2020 CIVITAS
Cleaner and better transport in cities

ELEVATE

Tools for self-supportive mobility interventions: A handbook

Deliverable No.:	D3.1
Project Acronym:	CIVITAS ELEVATE
Full Title: CIVITAS ELEVATE – CIVITAS 2020 Coordination and Support Action	
Grant Agreement No.:	824228
Work package No.:	3
Work package Title: CIVITAS Incubator and CIVINETs	
Responsible Authors: Ekaterina Uzunova, Hidde Westerweele and Nina Nesterova (BUAS)	
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Date:	27.11.2020
Status:	Final
Dissemination level:	Public

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THE CIVITAS INITIATIVE IS CO-FINANCED BY THE EUROPEAN UNION

FOREWORD

This is the handbook we were waiting for. Most cities and regions know *why* they need a transformation of the existing transport system - and the way we move from a to b - but are struggling with the *how*. Cities and regions deal with challenges such as congestion, lack of space, air pollution, climate change, liveability, noise, road safety, growing population and economic development. They know that a wide range of new mobility services enabled by new technologies and concepts such as connected, cooperative and automated mobility (CCAM), artificial intelligence (AI) and Mobility-as-a-Service (MaaS) offer opportunities to make their cities better, cleaner, healthier, wealthier, safer and more accessible. Also, cities and regions are aware they need to work in a process of 'learning by doing' in which they make mistakes and learn from them. They know the transformation needs to be an iterative process in which *design thinking concepts* and *user centric design* are crucial. Which is much easier said than done. Cities and regions are usually aware of the enormous complexity of this transformation to a sustainable urban mobility in which the car is no longer dominant. A complexity with three dimensions: A large number of stakeholders involved, many barriers to deal with and the very dynamic developments in technology and society. What we know today is obsolete tomorrow. Essential for a transformation in which the citizens are at the forefront is that local and regional authorities initiate and boost the development of *multi stakeholder learning ecosystems* in which ALL stakeholders are involved. A mission-oriented approach in which the *learning by doing* is facilitated for an ecosystem with industry, researchers, education, end-users and other stakeholders. Also, for governments to learn how to deal with their new role in *innovation procurement*, deployment and regulation of new mobility services. Existing industry, SMEs, start-ups, scale-ups play a key role in this transformation of mobility and all have their own struggle in creating new markets and growth. In these *learning ecosystems* companies learn from governments, researchers and citizens but moreover from other companies.

To be able cope with the transformation of the mobility market, new and existing businesses need to have an understanding of the changes happening around them and how these changes could impact their future. In like manner, they need to familiarise themselves with the appropriate tools that could support them in introducing new mobility services and products. Hence, this handbook offers insights into the changing mobility ecosystem and the implications it could have for the business models of existing and new players in the field. Having these insights could assist businesses in challenging the readiness of current business models to face the new ecosystem, and in identifying new value propositions.

One of the ecosystems - on a European scale - with the purpose to boost large scale deployment of new mobility in an urban context is the *New Mobility Services partnership (NMS)*. Initiated by DG MOVE from the European Commission and coordinated by the Province of Noord-Brabant / BrabantStad in the Netherlands. The partnership entails a wide range of companies, universities, governments and citizen networks. NMS has several *Working Groups* putting their teeth into challenges such as *Smart Parking Solutions, Urban Freight Transport, Intelligent Speed Assistance, Traffic Management of the Future* and *Smart Walking and Cycling.* This handbook comes as a welcome tool to learn from experiences and get inspired to take the next step. We assume that existing and new companies and other readers of this handbook find it interesting and helpful and will bring them further in creating impact and growth.

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CIVITAS 2020 | ELEVATE

Abstract

This handbook provides an overview of the changing mobility market and the tools mobility providers could use for support in achieving self-sustainability in the long run. It is written as part of *WP3: CIVITAS Incubator and CIVINETs* of the project CIVITAS ELEVATE. The handbook aims to support new and existing mobility providers who seek to understand how their actions could lead to the development of successful interventions in the changing market. The work has been carried out with the support of 'Fresh Brains', referring to the inclusion of students in the CIVITAS Network as a way to bring a fresh and external view on existing situations (linked to *WP4: Capacity Building*, Task 4.4: Bringing 'fresh brains' into CIVITAS). Christiaan Ilsink, an intern at Breda University of Applied Sciences, has contributed to this product in the framework of the 'Fresh Brains' activity.

Project Partners

Organisation	Country	Abbreviation
Mobiel 21	BE	M21
DTV Consultants	NL	DTV
ICLEI European Secretariat	DE	ICLEI
INOVA+ Innovation Services	PT	INOVA+
Breda University of Applied Sciences	NL	BUAS
TRT Trasporti e Territorio	IT	TRT

Document History

Date	Person	Action	Status	Diss. Level
13.10.2020	Hidde Westerweele, BUAS	Preparation of draft 1	Draft	PC
28.10.2020	Teije Gorris, DTV	First revision	Draft	PC
04.11.2020	Ekaterina Uzunova, BUAS	Preparation of draft 1	Draft	PC
11.11.2020	Teije Gorris, DTV	Second revision	Draft	PC
25.11.2020	Nina Nesterova, BUAS	Preparation of final version	Final	PC
27.11.2020	Fred Dotter	Submission of final version	Final	PC, PM, PO

Publication Disclaimer The official final review of this document will take place in 2022. If there are any corrections of the already published deliverable by the Project Officer, this document will be replaced by the updated one.

INTRODUCTION

AIM OF THE HANDBOOK

The mobility market is undergoing a transformation caused by key disruptive forces like automation and Internet of Things connectivity. Furthermore, as a result of the evolving mobility needs, changing consumer habits and global challenges, such as urbanization and climate change, traditional mobility ecosystems have diversified and new markets are emerging. To successfully introduce mobility interventions, businesses operating in this field need to ensure that their offers are financially and legally viable, and that they are able to be self-sustaining in the long run.

This handbook *aims to inform existing and new companies in the changing mobility market about the tools that could support them in becoming self-sustaining in the long run.*

The main target audience of this handbook is existing and new mobility businesses. The term self-sustaining in this handbook means that the business generates enough revenue from their product(s) and/or service(s), and, therefore, does not need outside capital to operate. An exception of this definition are companies that focus on subsidized projects as a source of income. The handbook does not promise that mobility companies will become self-sustaining, but rather offers knowledge and advice that could be used for support in achieving that.

ADDED VALUE OF THE HANDBOOK

Many tools and a great deal of knowledge has been gathered through CIVITAS over time, all available on the CIVITAS website (www.civitas.eu). However, many of these tools are supply-driven without understanding the specific demand. Furthermore, ELEVATE has noted the need for specific support around the so-called incubation of mobility solutions. A new balance needs to be found between public authorities and private service providers, which requires mutual understanding of the different roles in the mobility chain. Mobility solutions can only be sustained if there is a continuous mechanism of supply, demand and resource. To bridge the gap between the vast supply of information and the end user, and to provide specific know-how for the incubation of mobility solutions, CIVITAS ELEVATE will provide support and develop capacity through various incubation workshops and the provision of this guidance material. These activities will allow stakeholders to learn how to understand and asses the 'added value' of their products and services that is vital for their businesses to become self-sustaining. This handbook is one of the elements CIVITAS ELEVATE offers for support, which can be used to provide guidance material to conduct incubation workshops.

READING GUIDE

Chapter 1 sketches a picture of the changing mobility market. It firstly describes the trends driving the transformation of the mobility market, and then presents an overview of the transitioned traditional and new mobility ecosystem. Chapter 2 provides an overview of the tools that could support companies in understanding their added value that is vital for their businesses to become self-sustaining in the long run. It also presents examples of business strategies companies are using as a response to the changing mobility market. Chapter 3 presents advice on concrete actions stakeholders could take to ensure that their offers lead to self-sustainability and long-term impact.

LIST OF ACRONYMS

AI	Artificial Intelligence
AVs	Autonomous Vehicles
B2B	Business-to-Business
B2C	Business-to-Consumer
BMC	Business Model Canvas
BMT	Business Model Template
Bn	Billion
C2C	Consumer-to-Consumer
CAVs	Connected and Autonomous Vehicles
CO₂	Carbon dioxide
COVID-19	Coronavirus disease 2019
CSR	Corporate Social Responsibility
EIC	European Innovation Council
EIT	European Institute of Innovation & Technology
EPOMM	European Platform on Mobility Management
EU	European Union
EUREKA	European Research and Co-ordination Agency
GHG	Greenhouse gas
GPS	Global Positioning System
ICT	Information and communications technology
IoT	Internet of Things
LC	Lean Canvas
MaaS	Mobility-as-a-Service
NOx	Nitrogen oxide
NS	Nederlandse Spoorwegen
OECD	Organisation for Economic Co-operation and Development
PM	Particulate matter
PT	Public Transport
PwC	PricewaterhouseCoopers
R&I	Research & Innovation
RET	Rotterdamse Elektrische Tram
SMEs	Small and Medium Enterprises
TNCs	Transportation network companies
TUM	Technical University of Munich
TfL	Transport for London
UK	United Kingdom
UN	United Nations

LIST OF FIGURES AND TABLES

FIGURES

TABLES

2020 CiViTAS | ELEVATE

TABLE OF CONTENT

1. A GLIMPSE INTO THE CHANGING MOBILITY MARKET

Worldwide, cities are increasingly striving for the creation of more sustainable and liveable urban habitats. To increase their quality of life and environmental friendliness, cities are reclaiming urban spaces priorly allocated to car parking and transportation and allocating them for other uses, such as green areas and active mobility infrastructure. Furthermore, cities and companies are focusing on resource efficiency as a way to achieve greater productivity with lower costs and reduced negative environmental impacts whilst providing more consumer choices and opportunities for eco-friendly lifestyles.

