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E/E Community Leans Toward Collaboration

The mood to collaborate on E/E standards has been up and down over the years, but at the Automobil-Elektronik Kongress in Ludwigsburg in June, collaboration was demonstrably on the upswing.

**BMW** promoted cloud standards and Android. Showing a heightened interest in Autosar, **Ford’s** top E/E, Chuck Gray, pushed for common middleware for the onboard high-compute center. **TTTech** promoted a high-level international conference to advance an autonomous ecosystem with safety as the theme.

In the weeks following the conference I explored each these initiatives to see where we are today and what progress can be expected. The four articles that follow take a look at the Android Automotive Operating System, Autosar, the fledgling automotive cloud ecosystem and TTTech’s initiative to build a global community to shape the future of safe autonomous mobility.

More Carmakers Standardize on Android Automotive OS

At the recent Automobil-Elektronik Kongress, Stefan Butz, vice president of information and communications platforms at **BMW**, gave a talk that surprised me. The premium carmaker has for more than ten years been the main champion behind Genivi, the open source Linux-based infotainment platform developed by an alliance of carmakers and suppliers. BMW’s current Genivi implementation is essentially a vertical integration from the user interface to the vehicle’s electrical system. In the future BMW says it will employ an “industry-wide, standardized platform,” namely Android Automotive OS.

BMW’s fourth-generation head unit based on Genivi, likely its final Genivi implementation, will come to market in 2021. BMW’s first Android head unit will be aimed at the low end of its infotainment offerings. The carmaker wouldn’t say when it will come to market, but said an Android special interest group is being formed within the Genivi Alliance.
I checked in with Mickey Kataria, director of product management at Google, to see what more I could learn about the automotive industry’s embrace of the Android platform. Several year ago Mr. Kataria, who earlier worked on Google Maps, and Patrick Brady, now vice president of engineering at Google, together started the project to make Android a common platform for cars, much like it had become a common platform for phones. Work on Android Auto started in 2014, and on the Android Automotive OS specifically, in 2015.

The Android platform is open source and free. “Before Android and before iOS, there was a massive fragmentation of platforms on phones,” said Mr. Kataria. “Every phone maker had their own OS. The cost to a developer to maintain and update an application such as Google Maps on all the fragmented platforms was super high. … The same is true in the car industry today, where fragmentation has made it very challenging not just for us, but for any developer. With a common platform we can make innovation in the car much easier and much faster.”

Google’s Android strategy for cars appears to be working. Mr. Kataria told us that even a year ago carmakers representing half of all sales globally had made commitments to the Android Automotive Operating System. Of those, only Renault-Nissan-Mitsubishi, BMW, FCA and Volvo Cars have gone public. Together those OEMs account for just 20% of global sales. Some very big carmakers have been keeping quiet, but more Google partnerships will be announced later this year.

In September 2018, Renault-Nissan-Mitsubishi became the first carmaker to publicly declare for the Android platform. Starting in 2021, the alliance will employ the platform on multiple models and brands to provide services including Google Maps, Google Assistant and the Google Play store. In 2018 the alliance sold 10.6 million vehicles.

In April 2019, FCA announced that it will start equipping new vehicles with Android-based infotainment systems in the second half of this year. By 2022, the transition to Android infotainment systems will be complete.

In May 2018, Volvo Cars announced that its next-generation infotainment system will be based on the Android platform. Volvo’s offerings will feature the voice-controlled Google Assistant, Google Play, Google Maps and other Google services. Volvo’s Polestar 2 vehicle will be one of the first to come to market with the Android Automotive OS.
A Win-Win for Google and the Carmakers

As more and more carmakers move to the Android platform, Google saves the headache of adapting its money-making services to a variety of different platforms. The carmakers win as well. Android is free. It is a mature platform that is already in use on billions of devices from mobile phones, to TVs to watches. There are millions of Android developers. Carmakers can go to a developer like Spotify and say if you have an Android app you can just drop it into my car.

