Plextek

# Driving Innovation into the UK Automotive Supply Chain

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# Outline

Driving Innovation into the UK Automotive Electronics Supply Chain

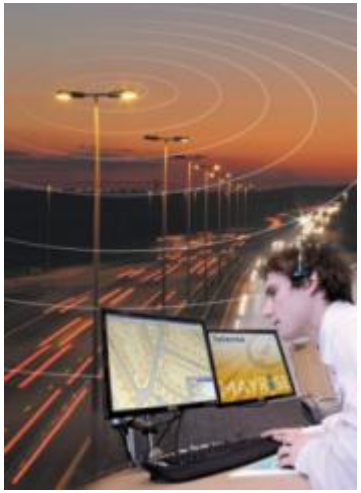
- The growth of Automotive Electronic Systems
- The innovation climate
- Current supply chain structure
- Successful innovation examples from other industries
- How to take advantage of the opportunity

# Background

- Plextek is an electronics design and manufacturing consultancy

- Plextek has specified designed and delivered for clients over 5.5 million automotive products

- Plextek is also very active in -
  Telecommunications
  Defence and Aerospace
  Healthcare
  Sensors and Tracking



# Growth of Automotive Electronics

Automotive Electronic Systems are playing ever increasing role.....

- *By Value*

  *"…some experts predict that by 2019 the percentages relating to the cost of electronics as a percentage of vehicle cost are expected to rise to 50 per cent for conventional vehicles and 80 per cent for hybrids." **

  *"It is interesting to note that electronics in todays car already exceed 20% of the total vehicle value and this is estimated to increase to nearer 35% by 2015" ***

- *By Warranty Claim*

  *"…50 percent of car warranty costs are now related to electronics and their embedded software…" ****

- *Arguably the car is becoming an electronic product rather than a mechanical one*

* IEEE 2009
** Infineon 2009
*** IBM 2009

# Growth of Automotive Electronics

The limit is being reached for the number of independent technologies within a vehicle platform

| 1970s | 1980s | 1990s | 2000s | 2010... |
|---|---|---|---|---|
| | | | | - Electro-mechanical valves |
| | | | | - Tyre pressure sensors |
| | | | | - Collision Avoidance |
| | | | | - Steer by wire |
| | | | | - Brake by wire |
| | | | | - Throttle by wire |
| | | | | - Bluetooth |
| | | | | - Multimedia entertainment |
| | | | | - Wireless connectivity |
| | | | | - LED lights |
| | | | | - Android OS |
| | | | | - iOS |
| | | | | - Personalisation |
| | | | - Advanced User Interfaces | - Advanced User Interfaces |
| | | | - ALC | - ALC |
| | | | - Night Vision | - Night Vision |
| | | | - ACC Stop and Go | - ACC Stop and Go |
| | | | - Force Feedback | - Force Feedback |
| | | | - Lane Departure Warning | - Lane Departure Warning |
| | | | - Energy Management | - Energy Management |
| | | | - Local Hazard Warning | - Local Hazard Warning |
| | | | - Telematics | - Telematics |
| | | | - Online Services | - Online Services |
| | | | - Integrated Safety Systems | - Integrated Safety Systems |
| | | | - Fuel Cell | - Fuel Cell |
| | | | - Software Maintenance | - Software Maintenance |
| | | - Vehicle Navigation | - Vehicle Navigation | - Vehicle Navigation |
| | | - CD Changer | - CD Changer | - CD Changer |
| | | - Bus Systems | - Bus Systems | - Bus Systems |
| | | - Active Cruise Control | - Active Cruise Control | - Active Cruise Control |
| | | - Adaptive Autobox | - Adaptive Autobox | - Adaptive Autobox |
| | | - Roll Stabilisation | - Roll Stabilisation | - Roll Stabilisation |
| | | - Xenon Lighting | - Xenon Lighting | - Xenon Lighting |
| | | - RDS | - RDS | - RDS |
| | | - Emergency Call | - Emergency Call | - Emergency Call |
| | | - Servotronics | - Servotronics | - Servotronics |
| | | - Electronic Shock Absorber Control | - Electronic Shock Absorber Control | - Electronic Shock Absorber Control |
| | - Electronic Gearing | - Electronic Gearing | - Electronic Gearing | - Electronic Gearing |
| | - Electronic Air Conditioning | - Electronic Air Conditioning | - Electronic Air Conditioning | - Electronic Air Conditioning |
| | - ASC | - ASC | - ASC | - ASC |
| | - ABS | - ABS | - ABS | - ABS |
| | - Seat Heating Control | - Seat Heating Control | - Seat Heating Control | - Seat Heating Control |
| | - Automatic Mirror Dimming | - Automatic Mirror Dimming | - Automatic Mirror Dimming | - Automatic Mirror Dimming |
| - Electronic Fuel Injection | - Electronic Fuel Injection | - Electronic Fuel Injection | - Electronic Fuel Injection | - Electronic Fuel Injection |
| - Electronic Ignition | - Electronic Ignition | - Electronic Ignition | - Electronic Ignition | - Electronic Ignition |
| - Cruise Control | - Cruise Control | - Cruise Control | - Cruise Control | - Cruise Control |
| - Central Locking | - Central Locking | - Central Locking | - Central Locking | - Central Locking |