These are only a few of the actions that are being taken to tackle challenges, such as urbanisation, scarcity of urban space and resources, rising pollution, congestion and inequality levels, and changing travel needs and mobility behaviours.

As a result of these global challenges, trends and developments, the mobility market is experiencing a shift, characterised by the alteration of established business models and the appearance of new types of mobility providers and services. This chapter provides an overview of the trends and developments driving the mobility market transformation and summarizes the major impacts they have on the mobility market.

1.1   Trends driving the transformation of the mobility market

This chapter delves into the social, technological, environmental, economic and political trends and developments acting as push forces and enablers of the changing mobility market. Figure 1 provides an overview of the trends and their roles as enablers or push forces. The paragraphs below the figure describe these trends in detail.
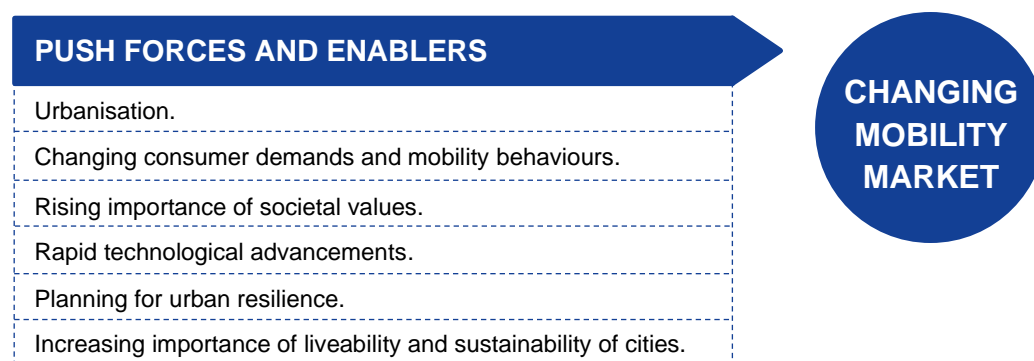
PUSH FORCES AND ENABLERS

Urbanisation.

Changing consumer demands and mobility behaviours.

Rising importance of societal values.

Rapid technological advancements.

Planning for urban resilience.

Increasing importance of liveability and sustainability of cities.

CHANGING MOBILITY MARKET

Figure 1. Overview of the trends: push forces and enablers of the changing mobility market.

URBANISATION

Urbanisation refers to the increase in the percentage of population living in urban areas, the size of cities, and the growing number of urban dwellers. As a result of this trend, cities are becoming places with high concentration of economic activity, innovation and basic services, often more accessible than in rural areas. According to the United Nations, 55% of the world's population was residing in urban areas in 2018, a proportion that is projected to increase to 68% by 2050 (United Nations, 2019). The rapid urbanization, and the resulting downsides from it - air pollution, congestion and urban sprawl, are imposing a pressure on the resources, infrastructure and scare space of cities. As a response to the resource constraints and the overloading of infrastructure, mobility players are disrupting the traditional ownership models by introducing collaborative consumption services, such as car-sharing and bike-sharing (Ernst & Young Global Limited, 2015).

CHANGING CONSUMER DEMANDS AND MOBILITY BEHAVIOURS

According to a 2018 consumer research by PwC, customer demand for new mobility services is increasing, as out of the 3 000 respondents, 74% opt for the most convenient way of getting to their destination, including using more than one transport mode. Furthermore, the study concludes that 47% of European consumers would consider giving up their own car in favour of widely available and adequately priced autonomous robotaxi services. (PwC Strategy&, 2019)

Simultaneously, some countries are experiencing a decline in the car ownership rates. For instance, the share of people who own a car in Germany has dropped from 43% in 2010 to 36% in 2018, while car fleets increased over the same period from 57% to 64% (CAR Center Automotive Research - Uni-DUE, 2018). In addition, modal split data for some high-income cities reveal a decrease in the share of trips by car and an increase in the modal share of walking, bicycling, and public transport over the past decade. Some examples include Berlin with a reduction of the car modal share from 31% in 2008 to 24% in 2018 (EPOMM, n.d.; TUMInitiative, 2018), Amsterdam – from 38% in 2008 to 19% in 2017 (EPOMM, n.d.; City of Amsterdam, 2020), and Vienna - from 34% in 2006 to 29% in 2018 (EPOMM, n.d.; City of Vienna, 2019). As a result of these trends, a new consumption culture is emerging – from consumers using a personal vehicle for all purposes to choosing an optimal mobility solution for each specific purpose (McKinsey & Company, 2016).

RISING IMPORTANCE OF SOCIETAL VALUES

Worldwide, countries have been experiencing rising income inequalities since 1980 (Alvaredo, Chancel, Piketty, Saez, & Zucman, 2018), and a rising older population (i.e. people aged 65 and older) that is growing faster than all other age groups. It is expected that the people aged 65 and older will be 16% of the total population worldwide by 2050, compared to 9% in 2019 (United Nations, 2019). Local authorities are increasingly aiming to enhance the inclusiveness of cities by providing diverse and more affordable transport options that could help to address the inequalities in modern-day cities.

As a result of the renewed interest in these social issues, and the growing environmental and economic concerns intensifying the need for sustainable alternatives, shared mobility is becoming more common. Shared mobility is referred to the sharing of a mode of transport instead of owning it, and the use of technology to connect passengers and mobility providers. The number of shared cars in Europe increased from 132,000 in 2016 to 370,000 in 2018 (ING Economics Department, 2018). Concurrently, the rapid technological advancements have made sharing vehicles and data easier and more efficient. This has caused automotive and rental companies, city-sponsored programs, and mobility start-ups to come up with new solutions ranging from physical networks to mobile applications serving to adjust routes, fill the available seats, and provide real-time information (Shared Use Mobility Center, 2020).

In addition, Europe is still facing road safety challenges. For instance, in 2019, there have been 22,800 deaths in Europe in road traffic accidents (European Commission, 2020). Compared with 2010, this represents a decrease of 23%. Despite the fact that the trend remains downward, progress has slowed in most countries since 2013. The EU has set in the EU road safety policy framework 2021-2030 a 50% reduction target for deaths and serious injuries by 2030. The Commission's Strategic Action Plan on Road Safety and EU road safety policy framework 2021-2030 also set out the ambition to reach zero road deaths by 2050 ('Vision Zero').

RAPID TECHNOLOGICAL ADVANCEMENTS

o **Automation**

Automotive companies are progressively developing next-generation connected and autonomous vehicles (AVs) that aim to improve the traffic flows and make transportation safer. By being able to track and optimize traffic flows, AVs could help to increase the efficiency of the road use. AVs could also potentially help to reduce car ownership, and thus, free up road space for other users than road infrastructure and parking. AVs could possibly contribute to the reduction of traffic accidents, a potential rooted in the fact that the majority of road crashes nowadays occur as a result of human error, and AVs eliminate the human error from this equation (NHTSA, n.d.). In addition to transforming private mobility, some sources even suggest that AVs could potentially allow public transport providers to move away from fixed-route and fixed-timetable services to on-demand autonomous alternatives, which would efficiently take people from door to door (KPMG International Cooperative, 2019).

o   **Artificial intelligence and big data**

The great leaps in artificial intelligence (AI) are a result of combining machine learning techniques with technologies used for searching and analysing big quantities of data (i.e. big data), which are a product of the development of the digital world (European Parliament, 2019). The growing efficiency of artificial intelligence has enabled the emergence of autonomous vehicles. Fully automated vehicles are still being tested worldwide, but AI technologies that take over certain driving functions are already available on the markets. The data-driven insights provided by AI`s algorithmic processing of big data further foster the creation of new mobility services, such as real-time journey optimization allowing for a more efficient use of existing mobility assets (Audenhove, et al., 2018), and sharing mobility platforms. For instance, the ridesharing platform Uber is using AI in all aspects of the service – from matching passengers and drivers to route optimisation (European Parliament, 2019).

o   **Internet of Things connectivity**

Internet of Things (IoT) connected devices worldwide have increased from approximately 15 billion in 2015 to 30 billion in 2020 (Statista Research Department, 2020). IoT is considered to be one of the technical backbones of smart cities (Nikitas, Michalakopoulou, Njoya, & Karampatzakis, 2020), helping to manage assets, resources and services more efficiently. The global smart cities market is estimated to be growing with 17% each year, providing governments the opportunity to improve urban areas and to grow the national economy (Arup & CEDI, 2016).

IoT technologies are influencing the future of mobility in cities as they introduce a continuous communication channel between mobility stakeholders, increasing the ability to capture and share data (Audenhove, et al., 2018). This, for example, makes it possible for consumers to access smarter route suggestions, and real-time traffic information.

