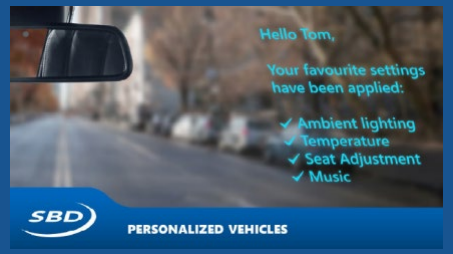

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636 – The Software-Defined Vehicle

SBD Automotive's Car IT Team has created The Software-Defined Vehicle report to support OEMs and suppliers.

It identifies the Software-Defined Vehicle and outlines how OEMs can utilize platforms and services to build cars that can be continually updated, and progressively maintained, by cross-platform software.

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Connected & Mobility Services

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Personalized Vehicles

Across numerous industries and sectors, personalization is known as the process in which customer journeys and experiences are individualized. To date, the automotive industry has delivered personalization across a selection of its own user experiences – including maintenance and infotainment. However, when compared to other sectors, it is largely lagging behind in delivering an individualized end-to-end experience.

While this offering is limited today, the industry shift towards software-defined, electric, and autonomous vehicles will provide a wealth of new opportunities for personalized experiences across several automotive user experiences. At the same time, these experiences will not only provide new features and incentives for customers, but also open new revenue streams, business models, and opportunities for OEMs.

The Personalized Vehicles report maps out what vehicle personalization looks like today and analyzes the impacts it could have on the consumer experience of tomorrow. To do so, it takes a deep dive into the ecosystem of automotive personalization features available today – identifying the different levels of maturity and profiling the latest offerings from a number of OEMs in different regions. The role that tech giants will play in enabling in-vehicle personalization is similarly outlined, while a five-year forecast provides key insights into how it is expected to evolve over time.

COVERAGE	FREQUENCY	PUBLICATION FORMAT	PAGES
GLOBAL, NA, CHINA, EUROPE	ANNUALLY, QUARTERLY, 1 ONE-OFF	PDF, POWERPOINT, EXCEL, ONLINE	75

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Key questions answered

- What are the different levels of personalization maturity?
- How are car makers implementing personalization today?
- What technologies and business models will form part of the next evolution in vehicle personalization?
- What role will tech giants play in enabling in-vehicle personalization, and where does that leave car makers?

This research supports

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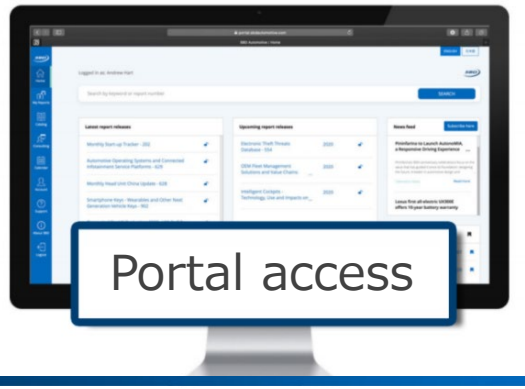

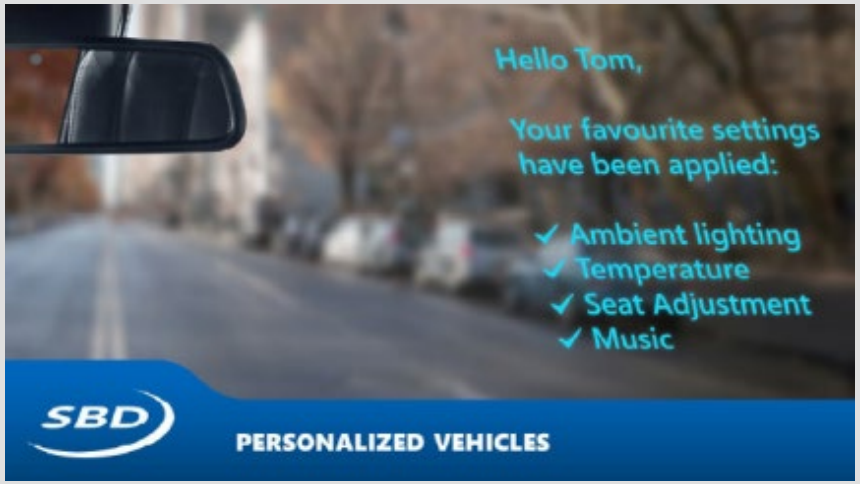

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Personalized Vehicles

Analysing the market opportunity & eco-system

Report Contents

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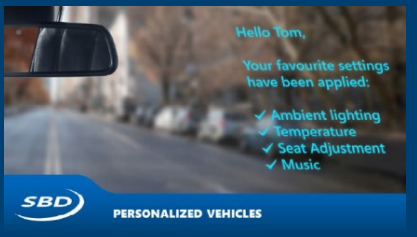
640 – Personalized Vehicles