Google has undertaken many engineering projects to adapt the platform to automotive requirements. “For example, cars have HVAC systems; phones do not,” said Mr. Kataria. “So we added the ability for the Android platform to talk to an HVAC system. Also, the sizes and shapes of screens are much different in cars than in phones. We have been working on changes to make sure Android can run on these. We’re also adapting the platform to handle rotary controllers.” Every year since 2015-2016, Android has released updates to the platform that make it easier to bring Android into cars, Mr. Kataria noted.

Concerns about Data and Brand Answered

Carmakers have been disinclined toward Android in the past because they were worried that Google would take advantage of vehicle data. Genivi and AGL alliance members pressed this point. But Android doesn’t in actuality pose that risk. “While Android is funded and largely developed by Google, it is an open source project that the carmaker controls. It has no technical connection to Google, no license agreement, and no server at Google that it is talking to,” said Mr. Kataria. “We didn’t do a good job explaining that. Some of the concerns we heard were from people who were conflating using something like Google Maps, which does require location data, with the Android platform, which has no demands for data.”

Carmakers also worried that using Android would water down their brands, that the infotainment system would have a Google look and feel. Carmakers using the Android platform can now build systems customized to reflect their own brands. “That feedback we heard loud and clear,” said Mr. Kataria. Google’s first public demonstration of the Android OS on a Maserati in 2016 did have a Google look and feel. Since then Google has done demonstrations with both Volvo and Polestar (Volvo’s answer to the Tesla’s Model 3) and with Audi on the A8. “While Android was running under the hood, the user interface was designed and customized completely by the automaker. … We continue to work on tools to make customization easier so that the end result is consistent with the OEM’s brand,” Mr. Kataria emphasized.
“Android is indeed becoming more interesting because it now has reached a point where you can customize it sufficiently to your own brand and style, which wasn’t possible a couple of years ago,” said Volkswagen’s top E/E, Rolf Zöller. “However, you still have to carefully consider what dependence you get when using Google APIs and whether you can maintain control of update requirements.” Volkswagen might use the Android platform to install apps, but would partition it and other OSes apart from its own operating system platform, VWOS. By 2025, all basic functions in all new Volkswagen Group models will run on VWOS. ◆
Ford Goes Deeper with Autosar

Chuck Gray, Ford’s head of E/E systems engineering, delivered a speech in June at the Automobil-Elektronik Kongress in Ludwigsburg, where he stressed the need for more industry collaboration and more standardization. Mr. Gray acknowledged the difficult and costly development that Ford must undertake to transition from today’s distributed electrical architectures to architectures based on multi-domain computers. He asserted that if each of the 15 top carmakers had to re-engineer all their ECUs into major compute centers on their own it would easily cost in excess of $7 billion and, “We would run out of embedded software engineers.”

In his presentation, Mr. Gray queried the audience: “How can we collaborate? Can we have standards to define smart actuators at the edge? Might we have common ECUs and common ECU partitions? What code can be shared on a non-competitive basis? Is there a place to generate a software brokerage where components or modules would be like parts you pull off the shelf and reuse? I don’t have all the answers, but I’m here to put these questions in front of this group, because if there is a group that might be able to start a real discussion, I think it is here [at Ludwigsburg].”

While Ford has been on the Autosar steering committee for years, it continued to rely on its own standards when specifying ECU components. But that will change. According to Mr. Gray, Ford is adopting a “renewed commitment to deliver on Autosar and to standardize within the standard, so it is truly facilitating interchangeability.”

Mr. Gray would like the Autosar consortium to develop a standard middleware solution that would be suitable in high-performance computing applications, an ADAS controller, for example. “From the middleware down I can standardize into the hardware and into the SoC, and from the middleware up, to the application layer. Now I can cross-shop for software modules,” he said. Mr. Gray would like to take this further than the frameworks that typify Autosar standards and explore standard compute centers and vehicle architectures.

