

In the current edition of the eMobility Excellence Report, the apps by mobility+, My Porsche and Fastned emerged as test winners in their respective segments. Porsche's app is the overall winner of the charging app benchmark. In addition to the test winners, various other charging services fulfil a wide range of user requirements and impress with special features.

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1. INTRODUCTION

The eMobility Excellence series aims to provide electric car drivers with guidance in navigating the complex charging market.

The previous issue from June 2023 looked at the coverage (number of connected charging points) as well as the price and tariff structures of the most important charging services. The current edition focuses on the range of functions and the user experience offered by the charging providers' apps. To this end, eMobility Excellence has been further developed this year and takes an even more comprehensive look at the providers using a new methodology.

2. INCREASING REGISTRATIONS OF E-VEHICLES & CONTINUOUS EXPANSION OF THE CHARGING NETWORK

Despite the high volatility of new registrations of electric vehicles in Germany this year, a clear increase can be seen. Due to the discontinuation of state subsidies for plug-in hybrids, demand for pure battery-electric vehicles (BEVs) is stronger than ever before. By November 2023, 424,623 battery-electric cars and 139,706 plug-in hybrids had been newly registered since the beginning of the year (KBA; 2023). The expansion of charging infrastructure amounts to over 27,500 newly installed (semi-)public charging points in 2023, around 21,000 of which are AC charging points, around 3,000 DC charging points up to and including 150 kW, and around 3,500 HPC charging points (over 150 kW). The current stock therefore comprises over 120,500 (semi-)public charging points, consisting of approx. 98,000 AC charging points, approx. 12,500 DC charging points and approx. 10,000 HPC charging points (Charging Radar; November 2023). With a sustained ratio of approx. eleven purely electric cars per (semi-)public charging point, this results in almost nationwide coverage of the charging infrastructure on the main transport routes and metropolitan regions in Germany.

In Germany, apps from mobility service providers (abbreviation: MSP; synonym: charging service, charging application, charging app, MSP app, MSP service) are often used to find, select and then charge at the right charging point. In the run-up to this publication, a survey was conducted to include customer expectations of MSP apps in our benchmark. This survey shows that customer requirements for these charging apps have increased since the previous year. The aim of this benchmark is to show which applications fulfil these requirements particularly well. To further establish electromobility on the mass market and make public charging customer-friendly, charging apps are needed that meet customer

requirements and thus offer intuitive features with added value for the user in addition to attractive price and tariff structures. This perspective is explored in depth for the first time in this issue of eMobility Excellence.

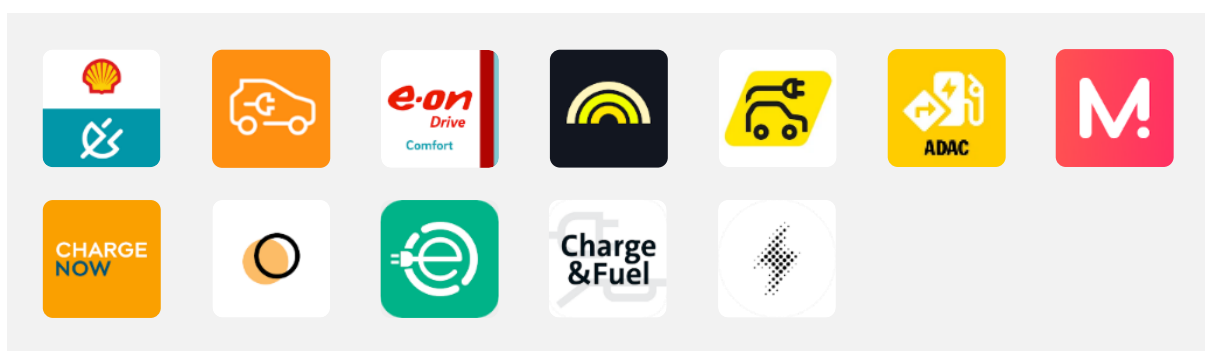
3. THE TEST CANDIDATES AT A GLANCE

The basis for the selection of the featured apps is a survey of over 100 electric car drivers, which was conducted in advance of the eMobility Excellence Benchmark via LinkedIn and electrive.net. In addition, the applications of the largest vehicle manufacturers are analysed in this benchmark. Selected applications that stand out due to their popularity, functions, size of the charging network, partnerships, and strategic positioning were also added to the scope of the test in order to reflect the dynamic development of the charging market and look at innovative functions from other providers. As part of the benchmark, the selected applications are divided into the candidate segments of free charging apps, OEM charging apps and network-based charging apps and compared within each segment.

CHARGING APPS FROM FREE PROVIDERS:

Free providers are MSPs that display their own and roaming charging stations in the app. However, operating your own charging stations is not a prerequisite for this segment.

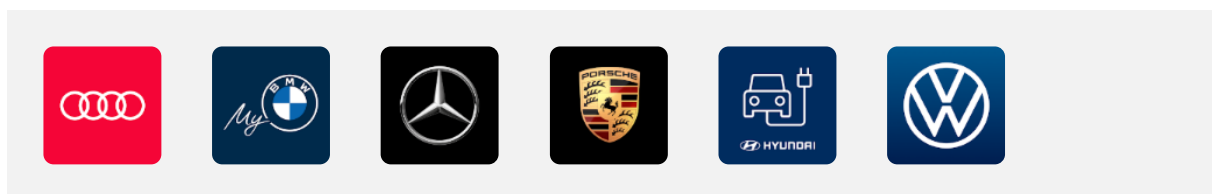
- Shell Recharge (Shell)
- mobility+ (EnBW)
- E.ON Drive comfort (E.ON)
- Plugsurfing (Plugsurfing)
- Maingau Autostrom (Maingau Energie)
- ADAC Drive
- Assembly
- Charge Now (DCS)
- Ray of light (Lichtblick)
- eSolutions Charging (Free2Move)
- Charge & Fuel (Logpay)
- Elli (Elli)



CHARGING APPS FROM VEHICLE MANUFACTURERS:

OEM MSP services are applications from vehicle manufacturers that support customers during charging processes in their own network or at roaming stations, often linking the MSP service to the vehicle to enable additional functions. The applications in this category are viewed from the perspective of a driver of the respective vehicle brand.

- My Audi (Audi)
- My BMW (BMW)
- Mercedes me (Mercedes-Benz)
- My Porsche (Porsche)
- Charge myHyundai (Hyundai)
- Volkswagen (Volkswagen)
- Tesla (Perspective: Tesla driver)



NETWORK-BOUND CHARGING APPS:

Network-based charging providers operate their own charging stations and only display these charging points in their own app. No charging stations from other operators are featured in the application.

The app from vehicle manufacturer Tesla is also categorised as a network-based charging app, as Tesla has now opened up its own charging network and the associated app to drivers of other vehicle brands. The application will therefore display the station locations of Tesla's own network. In this category, the Tesla application is viewed from the perspective of a non-Tesla driver.

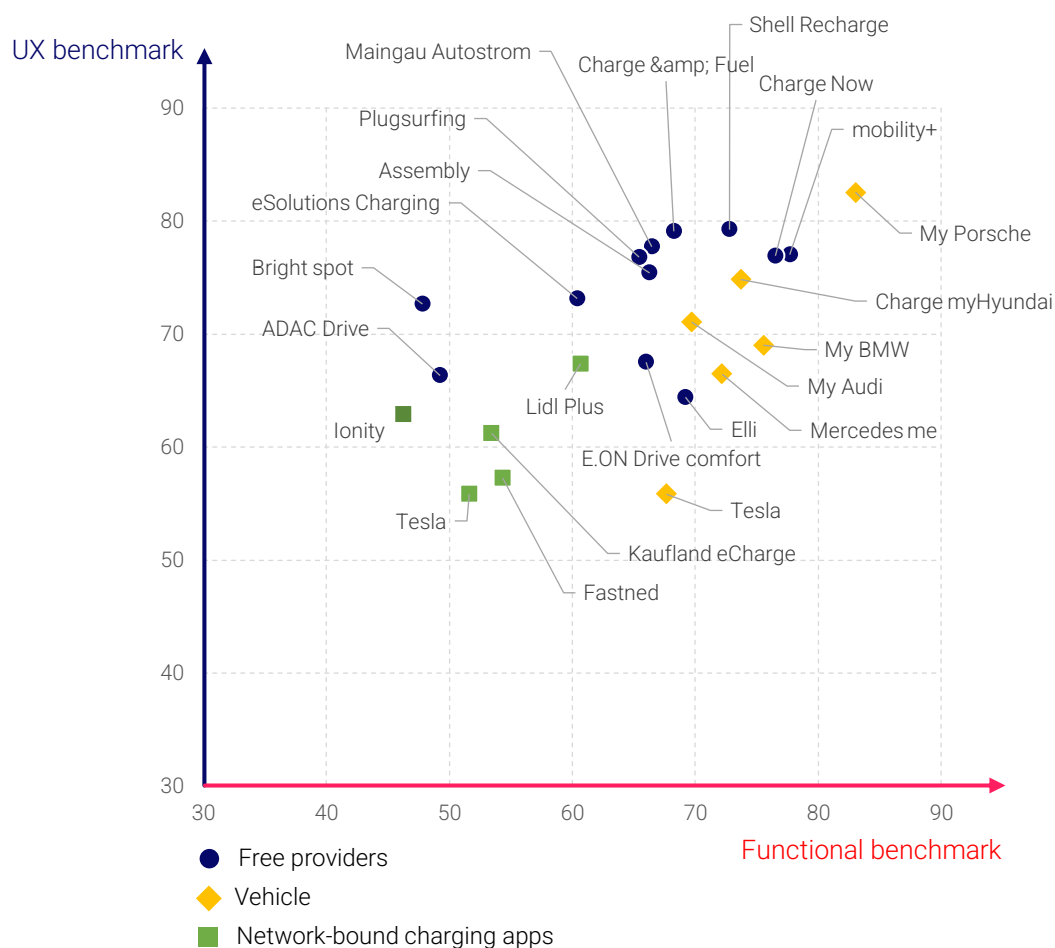
- Lidl Plus (Lidl)
- Kaufland eCharge (Kaufland)
- Fastned (Fastned)
- Tesla (perspective: non-Tesla driver)



4. TEST RESULTS

The latest publication of the eMobility Excellence Benchmark shows that the majority of the MSP services listed have very high network coverage in Europe and are constantly integrating new charging points. Due to the high number of integrated charging stations, a comprehensive range of functions being integrated into the respective applications in a user-friendly way is increasingly important to end customers. This trend is reflected in the tested apps. Providers are incorporating useful functions in combination with improved usability with the aim of differentiation.

In order to reflect this trend, this year's overall evaluation of the eMobility Excellence Benchmark is made up of two evaluation components: Functionality (weighting: 2/3) and usability (weighting: 1/3) of the charging apps. Overall, the results of the functional and UX benchmarks correlate. This means that applications with an appropriate range of functions have often also implemented user-friendly operation.



This year's e-Mobility Excellence Charging App Benchmark shows a predominantly positive assessment of the MSP applications. Selected applications, such as the charging services from Porsche and EnBW, particularly stood out in the benchmark. The practical test was carried out in the period from October 25th

to November 10th, 2023. Updates or functional enhancements after this period are hence not taken into account.

Due to the different use cases, it is recommended that the candidate segments are only compared with each other to a limited extent. For example, the use of a network-bound charging app differs fundamentally from the use of a free MSP application or the charging service of a vehicle manufacturer. Within the candidate segments, there is very high comparability between the different charging apps, as the participating charging services have the same use case and therefore the same requirements apply. The charging apps are sorted in the figure below according to the number of points achieved (decimal places are not shown but taken into account).

overall rating

placement	participants	points
placement free MSP		
1	mobility+ (EnBW)	77 (good)
2	Charge Now (DCS)	77 (good)
3	Shell Recharge (Shell)	75 (good)
4	Charge & Fuel (Logpay)	72 (good)
5	Maingau Autostrom (Maingau Energie)	70 (good)
6	Monta (Monta)	69 (good)
7	Plugsurfing (Plugsurfing)	69 (good)
8	Elli (Elli)	68 (good)
9	E.ON Drive (E.ON)	67 (good)
10	eSolutions Charging (Free2Move)	65 (good)
11	Lichtblick (Lichtblick)	56 (satisfactory)
12	ADAC Drive (ADAC)	55 (satisfactory)
placement OEM		
1	My Porsche (Porsche)	83 (very good)
2	Charge my Hyundai (Hyundai)	74 (good)
3	My BMW (BMW)	73 (good)
4	Mercedes me (Mercedes Benz)	70 (good)
5	My Audi (Audi)	70 (good)
6	Volkswagen (Volkswagen)	68 (good)
7	Tesla (Tesla)	62 (good)
placement network-connected charging apps (no roaming)*		
1	Fastned (Fastned)	63 (good)
2	Kaufland eCharge (Kaufland)	56 (satisfactory)
3	Lidl Plus (Lidl)	55 (satisfactory)
4	Tesla (Tesla)	53 (satisfactory)

* Weighting of grid-connected charging apps adjusted according to use case

4.1. TEST RESULTS - FUNCTIONAL BENCHMARK

Leading charging service providers are constantly striving to improve the charging experience of their customers. The e-mobility service providers tested this year are therefore also introducing new or improved functions to make using the apps increasingly convenient. However, there have also been changes in the ranking, especially among the free MSPs. In the following section, the general results of the apps in the respective segments are presented first. This is followed by the results within the individual evaluation categories. The results of the functional benchmark are included in the overall evaluation of this year's publication with a weighting of 2/3.

function-benchmark

placement	participants	points
placement free MSP		
1	mobility+ (EnBW)	78 (good)
2	Charge Now (DCS)	77 (good)
3	Shell Recharge (Shell)	73 (good)
4	Elli (Elli)	69 (good)
5	Charge & Fuel (Logpay)	68 (good)
6	Maingau Autostrom (Maingau Energie)	66 (good)
7	Monta (Monta)	66 (good)
8	E.ON Drive (E.ON)	66 (good)
9	Plugsurfing (Plugsurfing)	65 (good)
10	eSolutions Charging (Free2Move)	60 (good)
11	ADAC Drive (ADAC)	49 (satisfactory)
12	Lichtblick (Lichtblick)	48 (satisfactory)
placement OEM		
1	My Porsche (Porsche)	83 (very good)
2	My BMW (BMW)	76 (good)
3	Charge my Hyundai (Hyundai)	74 (good)
4	Mercedes me (Mercedes Benz)	72 (good)
5	My Audi (Audi)	70 (good)
6	Tesla (Tesla)	68 (satisfactory)
7	Volkswagen (Volkswagen)	66 (satisfactory)
placement network-connected charging apps (no roaming)*		
1	Fastned (Fastned)	61 (good)
2	Lidl Plus (Lidl)	54 (satisfactory)
3	Kaufland eCharge (Kaufland)	53 (satisfactory)
4	Tesla (Tesla)	52 (satisfactory)

* Weighting of grid-connected charging apps adjusted according to use case

In the area of free MSPs, there is a general improvement compared to the previous year. In total, 10 of the 12 applications achieved a score of "good". The first three places are taken by the apps mobility+, Charge Now and Shell Recharge. With its application mobility+, EnBW offers the start of the charging process with Autocharge, immediate help in the event of problems during the charging process via a chatbot, and displays the duration for which the selected charging point is already occupied. Charge Now was included in the eMobility Excellence Benchmark for the first time this year and is only about one point behind the test winner in this segment. The application is particularly impressive thanks to its convenient route planning, in which nearby services such as restaurants or shopping facilities can be taken into account alongside numerous other factors when charging. Shell Recharge also scored points for its route planning, which can consider factors such as the minimum charge level and weather conditions.

Once again this year, the vehicle manufacturers' apps performed best on average. Porsche's application was the test winner of the functional benchmark not only in the car manufacturer segment, but across all participants. With 83 out of 100 points, it is also the only app to achieve a "very good" rating. It particularly stands out with its availability forecast for charging points. In addition to the current occupancy time of the selected charging point, the average occupancy time is also displayed, allowing users to estimate when the desired charging point will be free. In general, automotive OEMs differentiate themselves through the implemented interface between vehicle and app, so that, for example, the current range of the vehicle is known. In this segment, all applications also offer charging stop planning. Charging service providers that are not also vehicle manufacturers do not have access to such a vehicle interface, which presents them with challenges when implementing vehicle integration.

