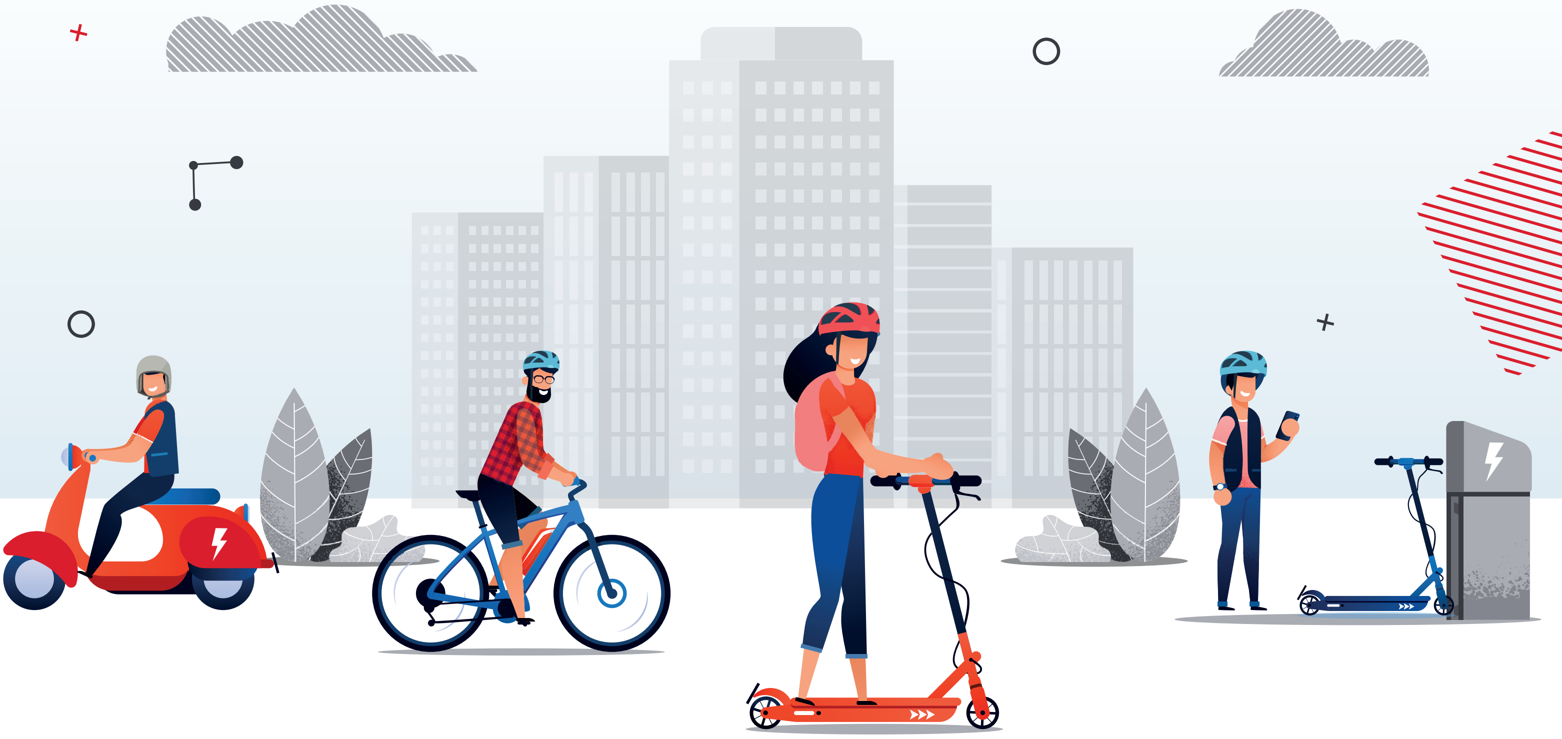
New Mobility



Deconstructing the Micromobility Phenomenon

A strategic analysis of crucial success factors

Porsche Consulting
Strategic Vision. Smart Implementation.

Introduction

The world of mobility is undergoing a tremendous transition. Traditional combustion engines are gradually being replaced by new electric drive concepts. Vehicle ownership is becoming less important and shared mobility services are on the rise. Micromobility shapes the future of urban transportation; therefore this paper analyzes the requirements for establishing a successful micromobility service.

Over the last two years, innovative micromobility services have drastically reshaped the urban landscape of countless metropolitan areas across the globe and contribute to the future of passenger mobility. According to Horace Dediu, a renowned expert in the field, the idea behind micromobility is the unbundling of the car. Instead of using one's own automobile for every trip, users will instead select a vehicle according to their specific need. For example, a user may choose an e-scooter to visit a friend around the corner or a bike with a big basket to go grocery shopping. Today micromobility can be defined as an electrically powered transportation solution involving e-bikes, electric scooters (or e-scooters), or any other lightweight vehicle used as a shared medium among multiple users. It usually covers short distances of not more than eight kilometers and reaches a top speed of 25 kilometers an hour. A weight limit of 500 kilograms differentiates lightweight utility vehicles from other transportation solutions and thus excludes automobiles.[1]

But why has micromobility rapidly increased in importance in the modern mobility landscape instead of remaining a side note? With 70 percent of the world's population estimated to be living in cities by 2050, there will be more demand for urban passenger transportation. While public transport remains the most efficient means of moving large numbers of people, micromobility's potential lies in connecting people to the existent transportation network, solving the common problem of the first and last mile. Furthermore, this business model is an environmentally friendly alternative for short-distance transportation. In the United States, for example, more than half of the trips taken by car annually are under eight kilometers[2], a distance that could be covered by e-scooters or e-bikes.