He sees opportunities for standardization and software reuse nearly across the entire compute platform value chain, from the sensors and actuators to the ECU hardware, the board support package, the operating system platform, the middleware, and the application programming interfaces, all of which are parts where there is little or no differentiation from OEM to OEM. From there, carmakers can differentiate on the basis of the features and applications that run on the platform.
“At the moment there is a lot of interest in features around central or high-performance controllers,” said Michael Niklas, head of software standards at Continental, and chairman of the Autosar steering committee.

I asked Mr. Niklas if Ford’s renewed commitment to Autosar was part of a trend toward more industry-wide collaboration. “The interest in standards is growing, because with the increasing complexity of systems nobody can develop a complete system on their own,” he said.

Autosar membership is up and the percentage of ECUs based on Autosar software has been growing. Even carmakers such as FCA, which isn’t an Autosar partner, will find themselves using Autosar software because “the tier ones are offering Autosar solutions whether they are interested or not,” said Mr. Niklas. ◆
BMW Wants a Common Automotive Cloud Ecosystem

Because it lacks the resources of some of its bigger competitors, BMW often advocates for collaboration as it strives to be in the forefront of E/E innovation. Such is the case now with cloud computing. In a presentation at the Automobil-Elektronik Kongress in June, the head of electronics development at BMW, Christoph Grote, urged the industry to work together to develop a common ecosystem to maximize the benefits of a cloud computing. “Multiple cloud based platform ecosystems have emerged in consumer electronics and social media, but none have yet been established for automotive,” he said.

Cloud solutions offer significant advantages compared with onboard solutions.

- Onboard resources are designed for peak workloads and therefore have idle capacity, whereas cloud resources can adapt on the fly to changing requirements.
- Hardware failures aboard the vehicle are costly and require visits to the dealer; cloud resources are highly fault tolerant and offer redundancy.
- Complex computing done centrally in the cloud can substitute for power-consuming computing onboard the vehicle.

Because of their reliance on huge data sets, the cloud is especially well suited to artificial intelligence applications including autonomous driving, digital voice assistants and intuitive user interfaces. The cloud also supports crowd-sourced data analysis for hazard warnings and on-street parking availability.

BMW wants to base an automotive cloud ecosystem on these six fundamentals:

- B2B platform providers should unbundle their B2C offerings to allow for fair competition among providers.
- A standard runtime environment
- Powerful developer tools
- Allowances for data sharing across carmakers
- Globally scalable solutions that allow for harmonization with local requirements
- Privacy and security
While **General Motors**’ global head of electronic components and subsystems, Gary Bandurski, told us that he is generally supportive of the need to develop cloud standards, and that the carmaker is “seriously considering,” collaborating with other carmakers, **Volkswagen** top E/E, Rolf Zöller, doesn’t want to wait for cloud standards to emerge. “We gave a thorough look at cloud-agnostic systems and our own IoT standards and decided to go into cooperation with **Microsoft** to really commit to their [cloud] technology and their IoT Edge technology. We are building up a Volkswagen automotive cloud with Microsoft technology. It just makes it a lot faster.”

The BMW Group has also partnered with Microsoft. The two companies are jointly developing cloud solutions for the factory and a separate platform for intelligent, multimodal voice interaction “to make conversations with the BMW Intelligent Personal Assistant more personalized.”◆
The Autonomous Event to Promote Expanded Collaboration

On September 5, 2019, C-level executives representing a global community of autonomous vehicle developers will gather in Vienna, Austria, to consider what they might do together to achieve safe autonomous mobility. Ensuring safety is the key to gaining acceptance of autonomous vehicles, by both consumers and regulators, on a broad scale. Attendees will consider whether additional collaboration to develop reference architectures and/or common standards makes sense. Key topics, all related to safety, include security, artificial intelligence, architecture and regulation.

“The challenge of autonomous mobility cannot be mastered by a single OEM, tier one or tech company,” asserted Georg Kopetz, CEO of TTTech Auto, the event’s lead sponsor. “They need to agree on common proposals that can be presented to government authorities who are trying to understand how things should be regulated.” Other sponsors include the World Economic Forum, Infineon, SAIC, Daimler, Audi and Samsung.