The participants in the category of network-bound charging apps receive lower scores compared to the other segments. These applications are mainly used by users to activate charging stations in the

respective charging network, and many convenience functions have not yet been implemented by the operators. This year, first place in this category went to the app from fast-charging station operator Fastned. Fastned stands out from the other MSPs with its charging stop planning in the app, among other things. Lidl Plus took second place and scored high with its wide range of filter options. Lidl Plus is the only network-based MSP to offer the option of filtering by occupancy and function status.

participants	station-information 25 %	preselection and filters 20 %	comfort functionalities 20 %	station availability 20 %	user feedback 5 %
placement free MSP					
ADAC Drive (ADAC)	65	53	46	44	0
Charge & Fuel (Logpay)	81	65	40	74	100
Charge Now (DCS)	81	77	69	74	100
E.ON Drive (E.ON)	88	47	48	72	50
Elli (Elli)	76	70	71	74	0
eSolutions Charging (Free2Move)	84	59	27	74	0
Lichtblick (Lichtblick)	69	65	10	52	0
Maingau Autostrom (Maingau Energie)	80	84	37	74	50
mobility+ (EnBW)	76	84	79	81	0
Monta (Monta)	69	67	48	87	0
Plugsurfing (Plugsurfing)	79	64	44	81	0
Shell Recharge (Shell)	85	70	60	87	0
placement OEM					
Charge my Hyundai (Hyundai)	84	71	69	74	50
Mercedes me (Mercedes Benz)	88	55	79	59	50
My Audi (Audi)	76	38	86	87	0
My BMW (BMW)	88	50	86	74	50
My Porsche (Porsche)	85	76	82	76	0
Tesla (Tesla)	82	0	86	59	0
Volkswagen (Volkswagen)	82	70	84	74	0
placement network-connected charging apps (no roaming)*					
Fastned (Fastned)	79	0	79	45	0
Kaufland eCharge (Kaufland)	79	0	20	70	0
Lidl Plus (Lidl)	79	50	26	59	0
Tesla (Tesla)	82	0	22	59	0

* Weighing of grid-connected charging apps adjusted according to use case

At a high level, the results of the functional benchmark paint a clear picture. In the categories of station information, pre-selection and filters as well as station availability, the majority of applications are achieving good results. In the area of convenience functionalities, it can be seen that some applications differentiate themselves through the implementation of selected functions. In terms of user feedback, there are currently still few apps that have integrated a satisfactory solution in line with customer requirements.

A look at the detailed results in the station information assessment category shows good to very good ratings for almost all test candidates. In this category, the E.ON Drive comfort and My BMW applications performed particularly well with 93% of test criteria fulfilled. E.ON Drive comfort leads the way with the option for users to add additional features to the charging location, such as a playground, toilets or cafés. This is realised through a set of icons in the view of the charging location, with one icon representing an amenity (e.g. a restaurant). Users can select relevant icons and thus inform other users about the respective location features. The My BMW app offers a model for CO₂ compensation and shows photos of the selected charging location.

participants	station-information	address data	connections and plugs	charging power	operator	opening hours	price details	further location information	directions	CO2 compensation	pictures
	25%	15%	14%	14%	15%	12%	14%	15%	7%	7%	7%
placement free MSP											
ADAC Drive (ADAC)	65	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Charge & Fuel (Logpay)	81	✓	✓	✓	✓	✓	✓	+	+	✓	✓
Charge Now (DCS)	81	✓	✓	✓	✓	✓	✓	+	+	✓	✓
E.ON Drive (E.ON)	75	✓	✓	✓	✓	✓	✓	+	+	✓	✓
Elli (Elli)	75	✓	✓	✓	✓	✓	✓	+	+	✓	✓
eSolutions Charging (Free2Move)	64	✓	✓	✓	✓	✓	✓	+	+	✓	✓
Lichtblick (Lichtblick)	69	✓	✓	✓	✓	✓	✓	+	+	✓	✓
Maingau Autostrom (Maingau Energie)	86	✓	✓	✓	✓	✓	✓	+	+	✓	✓
mobility+ (EnBW)	76	✓	✓	✓	✓	✓	✓	+	+	✓	+
Monta (Monta)	69	✓	✓	✓	✓	✓	✓	+	+	✓	✓
Plugsurfing (Plugsurfing)	79	✓	✓	✓	✓	✓	✓	+	+	✓	✓
Shell Recharge (Shell)	65	✓	✓	✓	✓	✓	✓	+	+	✓	✓
placement OEM											
Charge my Hyundai (Hyundai)	84	✓	✓	✓	✓	✓	✓	+	+	✓	✓
Mercedes me (Mercedes Benz)	75	✓	✓	✓	✓	✓	✓	+	+	✓	✓
My Audi (Audi)	75	✓	✓	✓	✓	✓	✓	+	+	✓	✓
My BMW (BMW)	75	✓	✓	✓	✓	✓	✓	+	+	✓	✓
My Porsche (Porsche)	85	✓	✓	✓	✓	✓	✓	+	+	✓	✓
Tesla (Tesla)	82	✓	+	✓	✓	✓	✓	+	+	✓	✓
Volkswagen (Volkswagen)	62	✓	✓	✓	✓	✓	✓	+	+	✓	✓
placement network-connected charging apps (no roaming)*											
Fastned (Fastned)	79	✓	✓	✓	✓	✓	✓	+	+	✓	✓
Kaufland eCharge (Kaufland)	79	✓	✓	✓	✓	✓	✓	+	+	✓	✓
Lidl Plus (Lidl)	79	✓	+	✓	✓	✓	✓	+	+	✓	✓
Tesla (Tesla)	82	✓	✓	✓	✓	✓	✓	+	+	✓	✓

* Weighting of grid-connected charging apps adjusted according to use case

EnBW's mobility+ app has the widest range of filters of the apps tested. The Charge Now app is the only app to offer the unlimited option of filtering for further location information.

participants	preselection and filters	connections and plugs	charging power	operator	opening hours	further location information	occupancy & function status
	25%	14%	25%	12%	12%	12%	25%
placement free MSP							
ADAC Drive (ADAC)	53	✓	✓	✓	✓	✓	✓
Charge & Fuel (Logpay)	65	✓	✓	+	✓	+	✓
Charge Now (DCS)	77	✓	✓	✓	✓	✓	✓
E.ON Drive (E.ON)	47	✓	✓	+	✓	✓	✓
Elli (Elli)	70	✓	✓	+	✓	✓	✓
eSolutions Charging (Free2Move)	59	✓	✓	+	✓	✓	✓
Lichtblick (Lichtblick)	65	✓	+	✓	✓	✓	✓
Maingau Autostrom (Maingau Energie)	64	✓	✓	✓	✓	✓	✓
mobility+ (EnBW)	76	✓	✓	✓	✓	+	✓
Monta (Monta)	67	+	✓	✓	✓	✓	✓
Plugsurfing (Plugsurfing)	64	✓	✓	✓	✓	✓	✓
Shell Recharge (Shell)	70	✓	✓	+	✓	✓	✓
placement OEM							
Charge my Hyundai (Hyundai)	71	✓	✓	✓	✓	+	✓
Mercedes me (Mercedes Benz)	55	+	✓	✓	✓	+	✓
My Audi (Audi)	38	+	✓	+	✓	✓	✓
My BMW (BMW)	50	+	✓	+	✓	✓	✓
My Porsche (Porsche)	76	✓	✓	✓	✓	+	✓
Tesla (Tesla)	82	+	✓	✓	✓	✓	✓
Volkswagen (Volkswagen)	70	✓	✓	✓	✓	✓	✓
placement network-connected charging apps (no roaming)*							
Fastned (Fastned)	79	+	✓	✓	✓	✓	✓
Kaufland eCharge (Kaufland)	79	✓	✓	✓	✓	✓	✓
Lidl Plus (Lidl)	50	✓	✓	✓	✓	✓	✓
Tesla (Tesla)	82	+	✓	✓	✓	✓	✓

* Weighting of grid-connected charging apps adjusted according to use case

The extensive options such as vehicle integration in the app and the rather limited options for network-based charging providers have resulted in mixed results in the convenience functionalities category. The Mercedes me app in particular achieved an outstanding result in this category. Alongside Elli, it is the only app that predicts charging costs. The majority of the apps analysed have already implemented an overview of the charging processes and the download of the invoice in their application and can therefore secure points in this test feature. Less common functions are, for example, a quick-filter option for charging power or FAQs on the subject of charging. The implementation of these functions therefore offers the potential to stand out from others. E.ON Drive comfort, Plugsurfing and Monta, for instance, offer a live chat function in the app, while EnBW mobility+ integrates instant help with charging problems via a chatbot.

participants	comfort functionalities	vehicle selection	forecast charging costs	navigation to the charging station	charging stop planning	vehicle integration	Autocharge/ Plug & Charge	quick filter option	overview of charging processes	quick help loading in app
	20%	13%	8%	13%	13%	13%	13%	13%	8%	8%
placement free MSP										
ADAC Drive (ADAC)	46	●	●	●	●	●	●	●	●	●
Charge & Fuel (Logpay)	43	●	●	+	●	●	●	●	●	+
Charge Now (DCS)	69	●	●	+	●	●	●	●	●	+
E.ON Drive (E.ON)	48	●	+	+	●	●	●	●	●	+
Elli (Elli)	71	●	●	+	+	●	●	●	●	+
eSolutions Charging (Free2Move)	27	●	●	+	●	●	●	●	+	+
Lichtblick (Lichtblick)	19	●	●	+	●	●	●	●	+	●
Maingau Autostrom (Maingau Energie)	37	●	●	●	●	●	●	●	●	+
mobility+ (EnBW)	79	●	●	+	+	●	●	●	●	●
Monta (Monta)	48	●	●	+	●	●	●	●	●	●
Plugsurfing (Plugsurfing)	44	●	●	+	●	●	●	●	●	+
Shell Recharge (Shell)	60	●	●	+	●	●	●	●	●	●
placement OEM										
Charge my Hyundai (Hyundai)	69	●	●	+	●	●	●	●	●	+
Mercedes me (Mercedes Benz)	56	●	●	●	●	●	●	●	●	●
My Audi (Audi)	55	●	●	●	●	●	●	+	●	●
My BMW (BMW)	70	●	●	●	●	●	●	●	●	+
My Porsche (Porsche)	86	●	●	●	●	●	●	+	●	+
Tesla (Tesla)	55	●	●	●	●	●	●	●	●	+
Volkswagen (Volkswagen)	69	●	●	+	●	●	●	●	●	+
placement network-connected charging apps (no roaming)*										
Fastned (Fastned)	79	●	●	+	●	●	●	●	●	+
Kaufland eCharge (Kaufland)	23	●	●	+	●	●	●	●	●	●
Lidl Plus (Lidl)	29	●	●	+	●	●	●	●	●	+
Tesla (Tesla)	22	●	●	+	●	●	●	●	●	+

* Weighting of grid-connected charging apps adjusted according to use case

Based on the user survey, station availability is the test category with the greatest influence on the result of the functional benchmark. The My Porsche app scored full marks in this category. With only one test feature less - the availability forecast of charging points - three other MSP apps follow: Shell Recharge, Monta and My Audi.

participants	station availability	occupancy status	display roaming status	availability forecast	notification station available charging station	favorite charging station
	30%	30%	22%	13%	13%	22%
placement free MSP						
ADAC Drive (ADAC)	44	●	●	●	●	●
Charge & Fuel (Logpay)	74	●	●	●	●	●
Charge Now (DCS)	74	●	●	●	●	●
E.ON Drive (E.ON)	72	●	●	+	●	●
Elli (Elli)	74	●	●	●	●	●
eSolutions Charging (Free2Move)	74	●	●	●	●	●
Lichtblick (Lichtblick)	52	●	●	●	●	●
Maingau Autostrom (Maingau Energie)	74	●	●	●	●	●
mobility+ (EnBW)	81	●	●	+	●	●
Monta (Monta)	87	●	●	●	●	●
Plugsurfing (Plugsurfing)	81	●	●	+	●	●
Shell Recharge (Shell)	87	●	●	●	●	●
placement OEM						
Charge my Hyundai (Hyundai)	74	●	●	●	●	●
Mercedes me (Mercedes Benz)	59	●	●	+	●	●
My Audi (Audi)	87	●	●	●	●	●
My BMW (BMW)	74	●	●	●	●	●
My Porsche (Porsche)	86	●	●	●	●	●
Tesla (Tesla)	59	●	●	+	●	●
Volkswagen (Volkswagen)	74	●	●	●	●	●
placement network-connected charging apps (no roaming)*						
Fastned (Fastned)	45	●	●	●	●	●
Kaufland eCharge (Kaufland)	20	●	●	+	●	●
Lidl Plus (Lidl)	39	●	●	●	●	●
Tesla (Tesla)	59	●	●	+	●	●

* Weighting of grid-connected charging apps adjusted according to use case

Most apps lose points in the area of user feedback. Only the Charge Now and Charge & Fuel apps scored full points in this category. Both promote the e-vehicle community by offering the option of visibly rating charging locations using a points system such as awarding stars on the one hand and providing feedback in the form of comments on the other.

participants	user feedback	evaluation options	comment function
placement free MSP			
ADAC Drive (ADAC)	0	0	0
Charge & Fuel (Logpay)	100	0	0
Charge Now (DCS)	100	0	0
E.ON Drive (E.ON)	50	0	0
Elli (Elli)	0	0	0
eSolutions Charging (Free2Move)	0	0	0
Lichtblick (Lichtblick)	0	0	0
Maingau Autostrom (Maingau Energie)	50	0	0
mobility+ (EnBW)	0	0	0
Monta (Monta)	0	0	0
Plugsurfing (Plugsurfing)	0	0	0
Shell Recharge (Shell)	0	0	0
placement OEM			
Charge my Hyundai (Hyundai)	50	0	0
Mercedes me (Mercedes Benz)	50	0	0
My Audi (Audi)	0	0	0
My BMW (BMW)	50	0	0
My Porsche (Porsche)	0	0	0
Tesla (Tesla)	0	0	0
Volkswagen (Volkswagen)	0	0	0
placement network-connected charging apps (no roaming)*			
Fastned (Fastned)	0	0	0
Kaufland eCharge (Kaufland)	0	0	0
Lidl Plus (Lidl)	0	0	0
Tesla (Tesla)	0	0	0

* Weighting of grid-connected charging apps adjusted according to use case

4.2. TEST RESULTS - UX BENCHMARK

The UX benchmark has started this year as a new part of the Excellence Report and provides insights into the usability of the apps tested. The results show a mixed field with overall scores ranging from 56 to 83 points, with the Porsche app being able to secure the top spot in the UX benchmark overall. The evaluation criteria are structured according to the seven interaction principles of ISO 9241-110:2020 and are explained in detail in the following section. The results of the UX benchmark account for 1/3 of the overall rating in this year's publication.

UX-benchmark

placement	participants	points
placement free MSP		
1	Shell Recharge (Shell)	79 (good)
2	Charge & Fuel (Logpay)	79 (good)
3	Maingau Autostrom (Maingau Energie)	78 (good)
4	mobility+ (EnBW)	77 (good)
5	Charge Now (DCS)	77 (good)
6	Plugsurfing (Plugsurfing)	77 (good)
7	Monta (Monta)	75 (good)
8	eSolutions Charging (Free2Move)	73 (good)
9	Lichtblick (Lichtblick)	73 (good)
10	E.ON Drive (E.ON)	68 (good)
11	ADAC Drive (ADAC)	66 (good)
12	Elli (Elli)	64 (good)
placement OEM		
1	My Porsche (Porsche)	83 (very good)
2	Charge my Hyundai (Hyundai)	75 (good)
3	Volkswagen (Volkswagen)	72 (good)
4	My Audi (Audi)	71 (good)
5	My BMW (BMW)	69 (good)
6	Mercedes me (Mercedes Benz)	66 (good)
7	Tesla (Tesla)	56 (satisfactory)
placement network-connected charging apps (no roaming)*		
1	Fastned (Fastned)	67 (good)
2	Kaufland eCharge (Kaufland)	61 (good)
3	Lidl Plus (Lidl)	57 (satisfactory)
4	Tesla (Tesla)	56 (satisfactory)

* Weighting of grid-connected charging apps adjusted according to use case

The correlation of the results of the task adequacy criterion with the functional benchmark can be explained by the selection of the main use case. Three apps achieve scores of over 80 points and enable appropriate and fast execution of the use case. Significant deductions were made for apps in the field that did not allow the use case to be executed due to a lack of functionalities or functionalities that could not be found by testers (e.g. filters or favorising the charging point).

In terms of self-description capability, this year's benchmark identified good results with over 70 points on average, which speaks in favour of a good information base in the tested apps. Informative previews were rated positively overall. This refers to small overviews of the most important key data of the charging station that do not cover the entire map section. Our testers made clear deductions for some apps that only provide price information at click level 3 or 4, making it difficult for users to get a targeted overview of costs.

The results in the area of expectation conformity naturally depend heavily on the previous usage experience of apps in general. Many of the apps tested are positively orientated towards the patterns users have learned so far: They use, for example, the preview functionality to show the most important information about the charging point. Testers also expected a clear overview at different zoom levels on the map overview, which can be achieved by clustering the respective charging stations. In this category, 12 of the apps tested scored over 70 points and were therefore able to achieve good results. Maingau Autostrom and Shell Recharge even achieved very good results in this dimension with 87.5 points.

