A Work Project, presented as part of the requirements for the Award of a Master's degree in Management from the Nova School of Business and Economics.

A STRATEGIC BUSINESS MODEL ANALYSIS OF THE MICROMOBILITY INDUSTRY

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The current analysis examines the micromobility industry, to determine existing business models and derive an improvement for the most vulnerable one. The analysis is carried out using Afuah's simplified business model canvas, in complement with primary and secondary research through interviews and industry analyses by consulting firms, databanks, and industry players. Starting as a free-to-use bike-sharing scheme, micromobility today has attracted more than $1.5bn in investments, and become an urban-mobility solution with the potential of replacing cars. Analyzing 26 micromobility firms shows that there are three types of business models: Platform, Mobility as a Service, and Ecosystem Model.

Keywords: Strategic Business Models, Business Model Analysis, Business Model Innovation, Micromobility

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STRATEGIC BUSINESS MODELS

A Strategic Business Model Analysis of the Micromobility Industry

AGENDA

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Scope, Motivation, Methodology

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5 **INDUSTRY OUTLOOK**

6 **CONLUSION**
Key Insights, Limitations, Extensions

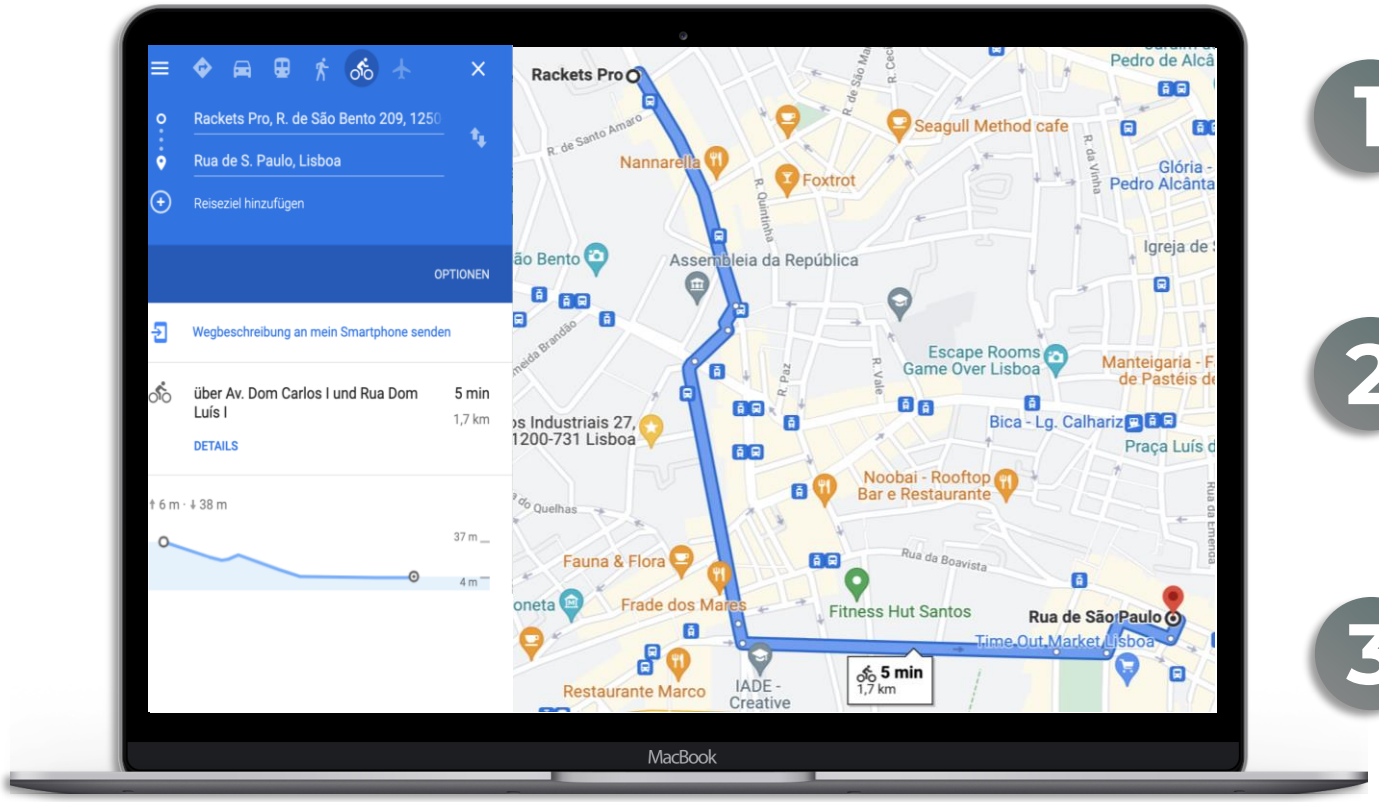
1

INTRODUCTION

The Alternatives

Getting from A to B by bike, bus or on foot are the usual alternatives, but these alternatives come with major drawbacks

How do I get from A to B?

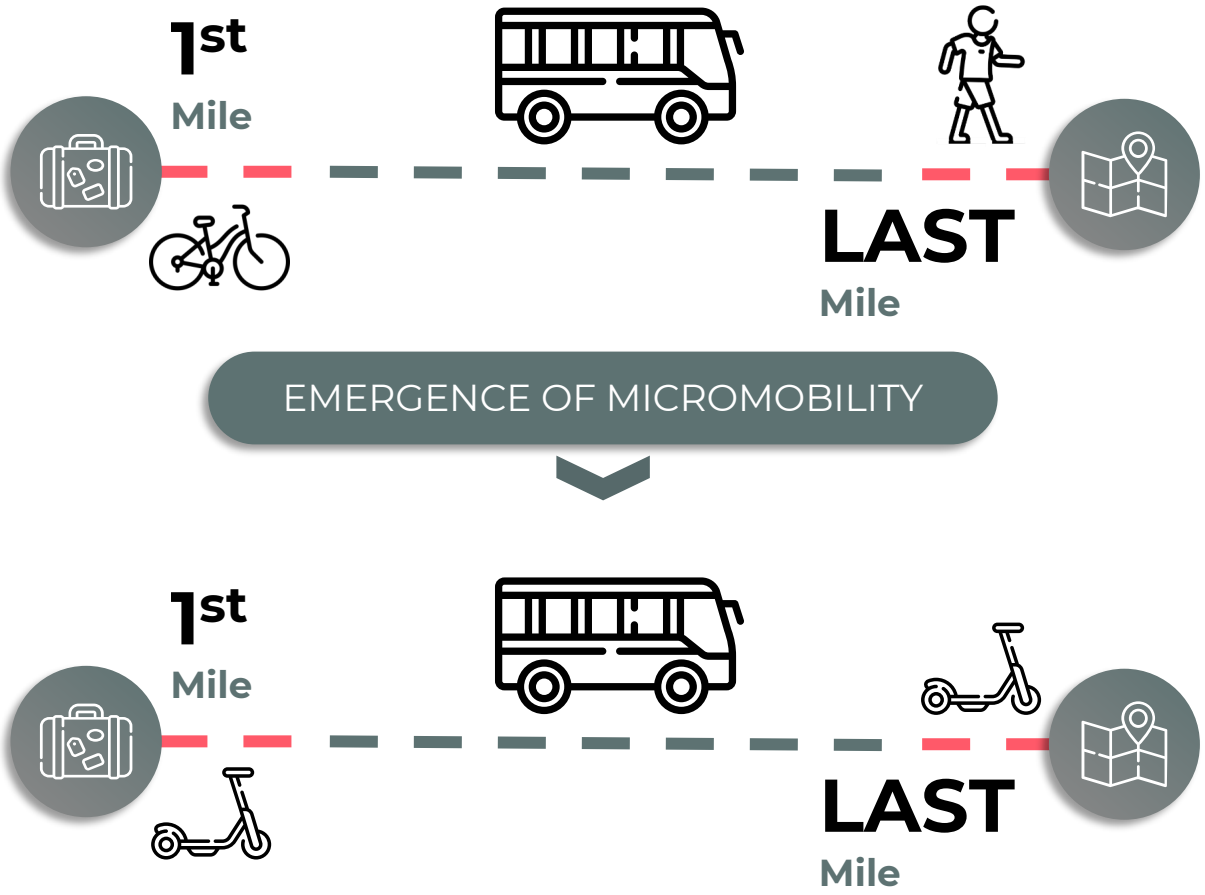


1. Time consuming
2. Exhausting, security and maintenance responsibilities
3. Dependent on proximity of public bus stations and traffic

The Solution

The problem of the first and last mile could be solved by micromobility and the related emergence of micro-vehicles like e-scooters

Sources:; 1) PolyMatter, 2018; 2) DuPuis, Griess, & Klein, 2019; 3) Song, Cherrett, Mcleod, & Wei, 2009



Comment

The inconvenient means of transportation such as walking or cycling can be replaced by **introducing micro-vehicles**. In addition, e-scooters are also poised to replace cars, or at least drastically reduce their use, as micro-vehicles can be used for an entire trip or up to a public transit stop. *Lime*, one of the most-known micromobility companies, underlined this fact. They indicated that in 2017 40% of rides with their e-scooters started or ended at a public transport station[1)].

If this micromobility phenomenon persists or further increases, **cities will gain space as the number of cars decreases**, leading to fewer congestions. Additionally, since the vehicles are electrified, it is also environmentally friendly[2)].

The **first and last mile problem can be solved**, and urban traffic may be disrupted[3)].

Definition

Many varying definitions of micromobility exist. The three major dimensions to consider are maximum speed, weight of the vehicle and the distance traveled

Sources: 1) Electronomous, 2017; 2) Lexico, n.d.; 3) Yanocha & Allan, 2019; 4) Santacreu, 2020

Origin of the term ”micromobility”

Bringing transportation to many more and allowing them to travel further and faster. I use the term micromobility precisely because of the connotation with computing and the expansion of consumption but also because it focuses on the vehicle rather than the service. The vehicle is small, the service is vast.[1)]

Horace Dediu

Horace Dediu is a business analyst, founding and coining the term micromobility in 2017.

LEXICO Powered by OXFORD

Transportation using lightweight vehicles such as bicycles or scooters, especially electric ones that may be borrowed as part of a self-service scheme in which people hire vehicles for short-term use within a town or city.[2)]

ITDP Institute for Transportation & Development Policy

We use the term “electric micromobility” to refer to electricpowered modes of transport that are low-speed (comparable to a bicycle), small, lightweight, and typically used for short distance trips.[3)]

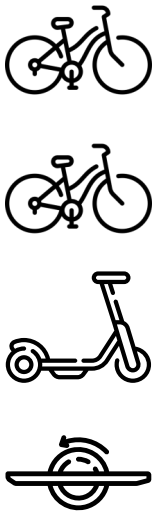
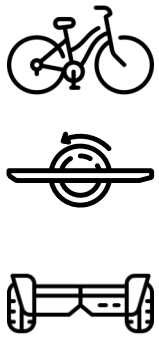
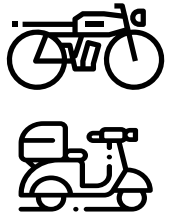
International Transport Forum

To define micromobility as the use of micro-vehicles: vehicles with a mass of no more than 350 kilograms and a design speed no higher than 45 km/h.[4)]

Micromobility Classification

The *International Transport Forum* along with the *Corporate Partnership Board* classifies micro-vehicles based on three factors – weight, speed and power form

Sources: 1) Santacreu, 2020

Type A	Type B	Type C	Type D
unpowered or powered up to 25 km/h		**Powered with top speed between 25 – 45 km/h**	
<35 kg	**35 – 350 kg**	**< 35 kg**	**35 – 350 kg**
			

Comment[1)]

According to the *International Transport Forum,* micromobility vehicles can be **classified depending on three factors** – **weight, speed and power form**. In this context, they identified four different types of vehicle categories.

In this distinction, **top speed is the first factor** to classify micro-vehicles. The ranges are up to 25 km/h to a maximum of 45 km/h. Moreover, vehicles are also **classified depending on power supply**, either human-powered or electrified vehicles. Besides speed also **the weight has a distinguishing role**. The ranges are either under 35 kg or 35 kg to 350 kg.

Type A vehicles are the most represented vehicles in the following analysis. These vehicles are characterized by speeds up to 25 km/h and weighing less than 35 kg.

Micromobility Classification

The *SAE International* defines micromobility vehicles based on four characteristics – weight, width, speed and engine-type

Sources: 1) SAE International, 2019

Types of powered micromobility vehicles as defined by SAE[1)]

	Bicycle	Standing Scooter	Seated Scooter	Self-Balancing Board	Non-Self-Balancing Board
					
Center column	YES	YES	YES	POSSIBLE	NO
Seat	YES	NO	YES	NO	NO
Operable pedals	YES	NO	NO	NO	NO
Foot pegs	POSSIBLE	YES	YES	YES	YES
Self-balancing	NO	NO	NO	YES	NO

Comment[1)]

The J3194TM standard published by *SAE International* defines powered micromobility as a category of **motorized vehicles that can be characterized by four main features**.

First is the **maximum weight** of micro-vehicles up to 227 kg. Second is **the width** of the vehicles up to a maximum of 1.5 m. Third is the **maximum speed** of up to 48 km/h. The last characteristic concerns **the engine**, either it is a fully or partially powered electric or internal combustion engine.

These characteristics **apply only to vehicles intended primarily for passenger transportation** and driven on paved paths and roads.

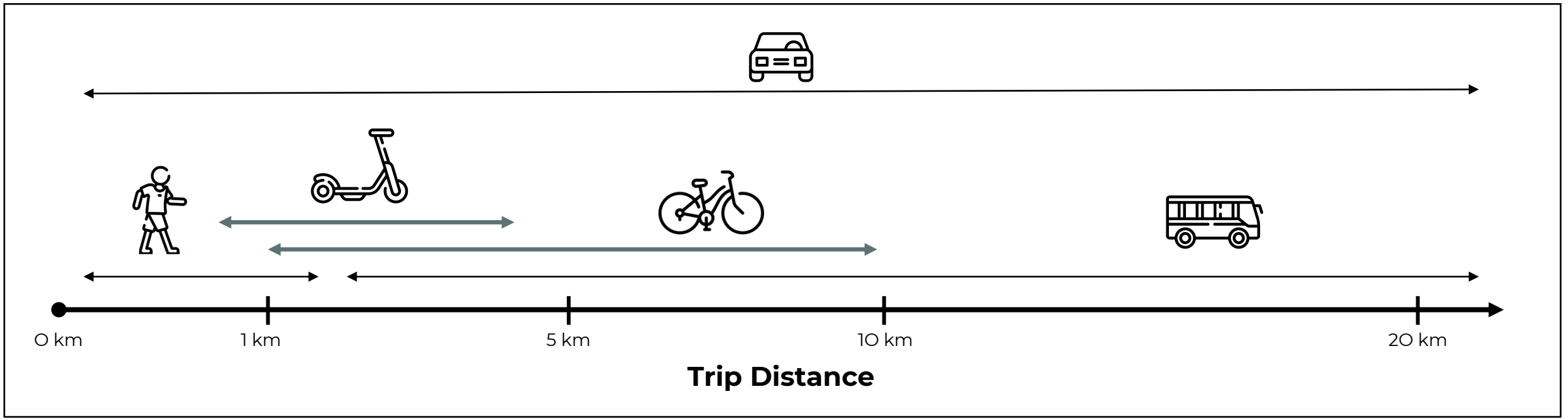
When considering the different vehicles classification methods, the differences to the *International Transport Forum* **vehicle classification do not differ significantly**.

Micromobility Classification

Micromobility focuses on short-distance trips up to a maximum of 10 km. The average travel distance of e-scooters is 1.6 km

Source: Statista, 2020

Micromobility defined based on travel distance



One dimension to define micromobility is the travel distance. Hereby, micromobility focuses on urban transport, which goes up to a **maximum of 10 km**. The **average travel distance by e-scooters is 1.6 km**.

Scope

Based on customer needs and industry driving forces, e-scooters are the most relevant micro-vehicle type. Therefore, this report emphasizes on e-scooters

Source: 1) NACTO, 2020

	PACE	CONVENIENCE	FUN	AVAILABILITY
				
				
				

Comment

The table on the left compares the three most widely used micro-vehicles in the categories of pace, convenience, fun and availability. In this analysis, **e-scooters perform strongly in each category**, outperforming bicycles and e-bikes. Due to the strong performance of **e-scooters**, **the use of these vehicles has been increasing significantly**[1].