Conference planners have assembled an impressive list of top-level speakers including:

- Reinhard Ploss, CEO of Infineon
- Hans-Joachim Rothenpieler, Audi Board of Management member for technical development
- Klaus Fröhlich, BMW Board of Management member for development
- Young Sohn, Samsung Electronics president and chief strategy officer
- Kurt Sievers, president of NXP
- Thomas Müller, vice president for chassis, ADAS and autonomous driving development at Audi
- Alejandro Vukotich, senior vice president automated driving and driver assistance, BMW
- Michael Hafner, head of automated driving and active safety, Daimler
- Rina Raman, vice president, Intel Network and Custom Logic Group
- Jean Francois Chouteau, vice president, Renesas Electronics Automotive Business Unit and Global ADAS Center
- Glen De Vos, president of Aptiv Mobility and Services Group
- Alexander Hitzinger, Board of Management member for technical development, Volkswagen Nutzfahrzeuge
The chairman of The Autonomous event is Ricky Hudi, managing director of Future Mobility Technologies and co-founder of TTTech Auto.

Quite a lot of collaboration among major self-driving ecosystem players is already well underway, but The Autonomous event organizers want to take that further. **Honda** is a major investor in **General Motors’ Cruise** division. **Ford** and **Volkswagen** are jointly developing an electric vehicle based on Volkswagen’s EV platform. Volkswagen is also investing $2.6 billion in Ford’s autonomous vehicle partner **Argo AI**. Both OEMs will have access to Argo’s technology for their future AVs. **FCA** joined **BMW**’s autonomous vehicle alliance. In April, BMW and **Daimler** formed an automated driving development alliance.

In July, eleven companies worked together to publish the Safety First for Automated Driving white paper, which presents a framework for the development, testing and validation of safe automated passenger vehicles. Participating in the effort were Aptiv, Audi, Baidu, BMW, Continental, Daimler, FCA, HERE, Infineon, Intel and Volkswagen.

The Autonomous event’s planners are encouraging upper management participation from the global community of autonomous vehicle technology developers. Mr. Kopetz noted, “This is an issue requiring C-level attention because it relates to the companies’ core strategies—whether and where they want to collaborate or compete. We need to bring the top decision makers together so they can talk to each other and decide the best path forward.” The conference organizers expect approximately 350 attendees. There is no charge to attend. For more information, visit [www.the-autonomous.com](http://www.the-autonomous.com).

Executives from Waymo, Mobileye, Tesla, Toyota, General Motors and Nvidia have been invited. ◆
Parkopedia

Finding available parking can be an enormous headache for car owners. According to Deloitte Insights, “Americans on average spend 17 hours per year searching for parking, resulting in a cost of $345 per driver in wasted time, fuel and emissions. Those costs jump in major metropolitan areas: Drivers in New York spend 107 hours and $2,243 annually.”

Since its founding in 2009, Parkopedia has been working on the urban parking dilemma. Serving carmakers, map makers and navigation companies, the company provides detailed information on 70 million parking spaces in 89 countries. Parkopedia helps drivers find the closest and cheapest parking. Its service covers both on- and off-street parking availability, especially in large cities where demand for parking is greatest. Parkopedia also provides parking transaction services. In development are high-definition maps of parking garages to help L3 and above autonomous vehicles park themselves.

Privately held, the company does not report revenues, but last year it received the Consumer Technology Association’s Innovation Entrepreneurs Award, which recognizes companies with revenues under $30 million. Now with approximately 100 employees in eight countries, Parkopedia says it has been growing at about 50% per year.

Parkopedia provides static information such as addresses, hours of operation, and prices for all its locations. For about half of these, Parkopedia also provides dynamic information about parking availability, either real time or predictive. Real-time data depends on the parking facility’s infrastructure, for example, whether it’s connected to a network. Parking facilities in Germany and France tend to be more automated than those in in Southern Europe or the U.S.