# Innovation in Society

At the same time, innovation in society is accelerating

- ❑ Smart Phones, App stores
- ❑ Telemedicine
- ❑ Video on Demand
- ❑ Personalisation
- ❑ Smart Infrastructure from electricity to roads

Do vehicles have a role to play here?

Should vehicles play their part leading innovation in society?

# Automotive Innovation

The UK is bursting with innovative automotive companies

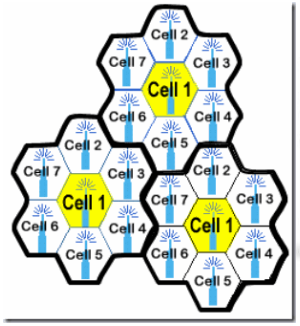
- These organisations are ideally placed to provide the new platforms and architectures to lead automotive innovation in society
- At the same time solutions are needed to solve the fundamental limits in automotive electronics now being reached
- For this to happen there needs to be incentive to embrace these ideas within the OEM / T1 / T2 / technology innovator supply chain.

# What can be learned from other industries?

- Step back and look at how other industries have embraced innovation

- First Define what to look for: complexity, regulation, market

  - Leading edge technologies
  - Complex supply chains
  - Highly regulated environment (ISO 26262)
  - Large marketplace ranging from consumer via professional to governmental
  - OEMs compete fiercely across specification, features, performance, price
  - Innovation is disruptive



# Industry 1 – Broadcast TV Transmitters

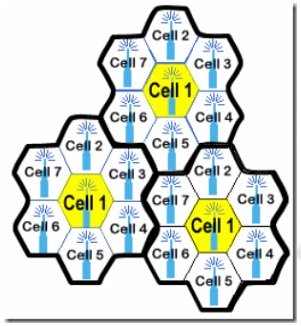
- TV Transmitters range from RF output per channel of 100W to 500kW with up to 4 transmitters per site
- Site Power consumption approximately 2kW to 8MW
- Electricity bill a significant proportion of Operational cost
- Highly regulated

- Disruptive technology developed by start-up (Nujira)
  - Increased transmitter efficiency by factor of 2
  - Site Power consumption reduced from 8MW to 4MW
  - Huge saving in Operational Costs

- Market Model – Pull Through
  - Nujira convinced TV Transmitter Operators of innovation
  - TV Transmitter Operators rang up incumbent transmitter suppliers and “encouraged” them to adopt the new technology
  - Transmitter suppliers contacted Nujira and licenced technology
  - To remain competitive suppliers adopted new technology and produced new equipment
  - Innovation was delivered

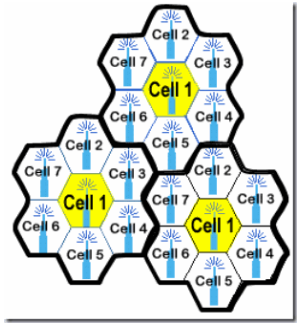
# Industry 2 – Mobile Phone Industry

- Global scale consumer, professional and govt. market
  - 1.6 billion phones shipped per annum
  - 10s of thousands of base stations installed per annum
- Ferociously competitive industry on features, price and performance
- Highly regulated
- Technology at leading edge of science
- Technology created within a framework of standards



