG incorporates Microsoft's Virtual Assistant Solution **a**ccelerator in it's infotainment systems.
Personalized Settings	Microsoft, Volkswagen	Volkswagen had partnered with Microsoft to develop its own Cloud to enhance its digital and mobility offerings . This Automotive cloud provides the consumers a personalized settings in making calls, personalized music list, Calendar appointments etc…
Google Services Access	Google, Renault Nissan Mitsubishi	This Partnership, helps Renault Nissan Mitsubishi Customers to access Google's maps, app store and voice assistant from their vehicle's dashboards
Native Android Auto System	Google, Volvo	Volvo had partnered Google to help in the build its native android system. This is expected to be released in 2020 Volvo model cars
Navigation-Voice Assistant	amazon, here	Amazon Alexa and HERE are working together to integrate Alexa with HERE's in vehicle navigation software. Consumers using HERE Navigation On-Demand can experience the intuitive virtual assistant.
Navigation-Voice Assistant	amazon, TELENAV	Telenav and Alexa partners to bring a voice conversational interface for in car navigation .The drivers can have hands-free access to the in-vehicle connected navigation system and also can get help from Alexa regarding traffic and directions information.
Integrated Digital Cockpit	intel, LUXOFT	Intel and Luxoft partners to build an Integrated Digital Cockpit computer reference platform. This platform allows flexible integration of third party applications.

Note: Analysis is based on the DRAUP's proprietary database, updated in Jan, 2019

Start-ups in Digital cockpit: HMI and Driver monitoring startups have been attracting a lot of investments

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Driver Monitoring	HMI	Mapping Solutions	HUD & Navigation
sfara Develops smartphone apps by applying cloud-based, situational awareness technology.	aito Aito specializes in Haptic Touch Control . Aito's touch and haptic feedback controllers provide a best-in-class user experience in car infotainment systems	Mapillary Mapillary is the street-level imagery platform that uses computer vision to fix the world's maps.	HUDWAY offers application and accessories that enable drivers to see the road more clearly on their windshield.
MOTION INTELLIGENCE Motion Intelligence has developed an ultra sound-based system that automatically identifies a smart mobile device in the driver's sphere, and locks the display of the smart device.	CAPIO Develops next-generation speech recognition and natural language processing technologies that redefines human computer interaction.	WAYZ provides complete location intelligence service solutions with the location-based service as a gateway, combining AI technologies with precision positioning, high-definition map (HD map), Safety testing as well as location cloud platforms.	embitel Provides software solution for Car HUD
Sober Steering Developed an alcohol detection technology that immobilizes a vehicle, when it detects the driver is drunk above the set limit	immersion. Specializes in Haptic touch control	DEEPMAP DeepMap develops and provides 3-dimensional mapping solutions for autonomous vehicles.	WAYRAY WayRay Specializes in AR Holographic technologies
TRUVOLO TruvoloData™ mobile platform provides smart alerts and reports via an app to track auto and driver performance.	RIGHTWARE Develops software tools for automotive Human-Machine Interface	Civil Maps Civil map with it's Edge Mapping™ technology, has redefined traditional map creation workflows and enables continental-scale base map crowdsourcing.	
nexar Nexar through sensors detects the danger ahead and sends alerts to the driver through a mobile app in real time.	gestigon Specializes in Gesture Control		
	Synaptics Specializes in HMI Hardware & Software		
	Inprisway Developed a sightless touch system, to avoid distraction of driver while driving.		