> *Internet of Things* *is referred to the interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data. (Oxford University Press, 2020)*
>
> A **smart city** is a place where traditional networks and services are made more efficient with the use of digital and telecommunication technologies for the benefit of its inhabitants and business. *A smart city goes beyond the use of information and communication technologies (ICT) for better resource use and less emissions.* (European Commission, n.d.)

PLANNING FOR URBAN RESILIENCE

From flooding to major heatwaves, rapid immigration to pandemics, all cities face a range of natural and man-made challenges. According to a report by the Urban Climate Change Research Network, approximately 70% of cities are already experiencing the impacts of climate change, with over 90% of all urban areas being coastal, which puts them at risk of flooding from sea level rise (Urban Climate Change Research Network, 2018). The increases in temperature, sea level and rainfall regimes and the projected increase in frequency and intensity of some extreme weather events pose a serious challenge for the transport sector. Some of the potential problems, which might disrupt its smooth operations are rail buckling, pavement deterioration, thermal discomfort for passengers in vehicles, delays, interruptions, and detouring needs in the event of destroyed infrastructure (European Environment Agency, 2014). To make Europe climate-resilient, in 2013, the European Commission has adopted the EU strategy on adaptation to climate change, which aims to enhance the preparedness and capacity of all governance levels to respond to the impacts of climate change (European Commission, n.d.).

In addition to the climate change-related challenges, scientists predict that disease outbreaks are expected to grow steadily (World Economic Forum and Harvard Global Health Institute, 2019). As a result of the coronavirus outbreak, various stakeholders, including city authorities and mobility companies, are already taking measures to prepare the transport sector for a smarter and cleaner mobility in the post-pandemic cities, helping to combat the climate and health crises. Commuters have been encouraged to walk or use bikes instead of cars and public transport to avoid a new spike in the number of coronavirus infections. Many cities introduced temporary measures like pop-up infrastructure to give more space for social distancing. In turn, some bike-sharing services have seen an uptick in usage (Movmi Shared Transportation Services, 2020).

To become resilient to the changing climate and disruptive events like pandemic outbreaks, a key challenge for cities is to transition to a low-carbon transport network, reduce air pollution, limit exposure to natural hazards and prepare for a future with pandemics on the rise.

> *A **resilient city** assesses, plans and acts to prepare for and respond to all hazards – sudden and slow-onset, expected and unexpected – especially those stemming from climate change.* (UN-Habitat, n.d.)

INCREASING IMPORTANCE OF LIVEABILITY AND SUSTAINABILITY OF CITIES

As cities are becoming bigger, the demand for personal mobility and goods transportation is also growing, leading to competition for the limited urban space. Cities are reserving more space for other purposes than transport and parking infrastructure, such as room for active mobility (i.e. cycling and walking) and green, perceived to make the city more attractive and increase its quality of life. There is also less public acceptance of the impact on the scarce city resources like space, green environment, low air and noise pollution and safety (Boer, Kok, Amstel, Quak, & Wagter, 2017).

Air quality is considered to be one of the key determining factors for the quality of life in cities (European Commission, n.d.), which calls for actions to transform the current transport sector, accounting for nearly 30% of the total CO_2 emissions in the European Union (European Parliament, 2019). Passenger cars are responsible for almost 61% of the total greenhouse gas (GHG) emissions from transport (European Parliament, 2019). Many city dwellers are exposed to these high levels of pollution, resulting in a considerable number of premature deaths each year. Europe`s response to the GHG emissions challenge in the transport sector is an irreversible shift to low-emission mobility - by 2050, GHG emissions from transport will need to be at least 60% lower than in 1990 and be firmly on the path towards zero (European Commission, 2016). This ambition is set in the European Strategy for low-emission mobility adopted in 2016. The top three priority areas of this strategy are: increasing the efficiency of the transport system; speeding up the deployment of low-emission alternative energy for transport; and moving towards zero-emission vehicles.

In order to satisfy the growing mobility demand while also contributing to the sustainability and liveability of cities, mobility providers would have to innovate and lower their consumption of the scarce resources.

1.2   The traditional and new mobility ecosystem: an overview

The social, technological, environmental, economic and political trends described previously act as important drivers in transforming the mobility sector. Cities are investing in making the public transport network more multimodal, sustainable, efficient and convenient. Mobility providers are introducing new mobility options and services, which contribute to reducing the parking demand, pollution, and congestion in cities, and providing energy and transportation cost savings for the users. The illustration below (figure 2) presents how the mobility market is transforming as a consequence of the previously described trends.
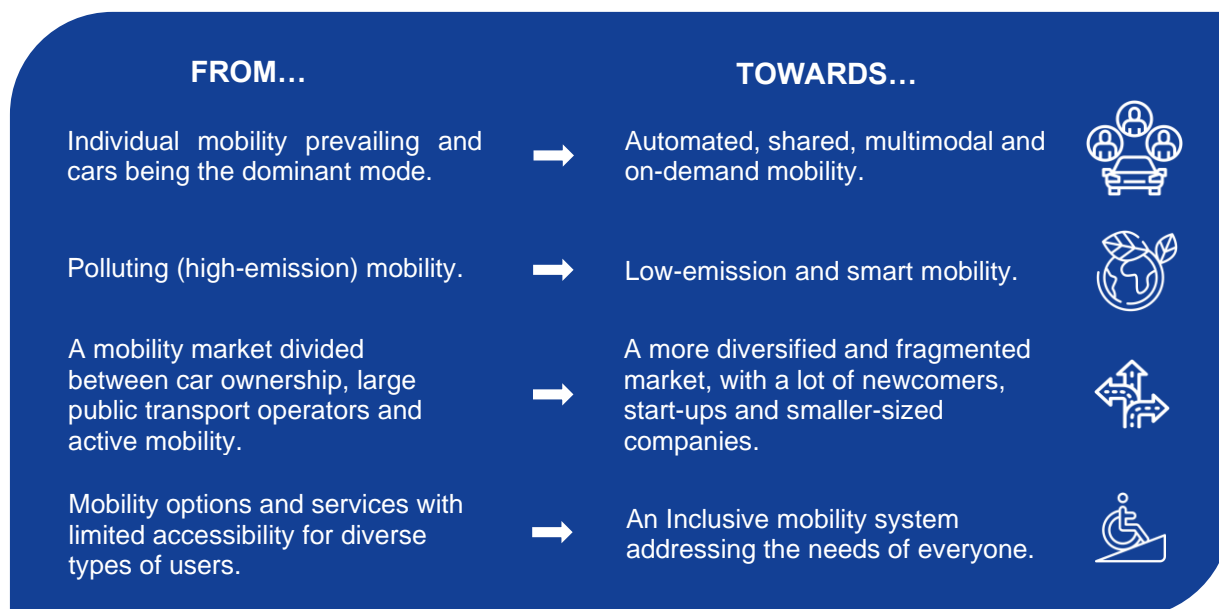
FROM…

Individual mobility prevailing and cars being the dominant mode.

Polluting (high-emission) mobility.

A mobility market divided between car ownership, large public transport operators and active mobility.

Mobility options and services with limited accessibility for diverse types of users.

TOWARDS…

Automated, shared, multimodal and on-demand mobility.

Low-emission and smart mobility.

A more diversified and fragmented market, with a lot of newcomers, start-ups and smaller-sized companies.

An Inclusive mobility system addressing the needs of everyone.

Figure 2. The changing mobility market.

New forms of transport and mobility players are appearing on this changing mobility market. Compared to established transportation players, new mobility providers are offering more personalised, convenient, accessible, reliable and sustainable transport options and services. The table below places the traditional mobility options and services/platforms next to some examples of the new mobility offers appearing on the market. The following chapters will briefly describe some of them, and will provide examples of the options and services/platforms.

	Traditional mobility offers	*New mobility offers*
Mobility options	Car ownership Taxis Rental cars Public Transportation Cycling Walking	Car-sharing Ride-sourcing Ride-splitting E-hailing (taxis) Demand responsive public transport sharing Bike-sharing Other vehicle sharing
Mobility services and platforms	Printed road maps and timetables Physical ticketing	Mobility-as-a-Service Digital journey planning Digital payment and booking Digital information

Table 1. Traditional and new mobility offers.

1.2.1 Traditional mobility redefined

CAR OWNERSHIP

Over the past five decades, personal transportation has been dominated by private vehicles powered by internal combustion engines. On one hand, privately-owned vehicles have increased the freedom of users allowing them to reach almost any location. On the other hand, their mass adoption has resulted in growing congestion, air and noise pollution levels; and degrading health, safety and liveability in cities. On average, car use has grown in Europe, while some capital cities have been experiencing a drop in car usage. For instance, household car ownership in Paris has dropped from 60% in 2001 to 35% in 2019 (Nossiter, 2019).