Nevertheless, micromobility companies that previously only offered e-scooters are currently **also investing more and more in their e-bike fleet** to diversify their product range. Other micro-vehicles which have been mentioned in the micromobility classification will not play a significant role in the context of this report.

The **definition and classification of micro-vehicles differ strongly** across experts. In the scope of this report, micro-vehicles are defined as **lightweight, electric or human-powered vehicles** – the focus will lay on e-scooters.

Motivation

The industry growth, the potential to disrupt a traditional industry, and environmental aspects make the micromobility a desirable industry to analyze

Sources: 1) Singh, & Mutreja, 2021; 2) Schubarth, 2018; 3) Micromobility Industries, 2019; 4) Yanocha, & Allan, 2019

Growth[1)]

The micromobility industry has **experienced impressive growth** in recent years. This development is not over, as **experts forecast continuous growth at double-digit rates**.

Moreover, the **rising valuation** of startups in this industry has been exceptional – for instance, *Bird* achieved **unicorn status within six months**[2)].

Disruption

The idea behind micromobility goes beyond a new transportation mode. The **ultimate goal is to reshape the whole urban transportation** environment.

The CEOs of leading micromobility companies have already declared **war on the car industry**[3)]. By substituting cars, **traffic and noise decrease, cities get more livable**.

Environment

The emergence of micromobility and the connected introduction of micro-vehicles has been a major **step towards a zero-emission world**.

Not only do companies in this industry follow **environmentally-friendly goals,** but their offered mobility services have the **potential to substitute carbon-dioxide vehicles**[4)].

These three topics perfectly combine **our interest in green startups, innovation and entrepreneurship**. Since **micromobility incorporates all of these aspects**, this analysis was of great interest.

Existing Literature

Most of the existing literature analyzes the economic status quo and prospects of the industry, as well as the environmental impact of micromobility

Industry analyses

Due to the immense growth of the market and the tremendous success of the companies operating in this industry, it has attracted huge attention. **Market research companies** conduct the majority of industry analyses. These analyses present **recent developments, drivers and future outlooks**. In particular, the question arose as to **how much this industry was affected by Covid-19**.

Environmental effects

Many reports related to micromobility concern environmental impacts. Because the vehicles are typically human-powered or electric and replace gasoline-powered alternatives, the impacts are clearly positive. In this context, micromobility companies are interested in **raising awareness about these positive effects**. On the other hand, there is real **scientific interest in assessing the extent of the impact**.

MINOR TOPICS

Safety

Accidents raised awareness to public authorities, which had to adapt their regulations. Therefore, many reports study the **safety of micro-vehicles** and how these risks can be mitigated.

Sharing

Other articles **compare vehicle sharing and ownership**. Since micro-vehicles are usually shared, the extent to which communities can benefit from this sharing system is examined.

Business

The success of this industry is attracting a great amount of public interest. For this reason, many analysts have **studied the major players with a focus on the KPI profitability**.

Existing Literature

This report contains similarities to existing literature, highlights differences, but also improvements

1

Similarities

The analysis conducted **echoes the existing literature** and contains many parallels, such as a comprehensive **analysis of the current state of the micromobility market**.

In addition, the **term micromobility** and the connected **vehicle classification was conducted closely to existing literature**.

2

Differences

The existing literature does **not intensively examine the industry business models**. Nevertheless, some articles address the analysis of business models at a company level.

For this report, through a thorough internal analysis of each market player, **business models could be grouped and analyzed**.

3

Extensions

Based on the previously mentioned analysis of the grouped business models, **insufficiencies were identified**. These insufficiencies form the starting point for the business model innovation part.

New approaches, detached from the existing literature, were presented, and **recommendations were made**.

Methodology

Priority was given to sophisticated sources from reputable institutions. In addition, to obtain robust conclusions, potential biases of respective authors were checked

Type of sources

Micromobility is a relatively new industry, but it has had great success right from the start. Due to this success, many parties are strongly interested in it, resulting in a **significant number of market analyses** that have been carried out.

A major source for this report has been analyses published by **well-known consulting firms** such as *McKinsey* or *Boston Consulting Group*. These provide an in-depth analysis of the industry and can be assumed to be reliable.

Other sources include publications from **reputable institutions** such as the *World Resource Institute* or government agencies like the *National Association of City Transportation Officials*.

In addition, numerous **reports from transportation and mobility institutions** have been cited. Information on specific companies was found on the respective **company websites**. Few valuable insights could also be obtained from **leading scientific business journals** like *ScienceDirect*.

1

Reputation

The background of the authors and the reputation of the editor have been verified to **ensure their ethos and reliability**.

2

Biases

To **prevent misrepresentation**, sources intentionally trying to convey biased views were avoided. Therefore, the intent of each publisher was questioned and verified.

Trustworthy

Methodology

By choosing a mix of quantitative and qualitative data, obtained via primary and secondary sources, a holistic view of the industry could be obtained

Notes: 1) Interview partners introduced thoroughly on slide 19 and appendix 2) Business model analysis framework explained in the next slide

RESEARCH QUESTION

What business models are applied in the micromobility industry, what are their characteristics and associated advantages and vulnerabilities? Based on the vulnerabilities, how can the business models be improved?

Type

The following report describes the micromobility industry mostly **qualitatively** but is also relined by **quantitative data**. Thereby, a **mix of primary and secondary data** was used. In such strategical problem statements, a holistic foundation is required to analyze and give sound recommendations.

Data collection

The quantitative data used is based on secondary data, whereas qualitative data was collected through primary and secondary sources. The method for collecting primary data were **interviews**[1)]. In addition, an **extensive literature review** was conducted – academic journals and industry reports were used most often.

Data analysis

The collected data was mainly analyzed by categorizing and discussing the underlying meaning of the content. Next to examining the conducted **interviews, strategic frameworks were applied**[2)]. Thereby, a comprehensive and deep understanding of the industry could be acquired.

Rational

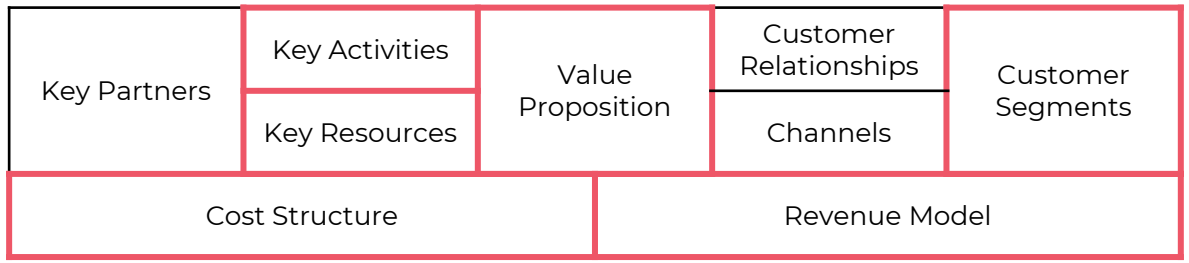
After gaining a **solid understanding of the industry**, it was possible to identify vulnerabilities in the industry's business models. The results of this approach, together with **industry expertise**, served as the **basis for sound recommendations** for improving existing business models.

Business Model Analysis

Based on the Business Model Canvas framework, the simplified Business Model Canvas is derived to give the appropriate weighting to the analysis

Sources: 1) Afuah, 2014

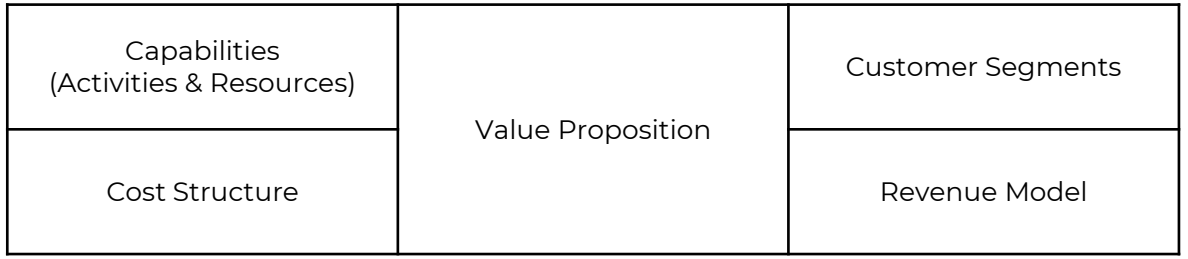
Business Model Canvas



The central part of this report is an in-depth analysis of parts of the above-seen framework. It is used to **describe business models** systematically. This framework represents one of the most detailed ways of a business model analysis and touches the back and – front – end of a business.

This report focuses on answering the questions: **who is the target customer, what is offered to them, how value is created, and how the revenue model looks like**.

Simplified Business Model Canvas[1)]



The simplified business model canvas focuses on **five essential business model components**. Hereby, the value proposition and revenue model analysis are prioritized, followed by customer segments, cost structure, and capabilities.

The results form the basis for **uncovering the advantages and vulnerabilities** of the respective business model, on which, in turn, suggestions for improvement are made.

Afuah's simplified framework was used to stay within the scope and give this report the proper weighting[1)]. It contains all the necessary components to understand the business models in the micromobility industry.

Interview Partners

Four industry experts and five individuals were interviewed to get a comprehensive picture of the industry and to proof the viability of our recommendations

Notes: Some of the interviewees prefer to stay anonymous 1) Further information about the interviewees in the appendix

T. S.

Micromobility provider

Corporate Strategy & Development

T. L.

Wunder Mobility

Business Development

Ping Hu

Goldman Sachs

Analyst & Investor

Rongbiao Li

Accenture

Consultant

Five Interviewees[1)]

Individuals

End-users & Travelers

Comment

To complement this report with primary data, expert interviews were conducted. Through cold-calling via social media channels or leveraging internal networks, it was possible to find **four experts willing to provide firsthand insights**.

Additionally, **individuals throughout different age groups** were interviewed to get a comprehensive picture at the back-end. These interviews were vital for business model innovation, as they served as proof of concept.

2

EVOLUTION

HISTORIC BUSINESS MODEL DEVELOPMENT

The Beginning of Ridesharing

The first and second generations of ridesharing still had many problems but set the foundation for future ridesharing programs

Sources: 1) Pacheco, 2015; 2) van der Zee, 2016; 3)Moon-Miklaucic, et. al., 2019; 4) Ruby, 2019

1965

Amsterdam (Netherlands)

The city of Amsterdam introduced the **first generation** of ridesharing in 1965. The program was called *Witte Fietsen*, where bicycles were **placed in Amsterdam for free usage by the public**[1]. The fight against air pollution was already by then one of the reasons for introducing such system[2].

Due to an **unregulated free of charge system**, many bicycles were **stolen and damaged**, causing the city to halt their ridesharing program. These issues made the bicycle-sharing programs not achieve any growth or further success[1].

Even the so-called **white bicycle plan** did not work out, the program was the foundation to build future ridesharing systems.[1]

1995

Copenhagen (Denmark)

The **second-generation** ridesharing system called ByCyklen was introduced in Copenhagen in 1995. The local municipality introduced the system with significant changes to solve the challenges of *Witte Fietsen*.[3]

Docking stations were implemented with a coin deposit system that incentivized riders to return bicycles to designated areas. The docking stations also helped reduce theft by securing the bikes in place[3]. Nevertheless, **problems such as theft or vandalism were not eliminated** but persisted. In addition, the vehicles themselves lacked many essential parts of an adequate bicycle, such as a basket, lights, or a locking system[4].

Monetization of Bicycle-Sharing

The monetization of the business model combined with the digitalization and electrification of the vehicles accelerated industry growth

Sources: 1) Pacheco, 2015; 2) Parzen, 2015; 3) Branquinho, 2020

1998 — 2000

Digitalization[1)]

Credit card payments and mobility passes replaced the coin system at docking stations. Therefore, collecting coins by hand was not necessary anymore. Additionally, **smartphones** allowed vehicles to be unlocked and paid for.

By **GPS tracking** bicycles, providers knew precisely where their vehicles were and thus prevented thefts.

2010

Monetization[2)]

As a significant improvement to the 2nd generation, the **3rd generation of ridesharing was monetized**. A partially free model enabled revenues to be generated for the first time in history.

An additional revenue source was created by allowing businesses to use the **vehicle frame for advertising**. The monetization of ridesharing also resulted in a **shift from the public to the private sector**.

2015

Electrification[1)]

By **2015**, improvements in **battery technology** initiated and accelerated the emergence of the **e-bike and the e-scooter**[3)]. This advanced technology represented the starting point for micro-vehicles to be electrified. E-vehicles then quickly gained popularity as they support an **environmentally friendly mode of transportation** and are highly convenient.

SUCCESS & GROWTH

Recent Developments

Due to improved technology and increasing adoption, e-scooter providers have experienced rapid growth in recent years

Sources: 1) Schellong, Sadek, Schaetzberger, & Barrack, 2019; 2) Rose, Schellong, Schaetzberger, & Hill, 2020

2017 – 2019

E-scooter beginnings[1)]

By 2017, the American firm ***Bird*** **launched the first e-scooter sharing system**. In the same year, the term micromobility was also established. In the early stages, the e-scooters only had a **lifespan of about 2-3 months**, which made it impossible for e-scooter providers to achieve profitability. Nevertheless, this industry rapidly gained popularity and **attracted many investors early on**.

By 2019, **more than a dozen prominent micromobility startups** such as *Lime* (2017), *Voi Technology* (2018), or *Tier Mobility* (2018) had emerged. Essentially, all of these firms offered the same e-scooter ridesharing system. By that time, **already more than $1.5 bn had been invested**.

2021

E-scooter status quo[2)]

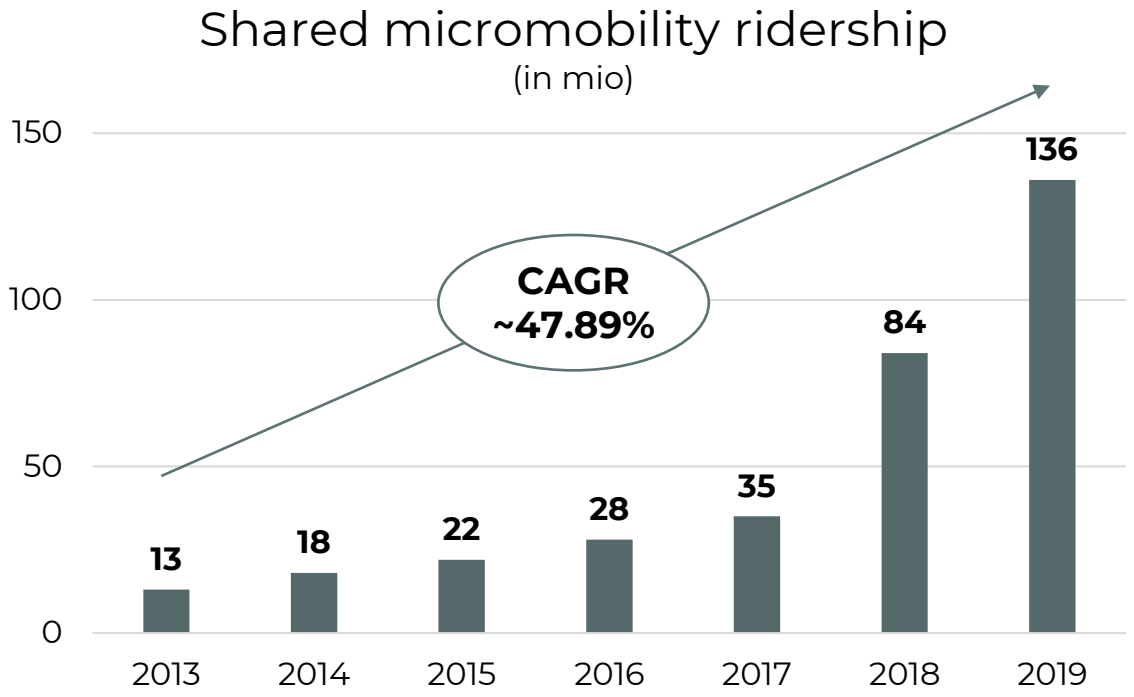
By 2021, more than **350 cities worldwide have adopted an e-scooter sharing system**, making it "*one of the fastest growing consumer phenomena in living memory*" (Schellong, Sadek, Schaetzberger, & Barrack, 2019).