Points of 61 to 85 were achieved in the learnability section of the test. For the most part, testers found it easy to learn using the apps, although our testers noticed some limitations with complicated filter logic.

In the controllability dimension, seven applications achieved very good results of over 80 points. For example, the testers positively emphasised in this interaction principle that it is sometimes possible to choose between a list and map view when searching for charging stations.

Robustness against user errors is tested, among other things, with the slightly incorrect input of places and points of interest. Differences between the apps can also be seen here: fast and correct suggestions or no error correction with no search success are the result of the tests and are included in the UX evaluation. Colour logics in the apps, which can sometimes trigger user errors (e.g., no indication of whether a charging station is available), also lead to points being deducted. Overall, the results in the "Robustness against user errors" dimension are very broad, ranging from 40 to 87 points.

The final dimension, user engagement, is assessed primarily via an inviting and appealing design, as well as the possibility of submitting suggestions for improvement being transparently offered. This shows a very different implementation of the applications in terms of how the topic of user feedback is dealt with. In some cases, feedback functions are hidden or only provided via a contact option. In other MSP

applications, the option to provide feedback is directly visible and possible via several communication channels (e.g., WhatsApp, chat, email). In this area, nine apps scored over 80 points with very good results.

participants	task adequacy	self-descriptiveness	conformity to expectations	learnability	controllability	robustness against user errors	user engagement
wgtrng	16%	16%	16%	16%	16%	16%	16%
placement free MSP							
ADAC Drive (ADAC)	51	68	73	69	68	58	71
Charge & Fuel (Logpay)	81	84	77	77	81	74	75
Charge Now (DCS)	79	78	75	75	79	75	81
E.ON Drive (E.ON)	76	68	67	77	48	70	69
Elli (Elli)	61	63	65	73	58	63	75
eSolutions Charging (Free2Move)	83	78	65	77	59	75	81
Lichtblick (Lichtblick)	83	81	75	78	75	88	72
Maingau Autostrom (Maingau Energie)	68	82	88	78	69	80	83
mobility+ (EnBW)	73	75	79	85	81	70	80
Monta (Monta)	68	72	66	85	82	83	79
Plugsurfing (Plugsurfing)	82	77	77	83	64	76	85
Shell Recharge (Shell)	75	78	88	73	83	73	78
placement OEM							
Charge my Hyundai (Hyundai)	75	77	71	71	81	72	78
Mercedes me (Mercedes Benz)	59	56	63	70	83	75	63
My Audi (Audi)	61	72	71	75	73	72	78
My BMW (BMW)	71	75	71	68	71	47	85
My Porsche (Porsche)	78	85	79	78	84	87	85
Tesla (Tesla)	53	74	84	68	38	53	69
Volkswagen (Volkswagen)	69	77	85	74	70	75	73
placement network-connected charging apps (no roaming)*							
Fastned (Fastned)	61	66	65	70	62	75	79
Kaufland eCharge (Kaufland)	57	67	56	61	53	68	67
Lidl Plus (Lidl)	56	71	57	69	42	40	68
Tesla (Tesla)	53	72	54	63	38	53	69

* Weighting of grid-connected charging apps adjusted according to use case

5. TEST SETUP & PROCEDURE

This year, the eMobility Excellence Benchmark is being expanded to include a user experience benchmark and therefore consists of two separately assessed components: the functional benchmark and the UX benchmark. The functional benchmark compares the functional scope of the charging apps, while the UX benchmark focusses on the quality of their implementation and the user experience. The scores from both tests are combined at the end to produce an overall score. The functional benchmark is weighted at 2/3 and the UX benchmark is weighted at 1/3 in the overall result. Overall, candidates can achieve a total score between 0 and 100 points and receive a corresponding rating from unsatisfactory to very good.

Grading scale

points	rating
81 - 100	very good
61 - 80	good
41 - 60	satisfactory
21 - 40	sufficient
1 - 20	poor
0	deficient

5.1. FUNCTIONAL BENCHMARK

This section contains a general introduction to the test concept of the functional benchmark and its further development. This is followed by a detailed description of the test categories and features as well as their weighting.

The functional benchmark consists of a practical test in which the apps of the e-mobility service providers are tested according to predefined test features. These features are weighted in an evaluation matrix and the categories of station information, pre-selection and filters, convenience functionality, station availability and user feedback are summarised. The categories will also be included in the overall result with different weightings. In order to reflect the needs of users in the evaluation, a survey was conducted in advance of this year's eMobility Excellence in which charging app users prioritised various features and categories. The weighting of the test features and the categories mentioned is based on this prioritisation by the users. Over 100 drivers of electric cars took part in the survey.

In line with the survey, expectations and therefore also weighting criteria are set for the network-based charging apps. Due to the different use cases of the respective charging apps, the weighting differs between the segments. The total score of network-bound apps is not comparable with the score of free MSPs or OEM MSPs. For readability purposes, the weightings that apply to the free charging apps and vehicle manufacturer charging apps segments are explained in the following section.

In addition to the survey-based weighting, the test features are expanded annually to reflect the development of the charging experience in electromobility. The evaluation of the individual features is also becoming stricter in some cases in order to meet the increasing customer demands on the apps. The eMobility Excellence Report is limited to the German market and the apps mentioned in the section "The test candidates at a glance". In addition, the current version of the app at the time of the practical test was used for testing.

The categories mentioned above and their weighting are explained below.

STATION INFORMATION:

This category encompasses basic information about the charging stations. This includes, for instance, address data, but also information that can set MSPs apart, such as details about toilets or restaurants near the charging location. The category accounts for a total of 25% of the functional test score and contains the test criteria listed below with their individual weighting:

- Address data 10%
- Connections and plugs 14%
- Charging power 14%
- Operator 10%
- Opening hours 10%
- Price indication 14%
- Further location information 10%
- Directions 7%
- CO₂ - compensation model 7%
- Photos 7%

An additional test criterion was added to this year's feature comparison in the status information category. Photos of the charging location or station were assigned to the user feedback category as a test feature in the previous year. As some of the participating MSPs integrate photos into their apps that were not added by users, the test feature has now been transferred to the status information category. In addition, the feature Additional location information is now evaluated more strictly, so that the mere indication that the location has a canopy is only sufficient for partial points. The full score can be achieved with further information such as details of restaurants, shopping facilities or similar information.

PRE-SELECTION AND FILTER:

A glance at the map of a charging app shows a large number of charging locations from which users can select the desired charging point. Filters should help to make this selection easier for users by reducing the displayed charging points to the most suitable stations as far as possible. This category accounts for 20% of the overall score and includes the following test criteria with individual weightings:

- Connections and plugs 18%
- Charging power 23%
- Operator 12%
- Opening hours 12%
- Further location information 12%
- Occupancy and functional status 23%

The respective filter options and their purpose depend on various factors. While connections and plugs are requirements that must necessarily match the respective vehicle, filters for further location information depend on the current situation and the user's preferences. For example, it is possible to filter only for charging stations that are currently open and with shopping facilities in the vicinity in order to combine charging with a late-night weekly shop.

COMFORT FUNCTIONALITIES:

The convenience functionality category includes functions designed to round off the charging experience for app users. Their task is to simplify or enhance the charging process, from planning the journey to arriving at the destination. In addition, charging apps can set themselves apart with functions in this category. Based on the results of the user survey, the weighting of this category was determined as 20%. It contains the following criteria and their individual weightings:

- Vehicle selection 13%
- Forecast of charging costs 8%
- Navigation to the charging station 13%
- Charging stop planning 13%
- Vehicle integration with Apple Car Play or Android Auto 13%

- Autocharge/ Plug&Charge 13%
- Quick filter option for charging power 13%
- Overview of charging processes and invoice download function 8%
- FAQs about charging as quick help 8%

The vehicle selection function allows users to select their electric vehicle in the app. For example, the vehicle's data, such as its range, can be used to plan charging stops. As in the previous year, full points were only awarded for navigation to the charging station if the navigation takes place within the app itself and no external map app such as Google Maps or Apple Maps has to be used. In contrast to the previous year, full points were only awarded if dedicated charging stops were displayed when planning charging stops. Simply displaying charging locations along the route is no longer sufficient for full points.

The features Autocharge/Plug&Charge, quick filter option for charging power, overview of charging processes and invoice download function as well as FAQs on charging were added based on the user survey.

Autocharge and Plug&Charge are authentication options that users must use to start the charging process with an app or charging card. The charging process starts automatically when the charging cable is plugged in. The quick filter option mentioned separately last year, which can be used to quickly filter by charging power, has now also been adopted as a test feature and has already been implemented by some MSPs. An overview of the last charging processes is important for users to be able to keep an eye on charging processes and costs. The full score was achieved if the invoice is also made available for download in the app. New electric mobility users who are not yet very familiar with charging their vehicle can quickly answer their questions themselves if FAQs are available in the app. This means it is no longer necessary to research online or call a hotline. Full points were awarded for the implementation of FAQs on charging within the app. Partial points were awarded for redirecting to FAQs in an external or in-app browser and for live chats in the app.

STATION AVAILABILITY:

The station availability category includes functions that show which charging points are available or unavailable at what time. Charging points that are currently in use or charging stations that are defective, for example, are considered unavailable. For some applications, the category contains features that provide information on real-time availability, while others forecast future availability.

This category was categorised as the most important in the user survey and accounts for 30% of the overall rating of the functional benchmark. The following test criteria are included:

- Occupancy status 30%
- Display of roaming stations 22%
- Availability forecast 13%
- Notification as soon as station is available or reservation function 13%
- Save favourite charging stations 22%

The notification function or reservation function was assigned to the convenience functionality category in the previous year. It has now been moved to this category, as it provides information about the availability of the desired charging point. In addition, the availability forecast was assessed more strictly this year. While a capacity utilisation diagram of the charging location previously led to a full score, only partial points were awarded this year. Full points were awarded to MSPs that were able to provide further information on future availability. This was only achieved by Porsche, which indicated the current occupancy time and the average occupancy time of the charging point in its app. This allows users to estimate the time at which the desired charging point will be available again.

USER FEEDBACK:

The user feedback category contains functions that create a community effect for users. In the current benchmark, two functions made it into this category, which accounts for 5% of the overall score:

- Rating option 50%
- Comment function 50%

The rating option is a rating based on a points system. For example, some apps allow users to rate the charging locations with stars.

The comment function allows users to write a comment or note about the station or location themselves. Both criteria receive full points if the rating or comment is visible to other users and therefore helpful for potential future users.

5.2. UX BENCHMARK

The ISO 9241 standard on the ergonomics of human-system interaction is an international set of rules for the design of interactive systems. Part 110 provides interaction principles and general design recommendations for the development and evaluation of user interfaces. These principles, which are based on many years of experience in the field of design and human behaviour, offer a holistic approach to understanding and improving the interactions between users and software. The interaction principles according to ISO 9241-110:2020 are

- Task adequacy
- Self-descriptiveness
- Conformity to expectations
- Learnability
- Controllability
- Robustness against user errors
- User connection

The interaction principles provide a clear and structured basis for the design and evaluation of user interfaces. By taking these principles into account, it is not only possible to create visually appealing designs, but also to ensure that the usability of an application is guaranteed. In order to gain a better understanding of the importance of the interaction principles and to underpin their relevance for the test procedure, the interaction principles of the standard are briefly explained in the following section.

TASK ADEQUACY:

An interactive system is adequate for the task if it supports users in completing their tasks, i.e., if the operating functions and user-system interactions are based on the characteristics of the task (and not on the technology chosen to fulfil the task). An interactive system should provide all the information necessary to enable users to perform the corresponding tasks. In addition to the necessary information, users should be provided with the necessary controls to complete a task appropriately. It is important to only impose interaction steps on users that result from the requirements of the task and, if possible, use standard selection options.

SELF-DESCRIPTIVENESS:

Wherever necessary for the user, an interactive system should provide appropriate information that immediately reveals the capabilities of the system and its obvious use without requiring unnecessary user-system interactions. Users should be guided through the system and recognise at all times which area of the system they are in and which interactions with the system are possible. The interactivity or non-interactivity of the corresponding elements should be clearly visible and a vocabulary familiar to users should be used.

CONFORMITY TO EXPECTATIONS:

The conformity to expectations of an interactive system is associated with the predictable behaviour of the system. The conformity to expectations of a system is strongly dependent on the corresponding context of use. The interactive system should fulfil the requirements of the broadest spectrum of users and usage contexts. In particular, an interactive system should use cultural and linguistic conventions that are familiar to the users for display, input and control, and ensure overarching consistency.

LEARNABILITY:

The interactive system should support users in discovering the functionalities and their use, trying out the system and discovering the system's possible applications. The interactive system should offer users suitable alternatives for searching for and navigating to information and functions. Furthermore, when users interact with the interactive system, it is important to provide appropriate feedback and thus inform users about the consequences of their actions and promote learning.

CONTROLLABILITY:

If an interactive system is controllable according to DIN ISO 9241-110, it allows the user to retain control over the user interface and interactions, including the speed, sequence and individualisation of user-system interaction. This is not about the general interaction with the system, but about the individual speed, including interruptions, to interact with a system and the individual adjustability of a system. If tasks are interrupted, users should be able to continue at the same point at a later time. Furthermore, users should be able to make individual settings in order to permanently change default values and/or selection options. However, the system should also offer the option of returning to the original default values and/or selection options.

ROBUSTNESS AGAINST USER ERRORS:

The focus of robustness against user errors is on avoiding and correcting errors and minimising the effects of incorrect entries. Effort minimisation goes hand in hand with error prevention. Part of the robustness against user errors is the avoidance of unnecessary entries that are relevant in the case of already existing information or standard selection options. This minimises the risk of input errors. If input errors are identified, users should be made aware of the errors and be able to reproduce them in order to correct them. An alternative to displaying errors is to correct them automatically. However, care must be taken to ensure that users have the opportunity to influence the correction and, if necessary, have the option to overwrite the correction. Furthermore, it should be ensured that the work done is not lost due to user or system errors.

USER CONNECTION:

The content of user connection is the inviting and motivating presentation of functions and information in order to promote continuous interaction with a system and create trust. The system should make a positive first impression on users and be attractive without compromising on effectiveness and efficiency. Furthermore, the interactive system should offer users the opportunity to submit suggestions for changes and system enhancements that would improve its use.

PROCEDURE OF THE EXPERT EVALUATION:

Description of the use case:

One or more use cases are required to carry out the test using the interaction principles. For this reason, the survey conducted in advance was analysed with regard to the most important tasks from the user's perspective and then reduced to a comparable main use case:

Searching for an available charging point in the vicinity, taking into account individual preferences (e.g., charging speed and price overview) and then favorising the charging point.

This use case is analysed by six interdisciplinary experts from the fields of electromobility and user experience according to the interaction principles described. The test subjects have different levels of experience in the use of charging services. The seven interaction principles are weighted according to the use case: the principles of learnability and user loyalty are weighted lower (10% each), whereas the other interaction principles are weighted at 14% each. This is due to the singular test procedure only capturing learnability and user engagement to a limited extent.

It is tested under conditions that allow an independent procedure for all testers. A five-point Likert scale and descriptive comments are used for later analysability. The tests are carried out under test conditions on two consecutive days and apps are tested independently and in random order to avoid bias effects. All tests are conducted using iOS devices equipped with both WiFi connection and network connection. In addition, an on-site test is carried out at a charging station to check the basic charging capability of the apps. However, findings from these tests are not included in the quantitative evaluation basis, as significant bias effects cannot be ruled out due to the selected charging station operator, the limited time available and the small sample size. Notable anomalies collected during the on-site test can be found in the "Special features" section without quantitative evaluation.

The selected test scope entails some restrictions that also limit the informative value with regard to the overall user experience:

- According to the survey, the selected use cases are the focus of the test subjects but cannot claim to reflect the complete experience in the everyday life of an EV driver.
- Although a UX expert evaluation based on interaction principles covers a large number of factors influencing the usability of charging apps, it does not claim to replace a test person study.

6. DETAILED RESULTS PER APP

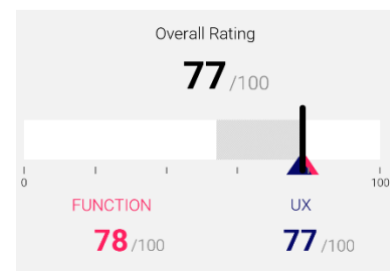
The following section describes the individual evaluation of the respective charging services. For readability purposes, the main advantages and remarkable features are emphasised. The sequence is chosen according to the overall ranking.