	1st era	2nd era	3rd era
	1965-1999	2000-2016	From 2017
	Station-based bicycle sharing	Free-floating bicycle sharing	Free floating electrified devices
Pioneers	Bycyklen	ofo mobike	BIRD Lime
Place of origin			
Key technological advancement	Rack locking system	Smartphone, GPS	Miniature electric motors
Business model	Subscription	Pay-per-use	Pay-per-use/ subscription

Fig.1 The three eras of micromobility[3]

The origin of micromobility was nonelectric and dates back to 1960s when the Provo countercultural movement in Amsterdam launched the first community bicycle program. In 1995 Copenhagen City Bikes, the predecessor of the Danish bike-sharing company Bycyklen, started the first station-based operation on a large scale with 1,000 units in Copenhagen. This is considered the first era of micromobility (Figure 1). Since then, a large number of urban bike-sharing programs have emerged that allow users to unlock the bike using a smart card or coin currency. This second era of "free floating" or dockless micromobility has flourished with the advent of smartphones and GPS sensors. The innovation became a huge phenomenon in China, where companies such as Ofo and Mobike deployed millions of bikes that ultimately cluttered the sidewalks and thus generated a great deal of criticism from residents and authorities. Better-engineered, electrically powered vehicles ushered in the third era of micromobility, perhaps most rapidly in the US, where e-scooter companies such as Bird and Lime are currently enjoying high adoption rates. This business model has also gained tremendous attention on a global scale, as it has the potential to solve urban mobility problems. That micromobility has become an essential component in the future of mobility is indicated by its recent growth: Lime, one of the largest companies for e-scooter sharing, has raised nearly US$1 billion in less than two years. In December 2018 the startup announced that it had surpassed the benchmark of 26M rides on its traditional and electric bikes as well as e-scooters,[4] a growth rate nearly four times that of the ride-hailing company Uber. And yet this California giant is not alone in yielding promising figures: the German startup Circ, for example, raised €55 million in its Series A funding round.[5]

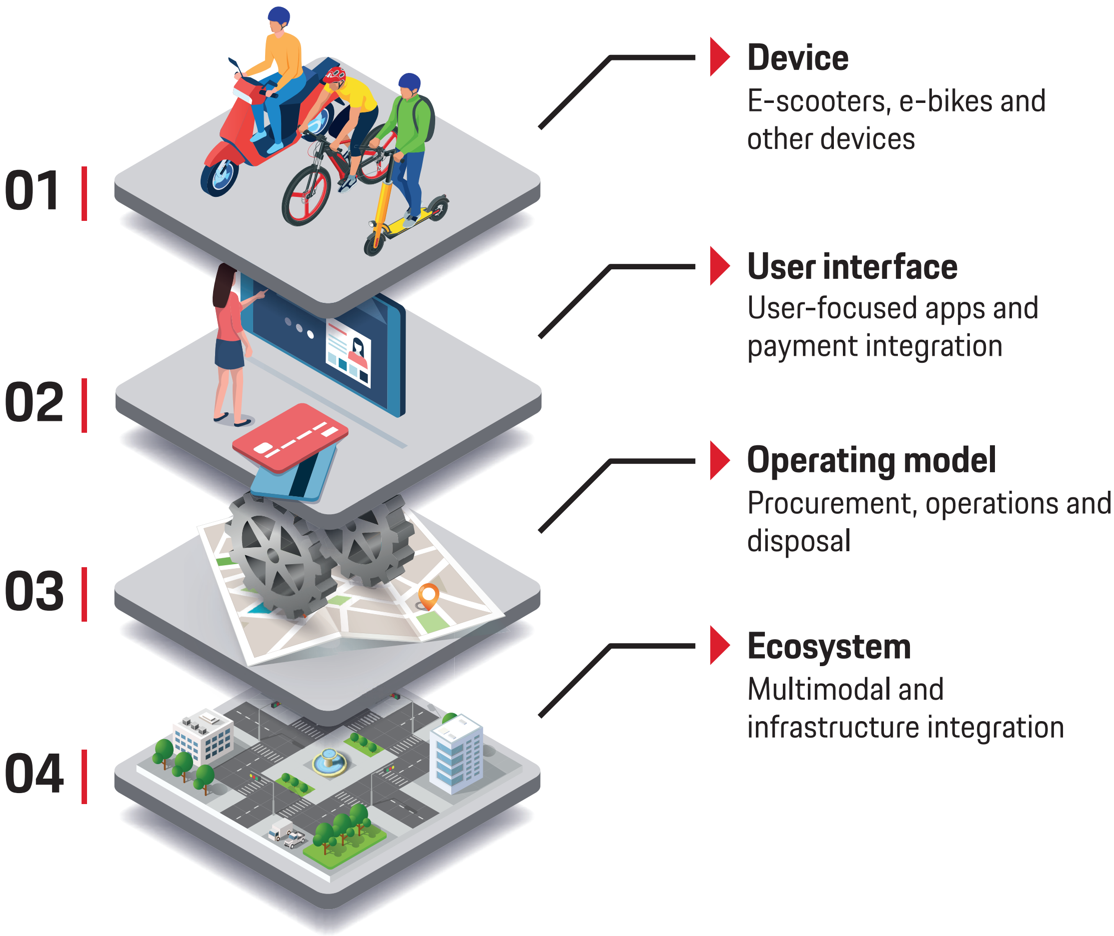


Fig.2 The four layers of micromobility services

Although the phenomenon is dominating global mobility headlines, shared micromobility is still in its infancy and therefore not well understood. Questions spring to one's mind, such as "what makes a micromobility service successful?" In seeking to answer this question, we have identified four layers that function as key determinants in micromobility's service success—device, user interface, operating model, and ecosystem integration—which will be explained in this paper (Figure 2).