Note: Analysis is based on the DRAUP's proprietary database, updated in Jan, 2019

Service Providers: Embedded Testing is the highly outsourced segment in Automotive Digital Cockpit

39 Active Outsourcing Partners

4000 – 5000 Workforce split across Outsourcing Partners

Top Outsourcing Partners

LUXOFT, Tech Mahindra, wipro, AVL, automotive engineering iav, TATA CONSULTANCY SERVICES, ALTRAN, bertrandt, KPIT, Elektrobit

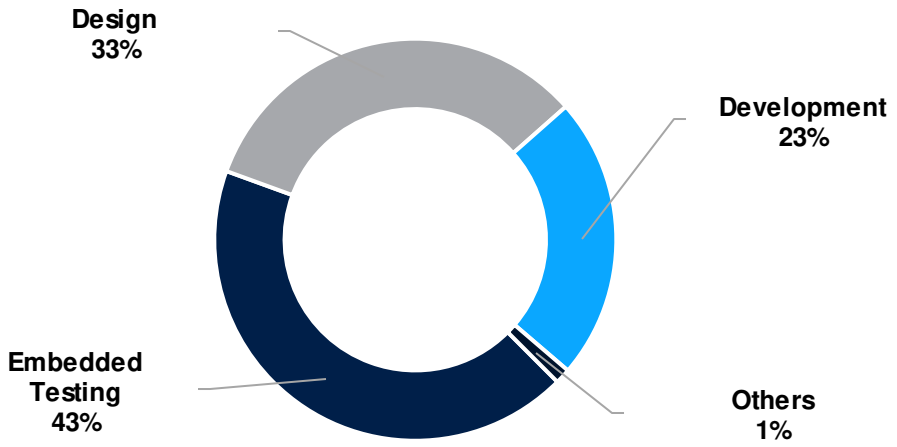
Key Buying Locations

- Barcelona Area, Spain
- Bengaluru Area, India
- Braunschweig Area, Germany
- Bucharest, Romania
- Chennai Area, India
- Gothenburg, Sweden
- Greater Atlanta Area, United States
- Mexico City Area, Mexico
- Shanghai Area, China
- Sodertalje, Sweden
- Stuttgart Area, Germany
- Ulm Area, Germany
- District Mlada Boleslav, Czechia

Key Provider Locations

- Barcelona Area, Spain
- Bengaluru Area, India
- Berlin Area, Germany
- Birmingham, United Kingdom
- Brasov County, Romania
- Chennai Area, India
- Gothenburg, Sweden
- Greater Atlanta Area, United States
- Nanjing, China
- National Capital Region, India
- Nurnberg Area, Germany
- Paris Area, France
- Prague, Czechia
- Stockholm, Sweden

Outsourcing Intensity by Sub vertical



Note - Above analysis is based on the DRAUP's proprietary Outsourcing module, updated in January, 2019.

Source : DRAUP

Key Vendor Engagements Snapshot (1/5)

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LUXOFT

Key Delivery Location
Bucharest, Romania

Split of Workforce by Sub Segment

Embedded Testing :
- Testing of Navigation system

Design :
- Design of System Code with Modular Car Computing Architecture
- Design of In-Vehicle API for Infotainment process

Development:
- Development of Automation Test for Navigation Controller

Others :
- Development of in-vehicle infotainment system

ALTRAN

Key Delivery Location
Paris Area, Toulouse Area, Stuttgart Area and Gothenburg Area

Split of Workforce by Sub Segment

Design :
- Design of ADAS sensors
- Design of Autonomous Emergency Braking System
- Design, Implementation and Optimization of Common Mathematical Library functions for Camera and Radar for Advanced Drivers Assistance System (ADAS)

Embedded Testing :
- Testing of BaseTechnologies in Infotainment ECUs

Note - Above analysis is based on the DRAUP's proprietary Outsourcing module, updated in January, 2019.Outsourcing details mentioned above are only some of the ongoing projects and not exhaustive.
Note – Outsourcing analysis is based on curation and analysis of deals data from various secondary sources followed by computation through Machine Learning models and manual effort. Deals are then tagged to Draup's Predefined Sub service segments and HC estimation is a result of estimation models based on aggregation of data collected from various secondary sources

Key Vendor Engagements Snapshot (2/5)

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Tech Mahindra

Key Delivery Location
San Francisco Bay Area, Greater Detroit Area Bengaluru Area, Nanjing Area, NCR, Greater Chicago Area, Stuttgart Area and Ulm Area