6.1. CHARGING APPS FROM FREE PROVIDERS:

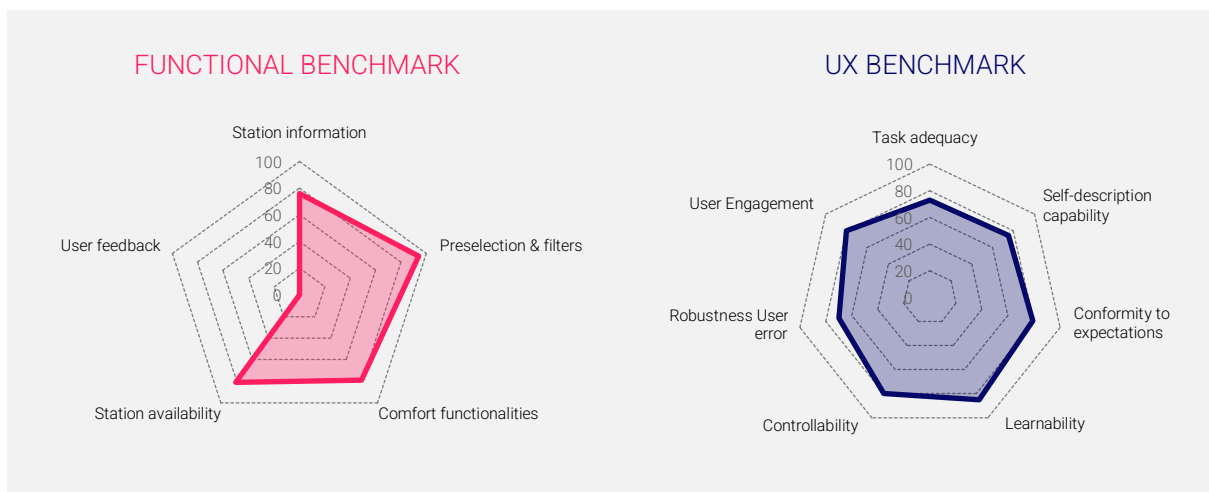
PLACE 01 - ENBW MOBILITY+ (ENBW)



The EnBW mobility+ app has developed further and comes in first place among the free MSPs. The app particularly convinces in the pre-selection and filter category, being the test winner. The app only failed to score in the user feedback category due to the lack of options for rating or commenting on a charging location. It should be emphasised that users can see how long a charging point has been occupied, which makes it easier for them to estimate the availability of the charging point. The charging application also performs very well in the UX benchmark. Availability, charging power, prices and opening times are quickly found, and the charging itself can also be controlled via the app. As minor points of criticism, the experts noted that some filter options are less intuitive and that the font within the app is very small at times.



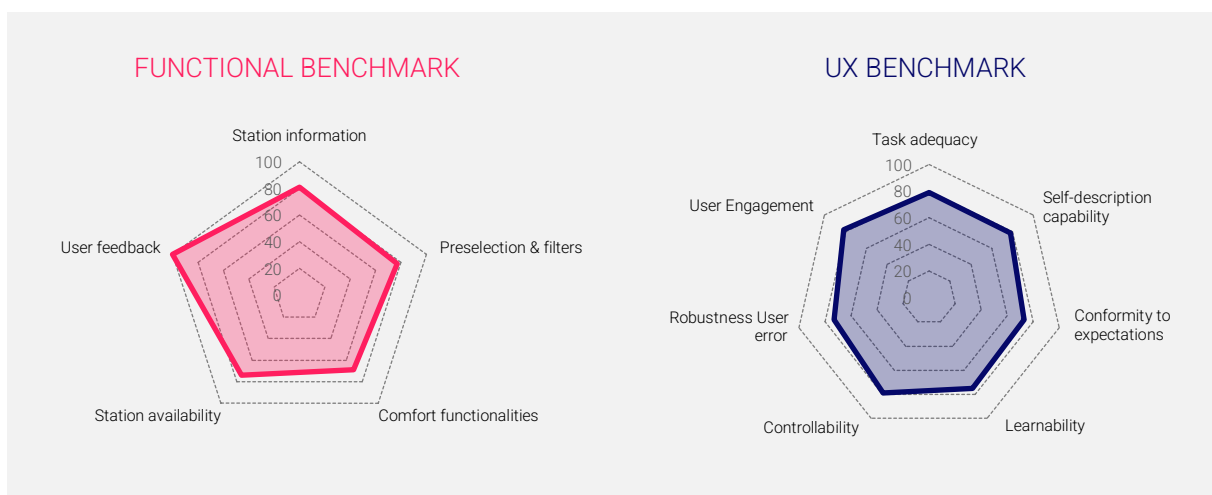
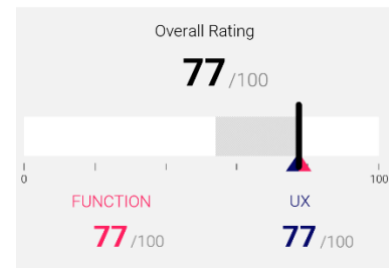
For ADAC members, mobility+ also offers the option of registering the app with the ADAC access code for the ADAC e-Charge tariff. After successful activation, the app then appears in the yellow ADAC look & feel. This co-operation between ADAC and EnBW is not included in our evaluation.



PLACE 02 - CHARGE NOW (DCS)



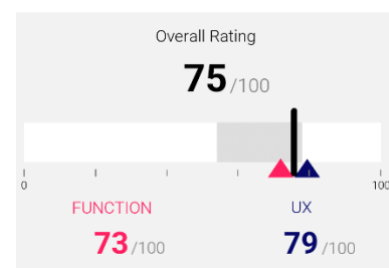
The Charge Now app is only marginally behind 1st place in the free MSP segment in the overall rating. The application not only scored highly in the user feedback category, where users have the opportunity to submit a star rating and a comment, but also thanks to the numerous filter options, which also scored very well in the UX test. Charging stations can be filtered according to nearby restaurants, cafés, shopping facilities or sights, for example. The distance of the stations to the desired service can also be restricted using a slider. The results of the UX benchmark show that there are minor anomalies with the large coloured POI markers that indicate the availability of the charging point. The UX testers state that slightly smaller and higher-contrast POI markers would be desirable. On the detailed view of the charging point, on the other hand, testers praised the clearly differentiated price and station information. Furthermore, the integrated charging planning is a highlight of the application. In addition to the aforementioned filter options, it is also possible to set the vehicle's current range, the minimum charge level at the station and at the destination, take into account the availability diagrams of the charging stations, and choose between different routes.



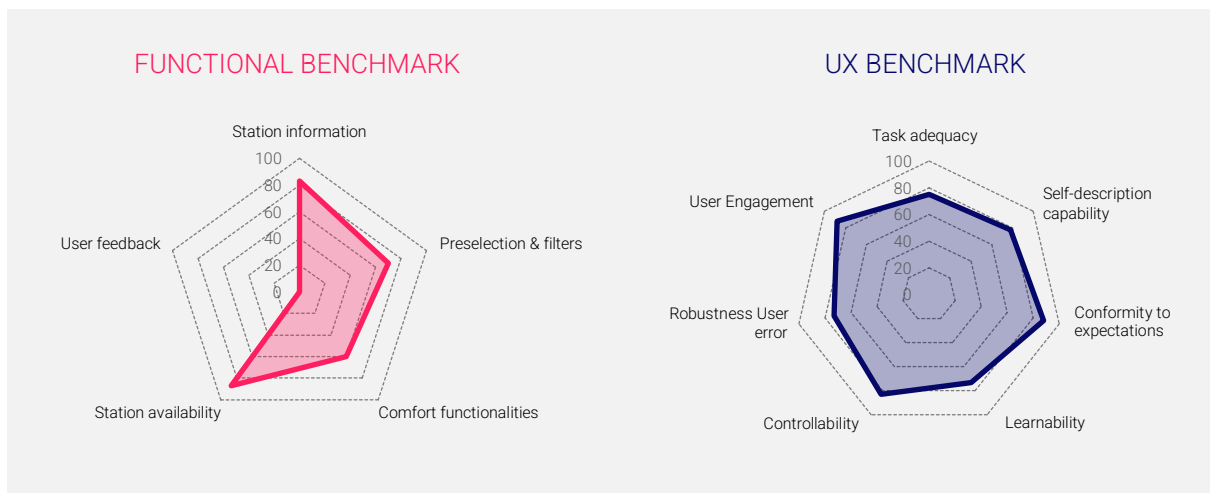
PLACE 03 - SHELL RECHARGE (SHELL)



Shell Recharge from Shell took third place among the free MSPs with 75 points. Shell's app performs well in terms of functions and operating concept. In the test of functions, the app stands out with particularly good results in the station availability category. For example, users can be notified as soon as the desired - but currently occupied - charging station is free again. Shell Recharge has also implemented functions such as route planning since the last functional comparison of the eMobility Excellence Report. Some functions such as the display of further location information, availability forecast of occupied charging points or integration of user feedback are not available at the time of testing. In the



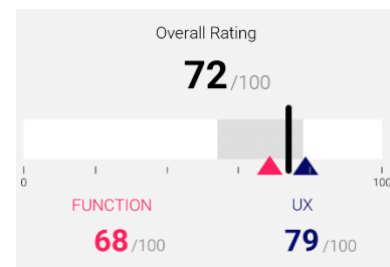
station information category, Shell impresses with the integration of Google Street View within the app, which allows users to take a closer look at the charging location in advance. In addition to the extensive functions, the Shell Recharge app offers an appealing user interface with appropriately designed icons and colours that convey the information clearly. Users benefit from various selection options such as the list view option. However, limitations such as the filter limit of 100 kW and interruptions in the plug selection on the charging screen could affect the overall experience of the app.

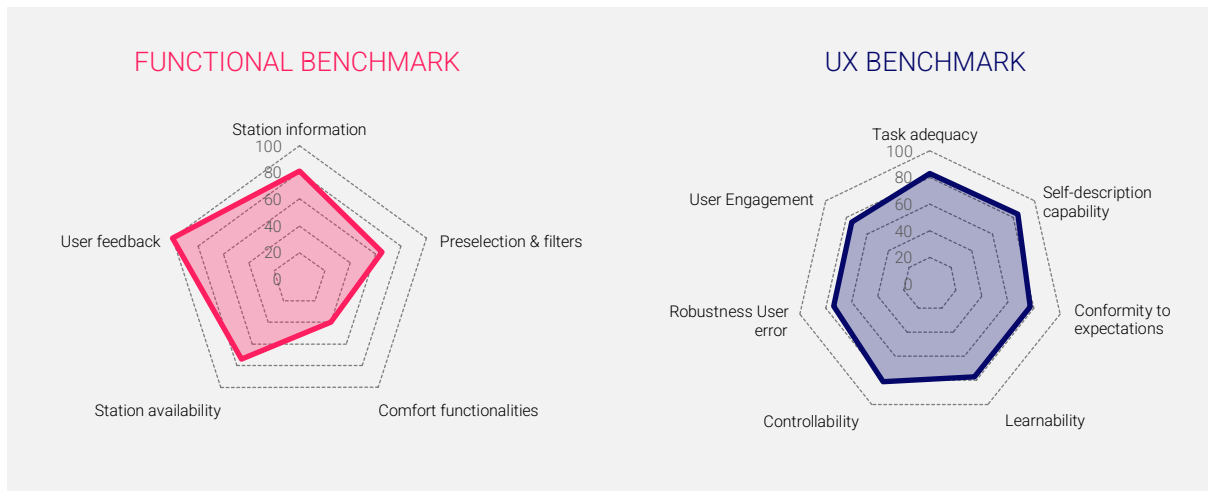


PLACE 04 - CHARGE & FUEL (LOGPAY)



As the name suggests, the Charge & Fuel app provides information on both petrol stations and charging options. The function test shows that the app contains very comprehensive information about the charging station and the charging location. Accordingly, Charge & Fuel achieved a very good result in the station information category. There is potential for improvement in the convenience functionalities, for example in the implementation of a vehicle selection or the integration of FAQs on charging in the app to quickly resolve user questions. Particularly noteworthy is the option to not only rate charging stations in the form of stars, but also to leave comments. This gives the app full marks and a very good rating in the user feedback category. The app's operating concept is sophisticated. The availability of charging stations is shown in colour on the map. Once the user has selected a station, all important information can be viewed directly. The list view is also a positive feature. The testers noted that the clustering of charging stations when zooming out even a little took some time getting used to.

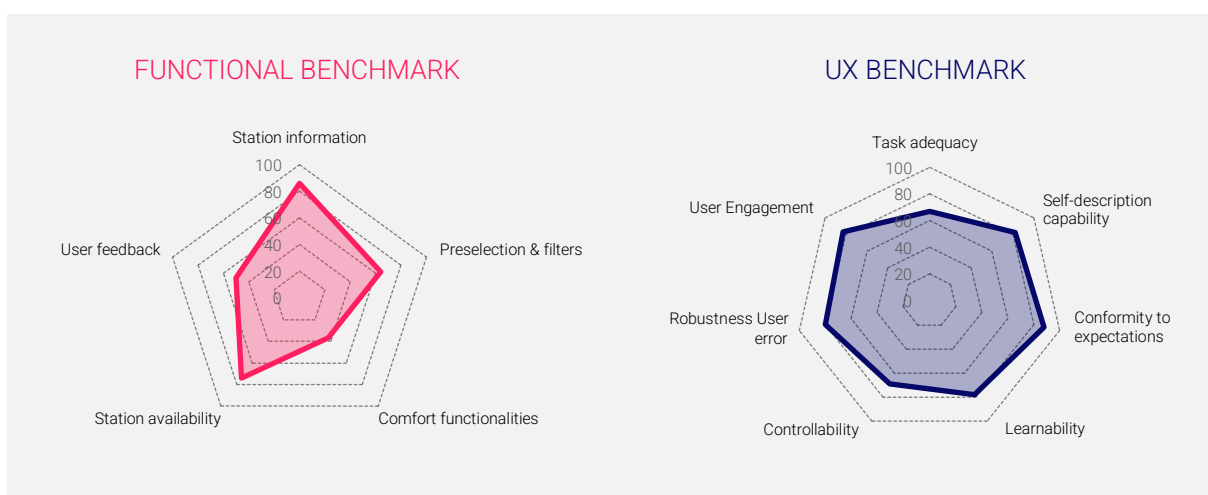
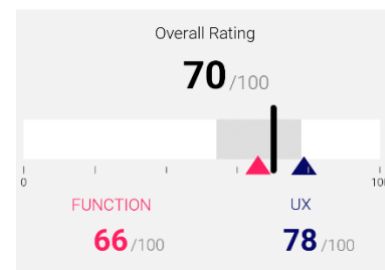




PLACE 05 - MAINGAU AUTOSTROM (MAINGAU ENERGIE)



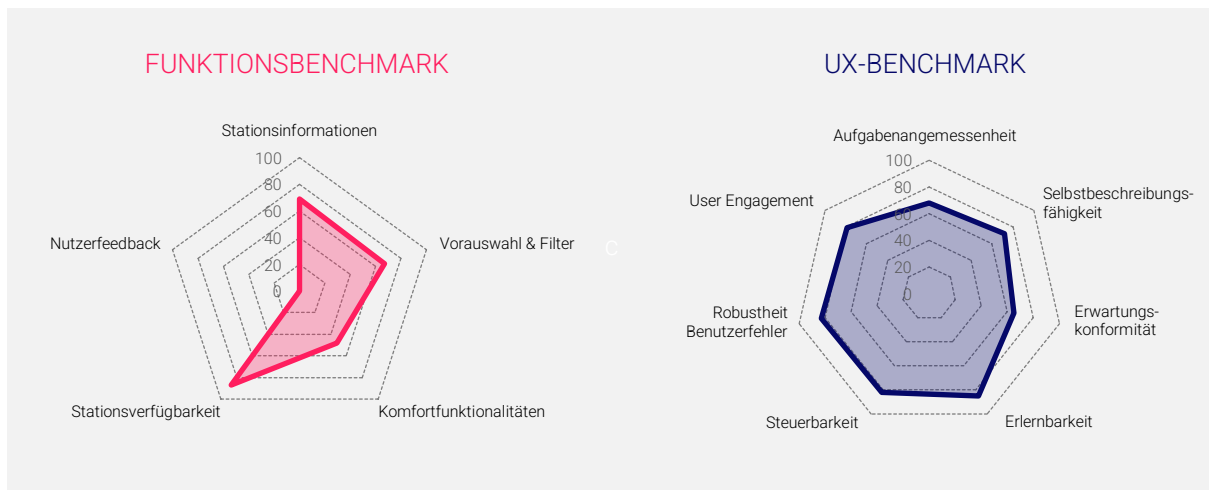
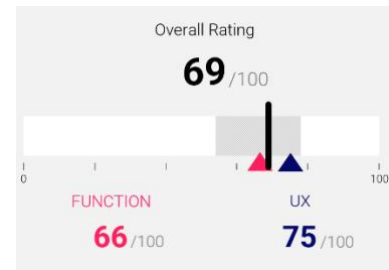
The Maingau Autostrom application from Maingau Energie once again achieved a good eMobility Excellence test result this year, despite the increasing demands of the market and this benchmark. In the functional test, the app even achieved a very good score in the station information category. Users have the option of viewing directions to the charging station or adding them themselves. Photos of the location are also integrated and can be added by users. There is still room for improvement in the range of convenience functions (e.g., charging stop planning, vehicle integration). Nevertheless, the navigation to the desired charging station within the app should be emphasised positively. Charging stations can also be rated by awarding stars. The usability of the app is particularly impressive due to its simplicity and focus on charging. It is easy to use, and charging station icons indicate their availability to users by colour. The filter options could be more extensive, however, and making the price information already available on the charging station overview would also prove helpful.