To establish a micromobility service, providers need to offer different devices according to specific use cases, usually determined by the demand in an urban area. The user interface offers a touchpoint to connect customers, alternative mobility providers (e.g., public transport) and the micromobility service provider. Choosing the right operating model is essential to ensuring high utilization rates and customer satisfaction. Finally, mobility service providers need to cooperate with cities on integrating their service offering into the existent ecosystem and building a multimodal platform.

Micromobility layers

01 | Device

The first component that users typically focus on is the device. Despite the user journey encompassing a great deal more, the user experience largely stems from the actual utilization of the mobility service's device to get from A to B. While the device serves its purpose as a means of transport, it can also evoke feelings of comfort and security or convey a sense of fun or prestige. Micromobility providers are well advised to include diverse devices in their fleet that cater to various use cases determined by not only climate conditions, street quality, and infrastructure but also patterns reflecting frequency of utilization (e.g., commuters compared to tourists) and a city's corporate centralization (CBD).[6]

Research findings from the US show that 80 percent of all personal trips cover distances of less than 15 kilometers,[7] which creates numerous opportunities to offer various kinds of micromobility devices and other short distance services like ride-hailing. While most people walk distances of up to one kilometer, typical use cases for micromobility vary. On average, e-scooter trips range from half a kilometer to five kilometers. Shared bikes are commonly used for distances of one to five kilometers, with e-bikes and large e-scooters[8] increasing the average trip distance (Figure 3).

> **Devices market themselves!**
>
> Salvatore Palella,
> Chief Executive Officer, Helbiz

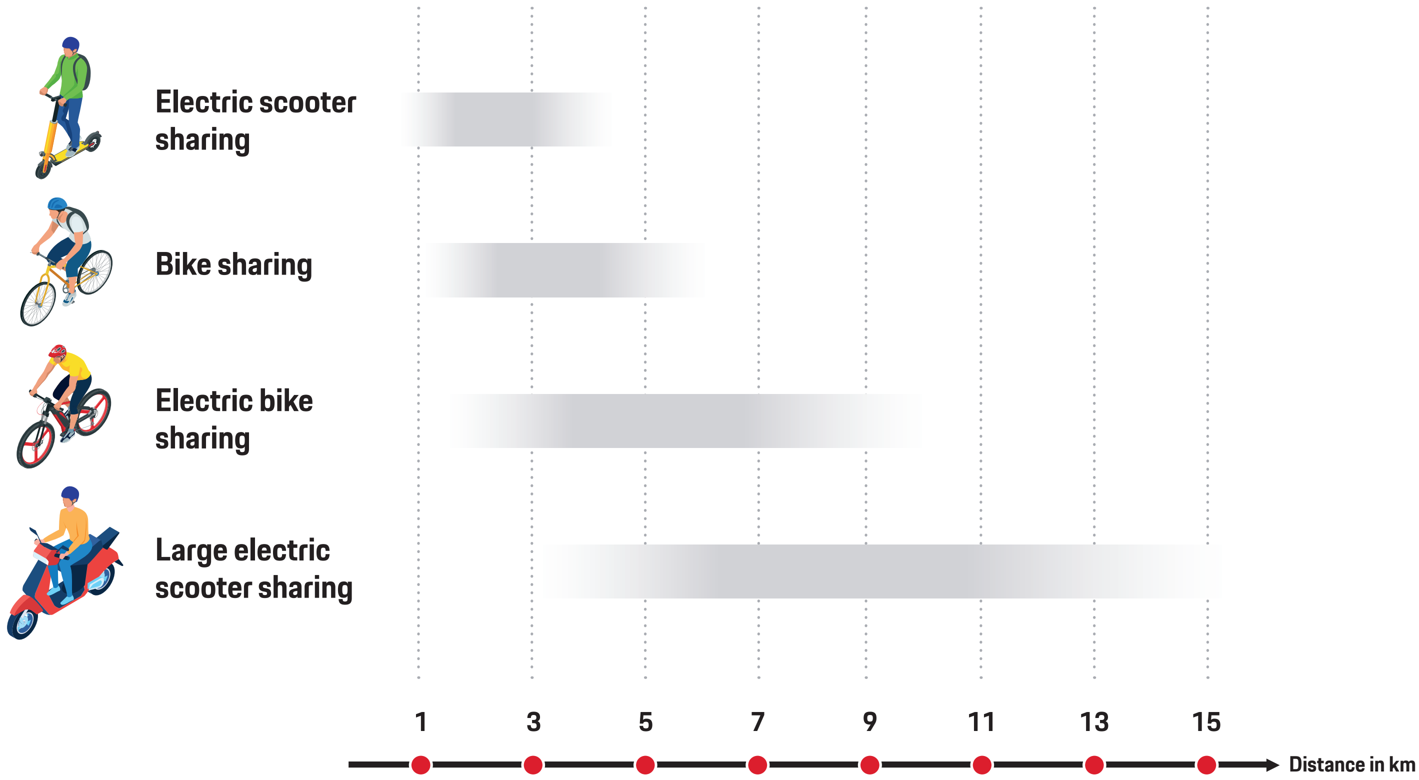


Fig.3 Typical device utilization by distance[9]

Nevertheless, every device has its limitations. E-scooters do not perform well on hills or on streets made of rough material, such as cobblestones. They are error-prone in wet weather conditions and seldom provide storage of bags. While traditional bikes may also seem unsuitable for hilly areas, both traditional and electric bikes can suffer from flat tires due to road pollution and offer limited adjustability to suit the different heights of users.

Micromobility service providers should evaluate the types of devices suitable for the local environment, analyze the need for different use cases, and develop their mix of devices accordingly. One example of a well-balanced selection of devices is found in Berlin, where Lime's micromobility service offers e-scooters as well as traditional and electric bikes. The right mix of devices can be a key success factor for micromobility service providers.