One of the reasons is the **improving e-scooter technology**. The significantly improved lifespan and battery technology have enabled operating costs to be reduced. In addition, while the public was initially skeptical towards e-scooters, it now accepts them as a real alternative to existing transportation modes. As a result, **acceptance rates are much higher than in the early days**. These factors all led to a dense current competitive environment.

Ridership Development

In the United States, the number of shared trips with micromobility has increased significantly. Between 2013 and 2019, this figure grew at a CAGR of 47.89%

Source: 1) NACTO, 2020



Comment[1)]

The number of **ridership has increased significantly** in recent years. The **average compound annual growth rate was 47.89%** from 2013 to 2019. This growth is **primarily caused by the emergence of e-scooters in 2017,** as it accounts for the majority of the total increase. From 2013 to 2017, only comparatively small growth was noticeable.

The reported figure of 136 mio trips in 2019 can be divided into **50 mio trips with bicycles and 86 mio trips with e-scooters**. These numbers show how e-scooters have already overtaken bicycles as the number one micro-vehicle and underline their popularity. While **e-scooter rides are increasing dramatically**, the number of bicycle rides is slowly growing.

These figures show the development in the U.S.. However, it can be assumed that **Europe has similar characteristics**.

The graph shows a significant **increase in ridership in the U.S. of 946.15%** over the indicated period. This is mainly attributable to the emergence of e-scooter ridesharing programs in 2017.

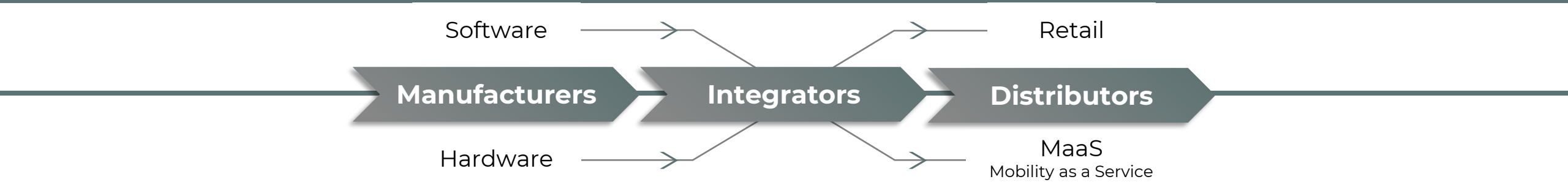
3

INDUSTRY BUSINESS MODELS

The Micromobility Supply Chain

The micromobility supply chain consists of three major parts – the manufacturers, the integrators and the distributors

Source: 1) Meruva, 2021



Manufacturers

The **hardware manufacturers** are responsible for the **physical parts of the respective vehicle**. Thereby, they can be further distinguished by the vehicle parts that they create.

Another essential part at the beginning of the supply chain are the **software manufacturers**. These **programmers and software developers** provide the micromobility providers with the appropriate **software to operate their ridesharing service**.

Integrators

Integrators are those who **put the software and hardware components together**.

There are also **many hybrid models** where integrators work closely with manufacturers and distributors. This occurs in cases where vertical integration has taken place, or very close partnerships exist. In general, **distributors have a strong influence** on the entire development process.

Distributors

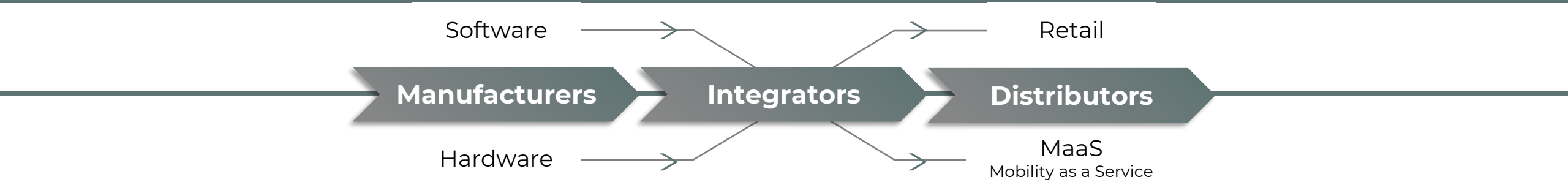
Most industry players that are known by end-users are distributors. The classic type of distributors are **retailers**. Usually, bicycle shops use **micro-vehicles to expand their product range**.

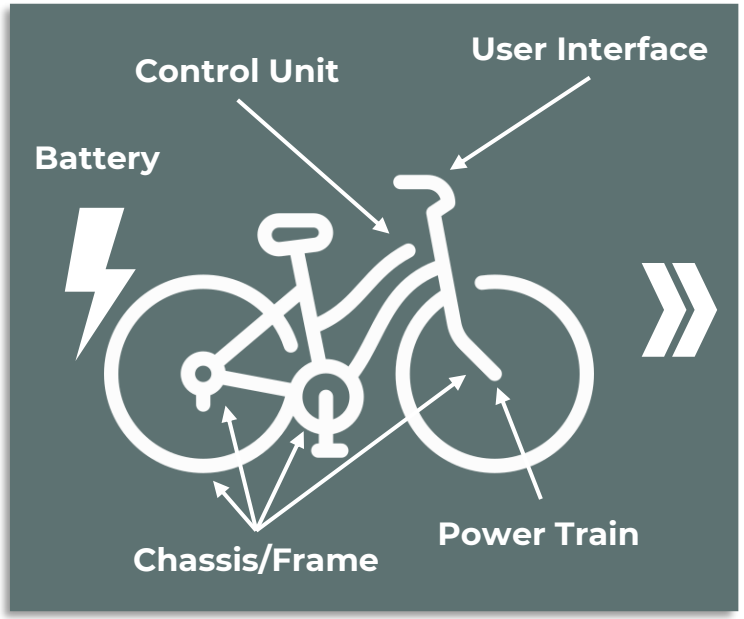
Pay-per-trip or subscription are commonly used revenue models around **mobility as a service**. Thereby, end-users of such ridesharing systems pay for **renting vehicles for a short time period**.

The Micromobility Supply Chain

Hardware manufacturers are not included in this report because the focus centers on companies essential to the operation of ridesharing activities

Sources: 1) Meruva, 2021; 2) Heetae, Choi, Kim, & Park, 2017





Components

The basic components of micro-vehicles are the **hardware parts**. The **installed software** gets crucial if the vehicle is intended for ridesharing. Connectivity with the vehicle and the operator is required, and an appealing user interface must be provided to the end-users.

Manufacturers that focus solely on **hardware manufacturing are not included in this analysis**, as the report focuses on ridesharing-related purposes. Nevertheless, the **boundaries are blurred**, as hardware manufacturers often work closely with software developers.

Ownership

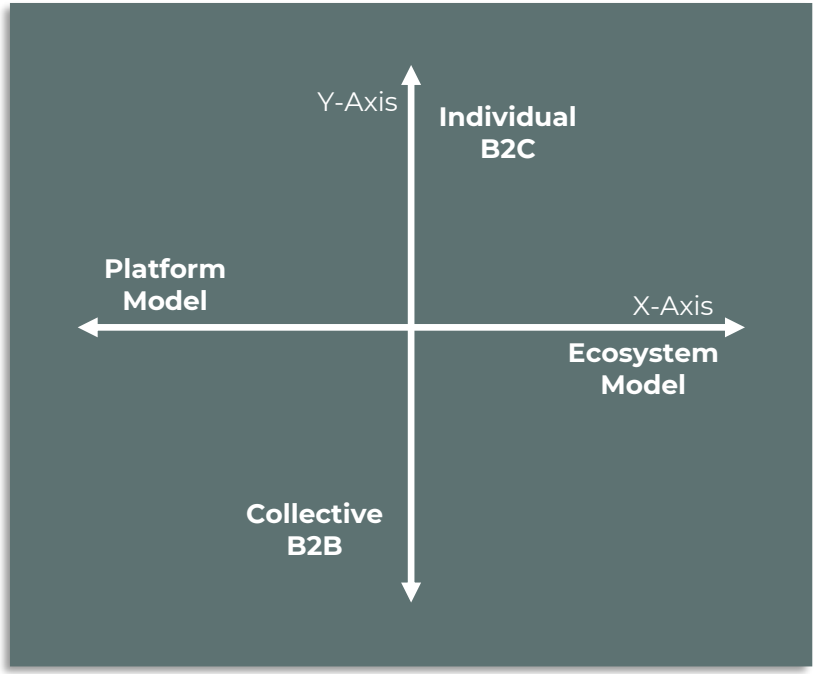
The ownership **options are either renting or buying a vehicle**. For renting purposes, MaaS models can be used, and for owning, vehicles can be purchased at retailers.

The **shift from buying to sharing** is evident. When analyzing the drivers and trends, it is striking that this shift is significant among users. Therefore, **this report will also focus on ridesharing** and the associated companies.

Perceptual Map

The clustering of micromobility companies on a perceptual map is the basis for disclosing industry business models

PERCEPTUAL MAP



X-Axis

The **X-axis simultaneously describes** two characteristics: the **product range and the position in the supply chain**. The extreme positions are called the platform and ecosystem model.

The left side describes firms with a small portfolio of products or services at the beginning of the supply chain. On the extreme right are companies with a wide range of products or services at the end of the supply chain. As the supply chain position differs, the companies within this illustration can also work as partners.

Y-Axis

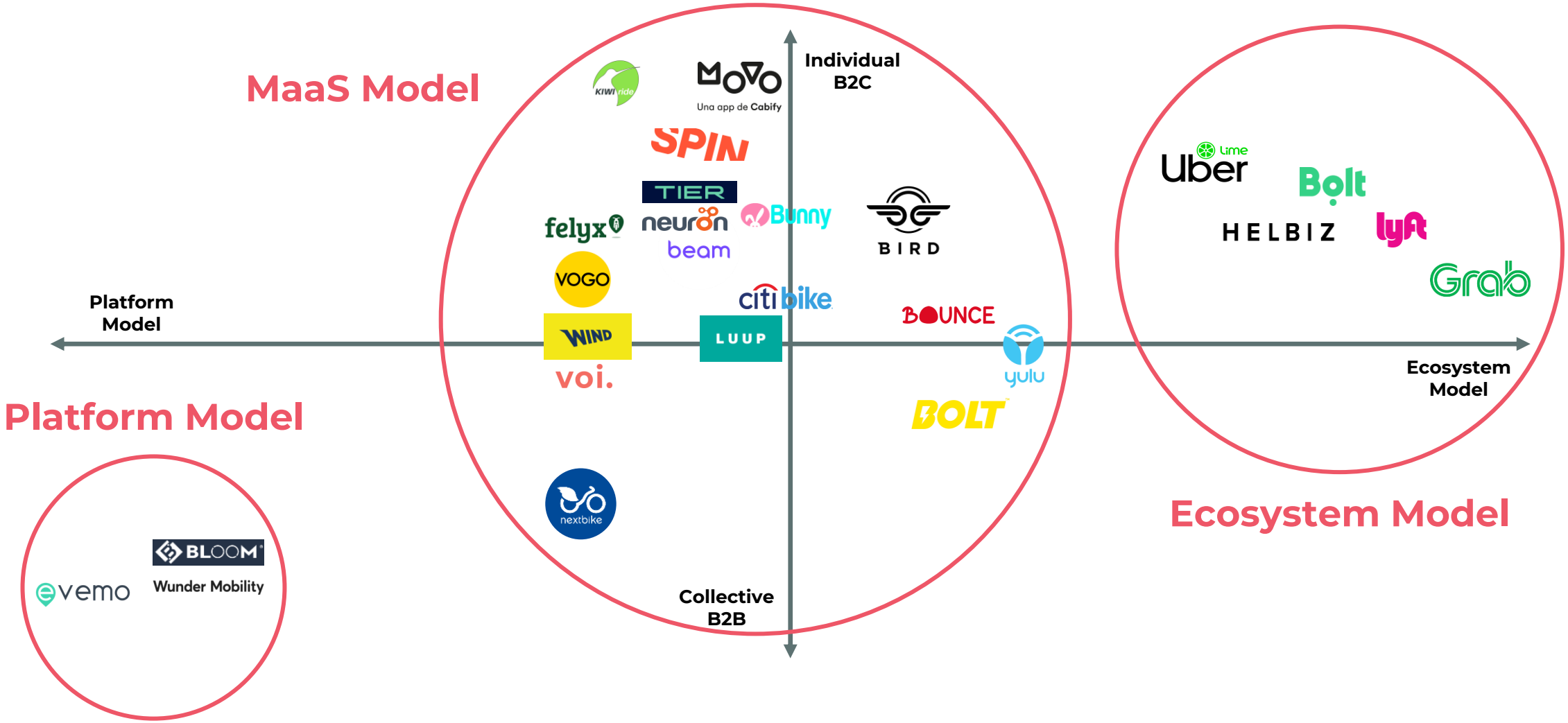
The **Y-axis defines the company's target customer**. The extreme positions stand for either B2C or B2B.

The higher the company is positioned, the greater the focus on addressing individuals. On the other hand, the lower the company is positioned, the more it is oriented towards collectives. B2B customers are, for instance, universities or municipalities.

In this regard, it must be noted that the **ultimate end-user of the service is still the individual**.

Clustering companies operating in the micromobility industry helped **identify the industry business models**. These results form the foundation and basis for further in-depth analysis.

Business Model Overview



Industry Business Models

Firms that offer mobility as a service are the providers of micromobility ridesharing. This model also falls into the area in which ecosystem companies operate

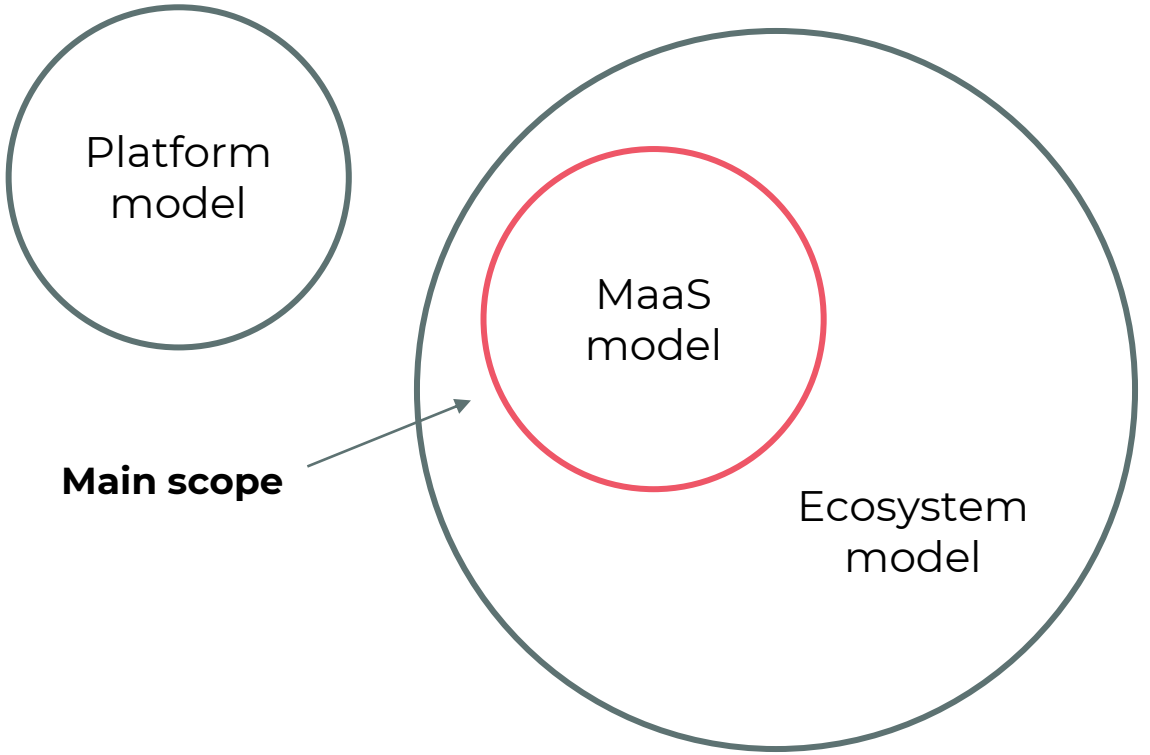
MaaS model

Companies that use this business model manage fleets of micro-vehicles, offer **ridesharing services,** and represent the distributor part of the supply chain. In doing so, they target individuals or organizations like municipalities, or both. Many of the companies also sell vehicles. However, this does not represent their core business.

The companies within this circle usually **differ in the type of vehicles and rental packages** offered to the end-customer. The operators either have their own platform or a third-party platform provided by platform model companies.