Automated parking garages are equipped with entry and exit gates, which open to allow the vehicle to enter, and then close when the payment is made and the vehicle exits. These gates generate real-time vehicle counts, from which parking availability is established and communicated to Parkopedia. For drivers’ convenience some parking garages employ cameras or sensors installed in the ground to indicate which spaces are available. But these systems are expensive and therefore not at all typical.
On-Street Parking Availability

Three years ago, using crowd-sourced data from probe vehicles in the same way real-time traffic data is collected, Parkopedia began testing its on-street parking availability prediction software. Today the company provides this cutting-edge service to some premium carmakers, according to Parkopedia CEO Eugene Tsyrklevich. “We tell drivers their chances of finding a parking space. Car manufacturers have started to keep their ultrasonic sensors turned on at lower speeds and collect data generated by the sensors as they pass the vehicles parked along the street. That information can then be sent to the cloud and delivered to us on a historical or real-time basis, under a license agreement.” Parkopedia has been talking to some of the larger mass-market carmakers who are interested in a similar arrangement.

To participate, carmakers need to have enough cars on the road that are connected to the Internet, along with sensors that can detect parking availability and link that data to location. “The service can be effective if even a single-digit percentage of the carmaker’s vehicles are equipped with the technology,” said Mr. Tsyrklevich. “We don’t have to wait a decade for all the vehicles on the road to be connected to the network. It is happening now with multiple OEMs. The volume of data is only going to grow in the coming years.”

Vehicle Integration

Numerous parking apps for smartphones are already available from a multitude of data and data analytics sources, including Parkopedia. Parkopedia gets paid the same whether it provides its service through a phone app or on the carmakers’ head units. The company asserts that drivers are best served when parking services and navigation are tightly integrated with the vehicle’s user interface, where the driver is directed to the available parking space and given the option of automatically paying for the space with a single click. “We have customers that provide such a service to consumers today,” said Mr. Tsyrklevich. Parkopedia provides the parking services along with some APIs. The integration is done by the carmaker or its tier-one supplier.

Autonomous Vehicle Parking

Looking to the future, driverless vehicles using parking garages will need detailed location information to know where to find available spaces and how to exit the facility when the vehicle is called for. Since GPS signals are blocked once the car enters a parking garage, Parkopedia is developing high-definition maps of the world’s parking facilities. With a map from Parkopedia, a vehicle equipped for L3 autonomy should be able to park itself.
Parkopedia expects to be able to go into production with its parking facility maps within the next five years. At this point it isn’t clear whether these will be sold to mapping companies like Here or directly to the carmakers.

“We believe that autonomous valet parking will be one of the first truly autonomous features, for two reasons,” said Mr. Tsyrklevich. “First, parking is a major pain point for urban drivers. Second, drivers are most willing to cede control to an automatic system for parking, because when the vehicle is parking itself it is moving very slowly in a controlled environment. Handing over control in those conditions is a lot different from doing so at 65 mph on a freeway.”

Compared with other semi-autonomous driving features, the relatively low cost of rolling out autonomous valet parking also makes it a viable candidate for early introduction. ◆
The Company Profile: Lear E-Systems

Thumbnail Sketch
Lear Corp.
2018 Sales: $21,148.5 million
R&D: NA**
Interest Expense: 0.4% of sales
Capital Spending: 3.2% of sales
Net Margin: 5.4%
Cash Flow from Operating Activities: $1,779.8 million
Employees: 169,000 at year end 2018
Revenue per Employee: $125,139
Working Capital: $1,709.3 million*
Long-Term Debt: $2,300.1 million*
Stockholders’ Equity: $4,236.4 million*
Market Cap: $8,032 million as of July 29, 2019

E-Systems
2018 Sales: $5,126.6 million
Margin: 12.3%, down from 14.0% in 2017
Engineers Employed: 2,500, including 1,200 electronics engineers
Major Products: Wire harnesses, terminals and connectors, electronic control modules

*As of June 29, 2019
**Lear does not show an R&D expenditure line item in its P&L.