Together with cities` increasing efforts to tackle the urban challenges and the changes in transport behaviour, technological advances are enabling the transition towards an automated, connected, electrified and shared mobility (European Commission, n.d.). Connected and automated vehicles (CAVs) could help to improve road safety and the accessibility to mobility. However, as car journeys become less costly and more comfortable, people might prefer riding solo in an autonomous vehicle than using PT or shared services. Because of the comfort AVs provide, people might also decide to move away from urban areas and commute longer distances to work (Duarte & Ratti, 2018). This could lead to lower car occupancy rates and more traffic congestion, making pollution worse (Alonso Raposo, et al., 2018). Alternative fuels and electrification of transport could help to break the oil dependency and reduce the GHG emissions. As with CAVs, there is also a potential risk - the combination of e-mobility with fossil-fuel-based electricity generation, which would move the road emissions to the power plants (Tsakalidis & Thiel, 2018).

TAXI

Taxis are passenger vehicles which provide on-demand personal mobility services. Despite the fact that taxis are more costly than public transport, they could provide a more flexible and convenient service. They are also crucial for elderly and disable people who cannot drive, and people who do not own a personal car (OECD, 2018). In recent years, technological innovations have been the driving force behind the evolution of the taxi industry. With the emergence of apps improving user experience and ride-sourcing companies like Uber utilizing this, traditional taxi companies have also begun investing in automating the booking service (Roddy, 2020). Additionally, with many governments announcing bans and fines on petrol and diesel vehicles, and electrification becoming a focus for car manufacturers, taxi companies are increasingly introducing electric fleets. This allows them to benefit from cost savings in terms of fuel and road tax, and an eco-conscious brand reputation (The News Wheel, 2018). For instance, about 2,450 hybrid-electric taxis have been licensed for operation in London since January 2018 (Topham, 2019). According to Transport for London, taxis contribute to 16% of nitrogen oxides (NO_x) and 26% of tiny particles (PM) in London's air, and a "greener fleet" could reduce NO_x emissions by almost half in the centre of the city (Boztas, 2017).

RENTAL CARS

The car rental industry offers a cost effective and convenient method of travel. However, due to the shifts in consumer behaviour, the emergence of new technologies, the smartphone revolution and new mobility services like car-sharing, car rental companies are embracing technological advances to stay relevant. Historically, rental agreements had to be signed before a key is issued. Keyless technologies are now allowing customers to remotely access and start the vehicles from their mobile devices. Furthermore, connected car technology allows companies to gain insight into the vehicle status, how many cars they have and where they are located (Fexco, 2019). Similarly to the taxi industry, the rental car companies are also adding more hybrid and electric cars to their fleets (Trejos, n.d.).

PUBLIC TRANSPORTATION

A reliable, safe and affordable public transport network is key to achieving sustainable mobility in cities. Mass usage of PT could help to reduce congestion, pollutant emissions and energy consumption, while improving traffic flows and reducing travel times (European Commission, n.d.). The European Union strongly encourages the use of PT as part of a multimodal transport scheme, as emphasized in the European strategy for low-emission mobility adopted in 2017 (European Parliament, 2020). Also supported by the Paris Agreement and the 2011 White Paper 'Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system', PT run on alternative and cleaner fuels and vehicles could contribute to the achievement of the transport emissions goals. Within these frameworks, national, regional and local PT actors are undergoing a sustainable transformation of their fleets. For instance, all electric passenger trains in the Netherlands, which are operated by the state-owned company NS, have been powered using green energy since 2017 (Government of the Netherlands, n.d.). Another example is the city of London, where as of March 2020, out of the total bus fleet of 9 102, 3 773 of the buses are hybrid, 316 – electric, and 10 – hydrogen (TfL, 2020).

Despite these developments, the Covid-19 pandemic has had a major impact on public transport systems across many regions of the world. Because of the physical distancing rules, the capacity of public transport systems reduced. However, the lockdown and stay-at-home measures have lowered PT ridership to 10 - 15 percent of the usual level, according to McKinsey analysis of multiple European countries (McKinsey & Company, 2020). With lockdowns easing and businesses reopening, the demand for PT is starting to grow again. A common measure governments are taking is to advise against all nonessential trips. Furthermore, a measure which helps to alter the commuting schedules of students and workers is staggering start times for schools, public services, and offices so that fewer people need to board PT during rush hour. For example, some schools and universities in the Netherlands have spread start times over the day. Another approach to dispersing riders is to limit the service. Paris, for instance, has suspended access to certain stations or reopened lines at different rates. (McKinsey & Company, 2020)

ACTIVE MOBILITY

Walking and cycling (i.e. active mobility) promote healthy lifestyles and contribute to the reduction of the noise and air pollution. Some cities have been particularly successful with promoting these modes of transport, including Copenhagen, Amsterdam and Vienna where the modal share of active mobility is more than 40% of the total modal split (European Commission, n.d.). Many other cities are also increasingly putting efforts into boosting cycling and walking by making them more attractive and convenient. To improve walkability, cities are introducing pedestrian city centre zones, making the pedestrian environments better by adding street lighting and green, and closing off streets to traffic during certain time periods. For instance, on the first Sunday of each month, the heart of Paris shuts down to most traffic, turning streets over from cars to pedestrians and cyclists (Peters, 2020). To increase the cycling modal share, cities are expanding and improving the cycling networks, introducing bike-sharing schemes and dedicated bicycle highways. As an example – Transport for London is creating 450 km of new Cycleways (formerly known as Cycle Superhighways) by 2024 (TfL, n.d.).

Covid-19 accelerated these actions with cycling and walking becoming the optimal choice of many in the midst of a pandemic. Various types of pop-up infrastructure are being implemented all around the world to allow social distancing and safe cycling and walking. Cities are reclaiming road space and reallocating it for walking and cycling infrastructure. Some of the measures are temporary bike lanes and closing off streets for car traffic. More than € 1bn has been spent on cycling-related infrastructure and 2,300 km of new bike lanes have been rolled out in Europe since the start of the pandemic (Vandy, 2020).

1.2.2 The new mobility ecosystem

CAR-SHARING

Car-sharing provides people with access to the mobility benefits of a car without requiring them to own one. There are different types of car-sharing, including:

o   Consumer car-sharing (B2C) - a company owns a fleet of vehicles and offers them to its clients. The vehicles can be accessed by means of unattended electronic systems. Consumer car-sharing can be one-way (users go from one depot to another), round-trip (users need to return the vehicle to the origin location), and free-floating (vehicles can be parked on random existing parking spots). (Shared Use Mobility Center, 2020)

o   Personal car-sharing (C2C) - a peer-to-peer car-sharing system where private vehicle owners make their cars available for other drivers to rent.

o   Corporate car-sharing (B2B) - a business car-sharing system where government agencies and employers replace their own private fleets with car sharing services. These cars are not open to anyone who registers, but only to members of a specific company/community.

> **Buurauto** is an electric car-sharing company for neighbours. A group of neighbours can make a contract with the company for at least 20,000 km/year. Booking and paying is done through a mobile app. Buurauto arranges the electric car, charging station and parking space. The service can be found in the following Dutch cities - Amersfoort, Breda, Rotterdam and The Hague. (Buurauto, n.d.) *(To find out more, please visit www.buurauto.nl)*

RIDE-SOURCING

Ride-sourcing services rely on mobile apps and GPS positioning to match passengers with drivers offering rides in their private vehicles for a certain fee. These services are often offered by transportation network companies (TNCs) like Uber, Lyft and Didi Chuxing. (Center For Automotive Research, 2016)

> **UBER** is a tech start-up that offers on-demand rides by facilitating a connection between independent drivers and riders with the use of an app. Uber has expanded its operations to more than 10,000 cities across the globe (Uber Technologies Inc., 2020). *(To find out more, please visit www.uber.com)*

RIDE-SPLITTING

Ride-splitting refers to the adding of additional passengers to a pre-existing trip. Travellers share trip costs, as drivers are filling the empty seats in their vehicles. Ride-splitting drivers are not 'hired', unlike ride-sourcing ones. Ride-splitting could be:

o   Carpooling - travellers share a ride in a private vehicle to save on fuel and vehicle–operating costs.

o   Vanpooling - groups of commuters (often co-workers) share a ride travelling to/from their work place with a vehicle often provided by the employer.

o   Real-time ride-splitting - drivers and passengers are matched through a mobile app, with the passenger usually expected to pay a share of the costs. (Bartolo, Bosetti, Stasio, & Malgieri, 2016)

> **BlaBlaCar** is an online marketplace for carpooling. Car owners planning a long-distance journey offer their ride online with a specified itinerary and cost. Travellers contact the driver via the BlaBlaCar platform or by phone. Co-travellers pay car owners a contribution. Car owners and passengers are able to get to know each other through the platform and leave a review after the trip. (BlaBlaCar, 2020) *(To find out more, please visit www.blablacar.com)*

DEMAND RESPONSIVE PUBLIC TRANSPORT SHARING

Demand responsive public transport sharing is an IT-based service that is operated by a company with professional drivers. The service offers flexible routes, schedules and stops based on customer demand. Most commonly used vehicles are vans or shuttle buses. It serves multiple independent passengers who may be expected at common pick-up and drop-off points (Burrieza, 2019).