Split of Workforce by Sub Segment

Embedded Testing :
- Testing of SYNC Gen 3 infotainment system
- Testing of Infotainment Diagnostics and CoC_System Platform
- Testing of applications using Sensorics-Testing(ADAS)

Development :
- Development of car infotainment systems for the Audi through Harman Becker Application System
- HMI Skin Logic Development for Navigation module of Infotainment System

Design :
- Design of Bluetooth application modules Support of PBAP and MAP

bertrandt

Key Delivery Location
Munich Area and Barcelona Area

Split of Workforce by Sub Segment

Design :
- Design and Validation of Digital and Analog Radio Tuner
- Design of Driver Assistance System

Development :
- Development of Camera based Driving Assistance System

Embedded Testing :
- Testing for Infotainment system of SEAT and AUDI models

Note - Above analysis is based on the DRAUP's proprietary Outsourcing module, updated in January, 2019.Outsourcing details mentioned above are only some of the ongoing projects and not exhaustive.
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Source : DRAUP

Key Delivery Location
Gothenburg Area and Stockholm Area

Split of Workforce by Sub Segment

Development :
- Development of Autonomous Drive
- Development of Volvo Connected Solutions

Key Delivery Location
Greater Detroit Area and Bengaluru Area

Split of Workforce by Sub Segment

Embedded Testing :
- Validation of cluster features like Telltales, Illumination, Driver Assist-ACC, Warnings\RTTs, Diagnostics for Jaguar Land Rover
- Testing of 14 CD4x instrument cluster

Development :
- Development of the Car Driver Assist Systems

Design :
- Design of Car Instrument Panel Cluster Systems based on STK Architecture (C language)

Note - Above analysis is based on the DRAUP's proprietary Outsourcing module, updated in January, 2019.Outsourcing details mentioned above are only some of the ongoing projects and not exhaustive.
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Key Vendor Engagements Snapshot (4/5)

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Split of Workforce by Sub Segment

Key Delivery Location
Greater Atlanta Area, Bengaluru Area and London

Design :
- Design of Radio Head Unit with AM or FM, digital and satellite radio, media, Bluetooth and high speed infotainment
- Design of VP4R infotainment platform

Development :
- Advancement in safety through IFV (intelligent front vision) for BMW Lane departure warning system
- Development of Next-generation NTG5 system for entertainment features, connectivity and navigation

Embedded Testing :
- Testing of high end car radio for complete infotainment system in automotive domain

Split of Workforce by Sub Segment

Key Delivery Location
Munich Area, Greater Detroit Area, Nurnberg Area and Brasov County

Embedded Testing :
- Validation and Verification of Navigation Software using Silk Central and JERA
- Testing of Navigation SDK Engine

Design :
- Design of EI - 62 Navigation and Connected Services

Others :
- Integration of navigation source code for different SW modules and also third party deliveries to Audi for testing

Note - Above analysis is based on the DRAUP's proprietary Outsourcing module , updated in January, 2019.Outsourcing details mentioned above are only some of the ongoing projects and not exhaustive.
Note – Outsourcing analysis is based on curation and analysis of deals data from various secondary sources followed by computation through Machine Learning models and manual effort. Deals are then tagged to Draup's Predefined Sub service segments and HC estimation is a result of estimation models based on aggregation of data collected from various secondary sources

Key Vendor Engagements Snapshot (5/5)

KPIT

Key Delivery Location
Pune Area and Bengaluru Area

Split of Workforce by Sub Segment

Design :
- Deign of Graphics for cluster displays or HMI.