Background
Lear’s roots date back to 1917 with the founding of American Metal Products in Detroit with backing from the inventor William Lear. AMP manufactured steel assemblies for automotive and aviation customers. By 1941 the company was serving seven automotive OEMs, including GM, Ford and Chrysler as well as other parts suppliers. Following World War II, demand for automobiles surged in the U.S. and by 1950, AMP’s sales, primarily automotive seating products, were approaching $31 million.
William Lear, preferring to focus on aviation, sold his interest in the company in 1962 to the Siegler Corporation, creating the company Lear Siegler Inc., which acquired AMP two years later. By 1971, LSI was the world’s largest independent seat supplier. LSI spun off its seating business in 1988 through a management buy-out, resulting in Lear Seating Company. The name changed to Lear Corp. in 1996.

Much of Lear’s growth was fueled by acquisitions. The 1999 acquisition of United Technologies Automotive allowed the company to expand into the wiring harness business, and the 2004 acquisition of Grote & Hartmann added terminals and connectors to Lear’s product portfolio.

When the Great Recession hit the U.S. automotive industry, production cuts at its largest customers, GM, Ford and Chrysler, resulted in Lear, mired in debt, ultimately filing for Chapter 11 bankruptcy protection in July 2009. It emerged from bankruptcy in November of that year. Standard & Poor’s gives Lear a credit rating of BBB-, its lowest investment grade rating, with outlook positive.

Lear today reports in two major business segments, Seating and E-Systems, which includes wire harnesses, terminals and connectors, and electronics modules. This profile focuses on the E-Systems segment and its strategy to respond to the current megatrends at play in the automotive industry today, autonomy, connectivity, electrification and shared mobility.

With global vehicle production down by 7%, compared to the second quarter of 2018, E-Systems’ net margin for the quarter declined sharply, from 14% for Q2

The Hansen Report on Automotive Electronics, July/August 2019
www.hansenreport.com
2018, to 8\% for Q2 2019. Vehicle production in China was down 17\% from the prior year. Ford’s C2 platform-based production fell 45\% over the past two years as Ford phases out several passenger car models.

**Strategy**

Lear E-Systems intends to diversify from being predominantly a supplier of high labor content products, mostly wiring harnesses, to a company able to support carmakers developing cars that are essentially data centers on wheels. Connectivity, electrification and software products are three growth engines that E-Systems plans to leverage in order to achieve that transformation. For example, embedding more software into the products it currently makes can be a means to improving margins. Lear’s 2015 purchase of Internet-based telematics technology from Autonet Mobile, and its acquisition of Arada Systems with hardware and software for V2V and V2I communications were an early step in building up E-Systems’ technology portfolio.

Lear is currently assessing E-Systems’ product portfolio with a focus on both product and customer diversification. The company could exit some minor, low-margin products. “Everything is under review, everything is on the table,” said Lear president and CEO Ray Scott in an analysts’ call. The company is considering expanding in-house production of the terminals and connectors that are part of the wiring harnesses it sells. Terminals and connectors, which accounted for 7\% of E-Systems sales in 2018, produce better margins than wire harnesses. Mr. Scott is hoping to increase that percentage to between 10\% and 20\% of sales.
E-Systems today relies on its three largest customers, Ford, General Motors and Renault-Nissan for 53% of the segment’s sales. In order to diversify its customer base, Lear will have to take market share away from its competitors, an effort that will further challenge margins. Regionally, North America and Europe account for 69% of sales.

◆ Connectivity
Under the brand ConnexUs, for all things related to communications from and to the vehicle, Lear has been building a portfolio of products aimed at the connectivity megatrend. Citing IHS Markit numbers, Lear expects that 63% of vehicles produced globally will be fitted with cellular modems by 2023, compared with 34% in 2018.

In 2015, when Lear acquired Arada Systems, a company that specialized in DSRC V2X technology, the U.S. was on a path to mandating the installation of V2X transceivers in new vehicles. Those plans evaporated with the new administration in Washington. Currently only a few carmakers have embraced V2X and some, like BMW, think it won’t be needed even for autonomous vehicles. At this point the market prospects for V2X are uncertain.