- Innovation is led by market Pull Through
  - Innovation occurs within OEMs and T1s
  - Innovation occurs in disruptive startups which are acquired by OEMs and T1s
  - Innovation occurs amongst the end users (App stores)
  - Innovation occurs through new commercial models (Apple)

# Industry 2 – Mobile Phone Industry




- Innovation Environment
  - Technology too complex and large scale for a single company to contemplate soup to nuts offering
  - Circa 30 OEMs
  - OEMs compete on features, price and performance
  - Tier 1s hold and develop products embodying essential IPR

- Driving Economies of Scale
  - Standards bodies drive the internal core technology development
  - 3GPP body defines a single set of standards for a particular technology release
  - OEMs/T1s volunteer effort to 3GPP to develop and agree standards
  - OEMs still able to compete on features, price and performance
  - Tier 1s hold and develop products embodying essential IPR

# Industry 3 – Aero Engine Industry

- Global scale consumer, professional and govt. market
- Ferociously competitive industry on features, price and performance
- Highly regulated
- Technology at leading edge of science

- Innovation is led by market Pull Through
  - Innovation through new business models
  - Model 1 - Time and materials - wholly benefits maintenance operator
  - Model 2 - Fixed price - benefits the airline
  - No risk sharing
  - Business relationships forced to re-align to share objectives and risks

- Fundamental Re-Alignment to benefit customer and supplier
  - Service model where maintainer is paid for engine time in the air
  - “Power by the Hour”
  - Effect is focus on engine reliability and operational costs
  - This aligns objectives of both airline and maintainer (usually OEM)
  - Model is extending to include engine supply

# Industry 3 – Aero Engine Industry

- Business Innovation supported by technology

  - Business focus guides technology requirements
  - New Innovations in real time engine monitoring
  - Engine and flight data passed to OEM monitoring centres during flight
  - Advanced reliability software at OEM processes data
  - Maintenance recommendations and parts available when plane lands
  - Performance optimisation recommendations produced eg water wash
  - Maintenance issues spotted early, acted upon preventing expensive damage
  - Engine optimised to produce best fuel efficiency – reducing operating costs

# Alternate industries - summary

- What can be taken from these examples?

- Example 1 – Broadcast TV
  - OEMs can force technology change by pulling through disruptive third party technology into the supplier base
  - Disruptive technology must have a compelling market advantage

- Example 2 – Mobile Phone Industry
  - OEMs and Tier1s can collaborate on technology development to achieve what would otherwise be impossible
  - Standards are key to the process
  - OEMs are still able to ferociously compete
  - Disruptive technology plays a fundamental role

# Alternate industries - summary

- Example 3 – Aero Engines
  - Innovation is also achieved by changing business models
  - Aligning objectives of customer and supplier provides compelling benefits
  - Technology advances to support new business models

# Good news – it's happening

The good news is that this is now beginning to happen:

Active discussions between innovators and influencers are now being facilitated

The NMI AESIN is leading the way

Collaborative engagements between OEMs, Innovators and Technology providers gives potential to bring innovation through the supply chain

Can vehicles play their part leading innovation in society?

# backup

## Presentation format

- *Driver information systems*
- *In Car Entertainment / Comms*
- *Drivetrain / Engine management*
- *Safety systems*
- *Fleet management*
- *Traffic management*
- *Toll systems*

- *Existing Activities*

*(significant incumbent experience)*

- *New application areas / technologies*

*(little or no experience)*

# backup

## Useful table format

| | CAR DESIGN | CAR MANUFACTURING | SALES/AFTER SALES | CAR USE |
|---|---|---|---|---|
| **IMPROVE COST EFFICIENCY** | OEM | OEM | Product suppliers | Consumers |
| | Tier 1/2 supplier | Subcontract manufacturers | Dealers | Insurance companies |
| **FLEXIBLE SOLUTIONS** | Technology providers | System integrators | Fitters | Recovery companies |
| | Innovators | ICT solution providers | Retailers | Service providers |
| **FUEL EFFICIENCY** | Consultants | Logistic companies | Repairers | Fleet management |
| | | | | Logistics |
| **NEW FEATURES** | | | | Parking |
| **NEW BUSINESS MODELS** | | | | |

However, manufacturers traditionally not well exposed to new innovation....