Development :
- Development of an Infotainment Device (IVI-In Vehicle Infotainment) through OVIP (Open Vehicle Infotainment Platform)

Embedded Testing :
- Testing of HMI and BL for continental infotainment system

automotive engineering iav

Key Delivery Location
Munich Area, Stuttgart Area and Braunschweig Area

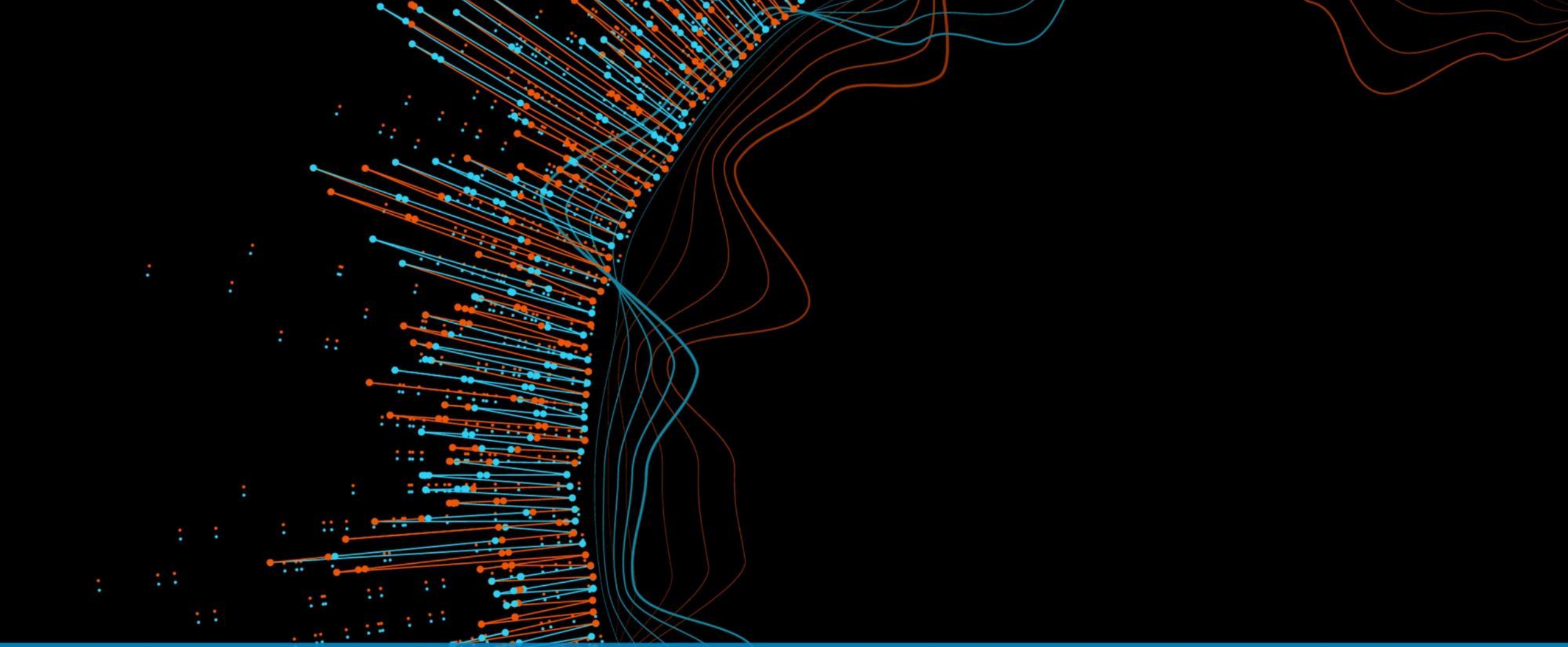
Split of Workforce by Sub Segment

Design :
- Design of Sound System
- Design of HMI for Porsche AG

Development :
- Development of Camera based Assistance Systems

Note - Above analysis is based on the DRAUP's proprietary Outsourcing module, updated in January, 2019.Outsourcing details mentioned above are only some of the ongoing projects and not exhaustive.
Note – Outsourcing analysis is based on curation and analysis of deals data from various secondary sources followed by computation through Machine Learning models and manual effort. Deals are then tagged to Draup's Predefined Sub service segments and HC estimation is a result of estimation models based on aggregation of data collected from various secondary sources