In 2018, Lear completed the acquisition of EXO Technologies, based in Tel Aviv, Israel and San Mateo, California, a developer of highly accurate—within five to ten centimeters—software-based GPS solutions. That level of accuracy is needed for L3 and above autonomous driving features.
For more than a year, Lear has been shipping communications modules and connected gateways to Porsche, for the 911 and Panamera, and to Audi, for the A4, A7, A8, Q5 and Q7. The communications module features 4.5G cellular connectivity with links to gigabit Ethernet networks, plus Wi-Fi and Bluetooth connections. The connected gateway includes an over-the-air software update manager and 20 network connections: 5 Ethernet, 4 FlexRay, and 11 CAN/LIN.

◆ **Electrification**

According to IHS Markit, nearly 50% of vehicles produced globally in 2028 will have electrified powertrains, a trend that Lear expects to benefit from with its growing product portfolio that includes high-voltage wiring harnesses, connectors and terminals, charging system battery electronics and converter/inverter systems. Lear has been serving the xEV market for more than ten years.

Lear is currently shipping 7 kW battery chargers with DC to DC fast charge capability. Next year it will begin shipping 11 kW chargers, and in 2021, battery monitoring electronics.

Lear is supplying, or will supply, high-voltage components and systems for hybrid and electric vehicles produced by BMW, Daimler, Fiat Chrysler, General Motors, Jaguar Land Rover, Renault-Nissan, Volkswagen and Volvo.

◆ **Less Wiring Content**

Long term, Lear will need to respond to the loss of electrical distribution system content as carmakers move to domain and centralized computing architectures, and to electric vehicles that drive themselves. Battery powered autonomous vehicles will have no engine, no transmission, no cockpit, no instrument panel, no steering wheel and no center stack. The vehicle’s wiring harness will be much simplified, and that will further reduce cost as parts of the harness benefit from automated assembly.

In the near term, Lear will benefit from the market transition to hybrid and electric vehicles. Lear asserts that fully electric vehicles currently offer the company an incremental content opportunity of $200 to $2,000 per vehicle. High-voltage power wiring costs significantly more the standard 14-volt wiring. But the price of the high-voltage harness is expected to decline significantly over the next several years with the optimization of the DC AC combination harness, the elimination of the 3-phase cable, and the integration of power electronics directly into electric motors.
Xevo

Lear has radically revised its acquisition strategy since 2012. Back then it was interested in acquisitions, but only small ones, for example companies with similar product lines, but with access to customers and business that Lear wasn’t presently winning. In April 2019, Lear completed its acquisition of Bellevue, Washington-based Xevo, a developer of cloud-based software solutions for enterprise companies in automotive, hotel, cruise and retail industries. Lear reportedly paid $320 million for Xevo. Founded in 2000, Xevo reportedly employs roughly 150 people at its headquarters, plus about 140 elsewhere around the world.

In connection with the closing, Lear issued 16,231 shares of restricted stock to 46 Xevo employees who joined Lear. The inducement awards will vest in two installments on each of the 18-month and three-year anniversaries of the closing. The new employees hope the coming months will look better for Lear than the recent past. Lear stock has dropped 43% from its high in June 2018.
Thus far Xevo has provided software solutions to GM, Toyota, Hyundai and Ford. Its most prominent engagement thus far is with General Motors. GM is using Xevo’s in-vehicle commerce platform for its Marketplace app, which lets drivers order food, book a hotel room or purchase fuel from their vehicle’s touch-screen display.

Marketplace is available in the U.S. on most 2017 to 2019 GM vehicles, though only a small percentage of drivers have so far engaged with the platform. GM won’t aggressively promote the feature until it is finished refining the system and adding more vendors. As of year-end 2018, 14 vendors were offering services. According to the *New York Times*, vendors include McDonald’s, Shell, Exxon, Dunkin’ Donuts, Applebee’s, Delivery.com, IHOP, Parkopedia, Priceline, Wingstop, TGI Fridays, Office Depot and Yelp for restaurant recommendations.

Marketplace has already received its share of criticism. Safety advocates worry that what drivers don’t need right now is more visual distraction. Speech interfaces are less distracting than the touch screen, which requires drivers to look away from the road. Amazon’s Alexa voice assistant, for example, is making headway with carmakers.