Total number of pages - 75

Example slides from the report



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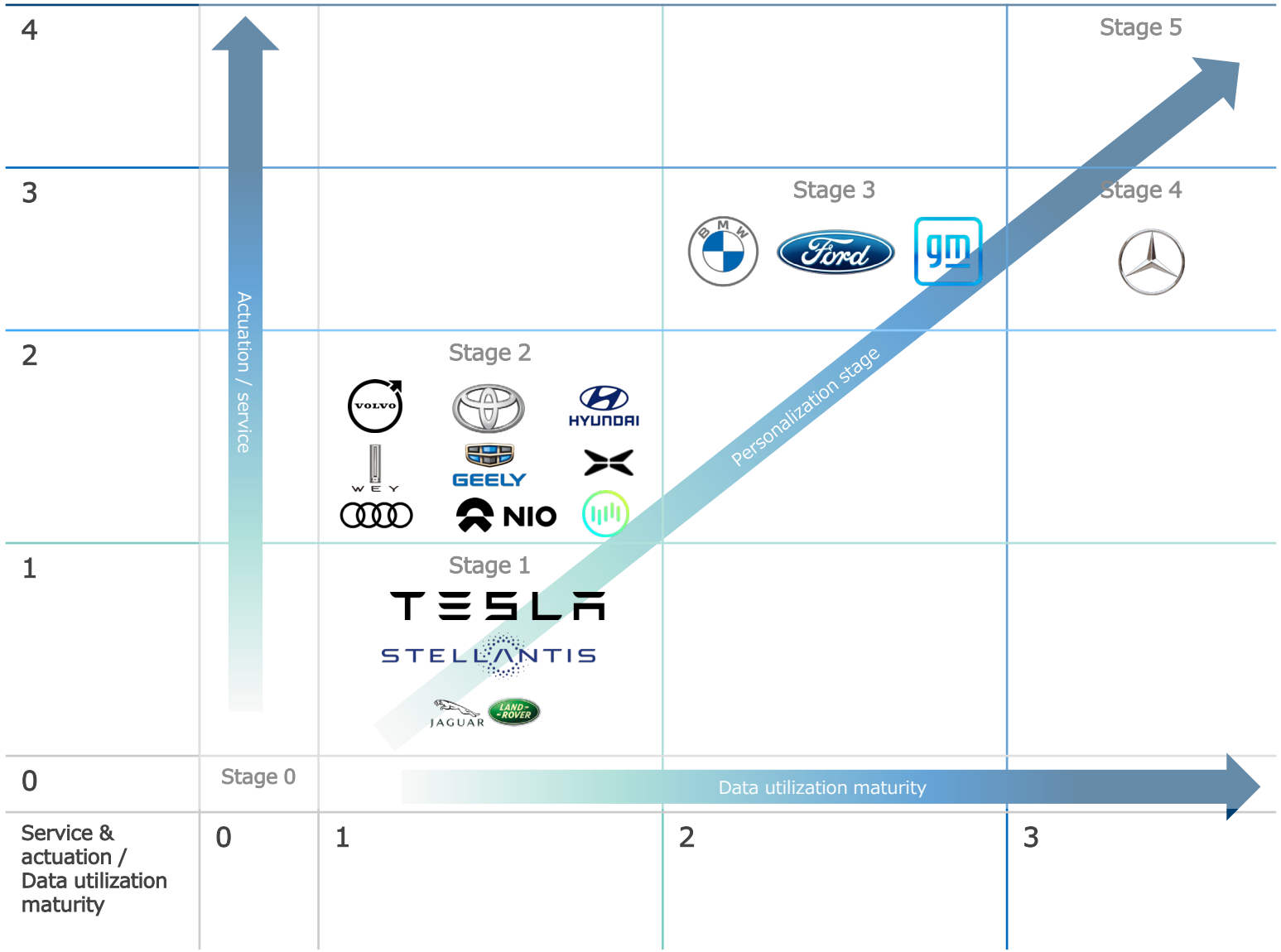
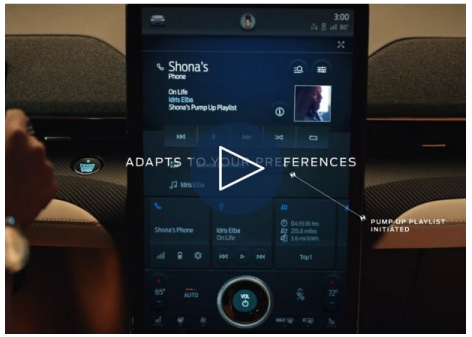
2022 market overview - Some leading OEMs offer anticipatory personalization