Another crucial differentiator is the device itself. Every service provider needs to ensure that its selection of devices supports business needs in the best way possible. When deploying a service, providers make a fundamental decision regarding device procurement and development.

One option is to purchase a common device that is already available on the market as a bulk purchase, retrofitting with branding and technology in a subsequent step. This strategy is exemplified by the scooter-sharing company emmy, which has deployed the large e-scooter model Elektro Schwalbe by Bosch and tailored the device to their needs. This approach may not differentiate the device from its competitors or provide the optimal solution for the local market, but it can achieve a cost advantage and ensure fast deployment.

The second option is to develop a device specifically tailored to the sharing use case. The development phase encompasses market research, user interviews, and user testing and results in a company-specific device. Uber Jump's unconventional electric bikes are a good example and include such details as a large basket for bags, a stable frame, and a unique design that conveys the brand, thereby differentiating the device from its competitors. Developing a device is more time-consuming and cost-intensive but can provide enormous value by carrying the brand, ensuring high quality, and thus distinguishing it from competitors.

Adaptions or special developments can also be triggered by legal or regulatory requirements. In contrast to many other countries, in which regulations are either nonexistent or established while operations are already running, the German legislation has clear requirements for all devices operating on German streets, such as a bell, two independent brakes, and front and rear lighting.[10] These requirements have led many service providers to rethink their device strategy by either adapting their current devices or creating new devices according to market requirements.

According to Salvatore Palella, CEO at Helbiz, service providers must keep in mind that devices market themselves. Distributed throughout the city, the devices serve as a direct marketing tool; hence, an extraordinary design, a catchy brand name, or practical add-ons can lead to the next customer acquisition. Alternatively, devices that are obviously malfunctioning or of inferior quality can hinder new customer acquisition.

Service providers need to be aware that device quality can determine the success or failure of a micromobility service. One of the most prominent examples of a devastated image due to poor quality is OBike. This bike-sharing company, now defunct, had major quality problems and therefore many dissatisfied customers. Flat tires, malfunctioning bike lights, dislocated bicycle chains, or loose handlebars are just a few of the reported issues. Most e-scooters on the scooter-sharing market are designed for occasional private use—not heavy public utilization. As a result, the average e-scooter's life cycle is less than three months. Companies like Voi have already adapted to this problem: their new e-scooters have been developed and designed in-house, with improvements based on data collected from Voi riders.

Looking ahead, the next step in terms of quality will address the levels of intelligence built into a device. Current standards, such as GPS tracking and battery status updates, will soon be supplemented by advanced data analytics of both the customer and the device. Regarding customers, data analytics serve individual profiling or the evaluation of driver performance, for example, by analyzing the level of care customers take while driving the device. With regard to devices, automated reports of errors, maintenance requests, and the device's position (tipped over versus on its stand) as well as additional service offers based on user patterns will prove advantageous to providers who best exploit accumulated data.

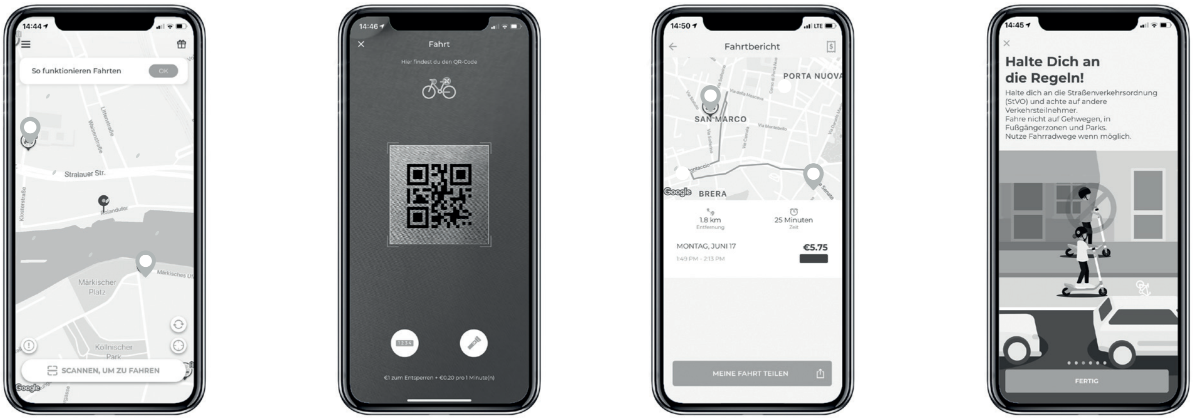
02 | User interface

The functionality and usability of a device's frontend, or user interface, is a core success factor for micromobility services. As with any user-focused app, customers expect a smooth registration process once the app is downloaded; providers need to keep track of their app "discoverability" and monitor the rating-downloads ratio. Chinese mobility apps (e.g., the courier app DaDa) have already established the benchmark with a mere two-second registration via phone number and code sent as an SMS (as opposed to entering full details).

Once downloaded and registered, the following four core functions often answer the most important questions that arise while using the micromobility service (Figure 4). Some of these would ideally be resolved even before beginning the registration process (e.g., whether vehicles are available in the user's city), thereby enabling users to quickly move forward with their aim of accessing the vehicle.

» Micromobility is a software business.

Horace Dediu,
micromobility expert



Locate

Finding the closest vehicle on a map. On average customers are only willing to walk 200 to 300 meters to the nearest vehicle. This can be solved by implementing a "nearby" button that automatically identifies the nearest vehicle.

Easy identification of individual vehicles, for instance, by grouping them together from a distance and making them visible upon zooming in.

Depiction of the possible travel range. This could be achieved by qualifying the vehicle's battery life in terms of distance instead of battery percentage, as is common today.

