Car HMI

Decades of rising complexity

Derek Sellin
Vice President, Marketing
Rightware
Cluster
Instruments
Warnings + indicators

HMI Inputs
Mechanical knobs + levers + dials + sliders

Interior Add-Ons
Entertainment: radio + cassette deck
Comfort: heating + ventilation
Cigarette lighter

‘80s
‘90s
‘00s
‘10s
Today
Tomorrow
<table>
<thead>
<tr>
<th>Cluster</th>
<th>HMI Inputs</th>
<th>Interior Add-Ons</th>
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<tbody>
<tr>
<td>Instruments</td>
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Cluster: Warnings + indicators

HMI Complexity

System electronic cost

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Cluster
Instruments
Warnings + indicators
Basic ADAS

HUD
Warnings + indicators

HMI Inputs
Mechanical knobs + levers + dials + sliders

Infotainment
Entertainment: radio + CD player
Comfort: heating + ventilation + AC
Navigation: Portable audio players

‘80s
‘90s
‘00s
‘10s
Today
Tomorrow
Cluster
Instruments
Warnings + indicators
Advanced ADAS

HUD
Warnings + indicators

HMI Inputs
Mechanical knobs + levers + dials + sliders
Touch NEW
Voice NEW

Infotainment
Entertainment: radio + CD player
Comfort: heating + ventilation + AC
Navigation + traffic PRO
Mobile device integration (phone + music) NEW
Car settings NEW
Cam NEW

Ecosystem
Companion app NEW

‘80s
‘90s
‘00s
‘10s
Today
Tomorrow

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Cluster
Instruments
Warnings + indicators
ADAS level 2
HUD
Warnings + indicators
HMI Inputs
Mechanical knobs + levers + dials + sliders
Touch
Voice
Infotainment
Entertainment: radio + CD player
Comfort: heating + ventilation + AC
Navigation + traffic + POIs
Advanced car settings
Mobile device integration (phone + music)
Surround view
EV charge management
Apps
Personalization
Ecosystem
Companion app
Integrated multiscreen
Cloud

‘80s
‘90s
‘00s
‘10s
Today
Tomorrow

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<tr>
<td>Mechanical knobs + levers + dials + sliders</td>
</tr>
<tr>
<td>Haptic touch</td>
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<tr>
<td>Natural voice</td>
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<tr>
<td>Remote web access</td>
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<td>Entertainment: radio + CD player</td>
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<td>Comfort: heating + ventilation + AC</td>
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<tr>
<td>Navigation in 3D Maps</td>
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<tr>
<td>Advanced car settings</td>
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<tr>
<td>Mobile device integration (phone + music)</td>
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<tr>
<td>Surround view + AR monitoring</td>
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<tr>
<td>Advanced EV charge management</td>
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<tr>
<td>App synchronisation</td>
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<td>Personalization + user management</td>
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<tr>
<td>Cloud</td>
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<tr>
<td>Smart devices + IoT</td>
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Cluster technology evolution:
- ‘80s
- ‘90s
- ‘00s
- ‘10s
- Today

Tomorrow

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Code Bases

- **Google Chrome**: 6.7
- **Android**: 12-15
- **Facebook**: 65
- **Mac OS X**: 85
- **Car Software (in a modern vehicle)**: 100

Source: [https://www.visualcapitalist.com/millions-lines-of-code/](https://www.visualcapitalist.com/millions-lines-of-code/)
Spinning faster and faster

HMI

More and more features added

Evolution in progress
Functional Value

Taming HMI complexity with seamless assistance
Seamless Assistance

- Rain-sensing wipers
- Traffic jam assistance
- Automatic emergency braking
- Blind-spot detection
- Dynamic radio volume
Advanced Surround View

Why?
1 out of 5 accidents happen in parking lots
Back-over accidents kill people
Backup cameras mandated in US since 2018
3D Animated ADAS

Why?
Consumers embrace ADAS features
ADAS visualization builds trust in the vehicle

Why?
Consumers embrace ADAS features
ADAS visualization builds trust in the vehicle

'20s '30s
Augmented Reality Navigation

Why?
Distraction is the #3 cause of pedestrian fatalities – eyes on the road!

20m
Distance
1.5m
Height
1:30
Arrival
Complexity in HMI Development
The automotive industry and software complexity

Left unchecked, software complexity is expected to rise rapidly with the introduction of new functionality, only slowing once vehicle autonomy becomes mainstream.

Productivity of tech leaders is outpacing automotive players but is still not fast enough to bridge the complexity gap.

Automotive-player development productivity has barely risen, on average.

- Software development complexity
- Software development productivity, tech leaders
- Software development productivity, automotive players
KANZI ONE

Taming complexity with a dedicated automotive toolchain

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