- Mercedes is considered to be the leading solution as of 2022, categorized at personalization stage 4. The personalization services offered by the OEM are sophisticated, utilizing many actuation domains with proactive suggestions, including biometrics data captured by compatible smartwatch
- BMW, Ford and GM are considered as the second group, categorized at stage 3. These three OEMs offer some level of anticipatory services and wide range of personalizable domains. With external data integration, they will be able to expand their personalized experiences
- At stage 2, Audi, Geely, Hyundai, NIO, Toyota, Volvo, Wey, Weltmeister and Xpeng are categorized. These OEMs offer personalization centered around the infotainment system and have started using cloud profiles.
- At stage 1, Jaguar Land Rover, Stellantis and Tesla are categorized. They already have good number of data points linked to onboard personal profile. With the introduction of cloud profile, they can easily jump up to higher stages

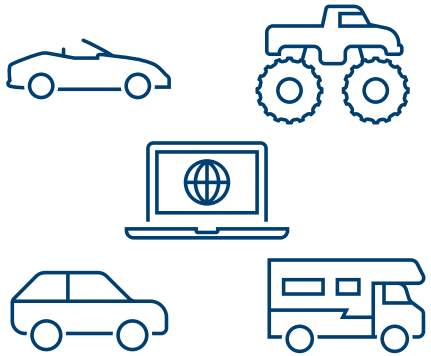
In-car UX rapidly catching up, but still have room for improvement

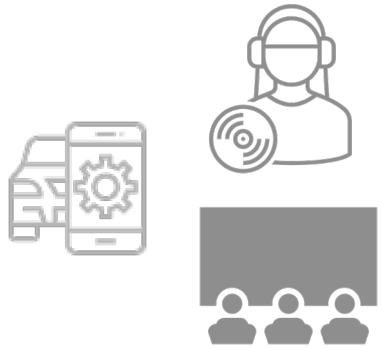
From the various types of cars evaluated for SBD's UX benchmarking report and bespoke research, SBD believes that some leader OEMs are making efforts to offer meaningful personalization within their vehicles. On this slide Ford from the US market and Weltmeister from Chinese market are shown as good examples of OEMs investing in personalization, but there's significant ground to make up when compared to leaders in other sectors.

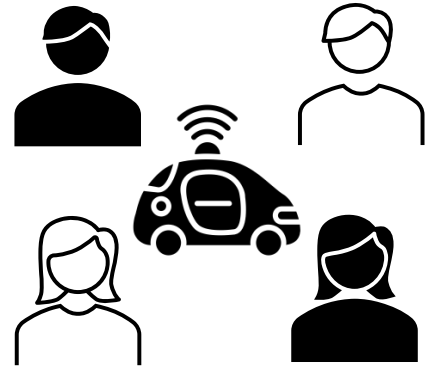
	Experience	Detail information	Potential improvement	Gap to digital services
Ford	 Intelligent Suggestions – personalized shortcuts to features	The system learns the driver's habits to offer suggestions. Suggestions are phone calls, radio selections, navigation destinations and charging station. The system takes time into account to provide suggestions categorized by time zones in a day.	Ford could leverage many data points which are assumed to be collected to provide some new suggestions learning from the history. For example, suggesting new coffee shop instead of the one the driver frequently stop by would provide more sophisticated feelings in the system.	A few years behind Ford → amazon "You may like" list shows products which the user have not bought on Amazon based on the user's past browsing and purchase history. It took Amazon 20 years until what they are now, but building up recommendation engine based on existing datapoints and attribute with the current technology level will not take long.
WELTMEISTER 威马汽车	 "Scenario Modes" set via companion app with 200+ actuation points involved	The owner creates different scenarios using companion app based on preferences and sets them from among more than 200 actuation points. The example scenarios would be such as "commute", "weekend", "with kids", each of which user can set arbitrary settings.	Weltmeister's vast amount of customizable setting might overwhelm some users. However, by utilizing machine learning model that many data points can be turned into much simpler mode suggestion, which user do not have to think about settings of every 200 actuation points.	A few years behind WELTMEISTER 威马汽车 → Spotify Spotify's recommendation algorithm takes into account so many attributes of a song from artist to how many seconds the user stayed in one track. Although catching up with the level of personalized experience Spotify offers would be challenging, it will not take Weltmeister too long, considering great AI engines, the amount of data fed into ML modeling, and high acceptance of consumers to data sharing in China market.