Offering the ability to reserve a vehicle, for example, up to 30 minutes for free or overnight (usually as a paid doorstep delivery by the provider).

Lock/Unlock

A simple mechanism, such as a QR code, that could be enhanced by adding location accuracy and context, thereby connecting the virtual to the physical world. Some companies are working on their GPS reliability or prompting the vehicle to make a sound (e.g., chirp or ring) to locate it more readily.

Easy recognition of the vehicle, which companies such as Bird or Lime achieve by requiring users to photograph their correctly parked vehicles. This helps the next user to find the vehicle and curbs illegal parking.

Pay

A transparent overview of the costs, which the user ideally receives as an estimate before commencing the ride.

Making the payment process seamless and quick, for instance, by integrating native payment options (e.g., Apple or Google Pay) and consequently increasing conversion. Studies show that by integrating native payment platforms, services can achieve a twofold conversion growth.[12]

The potential for further data, such as distance covered, CO_2 emissions saved, or calories burned.

Customer Service

A simple tutorial of how to use the service (a maximum of four screens).

Telling the customer why certain information is needed (e.g., location permission to find nearby vehicles or camera access to unlock the vehicles with a QR code).

Providing prompt assistance and support, either with FAQs or a direct link to a customer support hotline.

Fig.4 Core functionalities of service provider app[11]

In addition to such must-have functions, governments might also require providers to implement certain features, such as geo-fencing, no-parking zones, or access to certain data (e.g., departure and arrival points). For juicers and chargers, the feature set is usually similar to the one aforementioned: vehicle location, rebates for charging the vehicle (based on when it was last charged), and detailed guidance on where to place/release it once charged.

03| Operating model

Micromobility industry leaders agree that unit or device economics are paramount from an operations standpoint. Unit economics are calculated according to the tasks performed on a recurring basis for service operations, whereas costs incurred before and after the actual operations are mainly disregarded (Figure 5). Nevertheless, these costs play a crucial role not only for service profitability but also for sustainability. To provide a comprehensive picture of the micromobility phenomenon and its unit economics, a device's life cycle must be understood from beginning to end.