These companies are the **actual micromobility ridesharing provider** and sit at the end of the supply chain.

Defining the Scope



Industry Business Models

Platform model companies do not perform the actual ridesharing operations.
Ecosystem model companies offer several services and products, including MaaS

Platform model

Companies operating with the platform model focus exclusively on **providing a digital platform without operating a sharing system**. Thereby, they work closely together with companies performing the actual ridesharing operations. Operators' requests are taken into account, and **consulting service** is offered.

This means that the software is mainly sold to entities starting a micromobility ridesharing business or seeking to change their current software. The customer receives either a fully configured ready-to-go solution or just a digital platform.

Companies operating with this business model **do not perform the actual operations** of ridesharing. They lay **upstream in the supply chain**.

Ecosystem model

In the ecosystem business model, **micromobility solutions are part of a large ecosystem** that also includes other products or services usually related to mobility, such as ride-hailing or delivery services. However, the other business segments can also be completely independent of the core. The biggest ecosystem model firms are well-known internationally operating companies like *Uber*.

As **this business model incorporates MaaS**, all the characteristics of MaaS model firms are also applicable for ecosystem model firms.

The **recommendations on the MaaS model also apply to the MaaS branch** of the ecosystem model company.

4

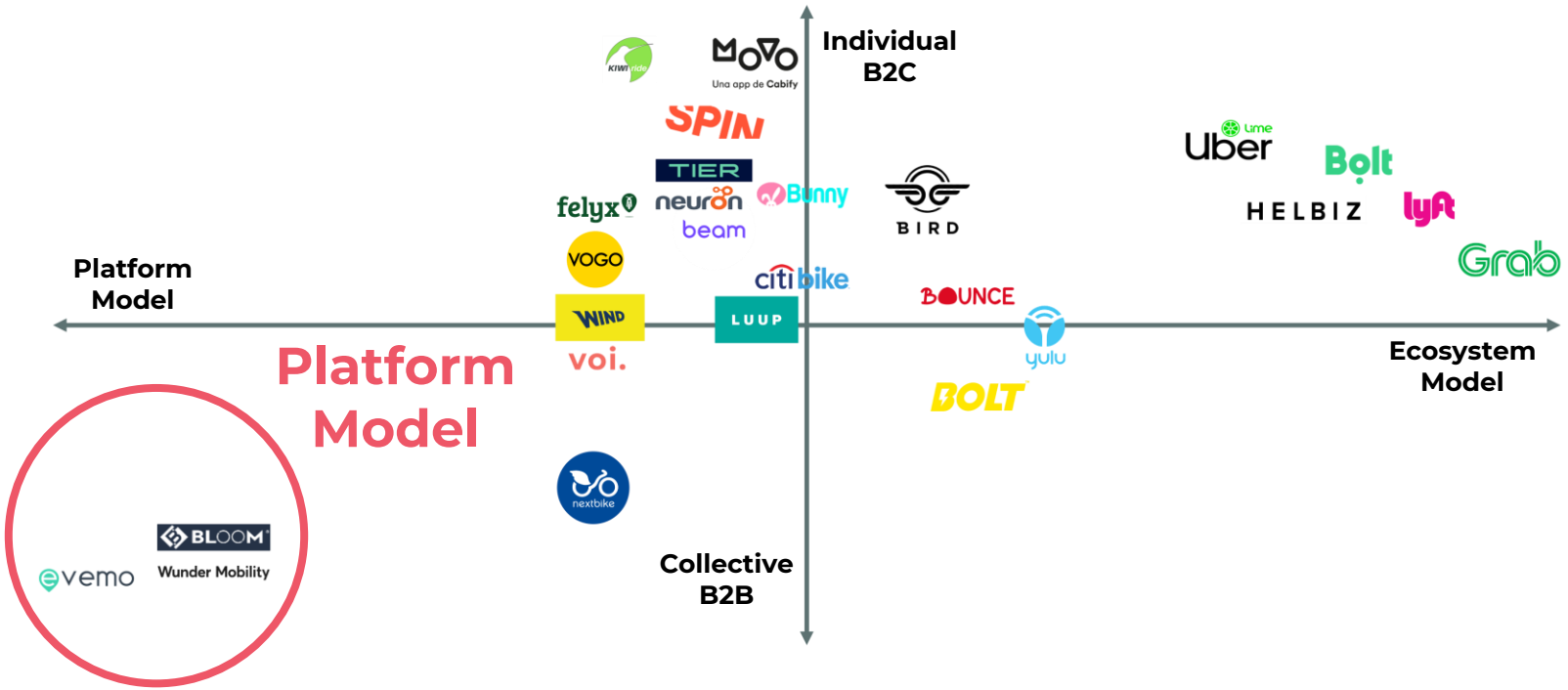
BUSINESS MODEL ANALYSIS

PLATFORM MODEL, MAAS MODEL, ECOSYSTEM MODEL

Platform Model

Platform model companies provide software solutions to enable entities a quick and easy entry into the mobility business

PLATFORM MODEL CLASSIFICATION



Comment

Platform model firms **provide a digital platform for ridesharing operators**. The platform manages rides and creates a vehicle network with which the end-user can interact. This means that B2B customers get a digital infrastructure for ridesharing. However, platform model firms **also offer ready-to-go solutions**, **including a fully functional vehicle fleet** next to the software.

Companies following a platform business model offer so-called **software as a service** (SaaS) solutions and **do not conduct ridesharing operations**. This digital solution is mainly sold to businesses and entrepreneurs.

Customer Segments

Institutions and individuals are the target customers of platform companies. However, individuals make up only a small part, while the majority are institutional customers

Sources: 1) BLOOM Sharing Technology LLC, 2021; 2) Wunder Mobility, 2021; 3) Evemo, 2021

Entrepreneurs[1)]

Individuals who want to **lead mobility into a more sustainable future**. Anyone who believes to have the required skills to run their own micromobility ridesharing business.

Institutions[2)3)]

These are **large companies or public institutions** that want to offer new green transportation options in their community. For instance, micromobility can complement public transportation.

Comment

Due to the reason that institutions usually have more resources and can carry out such investments more easily, the **majority of target customers are institutions**. Typical institutional customers are utilities, corporations, educational institutions, mobility companies or residential communities.

Individuals make up only a tiny proportion. These entrepreneurially driven persons try to fill a void in a specific target market.

The common thread among all customers is that they **want to provide an alternative way to travel** which is exclusive, reliable, and environmentally friendly.

Value Proposition

The value proposition of platform model companies can be divided into three parts: velocity, personalization and digitalization

Sources: 1) Wunder Mobility, 2021; 2) BLOOM Sharing Technology LLC, 2021; 3) Evemo, 2021

VALUE PROPOSITION

Velocity

Platform model companies offer their customers, whether budding entrepreneurs or institutions, **quick access to all the required resources to start operating** a micromobility ridesharing system. In particular, the provision of the software, but also the connection to hardware vendors, is established by them.

In addition, their broad expertise and experience **help to accelerate expansion into new markets**. In this context, they offer consulting services that ensure successful implementation.

Personalization

Based on a core software, customer specifications can be easily added. This means that any **functionality or design can be customized**[1]. For example, companies can integrate their own branding and choose from various features they want to include[2]. Platform providers can also **integrate third-party systems** for which they do not have own resources.

With this service, customers get an **individualized ridesharing software** designed after the needs of the customer's community.

Digitalization

Platform model companies **help providers to digitalize their mobility services**. For instance, mobility-sharing companies that use outdated software can benefit from such a solution, mainly because **software can be easily installed or integrated into existing systems**.

Integration into public transportation networks is one of the possible application area[3]. This would allow end-customers to use and pay for several transportation modes via **one single digital app**.

Key Partners

The key partners of platform model firms are vehicle manufacturers and public institutions. Third-party developers, investors and banks represent minor partners

Source:

Vehicle Manufacturers

For providing a sharing-ready network, vehicle manufacturers are one of the key partners. **Their vehicles are purchased to install all necessary digital components** such as connectivity or the user interface.

For providers with their own fleet, **software compatibility must be verified**, which may require coordination with the respective vehicle manufacturer.

Public Institutions

The **software must be adapted to local regulations** – for example, speed and age restrictions. These must be configured upfront in the software, which is why **close communication** with these is essential.

Public institutions such as municipalities or universities **impose regulations and act as customers**, as mentioned before.

MINOR PARTNERS

Third-party developers

Third-party developers may need to be consulted **to develop functions** on behalf of customer requirements for which the company's internal resources are insufficient.

Investors

As the industry and its companies grow substantially, **adequate financial resources are required** to serve the industry's growth rate accordingly.

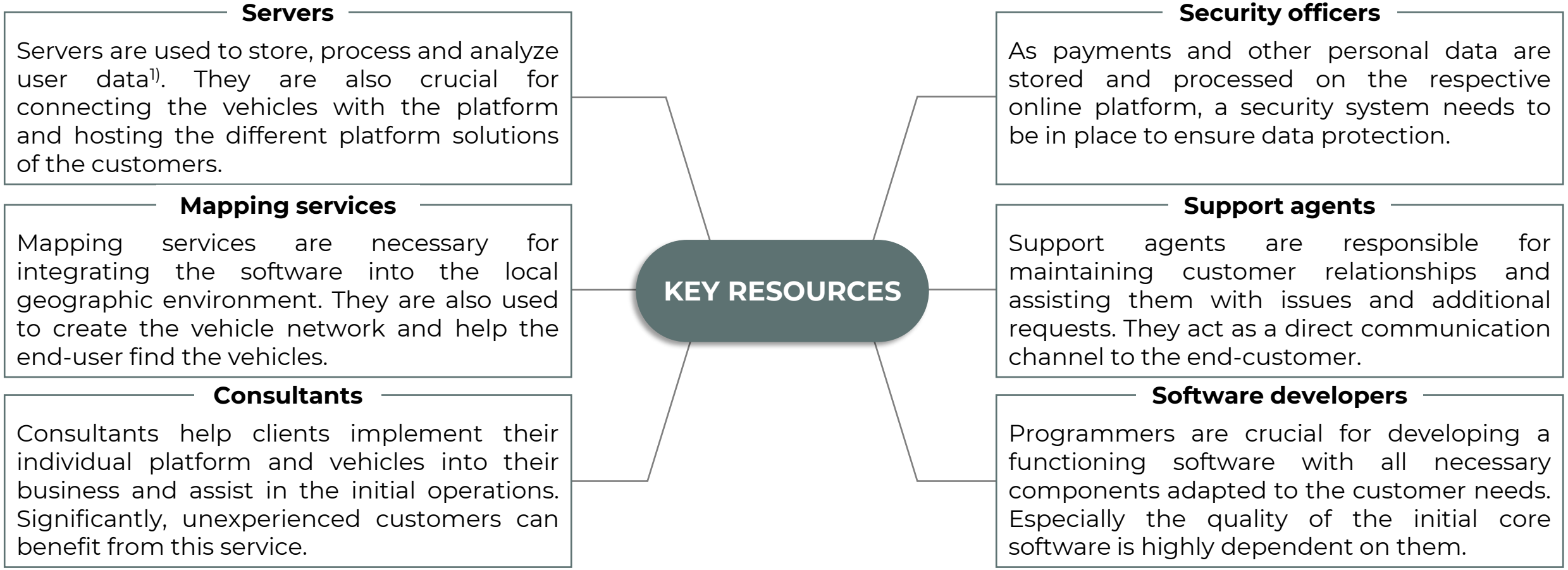
Banks

Payment systems need to be integrated into the software **to provide seamless payment options** for the end-customer. Therefore, payment processors are crucial.

Key Resources

Developing and implementing a micromobility platform successfully requires the combined effort of six resources

Sources: 1) Indeed, 2021



Servers

Servers are used to store, process and analyze user data[1]. They are also crucial for connecting the vehicles with the platform and hosting the different platform solutions of the customers.

Mapping services

Mapping services are necessary for integrating the software into the local geographic environment. They are also used to create the vehicle network and help the end-user find the vehicles.

Consultants

Consultants help clients implement their individual platform and vehicles into their business and assist in the initial operations. Significantly, unexperienced customers can benefit from this service.

Security officers

As payments and other personal data are stored and processed on the respective online platform, a security system needs to be in place to ensure data protection.

Support agents

Support agents are responsible for maintaining customer relationships and assisting them with issues and additional requests. They act as a direct communication channel to the end-customer.

Software developers

Programmers are crucial for developing a functioning software with all necessary components adapted to the customer needs. Especially the quality of the initial core software is highly dependent on them.

Key Activities

Software development, constant exchange, and maintenance are essential before, during, and after the product delivery to guarantee customer satisfaction

Software development

Software development involves hiring programmers and mobility experts to **create an all-encompassing sharing platform**. In this context, the initial development and its performance compared to other providers is crucial for its success.

A viable network must be created, integrating and connecting all necessary parties.

Maintenance

The **software and the corresponding applications must be constantly updated** and maintained. For instance, functionalities must be continuously improved, and bugs must be fixed efficiently.

In addition, **after-sales interaction** with customers is an essential component where adjustments and additions can be made.

Constant exchange

Close and continuous communication with customers and suppliers is necessary to develop a personalized mobility platform according to customer needs successfully.

As platform companies also connect their customers with vehicle manufacturers, permanent exchange with them is also crucial.

Revenues

The revenues are generated via a subscription model. The amount of revenue depends on the software specifications and the product package

Sources: 1) BLOOM Sharing Technology LLC, 2021

Revenue components[1)]

BASIC SOFTWARE

+ Geofencing Capability
+ Location-based Advertisements
+ Customer Branding/Design
+ Continuous Support
+ Analytics Portal
+ Consultation Fees
+ Third-party Integration

VEHICLES

+ Built-in IoT connectivity
+ Customer Branding/Design
+ Sharing Features (e.g., smartphone holders)

ALTERNATIVES

Software-only solution

Pricing is **based on the sophistication of the software** and the extent of features included. For example, consulting services can be purchased on top to support implementing a micromobility service in a target market.

Sharing-ready solution

A ready-to-go package **contains all necessary components to start a micromobility ridesharing business**. In addition to software and hardware components, extensive implementation support is included within this solution.

Both solutions can be further customized. The platform model firms earn via a **subscription model on a monthly basis**.

Costs

The main sources of costs are research and development and marketing costs. These costs are high, especially in the initial phase.

Sources: 1) Valchev, 2020; 2) Saljoughian, 2019

Cost components

COST OF GOODS SOLD[1)]

- Hosting and monitoring
- Customer success management
- Data communication
- Software license
- Website and app development
- Training personnel
- Costs of subscriptions

OPERATING COSTS[2)]

- Sales and marketing
- Research and development
- General and administrative

MAIN COST SOURCES

Sales & marketing[2)]

At around **40% of revenues**, sales and marketing costs **account for the largest share of costs**. These costs can be reduced through economies of scale, scope and learning and the development of strong brand awareness.

Research & development[2)]

R&D costs are high initially but drop after the first software version is developed. This is due to learning effects and the fact that only maintenance and updates are necessary once the core product is developed.

COGS account for 10-20% of revenue[1)]. The exact share of the individual variables depends on the final product's configuration.

Advantages & Vulnerabilities

The high margins and scalability are attractive. However, the threat of vertical integration and the high customer acquisition costs are a major drawback

Sources: 1) Cordrey, 2020; 2) IBM Cloud Team, 2020

ADVANTAGES

Margins

SaaS providers generally benefit from **high profit margins**. After the initial development, the main CAPEXs are spent, and only minor costs are required. The **gross margin** of software providers is **typically around 70%**[1]. In addition, companies in the platform model benefit from mediation to hardware manufacturers and consulting services, also representing services with high margins.

Scalability[2]

Companies following the platform business model develop and offer a basic software that contains all essential functions. In addition to that, these software are easily changeable and customizable depending on the customer's needs. As seen in the revenue analysis section, the range of functions that can be implemented is extensive. This **flexibility results in a highly scalable business.**

VULNERABILITIES

Customer acquisition

Customer acquisition is a major challenge for platform model companies in the micromobility industry. Once a mobility provider uses a specific software, their **willingness to switch is very low** as high switching costs lock them in. Combined with the threat of vertical integration, the **number of potential new customers is very limited**.