ArrivaClick is a flexible, on-demand minibus service for multiple passengers heading in the same direction in the UK. Users register through an app and select their pick-up and drop-off points. The app then connects them with the nearest vehicle. Users are able to track the driver in real time and pay with the app. (Arriva, n.d.) *(To find out more, please visit www.arrivabus.co.uk/arrivaclick)*

E-HAILING (TAXIS)

E-hailing services connect passengers and taxis directly using communication technologies like internet platforms and mobile apps. These could be maintained by either a third-party provider or the taxi company itself. This digital approach offers passengers a high level of comfort and efficiency, especially during rush hours and rainy days, compared to the traditional manner of hailing a taxi on the street. (Fang, Su, & Huang, 2018)

Taxi.eu is an e-hailing taxi app uniting taxi providers from 10 European countries. The app allows users to book a taxi through it, follow the arrival of the taxi in real-time, pay for the service, rate the rides, and keep track of all rides and bookings. There are four types of taxi options – regular, business, eco and XXL for up to 8 people. (Taxi.eu, n.d.) *(To find out more, please visit www.taxi.eu)*

BIKE-SHARING

Bike-sharing is a vehicle sharing system that provides affordable access to bicycles for short-distance trips, mostly in urban areas. Many of these systems are provided by local non-profit organisations or public authorities (Center For Automotive Research, 2016). The availability of a good bike infrastructure is a key determinant of bike-sharing success (Bartolo, Bosetti, Stasio, & Malgieri, 2016).

BIXI Montréal is a public bike-sharing system serving Montréal, Canada. After its launch in 2009, it has become North America`s first large-scale bike-sharing system. To get a bike, users go to a docking station, select a product (e.g. one way and one day), pay for the service and unlock the bike with the given code. Users can then return the bike to any BIXI station in the city when they are done. It is also possible to rent a bike through the BIXI app. (BIXI Montréal, n.d.) *(To find out more, please visit www.bixi.com)*

OTHER VEHICLE SHARING

Other vehicle sharing systems might be similar to car- and bike-sharing systems, but with special target groups. Examples include shared kick-scooters and scooter-sharing.

Felyx offers shared electric scooters in the Netherlands and Belgium for €0,30 per minute. Users can use an app to locate a nearby e-scooter and activate the vehicle without the need of keys. After arriving to the destination, users can park the scooter on a place where it is legal to park within the service area. Currently, the company has a fleet of 1,350 vehicles. (Felyx sharing B.V., 2020) *(To find out more, please visit www.felyx.com)*

MOBILITY-AS-A-SERVICE

Mobility-as-a-Service (MaaS) is a mobility distribution model in which transport options are bundled into a single package accessible on-demand through one interface. The single platform offers a multimodal service covering the entire trip. The MaaS operator acts as a broker between the user and the mobility providers. The MaaS app or platform offers an overview of the service, allows to make bookings, informs the user before and during the trip, and settles the payments between the involved parties. (Center For Automotive Research, 2016)

Moovit is an example of a Mobility-as-a-Service solutions company. Moovit offers a range of tools, such as mobility apps, mobile payments, urban mobility analytics, and on-demand and pre-scheduled transit. Moovit's real-time journey planner mobile and web app guide users from point A to B by using a variety of different modes like train, bus, metro, bikes and ride-sourcing. Users can access a live map, view nearby stops and stations, and plan trips across transport modes based on real-time data. (Moovit Inc., n.d.) *(To find out more, please visit www.moovit.com)*

DIGITAL JOURNEY PLANNING SERVICES/PLATFORMS

Digital journey planning services/platforms assist users with planning their itineraries and reaching their destinations efficiently. These services/platforms could be:

o   Trip planning mobile or web platforms which help users plan their itineraries.

o   Navigation services which acquire, analyse and present information to assists travellers in moving from their origin to their destination by means of mapping and routing. They offer a more efficient alternative to the traditional printed road maps and timetables. Nowadays, most navigation services are offered by private parties. (Burrieza, 2019)

Waze is a turn-by-turn GPS navigation application that provides real-time traffic updates. Waze users can actively update one another on traffic, construction, speed cameras, and more. After typing in their destination, users drive with the app open on their phone to passively contribute traffic and other road data. (Google, 2020) *(To find out more, please visit www.waze.com)*

DIGITAL PAYMENT AND BOOKING SERVICES/PLATFORMS

Payment and booking services have transformed from the traditional physical ticketing to methods that are powered by ICT and operational advances. The three types of digital payment and booking services/platforms are:

o   Ticket payment mobile services/platforms allow users to buy tickets in order to book and use a transport vehicle. This can be done with a subscription, a mobile paying application or a smart card.

o   Vehicle payment mobile paying services allow to pay and book a (shared) vehicle, which will be used in the near future. This can be done with a subscription, a mobile on the go paying application or a smart card.

o   Parking payment mobile paying services allow to pay for a parking spot. This can be in a parking garage or along the road, and is mostly done with a mobile on the go paying application.

Parkmobile is an app allowing users to find a parking spot and pay per minute. Once the car is parked, the user opens the app, check the zone code based on the GPS location and press 'Start'. The parking action is then transmitted to parking enforcement officers based on the user`s number plate. When the user is finished with using the parking spot, pressing 'Stop' on the app will end the parking session. The Parkmobile app is currently available in the UK, Belgium and the Netherlands. (Parkmobile, n.d.) *(To find out more, please visit www.parkmobile.nl)*

DIGITAL INFORMATION SERVICES/PLATFORMS

Digital information services/platforms provide real-time information that could support users with diverse mobility-related issues. For instance, instead of using printed public transport timetables, certain information services provide users with online real-time updates. Digital information services/platforms could be:

o   Vehicle information platforms provide users with real-time information about the availability of shared mobility vehicles, such as shared bikes, shared cars, shared scooters or shared kick-scooters.

o   Parking information platforms provide users with real-time information about the availability of parking spots.

o   Facility information platforms provide users with information about the location and availability of facilities, such as charging stations for electrical cars, bike-sharing stations or car-sharing stations.

o   Roadside assisting services provide users with the option to reach out to assistance when needed on the road, for example, in case of an accident.

o   Travel information platforms provide users with real-time information about travel-related issues like public transport delays and traffic jams.

Wegstatus.nl is a free of charge web map, which shows current traffic volumes, road works and signage information, bridge openings, and others. It uses historical and current data to better inform authorities and road users about the situation on the road. The travel information service was launched by TripService, a partner of Waze and Google Maps. (TripService, n.d.) *(To find out more, please visit www.wegstatus.nl)*

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2. BUSINESS MODELLING FOR MOBILITY PROVIDERS

The first chapter of this handbook illustrated that the mobility market is experiencing a transformation fuelled by trends, such as urbanization, rapid technological advancements and changing consumer demands. This transformation is characterised by the appearance of mobility players (e.g. Moovit) offering new forms of transport and services with traits like increased personalisation, convenience, accessibility, reliability and sustainability. The established traditional players are also making efforts to diversify their offerings with the introduction of new products and services (e.g. ArrivaClick), or altering their current offers by making the fleets more sustainable (e.g. NS). Being able to keep up with this changing market would mean that mobility providers are offering competitive products and services that align with the new market demands. To become (for start-ups) and remain (for established businesses) viable and competitive in the mobility market, mobility providers would have to innovate and come up with a strategy that would ensure long-term viability and competitiveness.

This chapter serves to support both new and established companies in the mobility field with:

- o *Understanding which business tools they could use to develop and/or alter their business strategy to cope with the changing market;*

- o *Understanding the added value of their offers by exploring the 'new mobility' business strategies start-ups and established players in the mobility sector are applying to cope with the changing market.*

2.1. Introduction to business modelling

A business model is a "blueprint" for how to run a business (Osterwalder, Pigneur, & Tucci, 2005). In the framework of changing mobility market, business model tools help companies to create a better understanding of what customers need and allow companies to develop market-driven value proposition.

This handbook focuses on the following tools:

- o The Lean Canvas (LC)
- o The Business Model Canvas (BMC)
- o The Business Model Template (BMT)

The LC and BMC belong to the most used business tools due to their simplicity and at the same time usefulness, making them easy and convenient to work with. The LC focuses on problems that customer segments experience and on solutions to the problems that deliver unique value. The LC helps start-ups to quickly work towards the assumptions they have. The assumptions can be then validated by reaching out to potential customers. This approach helps to develop products and services that better fit the customer needs and thereby increase the chances of companies to become viable in the long run (Maurya, 2020).

The BMC is a tool to document and communicate a business idea or concept on one page. It visualizes the elements of a company by describing several parts like the customers, finances, value proposition and key activities. Whilst the LC focuses on start-ups purely, the BMC is also relevant for existing companies. The canvas helps to gain a better understanding of the business in its current state and what changes might need to be made to become and/or stay viable in the future.

The BMT helps to create new business models, which is relevant for companies that operate in the changing mobility market. However, in comparison to other business models, the focus of the BMT is not only on profit, but also on the positive and negative impact of a business model on other values such as sustainability. Having a better understanding of this impact also helps companies to understand the value they could add and how they differ from their competitors. This knowledge can help to improve the business strategy and, as a result, the chances of a more viable business.

The table below (see table 2) shows the main differences between the LC, BMC and BMT. Based on the differences and the focus points, one can pick a tool that fits best.