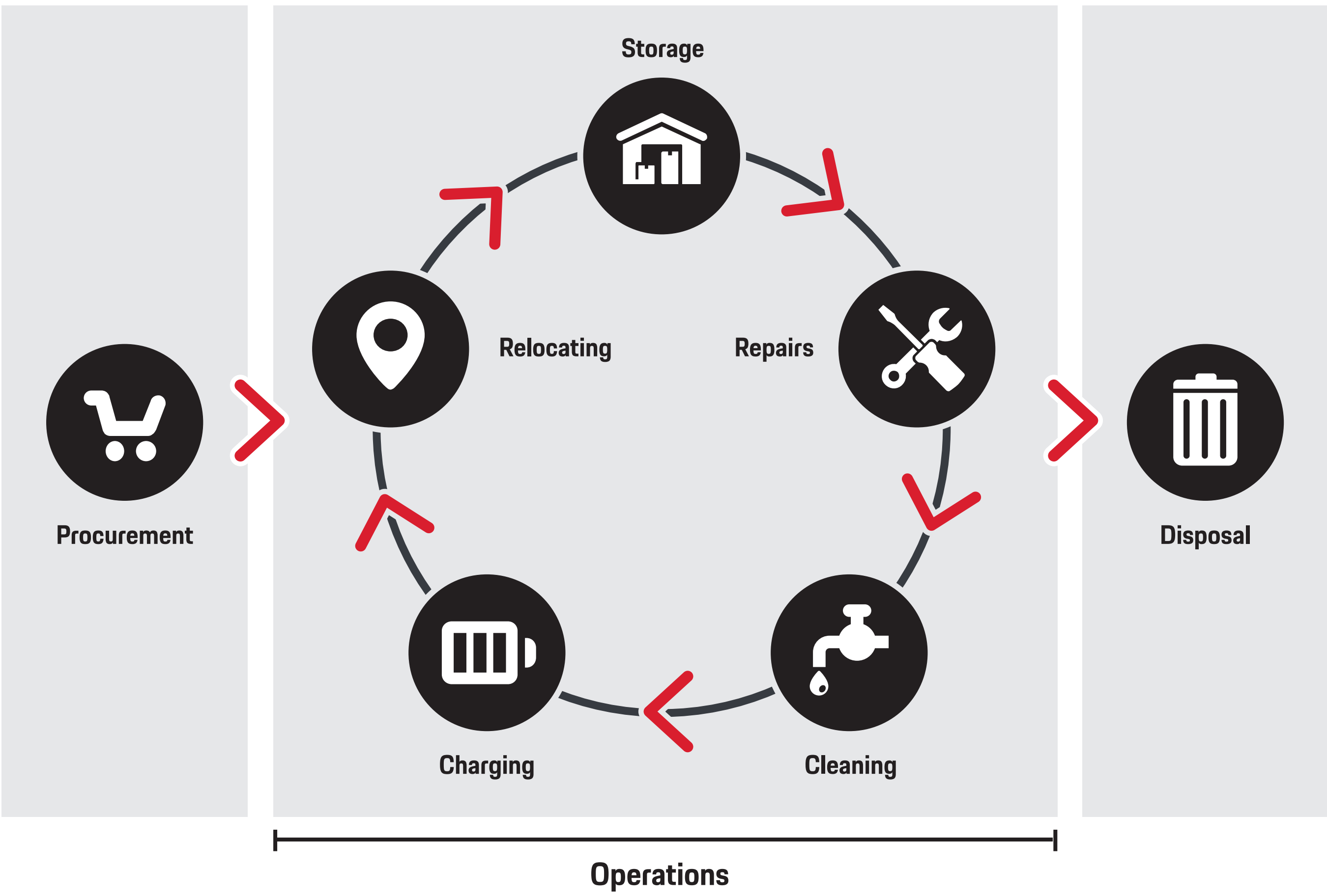


Fig.5 Three phases of a device's life cycle

Procurement

When the pioneers of e-scooter sharing launched operations in 2017, the majority of e-scooters were procured from Chinese manufacturers like Xiaomi or Segway Ninebot, with an average unit price of US$400–700. Today most micromobility players explore proprietary development to adjust specifications with the objective of improving device connectivity and sturdiness. When comparing the first e-scooter generation of Lime or Bird with their most recent (third) generation, the importance of device procurement and development becomes apparent. While the first generation seems more like a children's toy than a mobility vehicle, the third generation appears full-fledged and purpose-built for micromobility. Similarly, suppliers of micromobility devices have understood this shift in customer requirements, and manufacturers like Okai and Xiaomi have started to offer extremely durable e-scooters. According to industry experts, durability must be between 100 and 120 days per vehicle in order to operate micromobility services profitably.[13]

Logistics and import tax are two additional aspects to be considered in unit economics, as most e-scooter and bicycle suppliers are based in China. Industry experts view delays in the supply chain as extremely critical, because they pose an imminent threat to service operations and expansion plans. Micromobility providers cope with unavoidable interference by bearing the substantial costs to sustain operations and secure market-expansion milestones. Upon arrival in the target market, e-scooters are assembled, customized according to market requirements, if necessary, and then branded. Customization and branding are particularly important for service operations. Inadequate vehicle specification can incur substantial fines or even result in the revocation of a service provider's license. On the other hand, eye-catching branding ensures that the vehicle markets itself and achieves higher utilization.

Operations

Relocating and charging are the largest cost drivers in day-to-day operations, amounting to almost 50 percent of the operating expenses. Service providers deploy different kinds of models to deliver this share of the value chain in a cost-effective manner. In the US, it is common to utilize a peer-to-peer model, in which so-called juicers or chargers collect scooters in the evening, charge the vehicles overnight, and redistribute them systematically in the morning for a small fee. Alternatively, a professionalized industry offering full-fledged service to micromobility providers is on the rise in Europe and Asia. These companies are usually commissioned to relocate, charge, store, and repair the fleet. Relocation is crucial, as this activity has a primary impact on device utilization the following day. Attractive areas to place a scooter are quickly identified. But as city governments tend to require that all citizens have access to this new form of mobility, vehicles can also be found in less attractive urban areas. The city of Hamburg has therefore collaborated with service providers to draw up a memorandum of conduct that proposes an even distribution of the scooters throughout the city. Some startups, such as eFloater, have addressed the issue of relocation by initiating development of autonomous micromobility vehicles that independently position themselves to maximize utilization; these are still in the research phase.

Relocation requirements change based on whether vehicles have a detachable battery: vehicles with this feature can be equipped with newly charged batteries on-site, while those without must be transported to a storage facility for recharging. Such facilities may also be necessary for vehicles with exchangeable batteries, if the climate of the respective market only permits operation during the summer. Ex-urban locations are often selected to ensure proximity and keep rental costs in check.

» Focus on operational excellence [...] has set the foundation for the acceleration of further e-mobility

Lawrence Leuschner,
Chief Executive Officer, Tier Mobility,
on surpassing the two million rides mark[14]

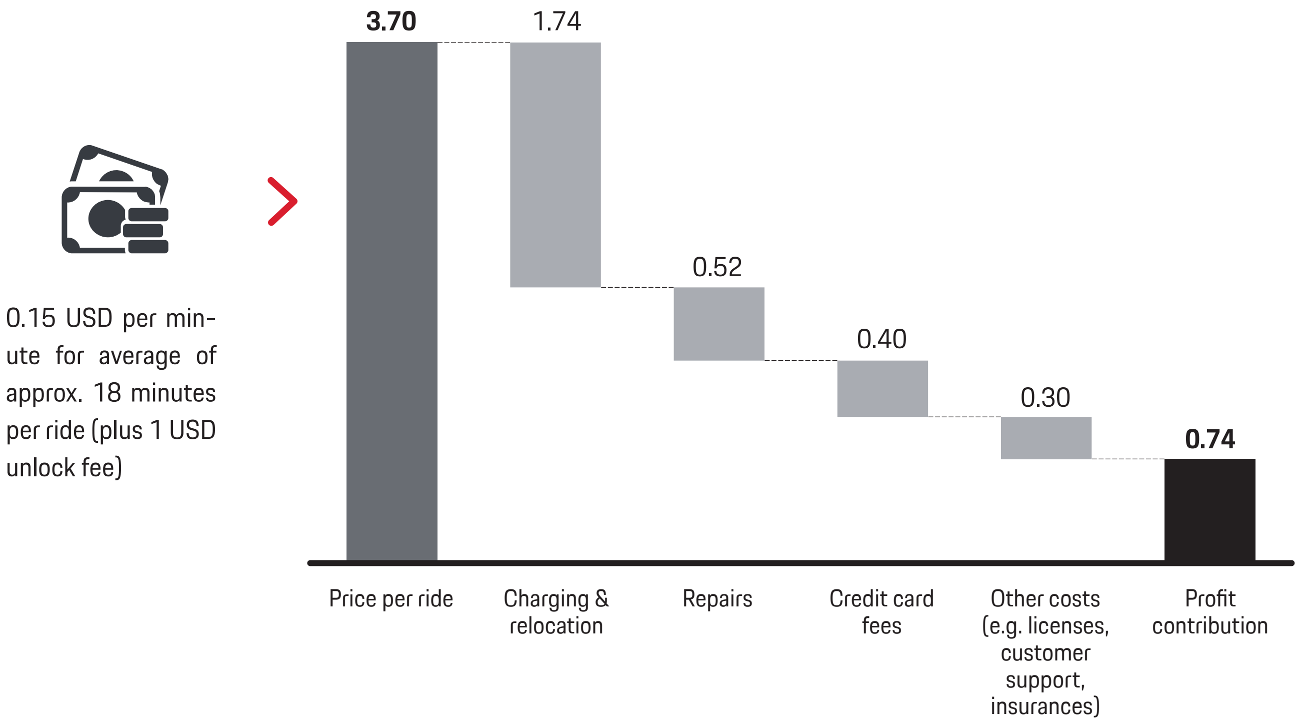


Fig.6 Unit economic breakdown for e-scooters in USD[15]