Source : DRAUP



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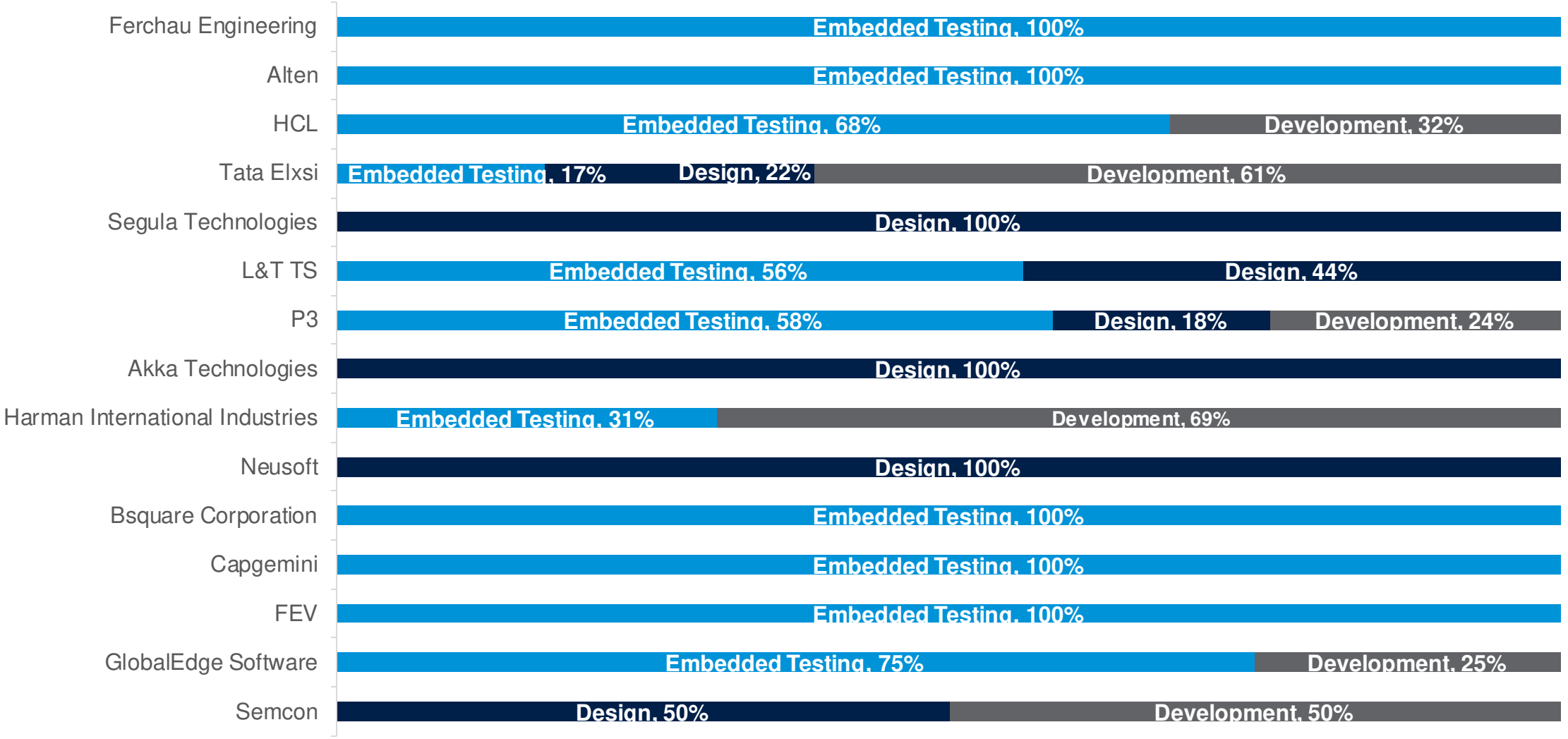
Appendix