	LEAN CANVAS	*BUSINESS MODEL CANVAS*	*BUSINESS MODEL TEMPLATE*
Author	Ash Maurya	Alexander Osterwalder	Jan Jonker and Niels Faber
Purpose	Helps to define a business model for one customer segment or problem by working towards key assumptions about the business.	Helps to create a business model by visualizing the key elements of a business.	Helps in making several coherent choices that will result in a design for a business model.
Target Audience	Start-ups.	Existing businesses and start-ups.	Existing businesses and start-ups.
Strengths	o Simplicity; o Helps to formulate assumptions that can be validated with potential customers in order to improve the product and/or service.	o Simplicity; o Applicable to different type of businesses (not just for start-ups like the LC).	o Does not focus on profit purely but also looks at other values; o Next to value creation, companies also must think about the impact they have (e.g. on the environment).
Weaknesses	For start-ups purely.	Focus is mainly on profit and not on other values like sustainability.	Takes more time to complete than other tools.
When to apply	If you want to work towards assumptions for a business idea or concept that can be tested in the market.	If you want to have a clear overview of the key elements of a business.	If you want to work towards a new and sustainable business model.

Table 2. Differences between the LC, BMC and BMT.

On the following pages, the three business tools are analysed in more detail. An explanation is provided on how these tools assist companies in dealing with the changing mobility market. To gather the necessary information, a desk research has been performed and several interviews with representatives from mobility companies have been conducted. The interviewed representatives have approved to have their company name present in this handbook.

2.2. Lean Canvas

The LC contains nine blocks that can be filled in for a business (idea), see table 3:

1. Problem and Existing Alternatives;
2. Solution;
3. Key Metrics;
4. Unique Value Proposition and High Level Concept;
5. Unfair Advantage;
6. Channels;
7. Customer Segments and Early Adopters;
8. Cost Structure;
9. Revenue Streams.

Whether the user starts by completing the 'Problem' or 'Customer Segments' block depends on what they already know. In some cases, a problem might be clear, but it is not yet clear which customers are experiencing this problem. On the other hand, sometimes a company wants to focus on a customer segment, but they do not know all problems of this target group yet. The role of the LC is to translate uncertain parts of the canvas into assumptions which, in turn, can be validated by talking to potential customers. Example questions that could help with completing the LC are presented in the table below (see table 3).

THE LEAN CANVAS

Problem	*Solution*	*Unique Value Proposition*	*Unfair Advantage*	*Customer Segments*
What are the main problems that your business wants to address and/or that your potential customers experience?	How will your business help to solve the problem(s) that your clients experience?	What unique value can your business add to the life of your customers?	What is the unfair advantage of your business (idea) in comparison to competitors? What are some assets you possess that cannot be easily copied or acquired by other businesses?	Who are the potential customers that your business will target? Who will benefit most from your product or service?
Existing Alternatives		*High Level Concept*		*Early Adopters*
What alternatives can your customers currently use to help solve their problems?	*Key Metrics* Which statistics indicate how well your company is doing?	List your X for Y analogy (e.g. YouTube = Flickr for videos)	*Channels* What channels do you use to reach your customers? How do your customers get in contact with your brand?	Who are the first customers that will make use of your solution?

Cost Structure	*Revenue Streams*
What costs do you have to bring the added value of your product or service to your customers?	What revenue streams do you get from the added value that you bring to your customers?

Table 3. The Lean Canvas – helpful questions. (adapted from Maurya A., 2012)

For each block of the LC, it is advised to have all questions answered as specifically as possible. Even if the idea is not yet finalised, answering all questions will help to make assumptions that can be validated with potential customers. Validating the assumptions helps to prevent that a product or service is developed without matching the needs of the customers. Having a better match between the products and/or services, and the needs of customers could help to create a more resilient business.

Examples below provide insights into the way three types of companies are using the LC to develop or alter their business strategy: a ride-sourcing company, a ride-splitting company and a scooter-sharing provider.

LEARNING FROM RIDE-SOURCING COMPANY A [1]

The LC of a ride-sourcing provider (see table 4) helps to get a clear understanding of what problems young people, young adults, urban dwellers, wealthy and busy professionals and tourists are facing when making use of cabs in a metropolitan area, and how a ride-sourcing company helps to solve these problems. As presented in the LC, the main problems have to do with finding a cab, knowing who is driving the cab, the quality of the cabs and the payment possibilities in the cabs. Knowing who is experiencing what problems helps to think of what value the company could add through which solutions. The provider, in this case, solves the problems by offering a guaranteed fast and reasonably priced pick up by a driver whose rating and personal details are shared in advance to the trip. Based on this solution, the company promotes itself as a cheaper, easier, and safer alternative to taxis.

The unfair advantage shows that the company has many drivers already and that the brand is well-known amongst adults. Knowing what is the advantage over other companies could assist this provider with attracting more customers. In turn, more customers would mean more market share. The key metrics help to keep track of how the company is performing. Knowing how to track progress and doing so is important for a business that wants to stay financially viable in the long run. The cost structure of the ride-sourcing provider shows that IT plays an important role in executing the business model. Changes in the mobility market, such as technological developments, use of data and smart payment systems help to make the service of this provider possible. The LC helps to get a clear picture of what these developments mean for the added value of the company, and also how they impact the financials. For example, based on the data that is generated by the users of the service, the price of the trips is adjusted to the supply and demand at that moment.

The LC also helps companies to understand how the changes in the mobility market (e.g. the rise of the sharing economy), can be implemented. For ride-sourcing companies this has led to a solution that is not based on improving the system of the existing taxis, for example, but instead to come up with a new solution where many more people could offer their vehicle to people who need a ride. This makes that specific business model scalable, as there is no need for such companies to own the vehicles.

THE LEAN CANVAS OF RIDE-SOURCING COMPANY A

Problem	Solution	Unique Value Proposition	Unfair Advantage	Customer Segments
▫ Difficult to find a taxi when you need it ▫ Never know who is driving the taxi, and cars are often old and not in decent conditions ▫ Taxis are expensive ▫ Taxis often do not accept cards	▫ Guaranteed fast pick up from a car through an app tracking the location ▫ See who the driver is and his/her rating, car plate and car model in advance ▫ Pay a reasonable price via the app	Allowing urban dwellers to get from A to B in a comfortable, safe, and reasonably priced ride by hailing a car through an app in one click	▫ Many drivers already active ▫ High brand awareness among adults	▫ Young internet-savvy urban dwellers and tourists ▫ Young adults urban dwellers and tourists **Early Adopters** ▫ Tourists opening the app ▫ Wealthy and busy professionals
Existing Alternatives ▫ Taxis ▫ Public Transport ▫ Personal vehicle	**Key Metrics** ▫ Apps installed ▫ Accounts created ▫ Journeys booked ▫ Money spent on trips per month	**High Level Concept** Like taxi but cheaper, easier, and safer	**Channels** ▫ PR ▫ Referrals – invite friends and get discounts ▫ Outdoor advertising	

Cost Structure	Revenue Streams
▫ IT infrastructure and development ▫ Marketing, PR, and legal costs ▫ Drivers recruitment and management	25% of a fare based on route and idle time

Table 4. The LC of a ride-sourcing company. (adapted from Studio Zao, n.d.)

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[1] Disclaimer: This company has been anonymised since the findings and analysis presented below are based purely on the analysis of internet data collected from company websites and other sources. (hereinafter referred to as "Ride-sourcing company A")

LEARNING FROM RIDE-SPLITTING COMPANY A [2]

The LC presented below (see table 5) is of a ride-splitting company that offers a platform for car owners to offer their ride, and travellers interested in it – to contact the driver. The ride-sourcing company and this one both offer a platform/service that matches travellers and drivers. However, in the case of the ride-sourcing company, the travellers wait for the driver to accept their request, and the traveller pays a certain cost for the ride. In the case of the ride-splitting company, users look for a trip on the platform and send the driver a request to join the trip where they will share the trip costs. When comparing both, the added value of the ride-splitting company is in offering trips that cover a larger distance. Next to that, the drivers will make the trip anyway, whilst the drivers of the ride-sourcing company make the trip on request of the traveller.

What both companies have in agreement is that the business model works only if:

○ The community of drivers and users is large enough; and
○ The platform does not offer a product that is sold just once but instead they offer a recurring service.

As observed, both companies have the same goal: to match travellers and drivers. However, they do have a business model that works in a different way. This said, having the same goal does not mean that they solve the same problems of the same customers.

THE LEAN CANVAS OF RIDE-SPLITTING COMPANY A

Problem	*Solution*	*Unique Value Proposition*	*Unfair Advantage*	*Customer Segments*
▫ Costs of regular taxis ▫ Costs of owning a car ▫ (Most) public transport is bound to fixed stations	A reliable ride-splitting platform that connects drivers with available seats with passengers looking for a ride.	▫ No fixed stations ▫ A huge community of drivers	A huge community of drivers and users	▫ Drivers who own a car and want to cover their travel costs ▫ Drivers who want to meet new people ▫ People who do not own a car, but travel often ▫ People who want to travel comfortably and flexible at lower prices
Existing Alternatives ▫ Hire a car ▫ Borrow a car ▫ Small scale carpooling	*Key Metrics* ▫ Apps installed ▫ Number of drivers ▫ Number of passengers ▫ Number of trips and money spent on trips	*High Level Concept* The digital market for ride-splitting	*Channels* ▫ Website ▫ Apps with Geolocation ▫ Social media ▫ Review, rating, and feedback system	*Early Adopters* People who already ride-split as driver or passenger

Cost Structure	*Revenue Streams*
▫ Technological set up and running costs ▫ Salaries to employees ▫ Pre-critical mass costs in new markets	▫ Commission from drivers upon every booking + flat rate ▫ Commission from passengers upon every booking+ flat rate

Table 5. The LC of a ride-splitting company. (adapted from Radu, 2016)

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[2] Disclaimer: This company has been anonymised since the findings and analysis presented below are based purely on the analysis of internet data collected from company websites and other sources. (hereinafter referred to as "Ride-splitting company A")

LEARNING FROM SCOOTER-SHARING COMPANY A [3]

The LC presented on the next page (see table 6) is of an electric scooter-sharing provider that offers an app to unlock the vehicles. The company offers a solution to last mile transport and the problem of having to deal with difficult booking systems for using electric scooters.