Others worry that Marketplace offers no advantage over other options. “Any in-vehicle commerce option has to provide some benefit over the driver’s current way of doing things,” said Chris Schreiner, director of syndicated research for Strategy Analytics’ UX Innovation practice. For example, using an in-vehicle commerce solution to pay for gas is more complex than using a card or mobile payment application, requiring three extra steps to complete the transaction. “A second point is that blatant attempts at commerce will not be well received by a typical new car buyer in the West. A separate “Market” icon on the dash just won’t be visited.”

With the Xevo acquisition, “Lear is seeking to secure a foothold in the connected car business to add to its networking/gateway business,” offered Roger Lanctot, director of the automotive connected mobility practice at Strategy Analytics. “The onus will be on Lear to prove out the Xevo model. The acquisition gets Lear into multiple high level conversations with strategic partners, but now the work of delivering begins.”

In June, FCA announced that it partnered with Xevo for the launch of FCA’s new Uconnect Market platform. Uconnect Market will be deployed in the second half of 2019 via an over-the-air software update on 2019 and 2020 connected Chrysler, Dodge, Jeep and Ram vehicles that have touch screens.
The FCA deal will begin to generate revenues this year. Xevo shares a portion of the revenue it receives from merchants with the carmaker. The Xevo acquisition had a small negative impact on Lear’s Q2 2019 earnings.

Xevo claims expertise in software, cloud computing, data analytics and AI, all of which are increasingly essential to future vehicles, but they are outside of Lear’s primary businesses. Whether this acquisition thrives under Lear management remains to be seen.

**E-Systems Management Unsettled**

Mr. Scott is now also serving as interim president of E-Systems. That position was held for less than a year by Jeneanne Hanley, a 24-year veteran of the company who was terminated without cause on January 28, 2019. Frank Orsini, now president of Lear Seating, also ran Lear’s electrical business for a time on an interim basis. As of July 2019, Mr. Scott said he is close to naming a new E-Systems president. From there, Lear wants to further strengthen the division’s senior management team.

**Seating and E-Systems Converge in Smart Seats**

Lear receives the bulk of its revenue, 75%, from its Seating segment, which supplies a range of products from complete seating systems to individual seating components. According to the company, its seating technology includes electronically controlled sensor and adjustment systems for comfort, as well as internally developed algorithms. It is common for Lear to have both seating and electrical content on a single or multiple vehicle platforms with a single customer.

Lear sees seating becoming “a more dynamic and integrated system requiring increased levels of electrical and electronic integration and accelerating the convergence of our Seating and E-Systems businesses.”

At CES 2019, Lear demonstrated its Intu seating system concept, which it describes as a full suite of intelligent technologies for enhanced passenger comfort, wellness, entertainment and safety, aimed at future autonomous vehicles. For example, BioBridge uses RF sensing to read passengers’ heart and respiratory rates, detect drowsiness or stress and activate the appropriate comfort features or in an emergency situation transmit health data to a medical facility.
ProActive Comfort dynamically adjusts the seat to optimize passenger comfort. Rapid Repositioning detects an imminent collision and instantly positions the seat, mounted on electric rails, to the safest position. SoundZone uses noise cancellation to provide a personal listening space, for instance in a shared vehicle.

Lear claims to be the only global supplier with complete capabilities in both seating and electronics. ♦

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**E-System Products**

**Electrical Distribution Systems for ICE and E-vehicles**
- Wiring harnesses
- Terminals
- Connectors
- Junction boxes

**Electronic Control Modules**
- Body control modules
- Audio control modules

**Electrification Products**
- Charging Systems
  - Onboard charging modules
  - Cord set charging equipment
  - Wireless charging systems
- Battery Electronics
  - Battery disconnect units
  - Cell monitoring systems
  - Integrated total battery control module
- Converter and inverter systems

**Connectivity Products**
- Gateway modules
- Connected gateways
- Communications modules
  - V2X modules
  - EXO real-time satellite positioning services