PLACE 06 - MONTA EV CHARGING (MONTA)



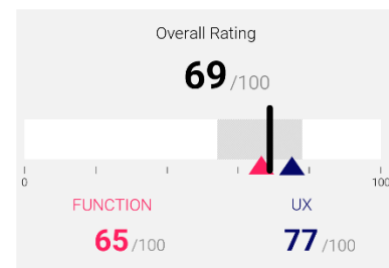
Overall, the Monta app ranks between Maingau Autostrom and Elli with 69 out of 100 points. The app is rated well in the areas of station information, pre-selection and filters. The app not only allows one to filter by available charging stations, but also by occupied or inactive stations. It is also possible to filter according to which stations users can use the "Smart Queue" function - a queuing system - or make a reservation. The app performs less well in the area of convenience functionalities. Furthermore, there is no integration of user feedback. By contrast, Monta achieved a very good result in station availability, sharing first place in this category among the free MSPs with the Shell Recharge app. The option to reserve charging stations is particularly noteworthy. Equally positive is the good overview of the charging stations. The preview especially is rated as helpful in the test when selecting the right charging option. However, it is not easy to save charging stations as favourites. When selecting filters, there is no support for plug selection and the selection of charging power is limited to 100kW. In addition, deselecting instead of selecting individual filters makes the application more difficult.



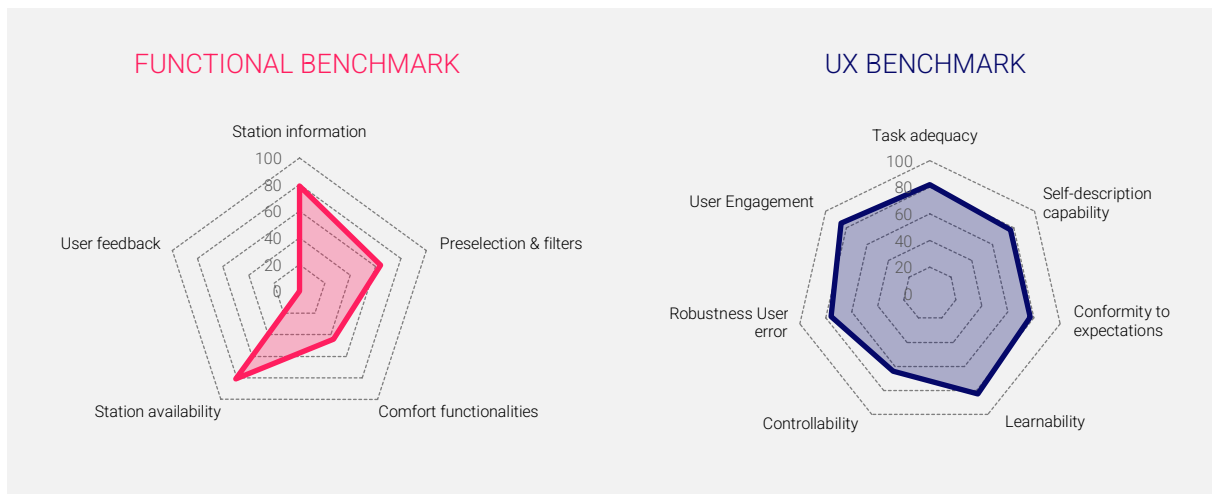
PLACE 07 - PLUGSURFING (PLUGSURFING)



Plugsurfing achieves a very good result in the station availability category of the functional benchmark. Favourite charging stations, for example, can now be marked as an improvement on the previous year. In the convenience functions category, on the other hand, the results are below average. The Plug&Charge/Autocharge and charging stop planning functions, among others, are not available. Integration with Android Auto or Apple Car Play is also not available at the time of testing. One positive feature is the integration of a utilisation chart with average utilisation of the charging location per day of the week and hour. Overall, Plugsurfing offers a clear display, easy-to-learn operation and intelligent filter functions, the most important of which can be accessed directly. Unfortunately, FAQ support is only available by



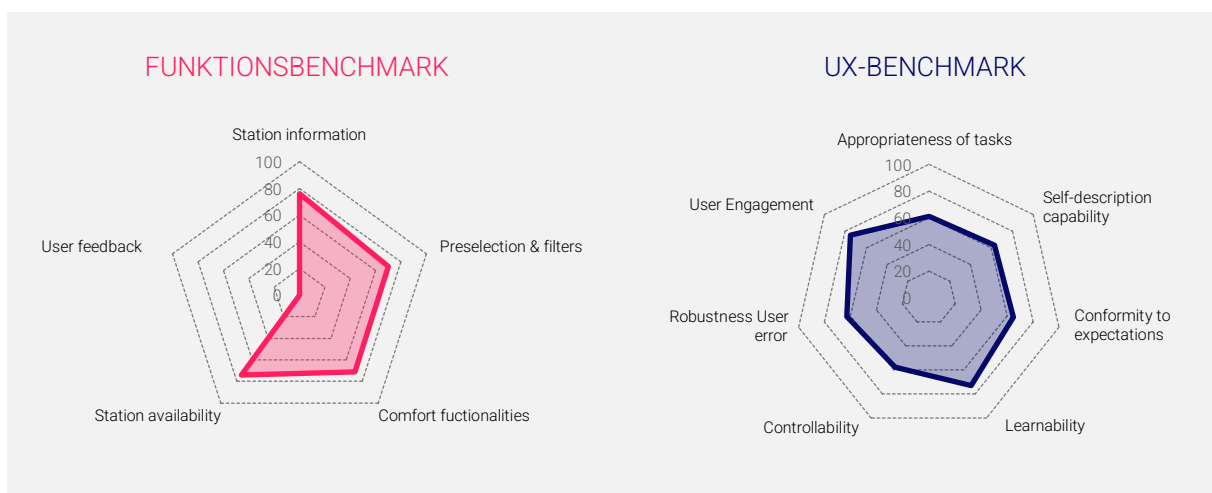
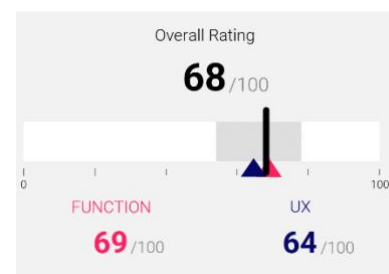
redirecting to the website. However, Plugsurfing does offer the option of clarifying user questions via live chat within the app.



PLACE 08 - ELLI CHARGING (ELLI)



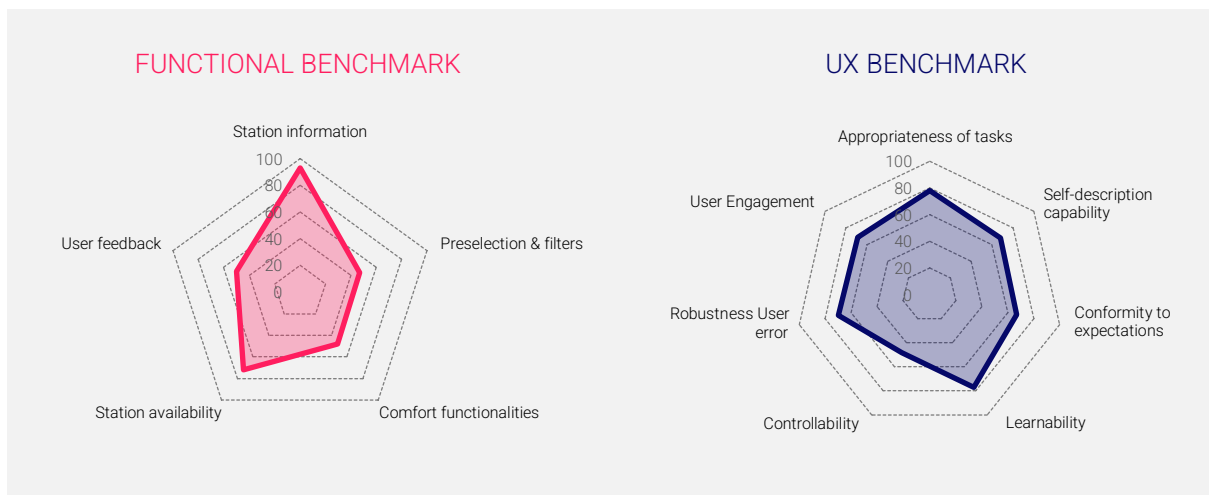
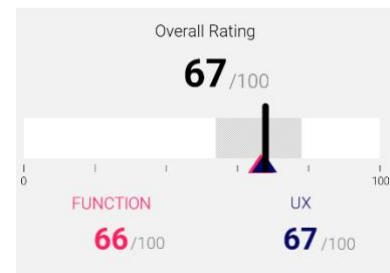
The Elli app achieves a good result overall with balanced scores in almost all categories. In addition, the application achieved a comparable score in the Function & UX benchmark. Elli only failed to score any points in the user feedback category. In terms of convenience functionalities, the Elli app stands out in particular for its charging cost forecast. These are calculated based on the charging tariff subscribed to. With an additional click, users can find out the estimated charging time and amount of energy to be charged. In the UX test, the app scored highly with extensive information on the charging stations, such as charging capacity, availability and opening hours. The telephone customer support is also positive. Unfortunately, specific price information for each charging point can only be seen late in the selection process.



PLACE 09 - E.ON DRIVE COMFORT (E.ON)



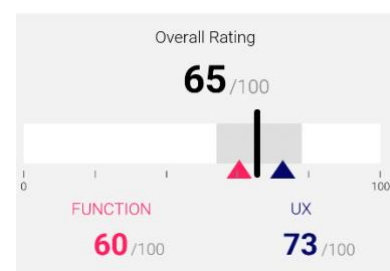
The E.ON Drive comfort app achieved 67 out of 100 points this year. Among the free MSPs, it took first place in the functional section in the station information category, as customers have the option of uploading pictures of the location and adding facilities of the charging location, such as restaurants or shopping facilities in the vicinity. The app is differentiated by the "Recommendations only" filter, which only displays charging locations with a particularly good rating. The "charging point scoring" used is sometimes displayed a little too prominently in the app for the testers and may not be immediately understandable to all users. An important element for users is the display of prices, which are not clearly shown in the app. One positive aspect worth mentioning is the option to start a live chat with customer service in the app if users need help or have questions.

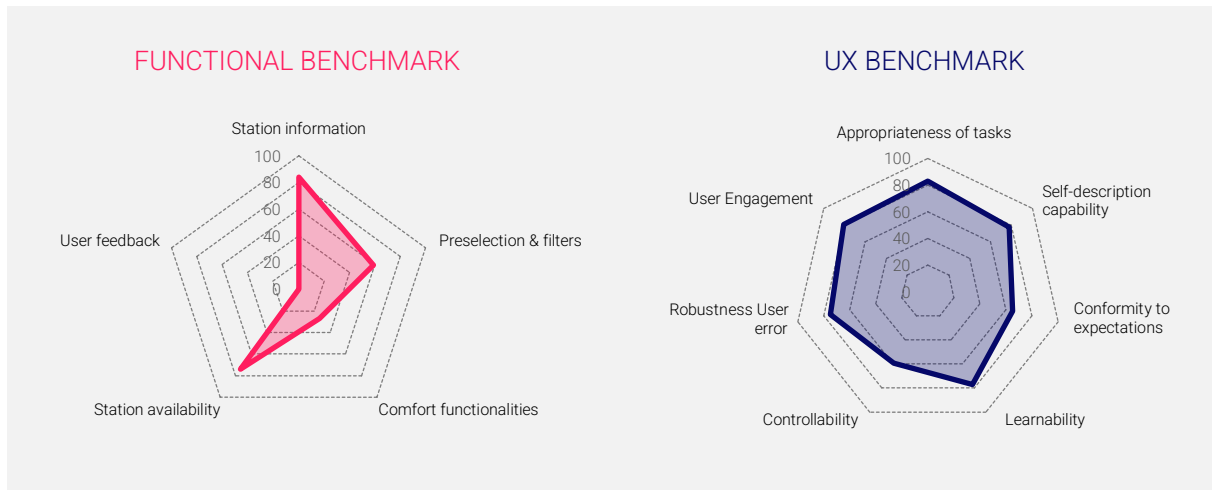


10TH PLACE - ESOLUTIONS CHARGING (FREE2MOVE)



The eSolutions Charging app achieved a good result. In the test of convenience functionalities, it achieved an above-average result in the area of station availability. Among other things, roaming stations and the occupancy status are displayed and it is possible to save favourite charging stations. In the convenience functionalities category, the app scores below average. The charging stop planning and vehicle integration functions, for instance, are not yet implemented, and the FAQs on charging are only accessible via a redirect to a web browser. There is no option for user feedback. However, the application performs very well in the area of station information and is among the top 3 free MSPs in this category. All basic information such as connections and plugs, charging capacity and opening times is available. In addition, eSolutions Charging scores highly with its CO₂ compensation model. When using the app, the support for the tasks and the logical, self-explanatory functions are particularly positive. The station preview clearly displays the information relevant to the customer. The zoom levels and clustering are the main problems.

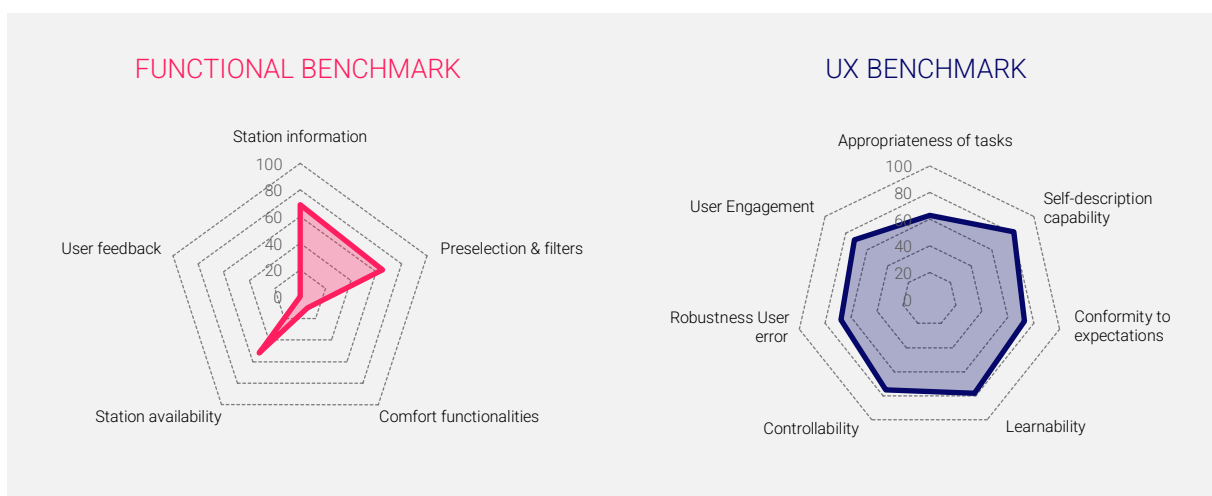
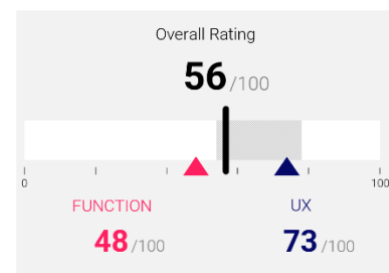




11TH PLACE - LICHTBLICK (LICHTBLICK)



The Lichtblick app achieves good results in the functional benchmark for filter options. In this function category, one can select by connections and plugs, opening times, occupancy status and AC and DC charging. The app performs poorly in the convenience functionality category. Only a download function for the invoice is integrated, but neither an overview of the charging processes in the app nor navigation to the charging station, which can only be carried out via an external app. In the area of station information, the application achieves a good result and differentiates itself through its CO₂ compensation model for emissions generated during the charging process. In the area of user experience, the app performs significantly better. For example, the display of charging power on the map can be emphasised positively. The functionality is perceived as somewhat limited due to a confusing station preview without good focus control. The testers also felt that it did not offer enough support against mistakes that users can make, such as incorrect search entries. On the other hand, the list view, which stands out from other

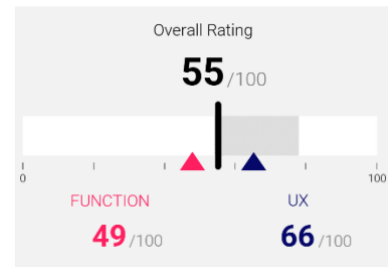


apps and offers a good overview, is particularly positive.