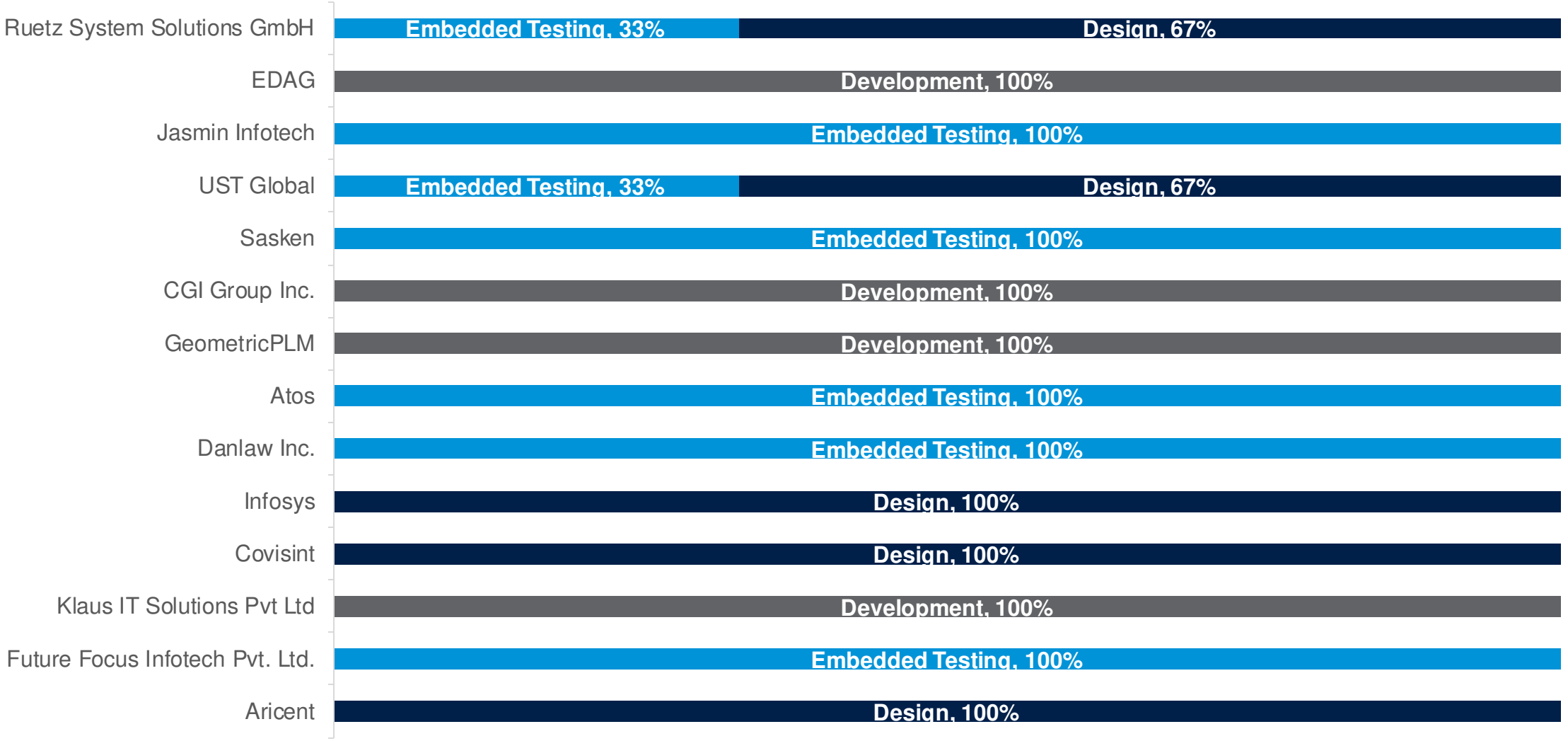
Service providers having outsourcing workforce of less than 3% of Automotive Digital Cockpit total outsourcing size



Note - Above analysis is based on the DRAUP's proprietary Outsourcing module, updated in January, 2019.

Source : DRAUP

Service providers having outsourcing workforce of less than 3% of Automotive Digital Cockpit total outsourcing size



Note - Above analysis is based on the DRAUP's proprietary Outsourcing module, updated in January, 2019.

Source : DRAUP