Their main customer segments are tourists, locals and people that want to explore the city. The LC helps to make clear that the unfair advantage of the company is the availability of e-scooters throughout different cities.

At 'key metrics' in the LC, it is mentioned which data is collected to improve the service. By analysing how and where the e-scooters are used, the provider knows where to place the e-scooters in a city. Knowing this could assist the company in staying ahead of the competitors and, thereby, growing the business.

The revenue streams in the LC show that users of the e-scooters pay a fixed price for the use, and a flexible price for the amount of time they spend on an e-scooter.

THE LEAN CANVAS OF SCOOTER-SHARING COMPANY A

Problem	Solution	Unique Value Proposition	Unfair Advantage	Customer Segments
▫ Last mile transport to reach destinations ▫ Difficult booking systems ▫ Need to own an e-scooter **Existing Alternatives** Other companies that offer shared e-scooters	A 'last-mile' scooter-sharing service that uses an app to unlock the vehicles **Key Metrics** ▫ Apps installed ▫ Number of trips and money spent on trips ▫ Minutes spent on e-scooters	▫ Easy to book ▫ Pay per minute ▫ Fun way of travelling ▫ Solves last mile problems **High Level Concept** The fun solution for last mile transport	Availability of e-scooters throughout different cities **Channels** ▫ App ▫ Website ▫ Social media ▫ Referrals ▫ Review and rating system	▫ Tourists who want a memorable, casual and fun experience ▫ Locals who want to take out-of-town visitors on a tour ▫ Locals who want a fund, casual activity ▫ People who want to explore the city **Early Adopters** People who want to explore the city in a fun way

Cost Structure	Revenue Streams
▫ Salaries for employees ▫ Lunch events and marketing ▫ Technological infrastructure ▫ Maintenance e-scooters	Per user ride

Table 6. The LC of a scooter-sharing provider. (adapted from Acestrada, n.d.)

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[3] Disclaimer: This company has been anonymised since the findings and analysis presented below are based purely on the analysis of internet data collected from company websites and other sources. (hereinafter referred to as "Scooter-sharing company A")

2.3. Business Model Canvas

The BMC can be used to communicate a business idea or concept on one page. Whilst the LC focuses on start-ups purely, the BMC is also relevant for existing companies. The canvas helps to gain a better understanding of the business in its current state and what changes might need to be made to become and/or stay viable in the future.

The BMC is usually completed in the following order:

1. Customer Segments;
2. Value Propositions;
3. Channels;
4. Customer Relationships;
5. Revenue Streams;
6. Key Resources;
7. Key Activities;
8. Key Partners;
9. Cost Structure.

The Business Model Canvas (see table 7) is divided in three parts:

1. The right half: from 'value proposition' to 'customer segments'. This part represents the part of the business that faces the customer and is also known as the marketing area.

2. The left half: the three blocks left of 'value proposition'. These blocks represent what needs to be done to provide the right half. This part is known as the supply area.

3. The bottom part: 'cost structure' and 'revenue streams'. What costs are made in the left and right half, and what revenues does the business generate? This is the financial area.

THE BUSINESS MODEL CANVAS

Key Partners	Key Activities	Value Proposition	Customer Relationships	Customer Segments
What activities will be performed by which partners?	What activities are necessary to carry out the business model?	What unique value can your business add to the life of your customers?	How will your company Get, Keep and Grow customers?	Who are the potential customers that your business will target? Who will benefit most from your product or service?
	Key Resources What are the resources necessary to carry out the business model (physically, financially, human resources, and intellectual property)?		**Channels** What channels do you use to reach your customers? How do your customers get in contact with your brand?	

Cost Structure	Revenue Streams
What costs do you have to bring the added value of your product or service to your customers?	What revenue streams do you get from the added value that you bring to your customers?

Table 7. The Business Model Canvas – helpful questions. (adapted from Osterwalder & Pigneur, 2010)

The examples below provide insights into the way three types of companies are using the BMC to develop or alter their business strategy – a bike-sharing provider, a provider of shared bikes and e-scooters, and a Mobility-as-a-Service company.

LEARNING FROM BIKE-SHARING COMPANY A [4]

Table 8 shows the BMC of a bike-sharing provider that offers an app through which the bikes can be reserved. This is an example of a dock-less system where bikes can be parked anywhere, except for no-parking locations.

The difference between the given company example and other bike-sharing operators is that most of the competitors buy their bikes from producers. Instead, this company has decided to build their own bikes. This means that they control the production of their bikes, which could lead to a cost reduction.

The BMC shows that it is also possible to participate in the mobility market without inventing a new mode of transport, or without combining several modes of transport in an app. Making use of technology in the right way offer lots of opportunities to companies in the changing mobility market. For instance, the innovative payment system of this company makes it easier for people to make use of the bikes. Another advantage of the provider is that they offer the option to reserve a shared bike in advance. On the other hand, it is still possible to make use of a bike without reservation, which makes the system more flexible.

THE BUSINESS MODEL CANVAS OF BIKE-SHARING COMPANY A

Key Partners	Key Activities	Value Proposition	Customer Relationships	Customer Segments
▫ Government ▫ Investors ▫ Mobile payment providers ▫ Manufacturers and suppliers	▫ Design and produce bikes ▫ Bike-sharing service operating in more than 100 cities ▫ Operation and consumer management ▫ Credit data ▫ Customer support	▫ Provide an efficient, convenient, and green transportation means for short distance urban trips ▫ Improve quality of life	▫ Bike-sharing community ▫ 'Invite friends' ▫ QR code to unlock: Scan & Ride concept	▫ Office workers ▫ College students ▫ Downtown inhabitants who are open to innovations
	Key Resources ▫ Human resource for design and operation ▫ Production department		**Channels** ▫ Mobile app ▫ Website ▫ Social media ▫ Blog	

Cost Structure	Revenue Streams
▫ Product development ▫ Maintenance ▫ Salaries ▫ International expansion ▫ IT infrastructure ▫ Customer service	▫ Hourly rental fee ▫ Deposit, which guarantees sufficient cash flow in operation process

Table 8. The BMC of a bike-sharing company. (adapted from Vizologi, n.d., and Wu & Xue, 2017)

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[4] Disclaimer: This company has been anonymised since the findings and analysis presented below are based purely on the analysis of internet data collected from company websites and other sources. (hereinafter referred to as "Bike-sharing company A")

LEARNING FROM SHARED BIKES AND E-SCOOTERS PROVIDER A [5]

The BMC of a provider of free-floating shared bikes and e-scooters is shown on table 9. Their main target groups are young commuters and people who are open to have an environmentally friendly lifestyle.

The revenues of the company come from providing a pay-as-you-go mobility service. Unlike some other companies that provide shared mobility vehicles, this particular company does not offer one, but two modes of transportation. Another way the provider tries to differentiate from other companies is by offering an 'Unlimited' package. For a minimum cost, subscribers can make an unlimited number of trips in any city where they offer the service.

All of the geospatial data the company collects has led to building a mobility analytics platform. It helps to analyse the trip data make informed conclusions about rider usage and vehicle demand. Next to using data to improve their own services, the provider also uses the data to inform city managers and government officials. They are able to monitor statistics, such as total trips, distance travelled, usage and CO_2 avoided. This monitoring dashboard has been adjusted to the needs of the users, which helps to strengthen the relationship between the company and governmental organisations.