Personalized CX is already becoming a key differentiator in car ownership

As shown on the previous slide, Personalization is becoming a key consideration in intelligent automotive UX. It is worth noting that personalization is not necessarily about in-vehicle experiences. The personalization opportunity is everywhere in the current automotive business eco-system, from the moment the consumer first uses an OEM's online vehicle configurator to mobility-related experience even when the owner is not driving his/her own car.







Car hunting	Ownership model	In-car UX	Out-car UX	Shared mobility use
State of the art today - Consumers will be given filtered internet search results already at this point – if the consumer looks at sports segment vehicles frequently, sport car ads will automatically pop up when just "new car" or "used car" was searched	**State of the art today –** Ownership models offer more variety with the rise of subscription-based business around the world. Consumers increasingly seek flexible ownership & access models	**State of the art today –** Automatic user authentication and setting adjustment, making suggestions based on the user's history of behaviors are introduced by leading OEMs	**State of the art today –** Integration with 3rd party services, for example, video streaming or media streaming are good examples for the personalized services which affects automotive CX	**State of the art today –** Some leading OEMs offer portable user profiles which can be shared among models in their brand. This means even rented or shared cars can load any user's profile onto them, accelerating loyalty to a certain brand which can be easily personalized
What could OEM do – Always try to be creative in marketing to catch consumers attention. More focus on specific differentiator in car / digital service can differentiate a car from competitors	**What OEM could do –** OEMs may have to consider developing a "mobility profile" rather than an OEM-specific user profile for more flexible choice of mobility ownership, which will be more frequently demanded by consumers	**What OEM could do –** Shifting vehicle intelligence to the next level, such as providing new options based on learning from the history of user behavior	**What OEM could do –** Having 3rd party media service is again becoming already common. Challenge for OEM is to achieve good level of integration which provides seamless connection to experience outside of the car	**What OEM could do –** On top of the cloud user profile, commoditized hardware platform will be a key enabler for the personalized experience in shared mobility services

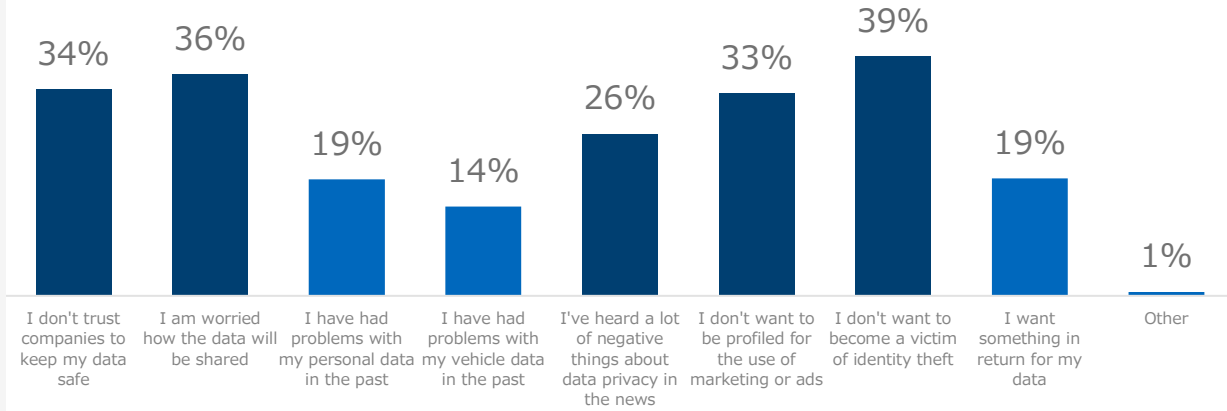
Increasing consumer awareness of data privacy and stronger protection

Although the laws vary by region, in broad terms any OEM wishing to implement biometric data collection to identify or profile an individual for services, personalization must carefully manage these factors:

- Consent for specific data to be collected
- Provide clear statements about the intended use of the data and who will process it
- Provide individual data access, provide facility to correct data and to withdraw consent or 'be forgotten'

These factors are evidently important from consumers' point of view – in the survey SBD conducted for this report, over 30% of consumers who don't want to share their personal data expressed concerns in how their data is treated.

