SOFTWARE DEFINED VEHICLE (SDV) & THE AUTOMOTIVE TRANSFORMATION

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TOPICS

• Change & Perception of Change
  • Emergence of SDV

• Key Drivers & Roadblocks

• Impacts of the transformation

• SDV & Data

• Takeaway
CHANGE & PERCEPTION/ANTICIPATION/CHATTER

Stakeholders Of Change

- OEMs
- SupplyChain Tech Ecosystem
- VC Industry Equity Market Analysts
- Economics Of Technology

Execution & Business

Media Ecosystem Bloggers Influencers

Enlighten Vs. Chatter

Stages of Technology Development

- POC
- Positive ROI
- Scaled up commercially
- Run as a pilot
- Validated for safety
- Demonstrated
- Can be done
AUTOMOTIVE TRANSFORMATION

2000: One off device

2010: Smartphone on Wheels

2020+: Living Space on Wheels

Vehicle As A Platform

Frequent Refresh & New Capability
Consumers

Control & Flexibility
OEMs
EMERGENCE OF SDV OR SOFTWARE-DEFINED VEHICLE

2010-2020

“Clean Sheet” Effect

Post 2020
Software Defined Vehicle (SDV)

CASE
Connected
Autonomous
Services
Electrified

OTA – Over the air Update
SOA – Service oriented architecture

Cloud Connectivity
3rd Party
Safety / Mission Critical
Proprietary Software
Other

Vehicle OS (Operating System)
Middleware

Computational Hardware
Sensors, Actuators, Harnesses, Electronics
KEY DRIVERS

- **Growth of CASE**
  - Dedicated ECU’s → Not Scalable

- **Processing Power**
  - Can not support the steady growth of complex computation

- **Communication**
  - Not designed for low latency communication

- **De-couple HW & SW**
  - Not open to expansion

Current Architecture
“Kitchen Sink Approach”
IS ELECTRIFICATION A CATALYST?

New EV Startups

- Rooted in the software industry & SOA framework

Traditional OEMs

- EVs offer
  - New modular physical architecture
  - Fewer legacy constraints of ICE vehicles
  - Natural scalability of the platform

- EVs happen to be the first adopters of SDV Architecture
ROADBLOCKS TO SDV - SUPPLY CHAIN

- **Over-optimized components** - from different suppliers, as black box tailored for specific task

- **Not transferrable** between sub-systems or programs

- **Not Reusable** - Variation in suppliers’ programming language or dependence on specific hardware
DIRECT CONTROL & CONTINUOUS DEVELOPMENT

- **Integration** - More direct role
- **Agile** product development
- New Skills – software development

- Design own hardware
- Build their own chip
- In-house development & owning software
- Partnerships

- **Move to More** Vertical Integration

A Generic Scenario – For Illustration Only
EMERGENCE OF A NEW VALUE CHAIN

- **OEMs** taking a bigger role & building new skills
- **Tiered suppliers**: Re-skilling for the digital age
- **Startups** interacting closely with the OEMs
- **Technology industry**: Engaging directly with auto industry

Shift from Pyramid to Network

![Diagram showing the shift from a pyramid to a network with layers labeled Tier 1, Tier 2, Tier 3 connected to OEMs, BIG TECH, T1, T2, T3, S (Startups), I&A (Incubators & Accelerators)]

S: Startup
T1,2,3: Tier 1,2 or 3
I&A: Incubators & Accelerators
HORIZONTAL TO VERTICAL INTEGRATION

Horizontal to Vertical Integration

Less Reliance on Tier1’s

- Traditional supply chain
- Tier1: system integrator
- Kitchen-sink approach

More Control & Flexibility to Innovate

- Own Software stacks
- Design own chips
- Manage Cloud

- Close gaps in HW/SW Competence
- Develop agile product development

In-house resources/skill sets: Software based Innovation & Hardware Competence

Traditional product development will struggle to adjust to the new reality
RECENT WARDS AUTO RANKING OF OEMS ON SDV PROGRESS

AUTOMAKER SDV RANKING

LEADERS

STRONG CONTENDERS

CONTENDERS

FOLLOWERS

EV Only, Clean sheet

Traditional, Established ICE business, Evolving
OTHER TRANSFORMATION TAKING PLACE.....

• Growing acknowledgment of the complexities – between Tech & Auto
  ✓ Better appreciation for safety & reliability
  ✓ More software talent & leadership migrating to automotive
  ✓ VC & startup culture finding stronger roots in automotive

Evolution of a more robust bridge

Traditional Auto Industry

Technology Industry

Detroit, Stuttgart, Tokyo...

Silicon Valley, Tel Aviv, Berlin...

2023 Detroit Ranking*

Startup Eco-system

*https://www.startupblink.com/startup-ecosystem/detroit-mi-us
WHERE DO DATA FIT IN THIS TRANSITION?

• **Data** - **New oil** or **new sand** or **new gold**?
  
  • **Value** not in the commodity but in innovation off the data

• Industry is still far from this goal
  
  • Predictions going back to 2016 are yet to materialize
THE MISSED DATA MONETIZATION OF SDV EVOLUTION*

Fragmentation of industry-wide data

Many OEM-specific APIs and data formats

Fragmentation due to siloed organization

Structured along vehicle function silos
Cross-functional data monetization is difficult

Limited data based services

Some of the services are available for free in the smartphone world

Success stories may be one off

UBI & pay-per-use insurance by one OEM;
e-Commerce deal with a single gas station brand

Open standards/APIs
Interoperability

Mitigate fragmentation & realize the potential of data

* Source: Dr. Moritz Neukirchner - Elektrobit (Linked-In: July 2023)
SUMMARY

• **SDV**: The biggest transformation of the automobile in a century
  ✓ An enabler to accelerate the progress of C.A.S.E
  ✓ The transition will be slower than anticipated
  ✓ Speed of adoption would be different for different OEMs

• **Value Chain Shift**: Tiered structure to a networked eco-system

• **Synergy between Auto & Tech**: A stronger cross-pollination

• **Data**: SDV architecture, by definition will facilitate better data management and new value creations → **Open standards/APIs & Interoperability** to realize this potential
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