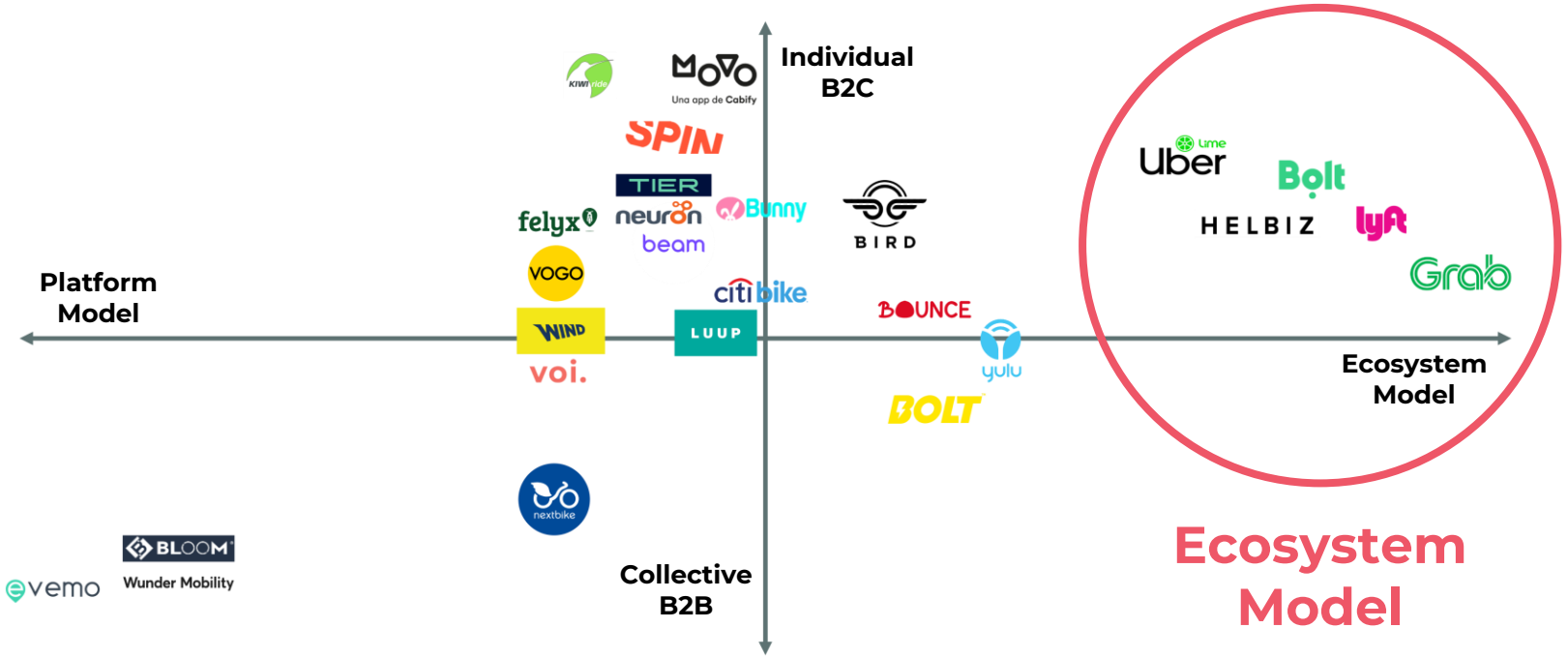
Threat of vertical integrations

Due to the industry environment with many different players in the market, **experts predict a market consolidation** in the near future. The larger players will most likely buy up smaller competitors in this process. Most of these larger firms have their **own internally developed software that will most likely replace the acquired company's software**, making their software obsolete.

Ecosystem Model

The ecosystem model encompasses, next to micromobility, other services mostly closely related to mobility

ECOSYSTEM MODEL CLASSIFICATION



Comment

In the ecosystem business model, **micromobility solutions are part of a broad range of products and services**. Micromobility can be the company's primary focus, but also just a smaller segment. For instance, *Helbiz's* main focus is micromobility, while *Lyft's* business focus is ride-hailing. The **other products or services of ecosystem model firms usually are related to mobility**. These can be delivery services or ride-hailing, but completely independent services are also possible.

Since the acquisition of the e-scooter company *Lime*, the **well-known company *Uber* is also included in this classification**.

Ecosystem Model

The mobility related businesses include ride-hailing, and food and grocery delivery. However, completely unrelated business segments are also pursued

Sources: 1) Bolt Technology OÜ, 2021; 2) Grab, 2021; 3) Helbiz, 2021; 4) Lyft, Inc., 2021; 5) Uber Technologies Inc., 2021

	MICRO MOBILITIY	FOOD DELIVERY	GROCERY DELIVERY	RIDE HAILING	OTHERS
1) Bolt	✓	✓	✓	✓	✗
2) Grab	✓	✓	✓	✓	✓
3) HELBIZ	✓	✓	✓	✗	✓
4) lyft	✓	✓	✓	✓	✓
5) Uber	✓	✓	✓	✓	✓

Comment

The table on the left compares the companies with an ecosystem model in terms of their services.

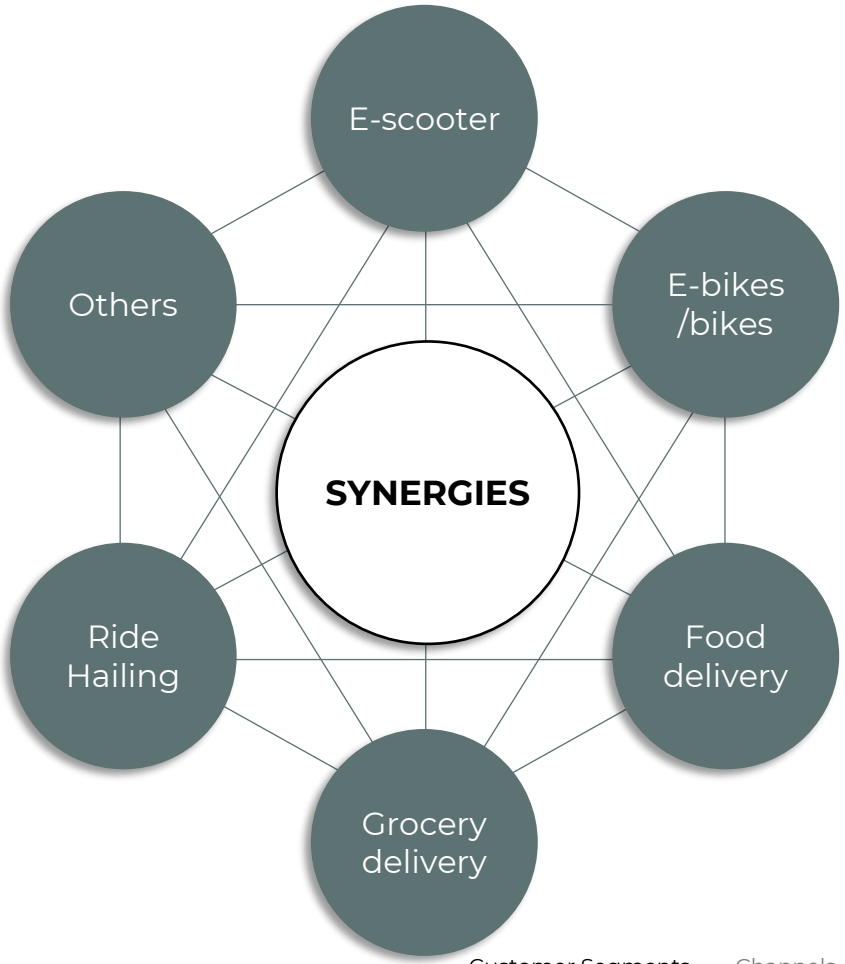
In addition to micromobility, **all companies are also involved in food and grocery delivery**. The only deviation is *Helbiz*, as they do not offer ride-hailing. In addition, **all of the companies mentioned**, except for *Bolt*, **operate in the "other" category**. *Grab*, for example, is additionally active in the payment industry, or *Helbiz* also offers sports streaming services.

Nevertheless, it is noticeable that the **overall focus of the companies analyzed lies on mobility services**.

As the companies in the ecosystem model operate in many different segments, this analysis will also touch on **business segments unrelated to micromobility**.

Customer Segment

Through synergy and spillover effects from other business segments ecosystem model companies are operating in, the MaaS customer segments can be extended



Comment

The customer segment of ecosystem model companies is **similar to the MaaS model when considering micromobility services**. However, the **customer segments within the various other business segments differ**. Nevertheless, ecosystem model companies can benefit from **synergy and spillover effects between the business segments**. Thereby, customers of one business segment are more likely to use other services of the same company, as **external hurdles** like downloading a new app or getting used to a new app interface **are lowered**. Consequently, customer acquisition **costs** for business segments within an ecosystem model company are **reduced**. Additionally, the compatibility and demand of new functions or features can be tested with existing customer segments, facilitating future proof of concepts.

As delivery and ride-hailing services require drivers to be viable, **drivers represent an essential customer segment** located at the back-end of the business. However, this back-end segment does not fall within the scope of this report.

The importance of each customer segment in the ecosystem model, strongly **depends on the business focus of the respective company**.

Value Proposition

In addition to an environmentally friendly mobility service, ecosystem model companies offer many other services that increase convenience for end-users

Source: 1) Uber Technologies Inc., 2021

VALUE PROPOSITION

Mobility

All mobility challenges in urban areas can be solved perfectly with ecosystem model firms' mobility services.

Short distances can be covered with **micro-vehicle sharing systems**, while **ride-hailing services** can be used for **longer distances**. These two alternatives are not mutually exclusive, which is why combining the services is also possible.

Environmental

Delivery and micromobility services are usually **provided with e-vehicles**.

Also, for ride-hailing, a **shift toward electrically powered vehicles** is noticeable.

Also, these ecosystem model firms have publicly communicated **green company values**. By 2040, for example, *Uber* has set a goal to achieve zero-emissions operations[1)].

Convenience

Most services offered by ecosystem model companies can be accessed via **one single app**. The respective app interfaces are **easily understandable and easy to use**.

Next to the accessibility, **the actual mobility or delivery services contribute** to the customer's convenience. For instance, always accessible micro-vehicles or delivery services.

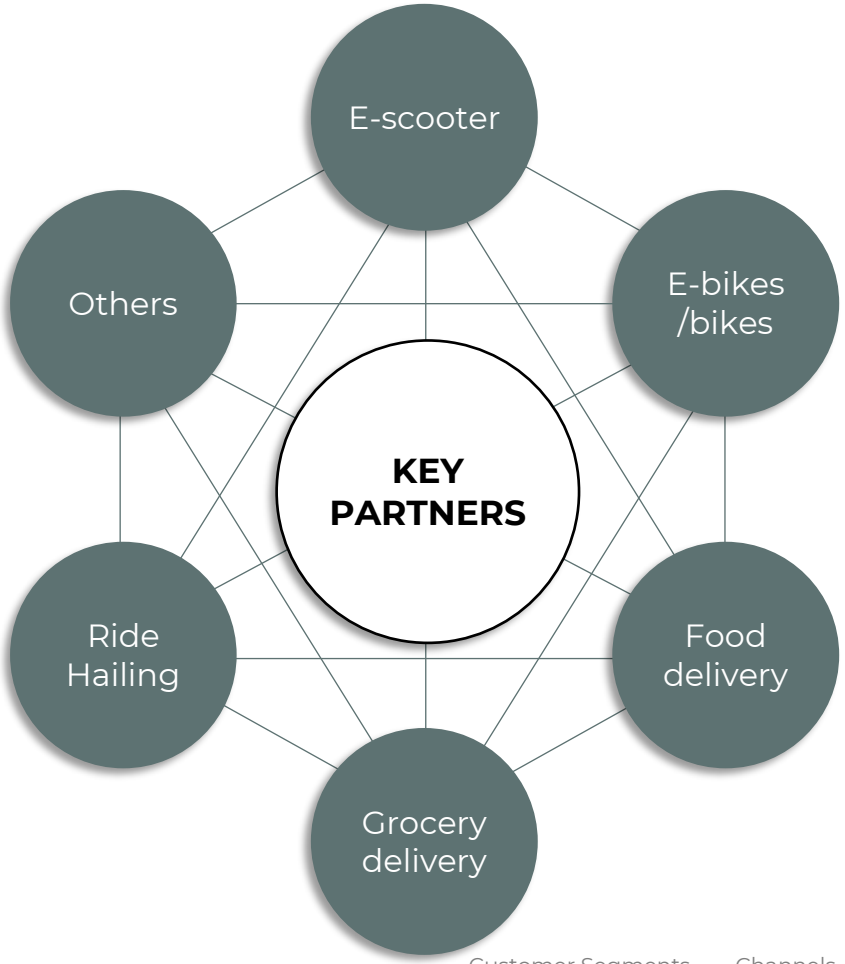
Others

The detailed description of the customer value proposition for the other service segment **depends on the type of service offered**. For instance, the sports streaming service of *Helbiz* contributes to customer enjoyment.

From a business perspective, a broad range of services **diversifies the value proposition** and thus the risk for the respective company.

Key Partners

The key partners of the MaaS business segment can be seen in the MaaS analysis.
The other business segments require further key partners.



Comment

Since each service requires different capabilities, companies with an ecosystem business model also **need multiple key partners** to deliver their services. However, as most of the services are related to mobility, **many of the key partners of the MaaS model remain the same**. Nevertheless, some additional partners are required. For example, some of the necessary key partners in delivery services are drivers, restaurants, and supermarkets.

Companies with an **ecosystem model can benefit from synergies among their key partners**. For instance, delivery drivers can leverage micro-vehicles to carry out their deliveries. However, **new partnerships must be established** when companies enter completely **unrelated business areas**. These partnerships are more difficult to build because there is no connection point within the existing business.

Drivers

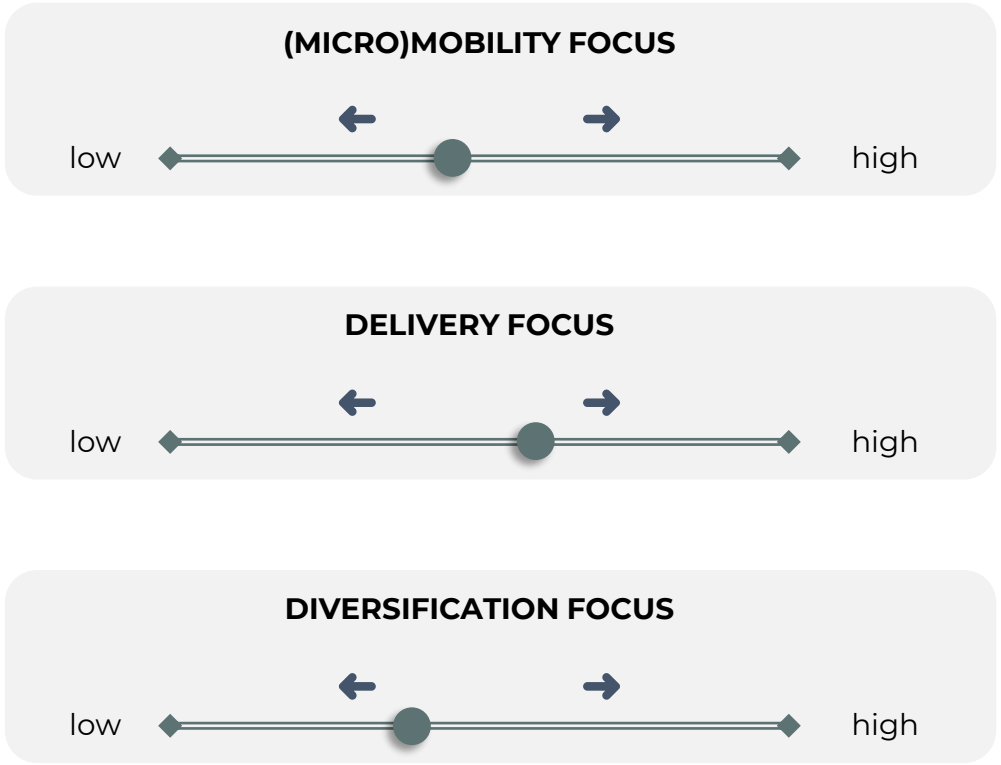
Restaurants

Supermarkets

Key Resources & Activities

Both key activities and resources depend on the company's business focus. Therefore, a general statement is difficult to make

BUSINESS ORIENTATION



Comment

Depending on the business focus of each company, the **main activities and consequently the required resources differ**. For example, *Lyft's* main activity is ride-hailing, while *Helbiz* focuses on micromobility. As a result, *Lyft's* main resource is its employed drivers, and *Helbiz's* main resource is its employed fleet managers. Nevertheless, all ecosystem models provide mobility services, which means that **many resources and related activities overlap**.