Source: SBD Consumer survey 2022. 635 respondents in China, Germany & US



Region	Name of legislation	What biometric data is covered	Notable protections	Timing	Impact to personalization	Impact reasoning
	GDPR – General Data Protection Regulation	Any biometric data used to identify an individual	Collection & processing of biometrics data for uniquely identifying natural persons must achieve explicit consent from individual.	In force	High	Any OEM must implement some explicit agreement in set up phase of personalized service to collect and process biometrics data.
	State-specific laws - see separate table on the following slide	Typically biometric data for identification of an individual	Typically collection & use of biometric data must have consent of the individual, stating purpose of use, and right to withdraw consent.	In force (several states)	High	The lack of Federal law poses a risk to any OEM wishing to use biometric data as different state laws emerge, each requiring specific compliance checks.
	PIPL – Personal Information Protection Law	• Facial biometrics • Biometric ID	• Facial biometrics only when sufficiently necessary • Tight controls restricting export of PII data collected in China across borders. • Data portability rights for the individual.	In force	High	Similar to GDPR, individuals have right to access, correction and deletion of personal information. IT systems must be compliant.
	Auto Data Regulation	• Biometric ID • Audio • Video	• Applies to PII data sets of >100,000 individuals • Operational data of vehicle charging networks • Data must be kept in China.	In Force	High	OEMs and suppliers must not collect data by default – explicit permission required. Processing must be in-vehicle, unless 'necessary'.

Tech giants dominate data in digital life

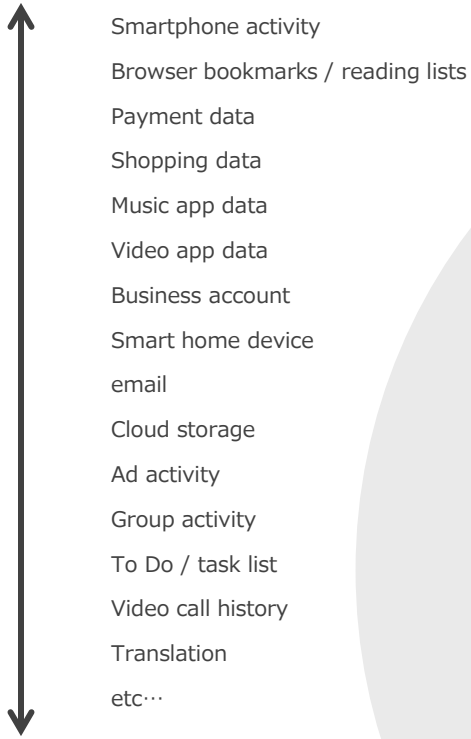
SBD investigated the difference in the amount and quantity of data OEMs and tech giants are collecting. After some investigation, a huge gap in the quantity of data points was found between OEMs and Google – on the right of this slide that difference is illustrated.

SBD found 14 categories of data points listed on the privacy policy published from BMW, on the other hand 289 categories of tracking data checked out from Google through a data access request.

The major gap comes from the data collected from consumer's activities in digital life. While Google or other tech giants may be able to collect almost all activities conducted on their own platform, OEMs are naturally only able to collect data from their own car and its connected infotainment system.

Leading automotive solutions such as BMW or Mercedes are collecting a variety of data, however it was found that only a small quantity of data is utilized for personalization. SBD believe that OEMs still have room for more personalized use cases utilizing the data set they are already collecting.

On the other hand, OEMs may want to draw a line between digital life and car life as overturning dominance of tech giants is extremely difficult.



Smartphone activity
Browser bookmarks / reading lists
Payment data
Shopping data
Music app data
Video app data
Business account
Smart home device
email
Cloud storage
Ad activity
Group activity
To Do / task list
Video call history
Translation
etc…

Charging data
Navigation data
Travel data
Infotainment data
Vehicle data / status
CCS usage
Security data
etc…

14 data categories tracked / stored

289 categories* of tracking / stored data

*Data checked-out from author's account. SBD interpreted one file can be understood as one data category. Hence, one data points could include huge amount of data in practice, e.g., search query history which tracks all the search history of a person conducted on Google search engine. Please note quantity and amount data could vary among individuals.

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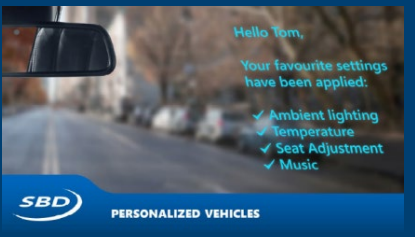

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