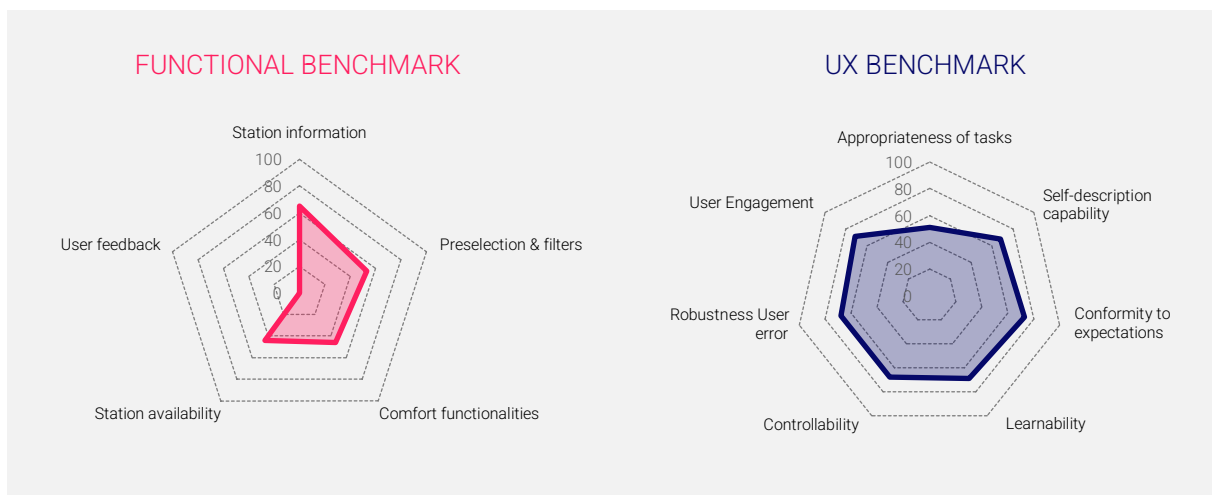
12TH PLACE - ADAC DRIVE (ADAC)



With its charging app, Europe's largest transport club is working on building a bridge from the tried-and-tested combustion engine to electromobility. As a result, the app offers an overview of petrol stations, charging stations, ADAC locations, and route planning. The application achieved a satisfactory result in this year's eMobility Excellence test report. The app contains the most important functions.



Most of the basic information, for example, such as address data, connections and plugs or charging capacity, is available in the status information category. When charging with ADAC, a charging card is required to start the charging process. It is not possible to start a charging process via the app and the application only provides support with searching for a suitable charging station. As the charging process cannot be started via the ADAC Drive app, functions are missing across several categories, such as price information, a CO₂ compensation model, Autocharge or Plug & Charge, an overview of completed charging processes, and the display of the occupancy status of a charging station. It is also not possible to rate charging locations in the ADAC Drive app, which results in further points being deducted. On a positive note, the app provides directions, e.g., that the station is located at the main entrance in the charge park. FAQs on the topic of charging are also integrated and offer users quick help with questions.

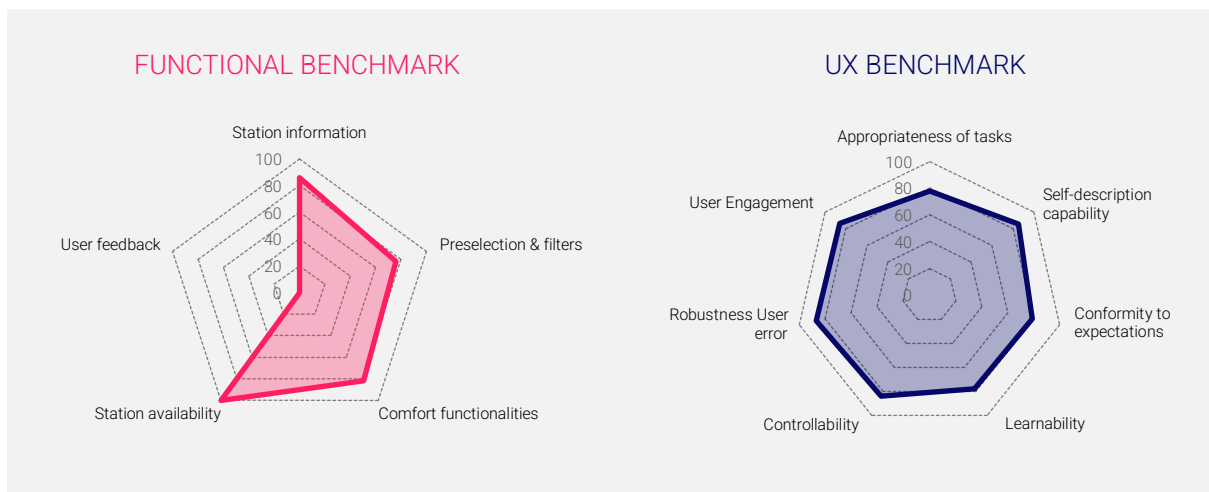
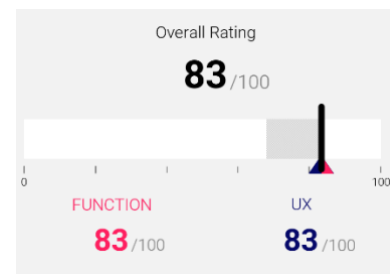


6.2. CHARGING APPS FROM MANUFACTURERS:

PLATZ 01 - MY PORSCHE (PORSCHE)



Among the vehicle manufacturers' apps, the My Porsche app took first place in both the function test and the UX test, thus defending its position as the test winner. The application achieved very good results in the areas of station information and availability. Very good results were also achieved in the pre-selection and filter categories as well as in the convenience functionalities. Here, the app impresses with its functional filters which remain in place even after the app is closed. Only the lack of an option to provide visible feedback on the charging locations means that no points are awarded in the corresponding category. In the user experience test scope, potential for improvement was identified in the presentation and usability. In particular, potential exists with regard to the search and intuitive handling of the list view. Despite these minor challenges for users, the customisation options for units in the map view, the saving of favourites and filters as well as the effective user assistance and the detailed feedback function in the support area were rated positively. Overall, the app scored "very good" in the overall evaluation. The My Porsche app not only scores points with its CO₂ compensation model and navigation within its own app. Particularly noteworthy is the availability forecast, which has been further developed since the last functional test. This now shows both the length of time a particular charging point has been in use and the average occupancy time. This allows users to estimate when the desired charging point will be available again.

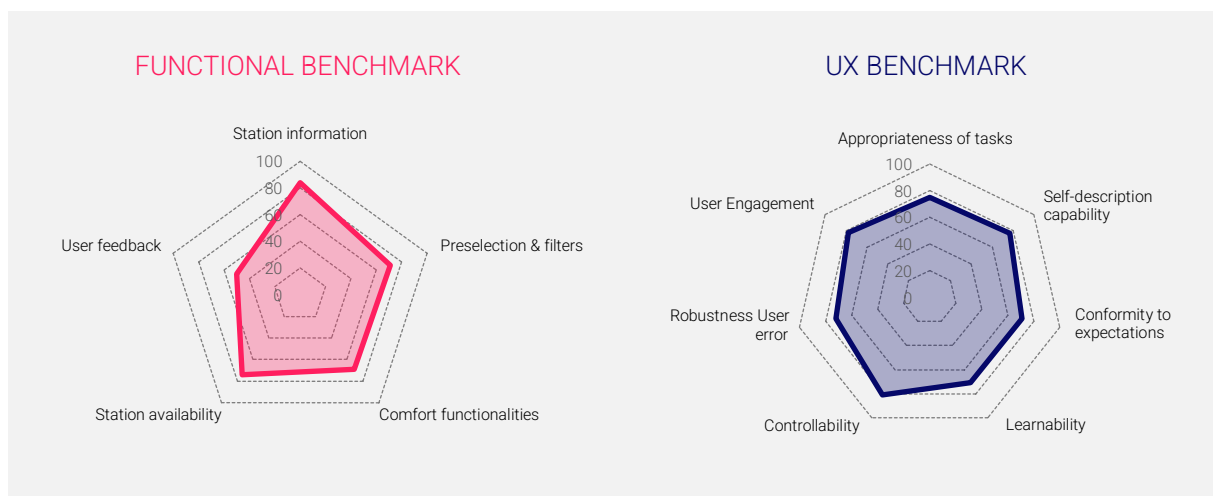
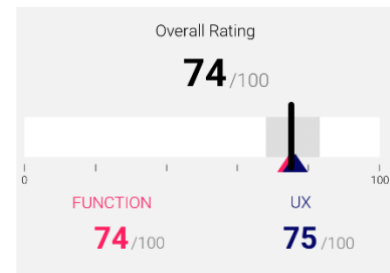


PLACE 02 - CHARGE MYHYUNDAI (HYUNDAI)



Hyundai achieves above-average results across all categories in the function test with its Charge myHyundai application. In the user feedback section, there is the option to rate the charging locations.

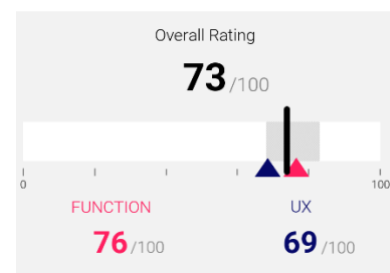
However, points are deducted because the ratings cannot be supplemented with comments. The app achieved a very good result in the station information section. For example, in addition to basic information such as address data, users can see in advance whether the charging location is equipped with a canopy. In terms of user experience, the app performs worse than in the functional test. Improved filter options and more precise displays of the available charging stations according to filter usage could help to further optimise the user experience. Nevertheless, the app offers a clear overview of charging stations and is characterised by an appealing design. It also enables good control of the kW settings.

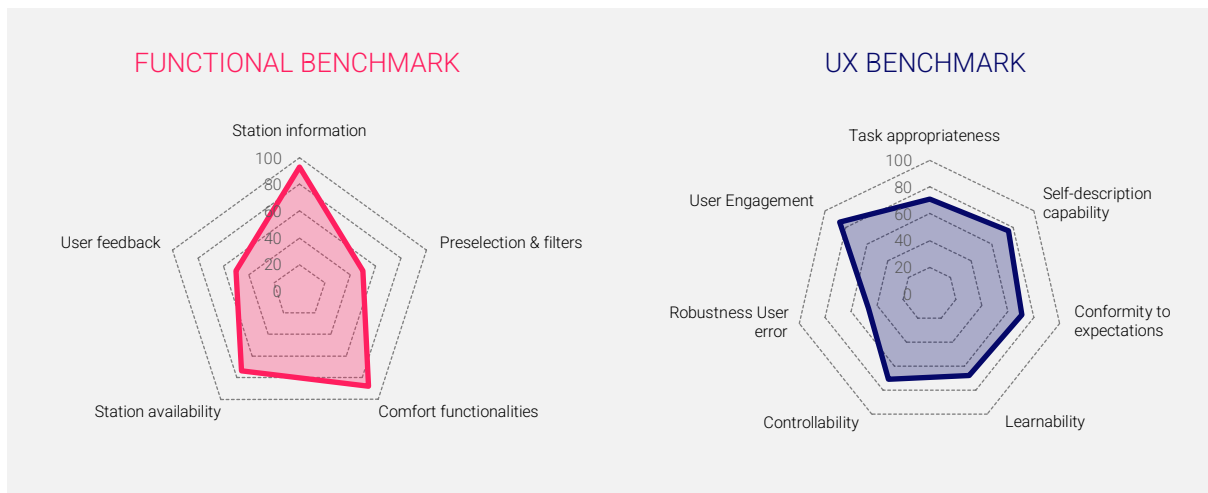


PLACE 03 - MY BMW (BMW)



The My BMW application performs above average in almost all categories of the functional benchmark. Only in the pre-selection and filter category, where, for example, only limited filtering by plug type or availability is possible, the results are in need of improvement. These complex filter options, shortcomings within the search functionality and problems with favourites management have a negative impact on operation and therefore also on the result of the UX benchmark. These limitations in terms of user-friendliness mean that the app is ranked third overall among car manufacturers. In the UX benchmark, the app impresses with customisable colours, map views and the option to provide feedback on the charging station. In the function benchmark, the BMW app particularly stands out in the station information category and is characterised by the integration of directions, photos of the charging locations and a CO₂ compensation model, among other things.

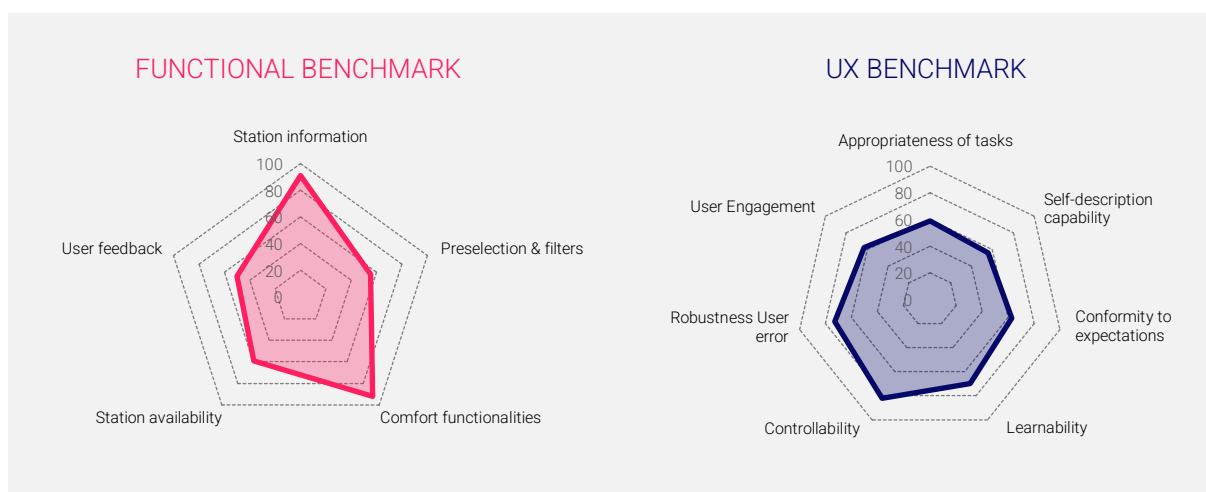
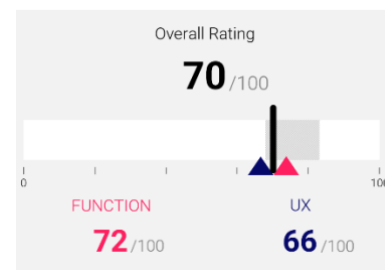




PLACE 04 - MERCEDES ME (MERCEDES-BENZ)



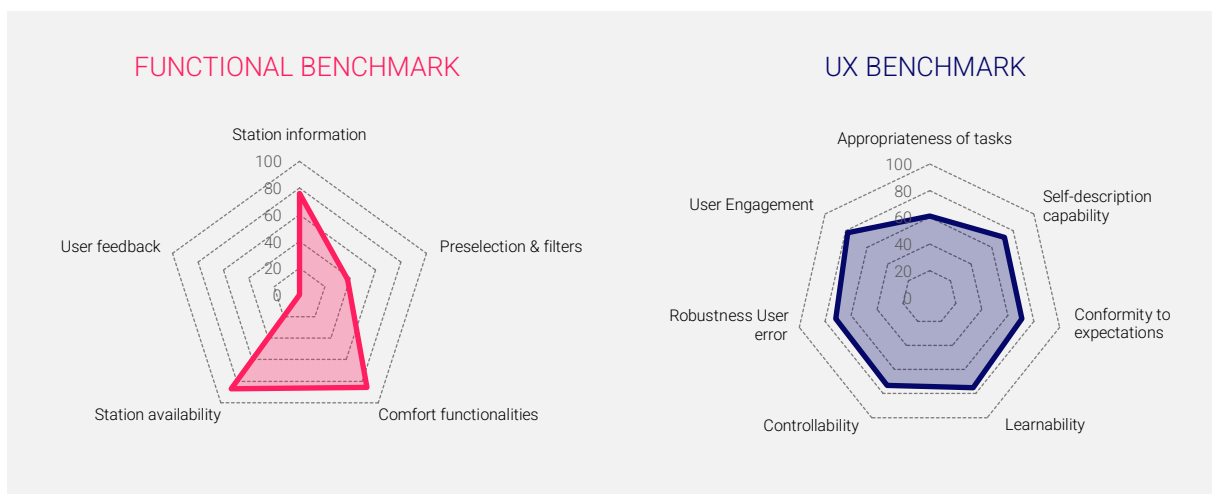
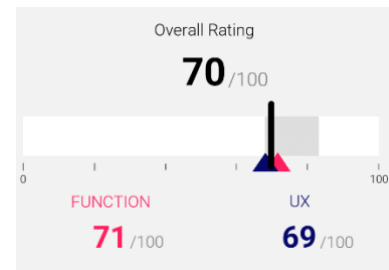
Mercedes-Benz once again performed well with its Mercedes me app in this year's function test. The well-placed filter options, for example, are positive for user experience. The app could be improved by offering a wider range of filters, such as filters by station operator or the option to save favourite charging stations. The app performs very well in the station information category, where it scores highly, for example, with directions to the charging station. The app's range of functions is impressive. Functions such as the charging cost forecast, which predicts the charging costs up to the full charge, including all relevant fees, help the app to win the test in the convenience functionalities category. Only the integration of FAQs within the app on the topic of charging is missing to achieve the full score in the convenience functionalities category. Nevertheless, prices are difficult to find, and the display is delayed. Together with a complicated display and operation of the charging functions, a conservative UI design and a slow response time of the app, this impairs the overall result. A positive aspect in both the functional benchmark and the user experience test area, is the option to file the user's vehicle. selection and the customisability of the app.