The three main characteristics in which the companies in the ecosystem model **differ are their degree of focus on (micro)mobility, delivery, and diversification**. Diversification is defined as not focusing on mobility- or delivery-related services or products. For instance, players like *Grab* are greatly diversified. In addition to micromobility and delivery services, they have also entered the cashless payment industry and are operating in the mailing industry.

It is **difficult to make a generally applying statement** about ecosystem model companys' key activities and resources.

Revenue

The three major revenue streams of ecosystem model companies come from the segments micromobility, ridesharing and delivery services

Source: 1) Heineke, Kloss, & Scurtu, 2020; 2) Ahuja, Chandra, Lord, & Peens, 2021; 3) Salas, 2021

MICROMOBILTY

The micromobility industry is expected to grow strongly[1]. Therefore, we can **expect increasing revenues through the micromobility segment** of these ecosystem model firms. The detailed breakdown of the revenue can be seen in the revenue analysis of the MaaS model.

DELIVERY[2]

Similar to micromobility, delivery services also represent a **strongly growing segment**. Here, the **majority of revenue comes from food delivery**. Nevertheless, grocery delivery services are becoming increasingly popular and will play a more important role in the future.

REVENUE

The exact breakdown of the respective firm's revenue depends on its focus. The companies' main income is represented either by ridesharing or micromobility services.

RIDE-HAILING

The initial business segment of the majority of ecosystem model companies is ride-hailing. Many companies like *Uber* or *Lyft* **generate the most revenue income from this business segment**[3]. *Helbiz*, on the other side, does not even have a ride-hailing service within their services.

OTHERS

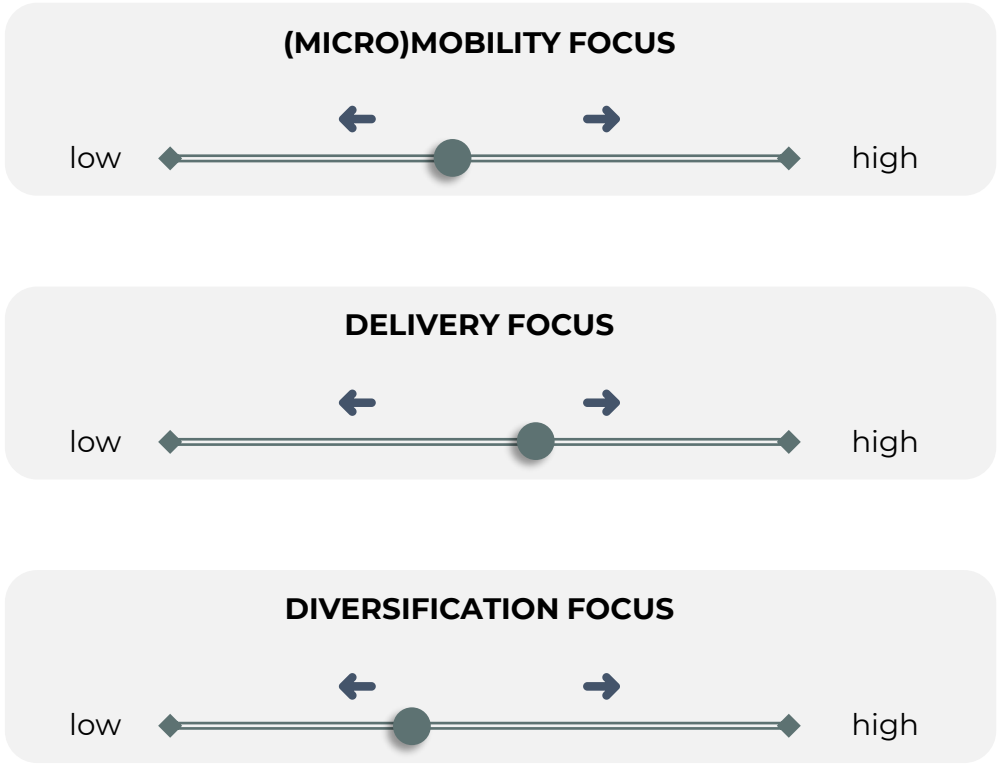
An additional revenue stream comes from the "other" business segments. However, **mostly only an unnoticeable amount**. For instance, the freight business of *Uber* represents only 9% of their revenue in 2020[1].

Costs

Next to the MaaS cost sources, additional cost positions arise from new additional business segments

Sources: 1) Talent.com, 2021

BUSINESS ORIENTATION



Comment

The cost sources in the micromobility segment of respective companies are the same as those in the MaaS model. The drivers are one **big cost driver in the mobility and delivery segment**. For instance, ride-hailing drivers of *Uber* earn ~$18.6 per hour[1)] and delivery drivers ~$17.7 per hour[1)] in the US. **Dependent on the importance and focus of the respective business segments**, costs are differing strongly. Nevertheless, due to the size of the ecosystem model companies, they can profit strongly from economies of scope. **Considering diversification, the costs sources are difficult to pinpoint**, as these business segments are almost fully unrelated to their core

As the services are unified on one digital app, the software is even more important than in the MaaS model. Therefore, the **maintenance costs for the software in the ecosystem model represent a significant stake**.

» **Cost synergies** between the individual business segments are to be assumed. Especially between (micro)mobility and delivery as they require alike costs.

Advantages & Vulnerabilities

The main advantages are synergy effects and a broad value proposition. However, these points are offset by complexity, which brings several vulnerabilities

Sources: 1) Damodaran, 2005; 2) Shine, Park, & Robert S. Wyer, 2007; 3) Sarafin, 2021; 4) Gilibert & Ribas, 2019; 5) Ansoff, 1957; 6) Pertusa-Ortega, Molina-Azorín, & Claver-Cortés, 2009

ADVANTAGES

Synergy effects[1)]

As ecosystem model companies operate in several business areas, it has in many overlapping parts. This **enables these companies to leverage cost-saving synergy effects and utilize brand and service/product synergy effects**[2)]. In addition, the knowledge acquired in the respective business areas can be transferred and used for other new business areas.

Value proposition[3)]

The value proposition of a company that offers **multiple services or products** is naturally more comprehensive than providing a single service. Since many of the **services complement each other**, a synergy effect also results here, enhancing overall customer satisfaction[4)]. In addition, a broad value proposition diversifies risk[5)] and dependence on one single service or product.

VULNERABILITIES

Complexity

A wide range of product/service offerings can also be a drawback. The question is whether a company that focuses on many different business segments can be exceptional and successful in each of them. Companies have to face the problem that they are **stuck in the middle** - neither are they cost leaders, nor do they have a differentiation factor[6)].

In addition, the previously mentioned cost synergy effects do not come into play if the business segments are very different. In such cases, entirely new relationships must be established, and synergy effects cannot be utilized.

When the company's management must consider information from numerous sources, the **complexity of the decision-making** process is substantially increased. Not only is it more complex, but it also carries the risk of missing out on decisive information.

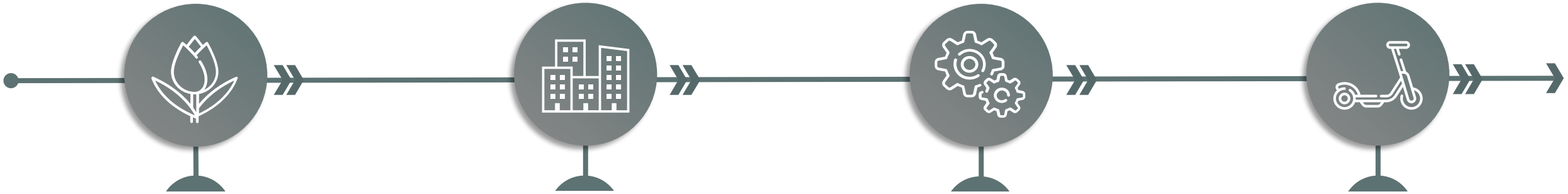
5

INDUSTRY OUTLOOK

Main Industry Drivers

The industry drivers of sustainability, urbanization, adoption and mobility are the main reasons why micromobility is expected to keep growing strongly

Sources: 1) VOI Technology AB, 2021; 2) Zukunftsinstitut, n.d.; 3) FutureBridge, 2020; 4) Oeschger, Carroll, & Caulfield, 2020; 5) Song, Cherrett, McLeod, & Guan, 2009; 6) BIS Research, 2020



Sustainability[1)]

One of the goals, pursued globally is the **reduction of CO_2 emission**. Since the vehicles are human-powered or electric, **environmental impacts are substantial** – especially considering that the micro-vehicles have the potential to replace the car.

Urbanization[2)]

More and more humans live in cities and this trend is still ongoing. As one of the so-called mega trends, this leads to an **increasing need for mobility solutions** in urban areas. In this context, micromobility with MaaS offers the perfect solution.

Adoption[3)]

The acceptance of micro-vehicles is increasing significantly – especially e-scooters had an acceptance problem which changed dramatically. Now **MaaS services are being integrated into public transport** on a large scale[4)].

Mobility

The **problem of the first and last mile**[5)] represents a real existing mobility problem. By introducing micromobility, a solid, sustainable solution has been found. The **potential is still vast**, as the market is still expected to grow tremendously[6)].

Additionally, to the above-mentioned reasons, further minor drivers contribute to the growth of the micromobility industry.

Market Consolidation

The management of the leading providers of micromobility agree that the market will consolidate

Notes: Citations from source 2) | Sources: 1) Schroeder, 2021; 2) Micromobility Industries, 2019

Caroline Hjelm
CMO, VOI

> *What I think will cause consolidation will be **regulation**. And us at VOI think that it will not only benefit us if there are fewer players, but it will **also better the environment for the users and the cities**.*

Eric Wang
CEO, Wind

> *If the **capital is constrained**, then consolidation could happen.*

Lukasz Gadowski
CEO, Circ

> *There are **too many players**. They might find **regional focuses**, some of them might consolidate like in Latin America like Grin and Yellow **to form the leader for the continent**.*

Comment

Since the **number of competitors in the micromobility industry is very high**[1)], the question is whether all players can survive. Even if MaaS providers seem to emerge on a regular basis, a **recurring expert opinion is that the market will consolidate in the short- to mid-term.**

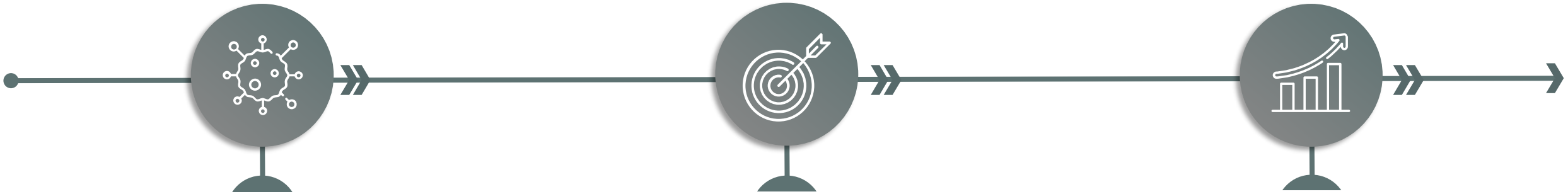
There are several reasons to support this statement. According to Lukasz Gadowski, CEO of *Circ*, one of the **possible reasons for consolidation is a strategic positioning** to take the leadership in a specific region. Eric Wang, CEO of *Wind*, sees the **lack of capital** in this capital-intensive business as a key reason companies will inevitably consolidate. Caroline Hjelm, CMO of *VOI*, also expects market consolidation. She believes the **main reason will be city regulations** aimed at having fewer players in a respective city[2)].

Industry consolidation is already ongoing, and Covid-19 has had a significant impact.

Market Consolidation

The lack of profitability and differentiators are the primary reasons for market consolidation. These two factors have been exacerbated by the impact of Covid-19

Sources: 1) Citron, 2020; 2) Heineke, Kloss, & Scurtu, 2020; 3) CB Information Services, 2021



Impact of Covid-19

The global lockdown had major impact on the micromobility industry. Companies such as *Lime* had to **stop their operations** in major markets[1]. Some **market players lost 80% of the valuation** or had to lay off up to 30% of their staff[2]. These up-to-now **unprofitable companies were put in even more financial distress**.

Market Opportunities

For larger players, the aforementioned devaluations combined with the lack of profitability of the micromobility companies, created **opportunities for acquisitions**. In this regard, for example, *Bird* has acquired *Circ* and *Scoot*[3]. The firms that survived the Covid crisis were able to **streamline their businesses**, **become leaner and grow externally**.

Future

Competitors have **few differentiating factors**, which is why **fierce price competition** is waged to achieve a high market share and to exploit network effects. In the long term, such **business strategies are not sustainable**, and the companies will either go bankrupt, be bought out or grow through acquisitions.

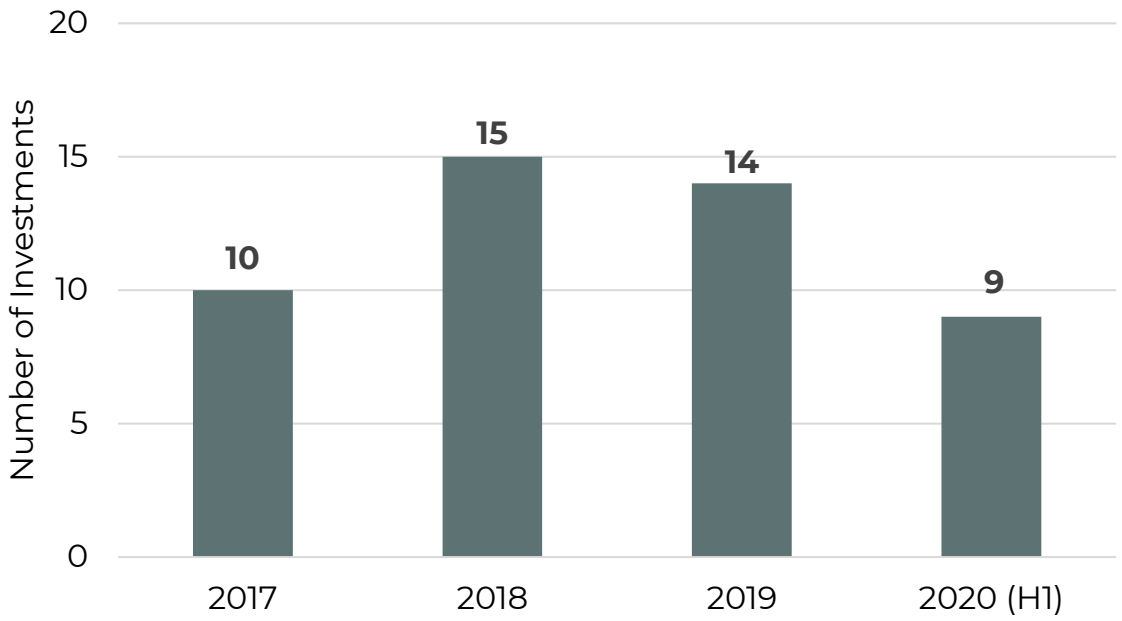
In addition, **investors are seeking reasonable returns**, which is impossible with current business practices. Accelerated by Covid-19, the **lack of profitability** is inevitably leading to **greater consolidation in the micromobility market**.

Investment Landscape

In recent years the number of investments in micromobility have been continuously high. This development underlines further growth for the industry

Sources: 1) Netscribes, Inc., 2020

Micromobility Investments[1)]



Comment

The number of **investments in micromobility is increasing**. Since the establishment of the term in 2017, *Netscribes counted* 48 startups that have received funding until the first half year of 2020. For the first half year of 2020, despite Covid-19, they registered already nine investments, indicating a **continued positive development**.

Not only are the numbers of investments high, but also the valuations. The most prominent companies are *Lime* and *Bird*. Even if their operations are not profitable yet, a more consolidated market with fewer players promises high returns.