Vehicle manufacturers have traditionally not been well exposed to new technologies and innovations, as their suppliers tend to favour the lowest cost, lowest risk path to satisfying their requirements.

This can stifle the flow of new innovation to the OEMs – an issue when radical new ideas are needed to address what are now becoming fundamental architectural limitation

There is a tremendous opportunity for key industry players to respond to the challenge and enable innovation to reach the end customer

# Set scene with History & growth slide

- <from this Infineon paper> from 2009:

'*It is interesting to note that electronics in today's car already exceed 20% of the total vehicle value and this is estimated to increase to 35% within the next 6 years, according to Infineon estimation. The majority of automotive innovations will be driven by electronics innovations enabled by semiconductors'.*

*'While the transistor was first developed in 1946, the introduction of electronics to the automotive industry didn't happen until the 1970s with the need for engine management and the introduction of electronic fuel injection technology'.*

*The automotive semiconductor growth in APAC has been phenomenal over the last few years and this is set to grow at a Compounded Annual Growth Rate of 14% from 2007 USD $ 2.9 billion to USD $ 5.6 billion in 2012 (source: Strategy Analytics, January 2009).*

*As automotive electronics remain one of the key drivers of the automotive industry, greater demand on innovation, solutions, cost, supply chain and service will point the way forward in Asia Pacific. Key to this is how suppliers adapt to these challenges as the global economy recovers.*

*Today (Oct 2011), an estimated 40% of the value of the vehicle is electronic with new entertainment, environmental control, navigation systems and safety systems. <from here>*

The reality is that almost all automotive innovations in the past thirty years would not have been possible without electronics .*Today, (Feb 2012) the car is almost more of an electronic product than a mechanical one.* One thing seems certain -- the trend toward increased use of technology isn't going to slow down <from here>

Maybe a brief comment on the indirect benefits that can also drive demand for more electronics content....

*new acronym AEB for autonomous emergency braking has emerged to describe this class of safety system and the insurance industry is clearly struggling to assess its attraction to consumers and life and property saving qualities in practice. As the HLDI study has shown and anecdotal evidence suggests, AEB may actually have the ability to pay for itself especially in the age of the distracted driver.*

# History & growth slide

<all from here> The worldwide market for automobile electrical systems and electronics is expected to grow at a rate of 5.9% per year, reaching 230 billion euros by the year 2015 and ultimately representing more than 30% of the automobile's value.

There is hardly a function in today's automobile that does not rely on electronic control systems. And the proportion of an automobile's value represented by electrical systems and electronics will continue to grow in the future. Today, electrical and electronic components and software make up 20% of an automobile's value, on average, on a worldwide basis. By the year 2015, this proportion will grow to more than 30%

In total, the worldwide market for automotive electrical systems and electronics can be expected to grow at a rate of 5.9% per year until 2015 – in particular because the applications now being used in premium models will spread to the lower-end market segments. But we can also expect to see innovative new features as well. The strongest growth will be experienced in the area of electronics for the car interior: According to the Oliver Wyman study, such applications could see growth rates of 7% per year. "Car interior" refers mainly to Infotainment applications, displays and various comfort functions.

**Pay close attention to the development of standards and automotive architectures**
No supplier can escape the trend towards standardization and new architectures. At the moment, however, it is impossible to tell what standards will be established, at what time and in what way. Quick decisions can be expected only in those areas in which new end user benefits can be created. For automotive suppliers, it will be very important to achieve an advantageous positioning within the changing world of automotive architectures, at an early stage of development.

# Introduction of the argument

<image of multiple boxes>
Practical limits have been reached for adding new features by simply adding more controllers and newer ‘innovative’ architectural change is needed to integrate so much functionality. To achieve this, new standards will have to be agreed and adopted and achieving this in the current supply chain is a tough challenge.

Do we want to include examples or just verbalise it
(bearing in mind Tim at McLaren will have already presented
their central processing argument – is probably stronger to refer to that) ?
<image of cpu in car>

Only once the manufacturers have seen first-hand what is possible and how new innovation can solve their issues, will they be armed to push their suppliers to deliver these new technologies.

Introduce the Pull-through model here....