PLACE 05 - MYAUDI (AUDI)



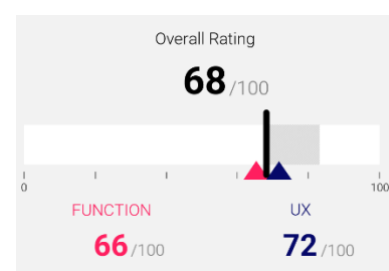
MyAudi achieved good results in the functional test in the areas of station information, and convenience functionality. The most important functions for users, such as vehicle selection, navigation and charging stop planning, are implemented in the app. The very limited and non-intuitive option to filter charging stations in advance and the lack of implementation of user feedback result in a low score in these areas. In the area of station availability, myAudi achieves mixed results. The provider achieved a very good result in the functional test, primarily due to the option of reserving a charging point at selected locations. Due to the lack of an availability forecast for charging stations, myAudi only just missed out on full points in this area. In the user experience area, on the other hand, the result is impaired by the lack of availability displays on the map and detailed information in the preview. The POI display on two levels and price information that is difficult to find also make it hard to use, especially for new e-mobility owners. The assessments of user-friendliness vary greatly: some functions are perceived as intuitive, while others are perceived as unclear. Positive features include the option to favour charging stations and to start a quick charging process without a confirmation screen.



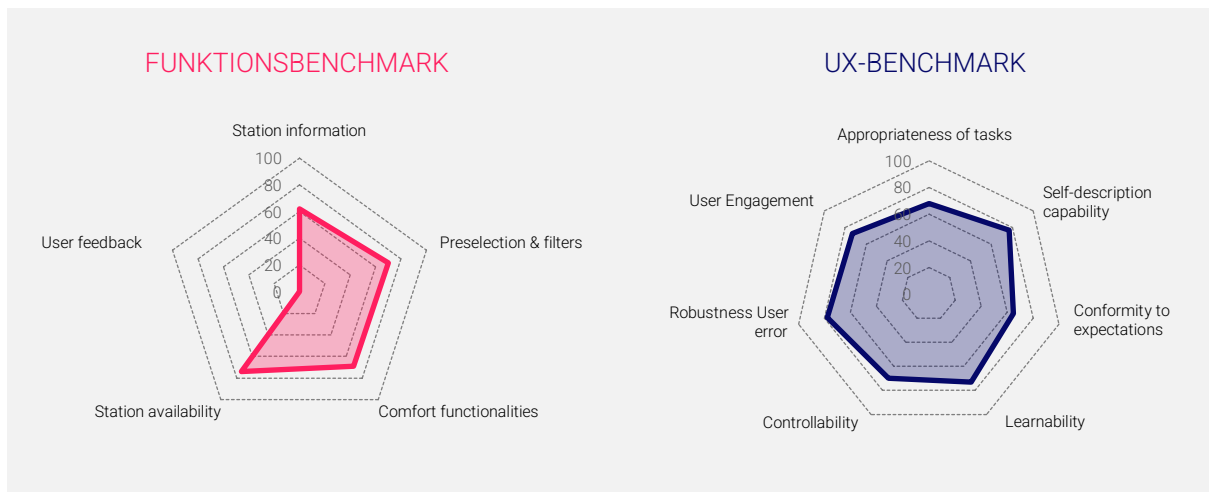
PLACE 06 - VOLKSWAGEN (VOLKSWAGEN)



The Volkswagen app scored 68 points in this year's eMobility Excellence Benchmark. Good results were achieved in all areas of the functional test with the exception of the user feedback category. Important functions for users such as displaying and filtering by occupancy status and storing the vehicle in the app are available. However, there are shortcomings in the quick filter options and the display of prices per plug in the detailed view. The filters for kW and charging power are also limited, and the display of additional information via links is unclear. The VW app stands out positively with useful price and availability information as well as the option to save favourites. Missing functions such as giving



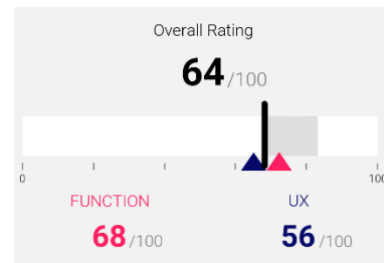
user feedback or displaying opening hours are a negative factor. There are problems with swiping quickly for a detailed view of the charging station. A navigation function is only possible via an external navigation app or the vehicle. However, charging stops are automatically taken into account here, making it easier for users to plan charging stops. Overall, there is room for improvement in terms of handling, display and filter options. Nevertheless, the application achieves a good, solid result in the overall rating.



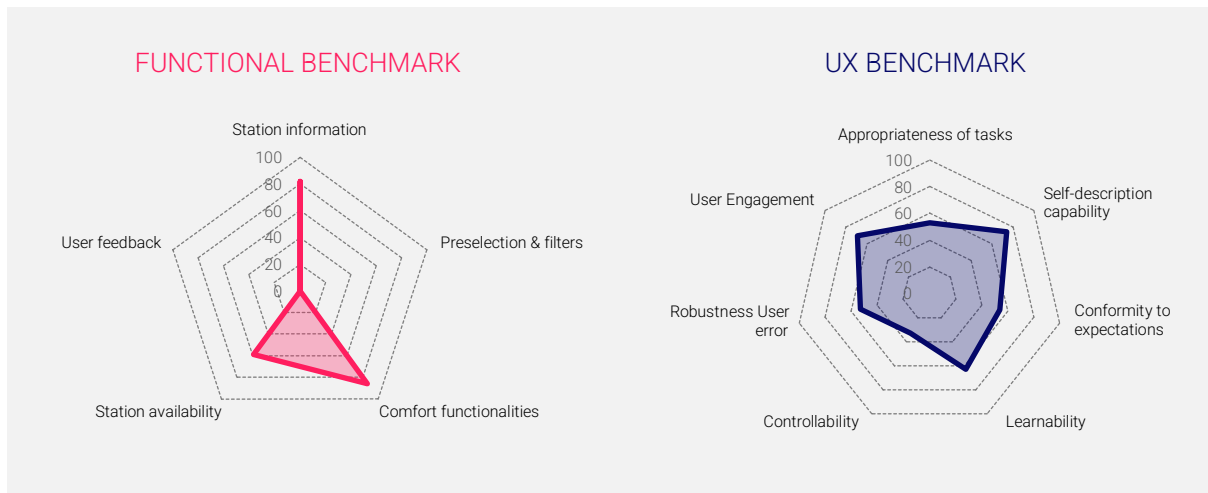
PLACE 07 - TESLA (PERSPECTIVE: TESLA-DRIVER)



The Tesla app from the perspective of a Tesla driver closes the ranking of vehicle manufacturers with 64 points. A decisive aspect when considering this evaluation is that Tesla integrates some functions directly into the Tesla vehicle display, but these are not shown in the app. In addition, this eMobility Excellence Benchmark is limited to the charging apps and does not include any functions that are implemented exclusively in the vehicle. This is a clear research limitation of this publication and has implications for the evaluation of Tesla from the perspective of a Tesla driver. Tesla's app is also considered from the perspective of a Tesla driver for the first time in this year's benchmark. Due to additional app functions for Tesla drivers (e.g., charging stop planning in the app, saving a vehicle), the Tesla charging app performs better from the perspective of a Tesla customer than from the perspective of a non-Tesla driver.



For Tesla drivers, the minimalist application displays basic information about Tesla charging stations and also provides insights into further information about the location (e.g., restaurant, toilet). Furthermore, a capacity utilisation diagram is implemented in the charging app so that availability can be predicted very well in combination with the large Tesla charging parks. Currently, no roaming charging points are displayed in the Tesla charging app and there is no option to rate charging locations.

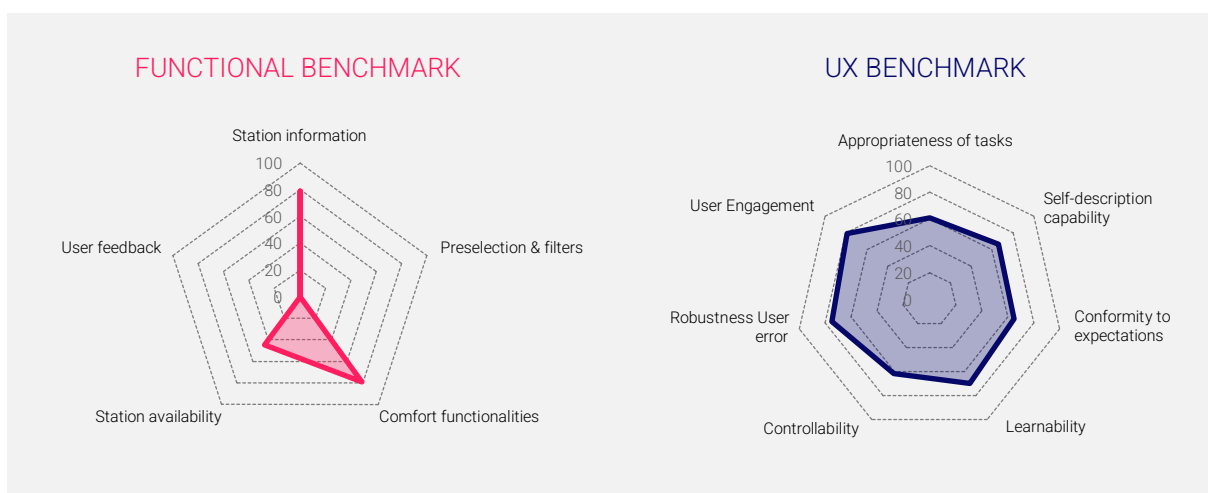
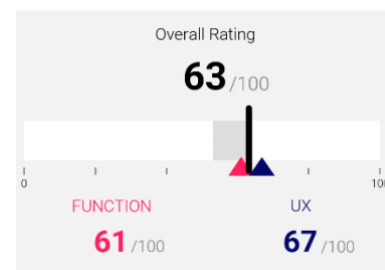


6.3. NETWORK-BOUND CHARGING APPS:

PLACE 01 - FASTNED (FASTNED)



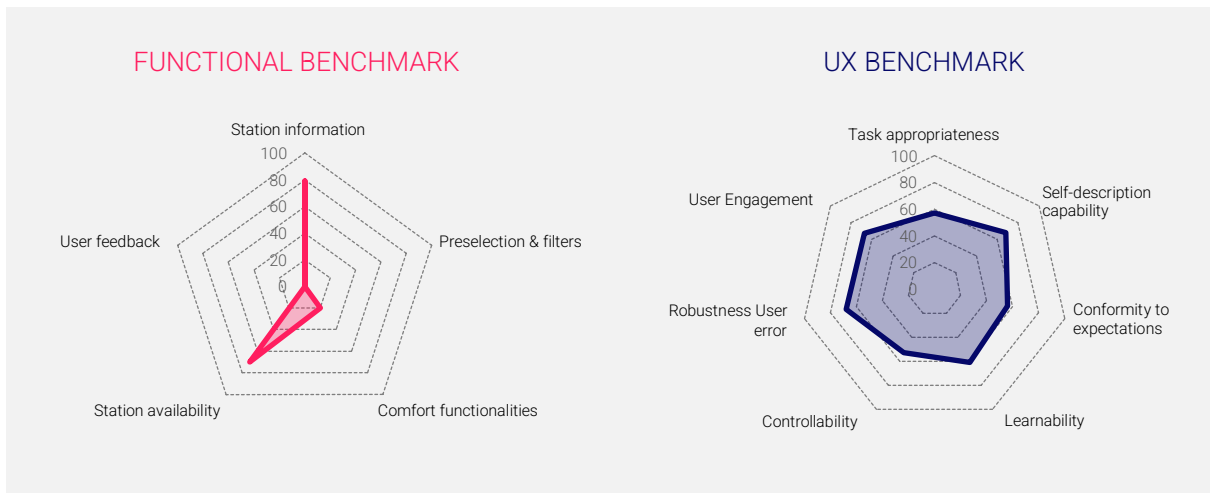
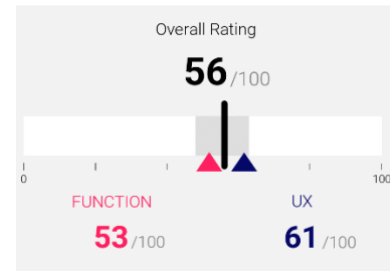
Fastned's MSP app came out on top among the network-based charging apps with an overall score of 63 out of a possible 100 points. In the functional test, Fastned achieved a good result in the station information and convenience functionalities categories, in line with the weighting for apps from fast-charging station operators. The lack of availability forecasts or notifications and the lack of options for rating charging stations led to points being deducted. Fastned impresses with the integration of charging stop planning and vehicle selection as the only network-bound e-mobility service provider. From a user experience perspective, Fastned only supports users in their search for suitable charging stations equally well as other charging apps. Although the functions are perceived as very clear, the support for tasks such as searching for a suitable charging station is rated as average. Some descriptions of functions and illustrations, are less in line with the usual handling of charging apps. For example, the display of detailed information about a charging station only appears on the third level.



PLACE 02 - KAUF LAND ECHARGE (KAUFLAND)



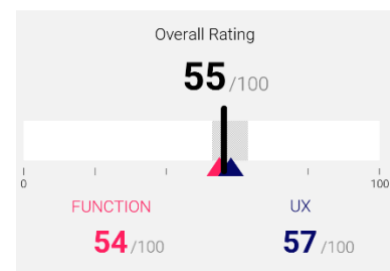
Kaufland's Kaufland eCharge app came in second place in the overall assessment of network-based MSPs. Kaufland achieved this rating primarily thanks to its good results in the areas of station information and station availability. A broader range of convenient functionalities (e.g., vehicle selection, charging cost forecast, FAQs for quick help for users in the app) as well as pre-selection and filters would be desirable from the end customer's perspective, but may be excessive for the current use case. The prices and availability of the charging stations are displayed very late in the app, filters are difficult to use as a new e-mobilist and must be deselected individually. If no free charging station corresponding to the filter is available, no additional charging stations are displayed and no instructions are given for an adjustment.