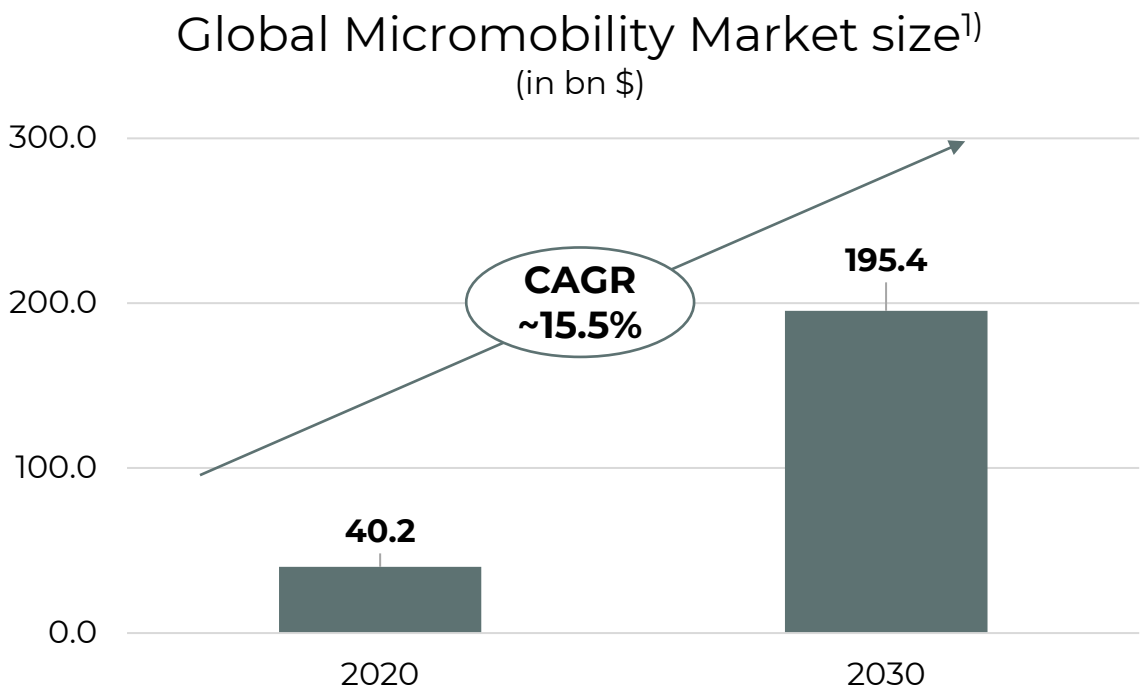
The names and reputation of the **investors in micromobility is also impressive**. Most famous names like *Sequoia Capital* or *Bain Capital Investors* come up when talking about lead investors of micromobility firms.

The **high number of investments** from various sophisticated investors worldwide **emphasizes the attractiveness and prospects** of the micromobility industry.

Future Outlook

The global micromobility market is expected to reach $195.4 billion in 2030. However, new Covid-19 variants such as Omicron pose high risks and challenge current forecasts

Note: CAGR calculation adjusted internally | Sources: 1) Singh & Mutreja, 2021; 2) Heineke, Kloss, & Scurtu, 2020; 3) The Economist Newspaper Limited, 2021



Comment

The global micromobility industry is forecasted to grow strongly over the next years, reaching a **value of $195.4 bn in 2030**. This represents an **annual growth rate of ~15.5%**. The industry is strongly driven by the aforementioned drivers.

The Covid-19 pandemic has had a tremendous impact on the micromobility industry[2)]. Looking at km traveled, there has been a massive decline of 50-60% from the first occurrence until early 2021. Although Covid-19 had a significant impact in the short term, the industry is expected to recover in the medium term fully. For instance, an analysis by ***McKinsey*** **suggests a full recovery from 2021 to 2022**. However, this analysis did not consider new mutations such as the current Omicron variant[3)]. Nevertheless, the impact is not expected to be as dramatic as when Covid-19 first occurred.

Forecasts for the industry remain very uncertain as Covid-19 mutations continue to be a major risk. However, companies and governments have adapted, so the **potential negative impact will not be as severe as when Covid-19 first appeared**.

6

CONCLUSION

KEY INSIGHTS, LIMITATIONS, EXTENSIONS

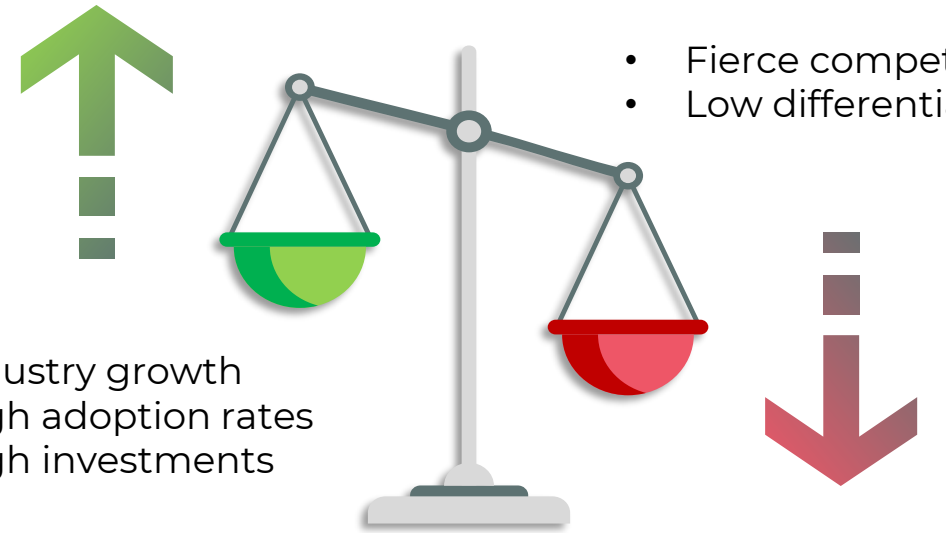
Key Insights

The micromobility industry offers desirable market characteristics. However, companies in this industry are struggling to become profitable

UNPROFITABLE BUSINESSES

Despite strong growth rates, high adoption rates and high investments in micromobility, **profitability among MaaS providers cannot be achieved**. Fierce competition with low differentiators are the main reasons.

Profitability



- Industry growth
- High adoption rates
- High investments

- Fierce competition
- Low differentiation

Comment

The aspects of the **industry outlook all suggest a highly profitable industry**. However, even the largest and most hyped MaaS providers like *Bird* are still net income negative.

The main reason for this is the **low profit margins** with which the companies operate. Since there is hardly any differentiation and the companies essentially offer the same service, price is the only way to compete. This fierce price competition is the main reason that leads to the low profit margins mentioned above.

Additionally, investors often disregard profitability, and companies are **measured only by their market share**.

Key Insights

The low degree of differentiation leads to low customer loyalty. Customers base their decision mainly on the proximity and price of the vehicle

Source: 1) Micromobility Industries, 2019

LACK OF DIFFERENTIATION

Micromobility companies involved at the **end of the supply-chain**, **lack differentiating characteristics**.
The offered services are very alike, and **no major unique selling points** to competitors are created.

André Mozzaglia
Student

I don't make any differences between the e-scooter companies.

Pedro Duarte
Employee

I choose the cheapest. That's BOLT at the moment.

Rongbiao Li
Consultant

There are no major differences for end-customer. This lack of differentiation leads to no customer loyalty at all.

Comment[1)]

The MaaS operators, especially the e-scooter providers, **exhibit a very low degree of differentiation**. The features touted by the companies themselves, such as the quality of the vehicle or customer service, ultimately have only little influence. The end-customer **bases his decision on two factors**: **proximity** of the vehicle and **price** of the provider. This implicates a **low level of customer loyalty** in this market.

The actual differences between the micromobility companies do not affect the end customer but are of a strategic nature. With a lack of differentiation, strategic decisions are even more critical and determine success or failure.

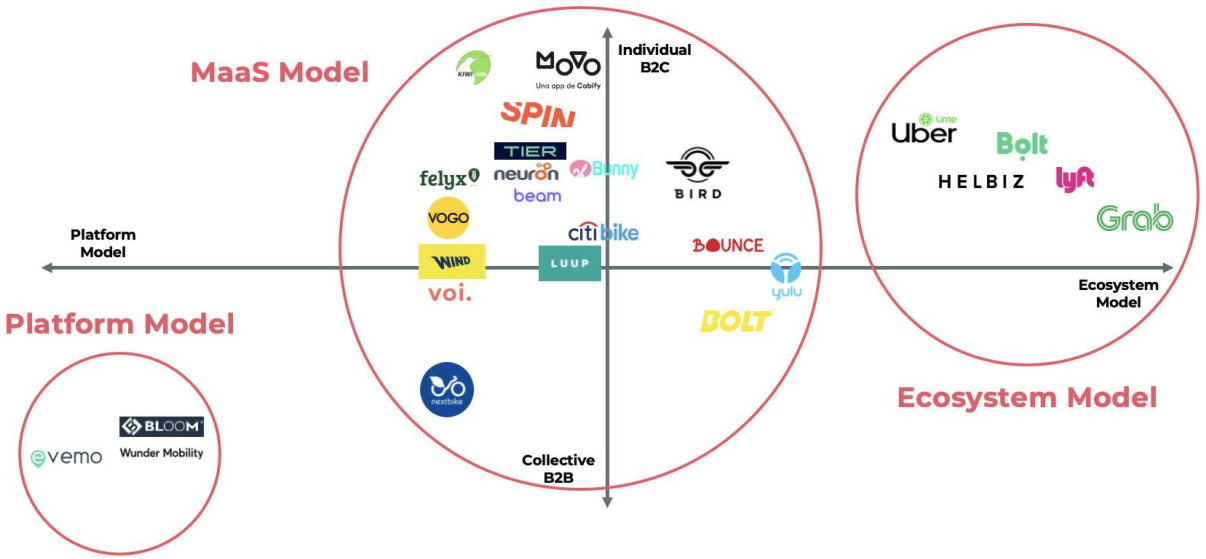
Key Insights

Three business models were identified by mapping micromobility companies onto a coordinate system with two defined dimensions

MICROMOBILITY BUSINESS MODELS

Three business models have been identified in the micromobility industry. **The so-called platform model, the MaaS model and the ecosystem model** mainly differ in two dimensions – target customer and product range.

Business Model Overview



Comment

Three business models could be identified by mapping micromobility companies on a perceptual map. The metric for this was the range of products from low to high on the x-axis and the target customer on the y-axis. The dimension target customer was distinguished in B2B and B2C. The **platform model played a special role** in this overview as they lay upstream of the supply chain and target B2B only.

It is worth noting that **ecosystem model companies offer a wide range of products or services, including MaaS**. Therefore, their MaaS branches have the same characteristics as MaaS model companies, and the given recommendations for MaaS also apply to ecosystem model companies.

Limitations

The analysis of the micromobility industry contained several limitations, mainly due to the fact that this industry is still emerging and relatively new

Lack of financial information

Since most of the firms studied are not publicly listed, **access to financial information was limited**. Particularly when examining the ecosystem model firms, it would have been interesting to find revenue or cost breakdowns by business area to obtain information on synergy effects. However, information in this regard was almost non-existent.

Limited scientific information

Since this industry is relatively new, **scientific information was limited**. There are only a few articles on micromobility in well-known and high-ranked journals. In the few cases that apply, industry business models were not examined. Therefore, this research relied mainly on industry reports, company reports, and expert interviews.

Difficult predictable industry

To draw well-founded judgments, the industry would have to have existed for a longer period. Therefore, there is **still a lot of uncertainty**. This uncertainty has been and is still being **intensified by the Covid-19 pandemic**. Thus, forecasts are only partially reliable and still depend on many unpredictable influences.

Varying definitions

Since the term micromobility itself is relatively new, there is **no uniform definition**. Besides, also **different definitions for the term "micro-vehicle"** exist. These differences make it difficult to draw conclusions from sources because it is **unclear what definition the author refers to**. However, by defining an own scope, this limitation could be mitigated.

Extensions

This report could be extended by a broader research scope, an updated analysis, surveys, and further interviews

Broader scope of research

The scope of the study could have been broadened by **including other complementary mobility industries** such as the automotive industry or public transport. An investigation of how these industries react to the emergence of micromobility and how they are affected by it would be interesting in order to obtain a more holistic picture of mobility in general.

Updated analysis

Understanding consumers and industry forces formed the foundation for this report and the final recommendations.

Because we are still in an uncertain time with Covid-19, the accuracy of **many statements from reports or articles written before or during the pandemic must be verified** post pandemic.

Surveys

The analysis **could be enhanced by incorporating surveys** to understand better how customers perceive micromobility services.

Especially, to get a wide range of opinions on the business model innovation “tourism mode” a **survey could serve as proof of concept** and basis for further improvements.

Interviews

The analysis can be expanded by conducting **interviews with experts downstream of the supply-chain**. For instance, with micro-vehicle manufacturers to get more insights about the hardware part of the service. Additionally, an **interview with an invested VC** could disclose the KPIs investors look for within a micromobility investment.

APPENDICES

1

INTRODUCTION

Environmental Impact

The environmental impact of micromobility is positive. Cars are being replaced and public transportation is supported

Sources: 1) City of Portland, Oregon, USA, 2018; 2) VOI Technology AB, 2021; 3) Moreau, et al., 2020; 4) Holmgren, 2020; 5) ITF, 2021

MICROMOBILITY

Cars

Several surveys show the impact that micro-vehicles have on current transit, particularly the way how **cars are being replaced as a mode of transportation**.

The *Portland Bureau of Transportation* found that 34% of survey respondents said they would have taken their own car or a cab if e-scooters were not available[1)].

Data collected by e-scooter provider *VOI* indicates a **15.3% increase in car replacement rate** in Europe by 2020, and there is no end to this trend. A recent study in Oslo found that more than 65% of respondents said they use their cars less when e-scooters are around.[2)]

Public Transportation

Micromobility has a **huge impact on public transportation**. These impacts are on the one hand pro public transport, and on the other hand contra.

For instance, some surveys show that e-scooters have a negative impact on public transport. In a survey conducted in Brussels, researchers found that 30% of users use **e-scooters instead of public transport**[3)].

An important pro aspect is that the presence of e-scooters increases accessibility to public transport[4)], by increasing the catchment area of public transport[5)]. Therefore, micromobility works a **complementary part to public transport**.

As cars are still predominantly gasoline-powered, while micro-vehicles are either human-powered or electric, the replacement of the car and increased accessibility to public transit is **contributing to a more sustainable way of traveling**.