In addition to recharging, vehicles may need to be repaired during overnight storage. Experts agree that vandalism rates are a key constituent of profitable operations. The types of vandalism are manifold: devices are broken, buried, or dumped into rivers. Instructions on how to do this are found in online tutorials. Although service providers are aware of this threat, their reactions to its occurrence are surprisingly reserved. Lime has stated that stealing its scooters is "unattractive," as all of its parts are customized, making their retail value close to zero. Spin's cofounder, Euwyn Poon, believes that this behavior will only last a short time: people have "fun" tampering with new things, but once the initial novelty has worn off, the number of incidents will decrease.

A micromobility service should provide both payment and customer services. These two aspects comprise a minority of the operating costs but play a major role in customer experience. The most common customer inquiries are related to locking, unlocking, and using the device as well as payment. Industry operating managers see this as particularly important for first-time users. Furthermore, customer service takes care of edge cases in which users have parked vehicles illegally or were even caught speeding. The small transaction amounts in micromobility can result in high payment costs, particularly due to credit card fees. Service providers have therefore begun to experiment with payment methods that do not immediately deduct rides from credit cards but bill and collect on a monthly basis. A detailed breakdown of all operating costs can be found in Figure 6.

Disposal

At the end of their life cycle, vehicles must be collected and recycled in order to prevent the oversupply and vehicle "graveyards" that occurred in China in 2017/18. The recycling of the lithium-ion batteries poses a particular challenge and is point of criticism for environmentalists. According to recycling companies, inappropriate disposal of electric-scooter batteries can cause fires or leak harmful substances that risk damages in the millions of Euros. Although the EU has enacted a law that stipulates the proper disposal of degraded device batteries,[16] e-scooter companies have not yet presented a clear strategy to address the issue of recycling dismantled vehicles. It remains to be seen whether service providers themselves will come up with a solution or legislation will make service providers responsible for recycling, as is the done in the automotive industry.

04| Ecosystem integration

Mobility service providers need to cooperate with cities, other mobility service providers, platforms, and original equipment manufacturers (OEMs) to integrate their service offering into the existent ecosystem (Figure 7). There are a number of options for service providers to interact with or integrate themselves into ecosystems.

Multimodal integration

Cooperating with multimodal platform providers or creating a multimodal platform around a service can provide enormous value to customers and rapidly increase the user group of a respective service. A standalone mobility service may not generate as much value for customers as one that is integrated into a mobility ecosystem. For example, Voi collaborates with Hamburger Hochbahn, the city's public transit company, to supplement public transport in the city's outer districts.[17] Other multimodal approaches are exemplified by the multimodal apps Switchh (Hamburg), moovel (Stuttgart), and Jelbi (Berlin), which facilitate booking the various mobility services of competing companies, public transport, and taxis in a single app. Collaboration with cities or public transport providers is crucial, as often only one multimodal app is permitted to fully integrate a city's public transport services.

When a service provider or partner company has a large customer base through its own app, a different approach can be taken: Uber integrates public transport and Uber Jump into its own ride-hailing app, thereby opening its app to competitors while also attracting new target groups.[18] A similar approach has been taken by Tier and Sixt, who cooperate by offering the former's e-scooters on the latter's app.[19]

Cities that have invested heavily in urban infrastructure and are under long-term contract with public transport service providers should view mobility services as supplementing their portfolio to improve residents' options rather than as competition. Cities and public transport providers are often interlinked and collaborate on mobility concepts. Service providers are therefore well advised to approach municipalities early on about their business models, operating models, and service offers.

> You'd want the city to be your friend.
>
> Salvatore Palella,
> Chief Executive Officer, Helbiz

Infrastructure integration

Markets and companies generally develop faster than legislation, which is evident in the US e-scooter market. Nevertheless, micromobility service providers who actively approach cities can still gain an advantage. The city of Berlin, for example, gave permission to one stationary bike-sharing provider to construct its stations but have not set limits on the number of free-floating, bike-sharing companies. Service providers whose business models are built on stationary bike sharing will feel the consequences if a city has already assigned this role. While free-floating bike and e-scooter services offer customers many advantages, local authorities may prohibit or limit free-floating concepts; Barcelona, for example, allows only one stationary bike-sharing, Bicing.

Another approach to introducing micromobility services to a city is by providing partial funding for its local mobility infrastructure. In the US, Bird has pledged to collaborate with municipalities to fund the construction of bike lanes that would facilitate their service, thereby creating win-win situations for both parties.[20] The city can reduce traffic by enabling residents diverse methods of transportation, and Bird can win new customers who were previously unable to use the service. Other forms of cooperation offer further options for integrating mobility services into local ecosystems—such as collaboration with local businesses and stakeholders including hotels, restaurants, cinemas, shopping centers, or university campuses. The Italian e-scooter company Helbiz is working closely with hotels not located on the beach. This collaboration helps customers gain easy access to the beach, increasing the hotel's competitive position.

In sum, it is important to work with the ecosystem—not against it. Disregarding the local infrastructure will most likely result in a less successful service.