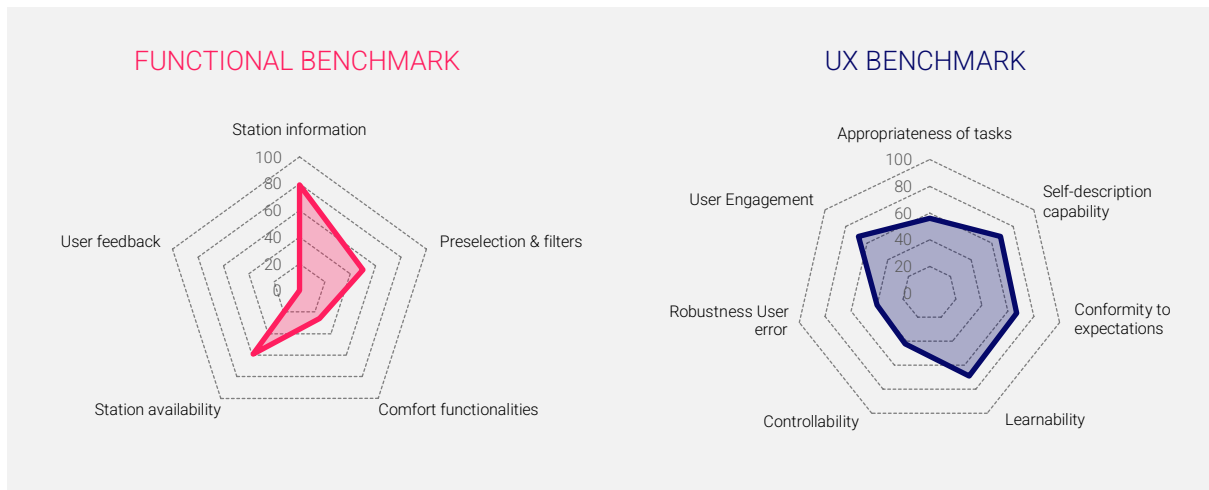


PLACE 03 - LIDL PLUS (LIDL)



The Lidl MSP charging service is integrated into the discounter's general app. In the overall assessment of network-based charging apps, the Lidl Plus app came in third place with 55 out of 100 points. The Lidl Plus (Lidl) app achieved high scores in the station information and station availability categories. Low scores are achieved for the functions assigned to the categories convenience functionalities and pre-selection and filters. Lidl Plus is not primarily designed as a pure MSP app, but rather as a supplement or additional offer for Lidl customers. Lidl's charging stations are powered by green electricity. Visible user feedback is not integrated into the application. Tasks can be carried out less effectively as, for example, prices are not displayed early on and the map search does not offer support for postcodes or locations. It would also be helpful to display the number of available stations directly on the map. Furthermore, cluster levels are not very plausible, and the zoom on the individual charging stations is sometimes irritating. Nevertheless, the application is sufficient in its current role as an additional charging service for customers of the Schwarz Group.

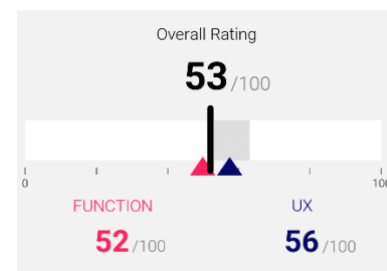


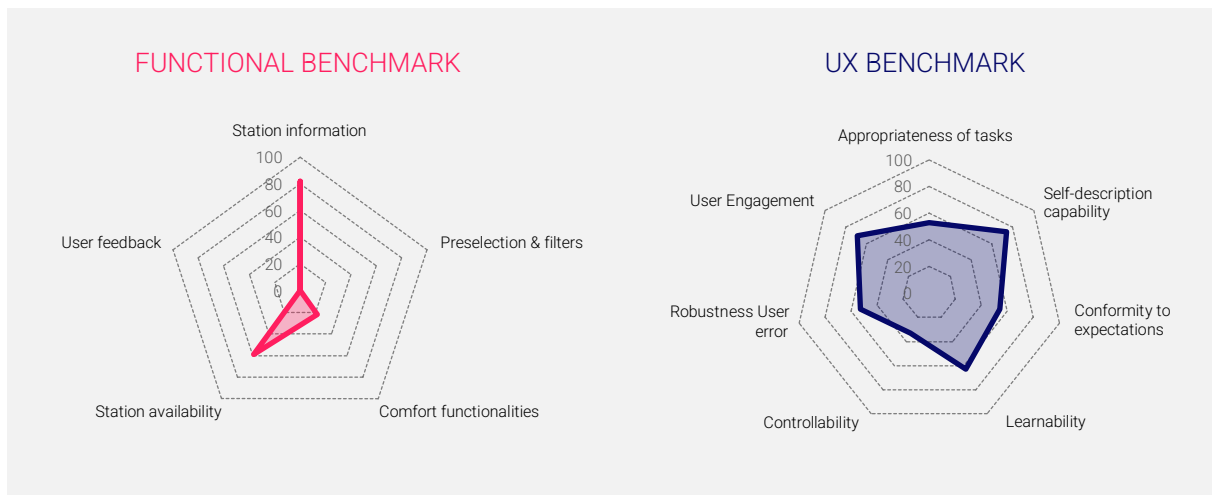


PLACE 04 - TESLA (PERSPECTIVE: NON-TESLA-DRIVER)



From the perspective of a non-Tesla driver, the Tesla app achieved a higher score in this year's benchmark than in the previous year. The app scores points for its comprehensive information on the charging station and charging location. In addition to the usual station information such as address and price, Tesla uses icons to display further information about the location, such as nearby restaurants or toilets. The utilisation of the charging location is also forecasted by means of an hourly utilisation diagram. Points are deducted for the lack of a vehicle selection for non-Tesla drivers or an option to rate charging locations. The limited functionalities are also clearly evident in the UX test and limit the feasibility of the use case from the respondents' point of view. It should be noted, however, that the application is of course designed for Tesla drivers and more functions are available from this perspective (e.g., route planning). Unlike Tesla, the charging services of other vehicle manufacturers are closed to drivers of other vehicle brands. Tesla has also opened its charging app to other brands in order to give a higher number of potential customers access to its own charging network and thus sell more energy at the Tesla charging parks. The current Tesla app is well designed for this strategy. For non-Tesla drivers, the application offers the basic functionalities that enable charging at Tesla locations. Beyond that, however, the app offers little support or convenience.

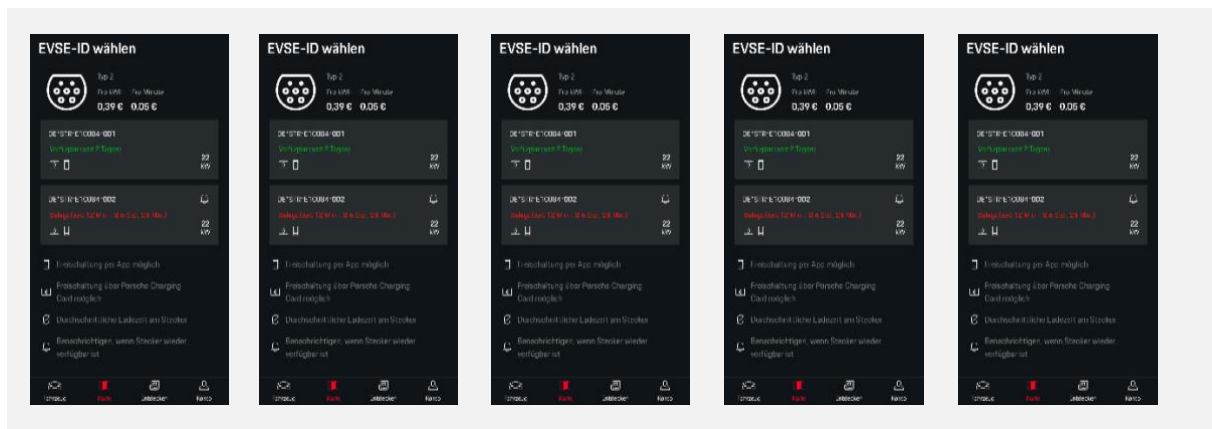




7. SPECIAL FEATURES

STATION AVAILABILITY:

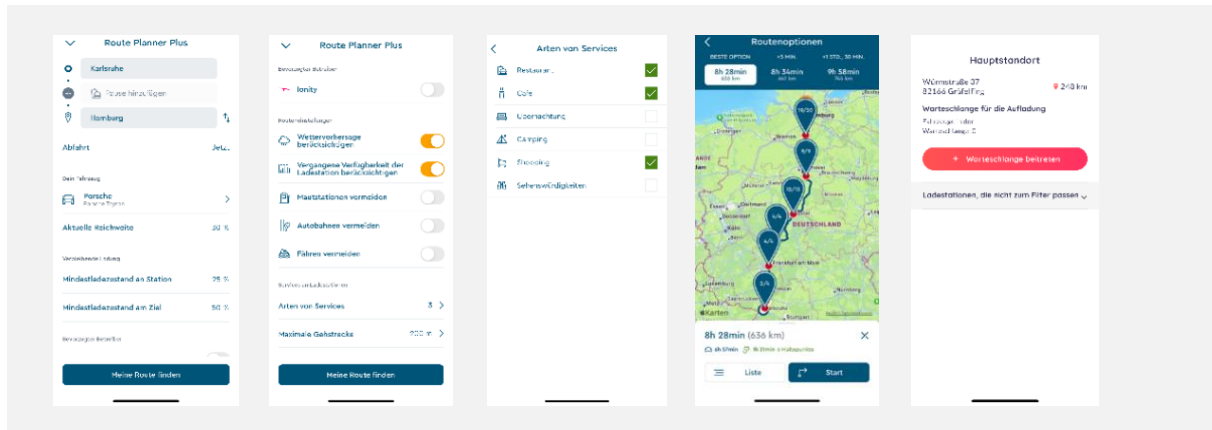
The mobility+ applications from EnBW and E.ON comfort Drive have introduced a new feature since the last functional benchmark which shows the current duration for which the desired charging point has already been occupied. However, the My Porsche app is taking the forecast of station availability to a new level this year. When clicking on an occupied charging station, Porsche not only shows the current occupancy time. The average occupancy time is also displayed, allowing users to estimate when the desired charging point will be available again.



CHARGING STOP PLANNING:

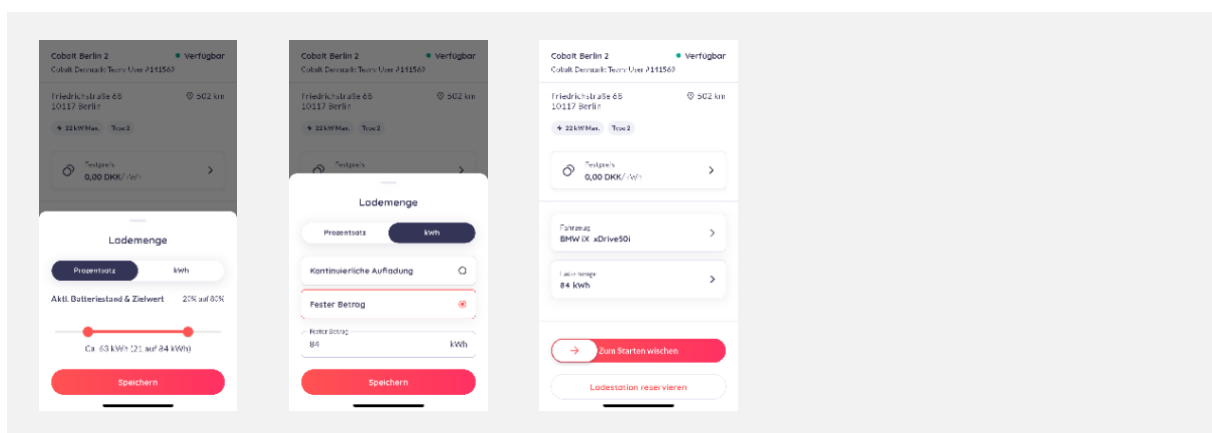
Charge Now shines this year with its outstanding charging stop planning. Users of the app can select their vehicle, current range, minimum charge level at charging stops and destination and preferred operators for their charging stop planning. Extended possibilities are offered by certain route options that not only include toll, motorway and ferry settings, but also allow weather forecasts and the past availability of charging stations to be taken into account. Users can select their charging stops according to

additional services at the charging location, such as restaurants, accommodation, shops and sights. This way, not only route planning works optimally but also the time spent charging can be spent as comfortably as possible. The apps Shell Recharge, ADAC Drive, Fastned and the apps of the OEMs Audi, BMW, Mercedes-Benz, Porsche, Hyundai and Volkswagen also offer their users charging stop planning.



COMFORT FUNCTIONS:

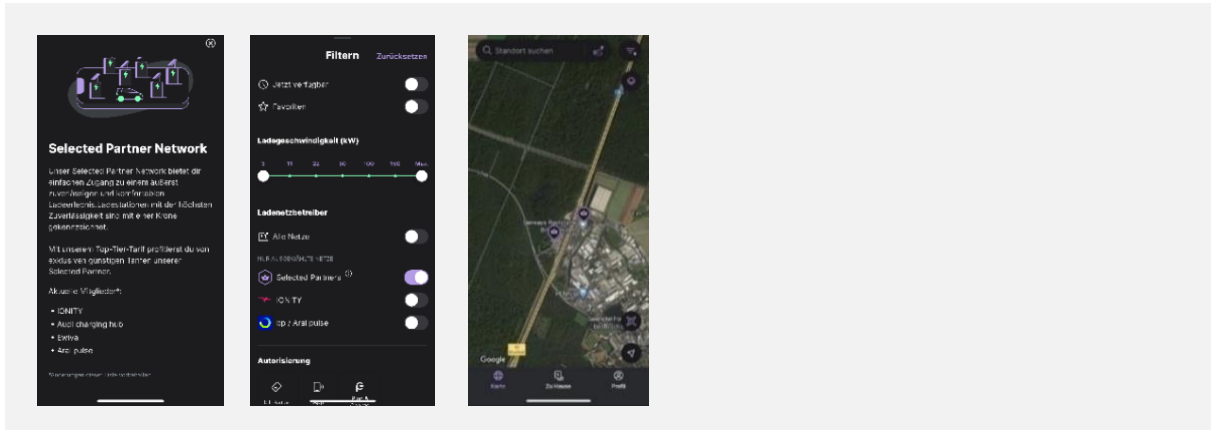
The MSP app Monta offers particularly innovative functions. In addition to the option of reserving a charging point, there is also the so-called "Smart Queue". This function allows users to join a virtual queue at some charging points and receive a notification as soon as it is their turn. If they are not yet ready to charge, users can let the next person in the queue go first. Another new feature in the Monta app is the setting of the charging quantity. While the vehicle is usually charged continuously, users of the Monta app can set whether the charging process should end after a certain amount of charging instead, or when a desired target battery charge level is reached. Audi also offers the option of making a reservation at its charging hubs.



QUALITY CHARGING:

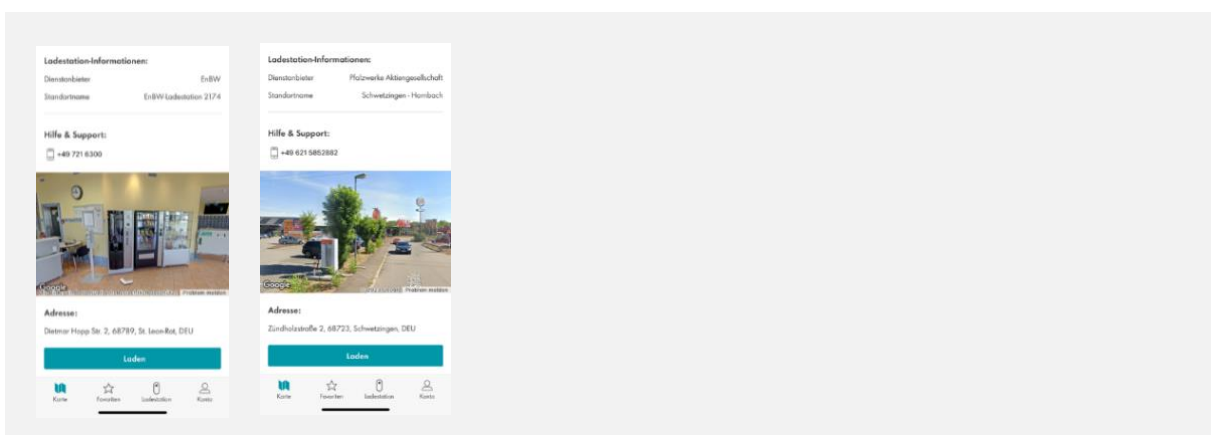
Elli and E.ON Drive comfort stand out with a special filter option. Both providers rate charging stations according to their reliability. Charging locations with particularly reliable stations can be filtered separately

by users. E.ON Drive comfort realises this feature with the elvah score. Recommended stations are highlighted here with a diamond icon. Elli implements the function through the Selected Partner Network. With charge point operators who are members of this network, users benefit from a more favourable charging tariff. The most reliable stations of these partners are labelled with a crown.



FURTHER LOCATION INFORMATION:

Additional location information helps users to select charging locations that offer them a particularly convenient charging experience, as they can select charging stops based on whether there are toilets or a café nearby, for example. E.ON Drive comfort relies on the community effect and gives users the opportunity to add the features of a charging location themselves using various selection options. Tesla shows icons when clicking on the charging location which indicate for instance a toilet or food option. Shell Recharge integrates a special function into its app. Each charging location contains a Google Street View with which users can explore the area surrounding the charging location in the app. This allows them to find out for themselves what special features the charging location has to offer and whether additional facilities such as toilets or restaurants are available.



SUPPORTING INFORMATION DURING THE CHARGING PROCESS:

E.ON Drive comfort provides various information during the start of a charging process, which can be particularly valuable for e-mobility newcomers. The app informs users about the station first checking the connection and notes that E.ON Drive Comfort does not immediately receive live information about the success of the charging process. Users can then also confirm themselves that the car is charging and the view jumps to the charging time overview.