International Vehicle Classification System

Source: Santacreu, 2020

International vehicle classification				
	U.S.	**Latin America**	**Europe**	**Asia**
E-bikes	**Distinction in 3 categories:** • Class 1: E-bike with motor that provides assistance only when rider is pedalling and stops assisting when speed of 32 km/h is reached • Class 2: E-bike with motor intended to be used only to propel the bicycle and cannot provide assistance when bike reaches speed of 32 km/h • Class 3: E-bike with motor and speedometer that provides assistance only when rider is pedalling, no longer provides assistance when bike reaches 45 km/h	Countries classify micro-vehicles relating to the speed developed: **Mexico**: • Non-motorized vehicle is one able to develop autonomously a speed of max. 30 km/h • A vehicle that exceeds 30 km/h is considered motorized and needs a license plate, registration and must follow car rules **Colombia:** • Motor power up to 300 W • Weight up to 35 kg • Max. speed up to 25 km/h	EU regulation established L-category vehicles as a reference for member countries: **L1e-A:** • Max. speed of 25 km/h • Power between 250 W and 1000 W	**China:** • Working pedals • Max. speed of 25 km/h • Max. weight of 55 kg • Max. motor power of 400W • Max. battery voltage of 48V **Korea**: • Power driven vehicles classified as motor vehicles • UNECE regulation is used to classify vehicles
E-scooters	Speed limit vary by state and range between 20 km/h to 32 km/h	**Classification as PMDs:** • electrical motorised individual vehicles • with one or more wheels • Max. speed of 25 km/h	**L1e-B:** • Max speed of 45 km/h • Power of 4000 W	**Singapore**: • Classified as PMDs (Personal Mobility Devices)

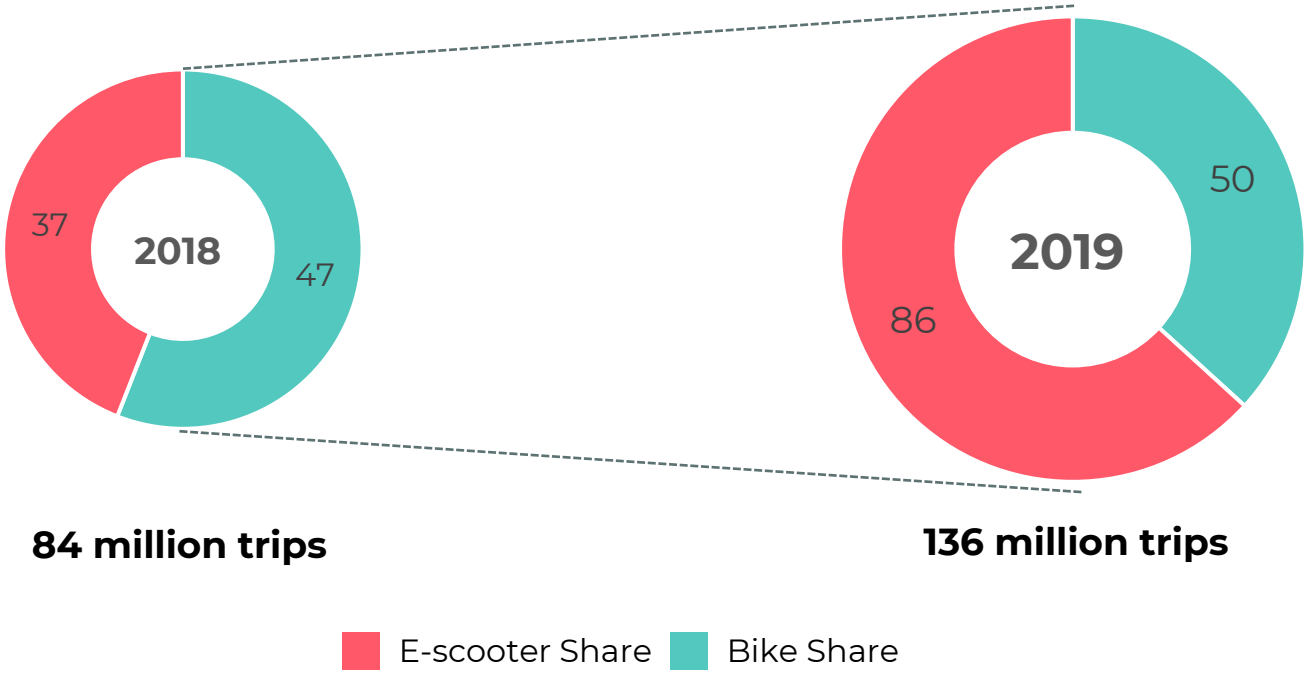
E-scooter Focus

In the U.S., trips on shared bikes, e-bikes and e-scooters increased by 60% from 2018 to 2019. Thereby, e-scooters play the most essential role

Sources: 1) NACTO, 2020

Shared micromobility ridership growth[1)]

(2018-2019, United States, in million of trips)



Comment

In 2018, the number of e-scooter share trips was 37 mio. This accounts for 10 mio less rides, compared to bike share.[1)]

The **scooter rides in 2019 skyrocket**ed with a growth rate of over 132%, reaching a total of 86 mio rides. On the other hand, the number of **bike rides almost stagnated**. It only slightly increased by 3 mio from 47 mio to 50 mio. Overall, the number of micromobility trips are increasing strongly.[1)] However, 2020, due to the pandemic, represented an exception. The restrictions and lockdowns led to decreases of 50-60% of passenger-kilometer traveled. Nevertheless, experts claim that this industry will emerge stronger from the Covid-19 crisis.

This development underlines the **importance of e-scooters** in the micromobility industry.

Interviewees

Five individuals were interviewed to get a consumer point of view of the industry

André Mozzaglia

Student

Regular user

”With the implementation of e-scooters in Carcavelos I can get to Nova faster”

Julika Diano

Employee

Occasional user

“E-scooters are the means I use most frequently to get around the city”

Pedro Duarte

Employee

Regular user

“I use e-scooters regularly to get to my office”

Giulia Croxatto

Entrepreneur

Regular user

“I use e-scooters more than I use my car or any other vehicle”

Vladyslav Chernyshov

Employee

Regular user

“Apart from my age I regularly use shared e-scooters”

3

INDUSTRY BUSINESS MODELS

Industry Overview

Company	Products	Target Customers
acciona	E-mopeds	Individuals
beam	E-Scooters, E-Bikes	Individuals, Cities
BIRD	E-Scooters, E-Bikes, Long-term rental option, Buying Option	Individuals
BLOOM	Stand-alone platform, Ready to use platform	Entrepreneurs, Businesses
Bolt	Scooters, E-Scooters, E-Bikes, Ride-hailing, Food Delivery, Leasing Options	Individuals, Restaurants, Drivers, Cities, Public Institutions, Businesses
BOLT	Scooters, E-Scooters, E-Bikes, Delivery, Leasing Options	Individuals, Cities, Businesses, Public Institutions, Restaurants
BOUNCE	Powered scooters, Buying Option, Platform sharing	Individuals, Scooter Owners

Company	Products	Target Customers
Bunny	E-scooters, Long-term rental	Individuals
citi bike	Bicycles, E-Bicycles, Long-term rental	Tourists, Commuters, Businesses
cooltra	E-mopeds, Mopeds	Individuals, Businesses
felyx	Scooters	Individuals, Businesses
Grab	E-scooters, Food/Grocery delivery, Ride-hailing, Logistics, Online payment, E-commerce	Individuals, Businesses
HELBIZ	Scooters, E-Scooters, E-Bikes, Food Delivery, Buying Option	Individuals, Cities, Businesses,
KIWI ride	E-scooters	Individuals

Industry Overview

Company	Products	Target Customers
Uber Lime	Scooters, E-Scooters, E-Bikes	Individuals, Businesses, Property Developer
LUUP	E-scooteers, E-bikes	Individuals, Businesses (for charging spaces)
lyft	Bikes, E- Bikes, Scooters, Ride-hailing, Food Delivery, Car rental	Individuals, Businesses
MOVO Una app de Cabify	Scooters, E-scooters	Individuals
neuron	E-Scooters, E-Bikes	Individuals, Cities
nextbike	Bikes, E-Bikes	Cities, Public Institutions, Universities, Businesses
SPIN	E-Scooters, E-Bikes	Students, Individuals

Company	Products	Target Customers
TIER	Scooters, E-Scooters,	Individuals, Businesses
evemo	Mobility Platform (Ecosystem model)	Businesses, Municipalities, Public Utilities
VOGO	Scooters	Individuals
voi.	E-Scooters	Individuals, Businesses
WIND	E-scooters	Individuals, Cities
Wunder Mobility	Stand-alone platform, Ready to use platform	Municipalities, Public Utilities
yulu	Bikes, E-Bikes, Mopeds,Long-term rental Advertisement	Individuals, Cities, Universities, Businesses

4

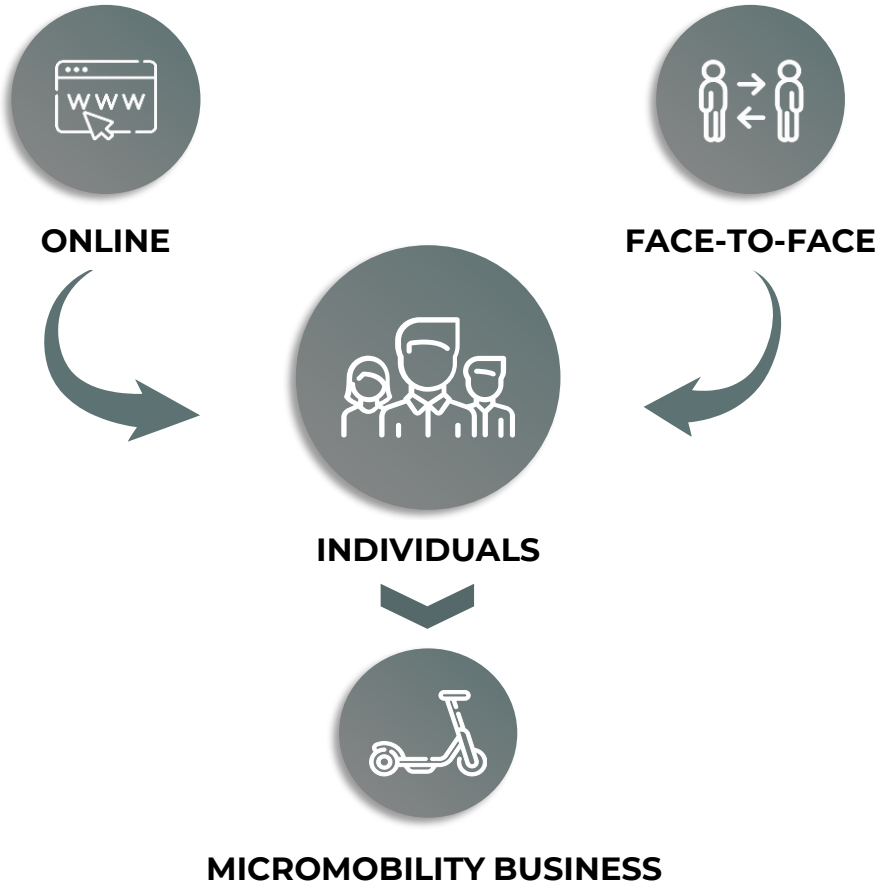
BUSINESS MODEL ANALYSIS

MAAS MODEL, ECOSYSTEM MODEL

PM: Channels

Platform model companies approach their customer segments via a combination of online and face-to-face communication channels

Sources: 1) Wunder Mobility, 2021



Comment

Social media platforms are ideal for targeted outreach to individual entrepreneurs and professionals, seeking to offer mobility solutions. Platforms such as LinkedIn and Twitter are best for direct communication. Facebook and Instagram are best for advertisement/marketing purposes.

The **websites are used to provide detailed information** and allow potential customers to contact platform providers online. Companies such as *Wunder Mobility* have their own blog and publish various articles about urban mobility. Thereby, they raise additional brand awareness in the micromobility industry next to communicating with stakeholders and shareholders[1)].

In contrast to online platforms, **conventional channels** such as conferences, exhibitions, phone calls and direct messages are most effective for reaching public institutions and larger corporations.

The communication channels for platform model firms are essential, as this is how they maintain old customers and acquire new ones. Nevertheless, customer acquisition costs are very high in this segment.

PM: Customer Relationships

Close guidance from the start to aftersales is essential for platform companies to ensure customer satisfaction and thus success

Sources: 1) Buchberger, 2020; 2) Strategyzer, n.d.; 3) Wunder Mobility

We pick up the phone even after your successful launch, and you'll receive on-demand help from the Wunder Mobility team whenever you need.

Nele Toebelmann
WUNDER MOBILITY

Marketing Initiatives → **Initial Contact** → **Demo & Testing** → **Closing** → **Roll-Out** → **Customer Success**

Comment

Above, the B2B SaaS sales process has been illustrated. The first contact starts after the marketing initiatives have been successful. From then on, every step must be **closely accompanied by the sales manager** resp. the customer success manager. This means that after the actual sale, providing support is essential.[1)]

Customer relationships are a decisive factor for the success of platform companies. As these are long-term relationships, customer satisfaction must be guaranteed from the initial consultation through to aftersales.[2)] In this business model, each customer receives **dedicated personal assistance**, which represents the deepest and closest possible relationship between provider and customer.

Hence, companies like *Wunder Mobility* need to be **highly reliable in all circumstances and be in constant exchange** with its customers[3)]. Especially since the service is personalized, close and continuous communication is crucial to be successful.

MaaS: Channels

The versatility of online marketing is being utilized and represents an essential part of the communication strategy of MaaS companies

Sources: 1) Wong, 2021

Online Marketing

The **following communication channels are part of online marketing** – Social media, the app store presence and search engine optimization.

Social media is the most important communication channel for MaaS companies. There are many uses for social media, such as recruiting talent, B2B relationship building, interacting with industry experts, or enhancing brand awareness.[1)] For example, *Facebook* and *Instagram* are ideal for building a community of enthusiasts, taking in a brand ambassador role. Additionally, the social media pages are directly linked on how the brand is perceived by the customers.

In addition to social media, traditional online marketing such as **Google advertising** are also important. Furthermore, presence and presentation in the app store is another important aspect.

Business Model Comparison

All three business models have some parts in common and differ for others

Business model comparison							
	Customer segments	**Channels**	**Value proposition**	**Key partners**	**Key resources**	**Key activities**	**Revenues & Costs**
Platform model	Different	**Similar**	Different	Different	Different	Different	Different
MaaS model	**Similar**	**Similar**	Different	**Similar**	Different	Different	Different
Ecosystem model	**Similar**	**Similar**	Different	**Similar**	Different	Different	Different

Comment

The table above shows a **comparison of all three identified business models**. The analyzed parts of the respective business models faced an evaluation and were either categorized as similar or different.

As expected, across these categories, the **MaaS model and the ecosystem model show some similarities**. This is reasoned by the facts that ecosystem model companies incorporate the MaaS model and lay at the end of the supply-chain.

6

RECOMMENDATIONS

BUSINESS MODEL INNOVATION

Impact on Revenue

Revenue impacts are estimated based on several assumptions and benchmarking figures to simplify the calculation

Sources: 1) Graefe, 2021; 2) Bassig, 2019; 3) Xinhua, 2018; 4) Zomato, 2018

APP ADVERTISMENT	
Number of gastronomy	11.130
% of gastronomy using the service	10%
Number of gastronomy using the service	1.113
Approximated TripAdvisor costs	1.967
Yearly revenue by advertisement	**2.189.649**

DISTRIBUTION GERMANY		
Restaurants	70.600	56,98%
Clubs + Bars	4.500	3,63%
Cafés	11.800	9,52%
Snack Bar	37.000	29,86%
Total	123.900	

TOURIST SHARING	
Number of tourists[3]	4.500.000
% of tourists using the Service	35%
Number of Tourists using the service	1.575.000
Approximately km to explore Lisbon	20
Average Speed (in km/h)	15
Duration (in minutes)	80
Average Costs per minute	0,2
Cost per ride	16
Yearly revenue by mobility	**25.200.000**

DISTRIBUTION LISBON		
Restaurants[4]	6.342	56,98%
Clubs + Bars	404	3,63%
Cafés	1.060	9,52%
Snack Bar	3.324	29,86%
Total	11.130	

Total revenue increase	27.389.649

App advertisement assumptions

- Distribution of German gastronomy also applies to Lisbon[1]
- 10% of experience providers are making use of our advertisement service
- The 10% making use of the advertisements service pay €1.967 per year – a benchmarked figure with TripAdvisor advertisement costs[2]
- Other experience providers next to gastronomy neglected

Tourist sharing assumptions

- 35% of Lisbon's tourist will use the new city tour
- 20 km needed to explore Lisbon city – compared to bus tours and free walking tours
- Average rider speed of 15 km/h
- B2B tourist sharing franchise model and spill over effects, leading to more rides and effects of new unlocking fee structure neglected

Impact on Costs

Cost impacts are estimated based on several assumptions and benchmarking figures to simplify the calculation

Notes: 1) one of the largest micro-.vehicle suppliers of the industry | Sources: 2) Alibaba.com, 2021; 3) Carey, 2020; 4) Alibaba.com, 2021; 5) SPD Load, 2021; 6) Rowe, 2021

VEHICLE LIFESPAN	
Okai wholesale price[2)]	478
Life expectancy (in years)	1
Increased life expectancy	100%
New life expectancy (in years)	2
Depreciation before	478
Depreciation after	239
Number of vehicles[3)]	12.000
Depreciation savings	**2.868.000**
INTIAL CAPEX	
App development	300.000
Tourism Expert	40.000
Docking Stations acquisition per unit	200
Number of docking stations needed	85
Docking Stations acquisition total	17.000
Docking Station implementation costs	40.000
INTIAL CAPEX	**397.000**
FLEET MANAGER COSTS	
Fleet manager cost per vehicle	370
Vehicles per fleet manager	10
Fleet managers needed in Lisbon	1200
Cost of fleet managers	446.400,00
Reduced need of fleet managers	50,00%
Fleet manager savings	**223.200**
Total costs decrease	**2.694.200**

Vehicle depreciation assumptions

- Okai[1)] e-scooters benchmarked on Alibaba
- Vehicle lifespan one year – average of many sources
- Through docking stations vehicle lifespan improved by 75%

Initial CAPEX assumptions

- Dockings stations acquisition and implementation costs benchmarked with e-bike docking station[4)]
- App development considered complex[5)]
- Number of docking stations estimated over the number of tourists and their need for charging

Fleet manager costs assumptions

- Cost of fleet manager estimated over the cost per vehicle and the number of vehicles[6)]
- 50% less need of fleet managers with the implementation of docking stations

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