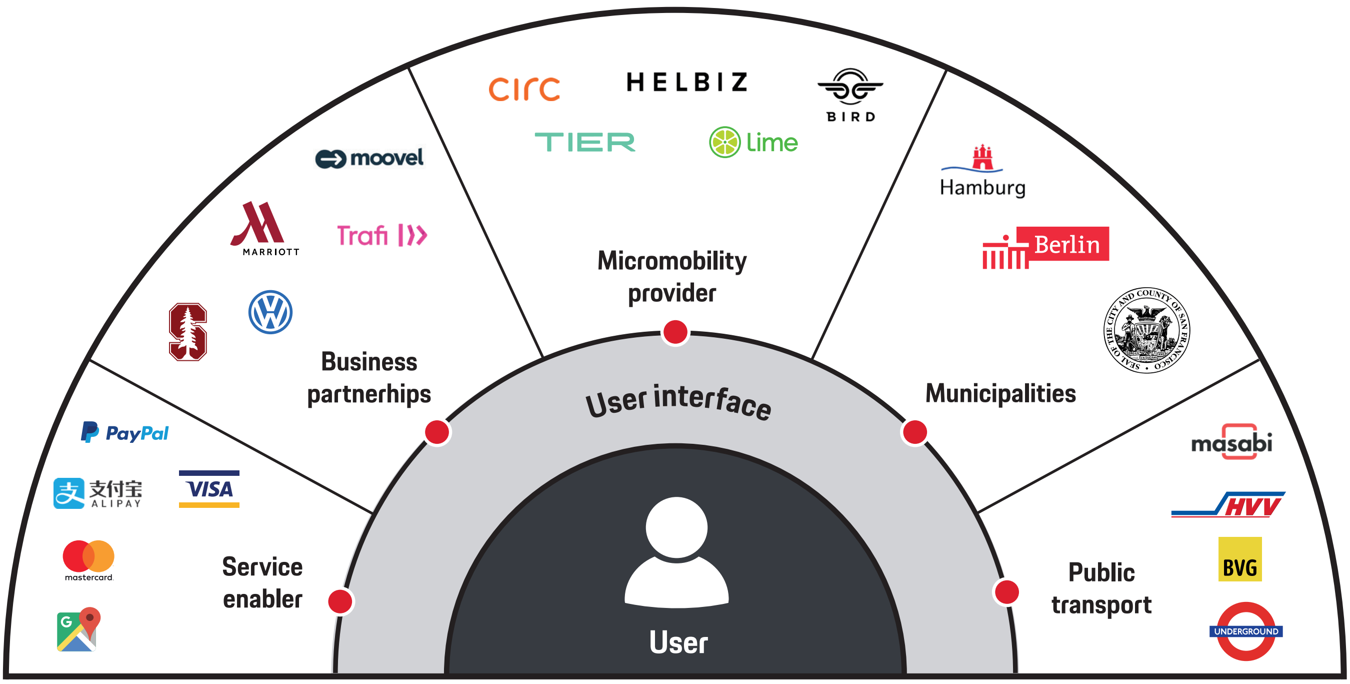


Fig.7 Micromobility ecosystem with exemplary stakeholders[21]

Strategic recommendation

To compete in the field of micromobility, service providers are advised to further invest in device development, as the trend is moving toward purpose-built vehicles with sophisticated connectivity coupled with improved sturdiness to enhance durability. Market leaders have demonstrated that device lifetimes sufficient for profitable service will not be achieved without customized vehicles. Devices can also serve as a means to market the service brand. Although e-scooters currently dominate micromobility, it remains doubtful that a single vehicle form will prevail on the market. Given regional particularities and distinct customer preferences within certain geographies, it becomes especially unlikely that a single vehicle type will be sufficient to service heterogeneous customer groups.

Software and apps are essential enablers for micromobility. Service providers can leverage software's inherent potential by not only focusing on its base functions, but also ensuring that it is scalable and extendable. There is opportunity in augmenting device connectivity to acquire additional data that helps increase operational efficiency while simultaneously improving customer centricity. Moreover, APIs (Application programming interface) are paramount for micromobility's long-term success, as these define aggregation possibilities with other mobility services and establish a foundation for further ecosystem integration.

Micromobility service providers wishing to remain competitive should focus on a number of critical factors: device lifetime is the biggest lever to achieve profitable operations. According to industry experts, device life cycles must be prolonged using highly durable, purpose-built vehicles to accomplish unit economics that contribute to the bottom line and make business scalable. Underlying mechanisms such as purchase price and vandalism rate, affecting both device life cycle and unit economics, must be kept in check to secure profitability. Like any other asset-based mobility service, asset utilization is a main constituent of success. Data-driven relocation to enhance pricing and vehicle occupancy rates will therefore to be crucial for long-term economic profit. This affects operating costs as well: any achievable reduction in operating costs—especially for vehicle distribution and charging—will secure the competitiveness of a micromobility offering.

In order to tap the full potential of micromobility, there is no way around ecosystem integration. If service providers are not on good terms with city governments, it is questionable whether the service offering can be sustained over a longer period. Local partnerships and collaboration with public transit providers can upgrade micromobility offerings, as exemplified by Uber Jump's partnering with mobile ticketing company Masabi, or German micromobility startup Tier cooperating with Berlin's public transit provider, BVG. Ultimately, the opportunity for micromobility goes beyond passenger transport; partnerships with hotels, universities, and other businesses promise further growth and revenue potential in the years to come.

Appendix

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Authors

Knut
Krümmel
Senior Partner

Eike
Gernant
Associate Partner

Robert
Stolt
Senior Manager

Benedikt
Stolze
Senior Consultant

Hannes
Moschner
Consultant

Contact

+ 49 711 911 1 22 29
Knut.Kruemmel@porsche.de

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