THE BUSINESS MODEL CANVAS OF SHARED BIKES AND E-SCOOTERS PROVIDER A

Key Partners	Key Activities	Value Proposition	Customer Relationships	Customer Segments
▫ Investors ▫ Public policy makers ▫ Scooter and bike manufacturers ▫ Specialised technology providers (GPS, payment, analytics, and specialised API) ▫ Cloud service providers ▫ Payment service providers	▫ Free-floating mobility service ▫ Data analysis to optimise service	▫ Vehicle availability ▫ Easy parking (free-floating) ▫ Charging sharing formula	Automated services and self-service with personal assistance in specific situations	▫ Young commuters ▫ Smart commuters, either car or non-car owners (environmentally friendly lifestyle)
	Key Resources ▫ Physical sources: Software enabling the platform ▫ HR: website and app designers and developers, marketing and sales team ▫ Information sources		**Channels** ▫ App ▫ Website	

Cost Structure	Revenue Streams
▫ Float purchasing and maintenance costs ▫ Software development and maintenance costs ▫ Employee salaries ▫ Marketing and advertising fees ▫ Payment for charging vehicles	Revenues from service fees (pay-as-you-go)

Table 9. The BMC of a shared bikes and e-scooters provider. (adapted from Kao, Busquet, Lubello, Meta, & Heuvel, 2019)

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[5] Disclaimer: This company has been anonymised since the findings and analysis presented below are based purely on the analysis of internet data collected from company websites and other sources. (hereinafter referred to as "Shared bikes and e-scooters provider A")

LEARNING FROM MOBILITY-AS-A-SERVICE COMPANY A [6]

Table 10 presents the BMC of a Mobility-as-a-Service (MaaS) company offering an app that enables its users to search, find, reserve, and pay for vehicles. In the app, users can compare prices and distances, but also look at their previous bookings, expenses, routes, and travelled time. The vehicles that could be used include trains, taxis, car-sharing, bike-sharing and more. Next to offering a Business-to-Consumer (B2C) solution, the company further offers a Business-to-Business (B2B) service. Their MaaS solution helps businesses to manage their mobility and make it more efficient.

As the BMC below shows, the company does not own vehicles but instead links users of the app to vehicle providers. The company differentiates itself from competitors by including many services in one app. Through a multimodal trip planner, users can choose between many different modes of transport. Reservations and payments can be done via the app, as well.

In case a user cannot find a vehicle near them, they can activate the 'Rader' feature. This will advise the user when a vehicle becomes available within a selected distance. The option 'Reserve it for me' can even automatically reserve the first vehicle that gets free. The app also includes an offline option. This makes it possible to see the stationary locations, even without having an internet connection. Similarly to 'Shared bikes and e-scooters provider A', data collection is also a core part of the MaaS company A. The collected data serves to provide the users with suitable travel options.

THE BUSINESS MODEL CANVAS OF MOBILITY-AS-A-SERVICE COMPANY A

Key Partners	Key Activities	Value Proposition	Customer Relationships	Customer Segments
▫ Transport service providers ▫ Payment providers ▫ Cloud providers	▫ Third parties` mobility services aggregator	▫ Traffic jam reduction ▫ CO_2 reduction ▫ Unique platform for diverse mobility services, such as car-sharing, bike-sharing and scooter-sharing	▫ Automated services and self-services ▫ Personal assistance	▫ Commuters residents and non-residents in bigger cities ▫ Smart and no-car owner workers/students/residents in major city centres ▫ Companies
	Key Resources ▫ Physical resources: software enabling platform ▫ HR: website and app designers and developers, marketing and sales team		**Channels** ▫ Mobile app ▫ Website	

Cost Structure	Revenue Streams
▫ Network implementing ▫ Software development/maintenance cost ▫ Marketing and advertising fees	▫ Revenue from commission on third parties` services

Table 10. The BMC of a Mobility-as-a-Service company. (adapted from Kao, Busquet, Lubello, Meta, & Heuvel, 2019)

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[6] Disclaimer: This company has been anonymised since the findings and analysis presented below are based purely on the analysis of internet data collected from company websites and other sources. (hereinafter referred to as "Mobility-as-a-Service company A")

2.4. Business Model Template

In comparison to other business models, the focus of the BMT is not only on profit, but also on the impact of a business model on other values such as sustainability. Having a better understanding of this impact also helps companies to understand the value they could add and how they differ from their competitors. This knowledge can help to improve the business strategy and, as a result, the chances of a more viable business.

The Business Model Template is filled in from left to right and from top to bottom (see table 11). The BMT is characterised by the following three phases:

1. Definition phase: The answers that belong to this phase will help to create an outline of the context, the problem that plays within it, the ultimate end situation and a formulation of a proposal to achieve that ultimate goal.

2. Design phase: The first four building blocks in this phase help to shape the organization of the business model as concretely as possible. The fifth block businesses are challenged to do an external check to receive feedback on the business model.

3. Result phase: Insights are provided into the values that are created by the business and how this is done.

THE BUSINESS MODEL TEMPLATE

Definition phase	*Reason and context* What is your problem, opportunity, or challenge and in what context does this occur?		*Dream* What is your dream goal? Where are you going to make the difference?		*Proposition* What are you going to do to solve the problem, take the opportunity, take the challenge?
Design phase	*Type of business model* What type of business model will you use to create value?	*Involved parties* Who are you going to do this with?	*Strategy* Which route do you choose to achieve your dream goal?	*Core activities* What are the activities you will undertake to realize this strategy?	*External tests* What do others think of your idea? Are you on the right track? Is it there yet? Is it allowed? Ask the request for help!
Result phase	*Determining impact* What are the positive and negative consequences of your business mode, now and in the future?		*Value(s) creation* How do you shape transactions and what do you exchange? Which values are permanently hidden?		

Table 11. The Business Model Template – helpful questions. (adapted from Jonker & Faber, 2020)

The examples below provide insights into the way three types of companies are using the BMT to develop or alter their business strategy – the data collection company Skialabs, the company that provides data-based traffic management insights TripService, and the scooters provider Scoozy.

LEARNING FROM SKIALABS – A DATA COLLECTION COMPANY [7]

Skialabs is a company that uses data to optimize the routes of logistic service providers in cities, while taking the preferences of drivers, city restrictions and real-time traffic into account. By filling in every block of the BMT, it becomes clear why Skialabs exists, how do they want to achieve their dream and which are the consequences of their business model (see table 12).

The dream of Skialabs is to optimize routes and, thereby, reduce carbon emissions. Skialabs wants to achieve that dream by selling data-based insights. The key activities of Skialabs are scalable, as the optimization of logistics routes can be applied everywhere. However, Skialabs does depend on having the right data to generate these insights.

In contrast to most other business tools, the BMT also allows companies to think about the consequences of their business model. The solution of Skialabs will lead to less and faster trips, which, in turn, will lead to less carbon emissions. In exchange for providing this solution, Skialabs will generate earnings from their involved parties which are currently the municipalities of Amsterdam and Delft. Skialabs did not experience many difficulties as a result of COVID-19, because they operate in a field where the demand stayed strong, as package delivery and garbage collection remain operational.

THE BUSINESS MODEL TEMPLATE OF SKIALABS

Definition phase	Reason and context Data offers opportunities to provide new and useful insights.		Dream ▫ To optimize routes and thereby reduce carbon emissions ▫ Personal dream: Try to grow and compete on an international platform or stage		Proposition Using real-time data to optimize routes, while taking the preferences of drivers, city restrictions and real time traffic into account.
Design phase	Type of business model Software-as-a-Service	Involved parties ▫ City of Amsterdam and City of Delft ▫ Later, more cities will be involved	Strategy ▫ Sale of data-based insights ▫ Keep an eye on competitors and monitor the market	Core activities ▫ Using the Smart Routing platform to optimize routes of logistic service providers ▫ Improving the software	External tests ▫ The company's focus has been altered due to brining the solution in practise ▫ Participated in a program to get in contact with potential clients
Result phase	Determining impact ▫ Up to 10% faster routes ▫ Up to 20% less routes ▫ Less carbon emissions			Value(s) creation Money for providing optimized route advise based on the data	

Table 12. The BMT of Skialabs. (source: Skialabs, online interview, October, 2020)

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[7] Disclaimer: An interview has been conducted with a representative from the company Skialabs to gather the necessary input for this handbook. The interviewee will remain anonymous, but it was agreed to have the company name present in this document.

LEARNING FROM TRIPSERVICE – A COMPANY OFFERING TECHNICAL KNOWLEDGE COMBINED WITH TRAFFIC ENGINEERING INSIGHT [8]

As shown in the table below (see table 13), TripService saw a gap in the market for the exchange of data between the Dutch government and Waze (carpool and navigation platform). Filling in the BMT can help to think of how this opportunity can be turned into a business model. For TripService, this means offering data-based traffic management insights to governments, mobility organizations, event managers and up-to-date information to travellers.

To create a product that matches the needs of potential customers, it is recommended to perform external tests. TripService has done so by developing the product together with their key customers. This assists in creating a market-fit product, which is important for companies that want to survive in a changing mobility market.

By having a better understanding of the impact that a company has, it could help to decide whether the negative impact outweighs the positive. If not, the business idea or -model can be adjusted and be re-evaluated with help of the BMT. The impact of TripService is that mobility streams can be improved, and travellers will become more informed before, after and during their trip. This impact matches with the needs of the clients that became clear during the external tests. TripService earns money from providing the traffic management insights to their customers.

THE BUSINESS MODEL TEMPLATE OF TRIPSERVICE

Definition phase	Reason and context		Dream	Proposition	
	TripService saw a gap in the market for the exchange of data between the Dutch government and Waze (carpool and navigation platform)		▫ Introduce an app ▫ Become a destination planner for large events	▫ Offer dashboards for insight, analysis and management to governments, mobility organizations and event managers ▫ This allows them to take better traffic measures, influence travel behaviour or make policy adjustments ▫ Offer up-to-date, correct data to travellers before, during and after their trip	
Design phase	Type of business model Software-as-a-Service	Involved parties ▫ Waze ▫ IT company (for development) ▫ Dutch Government ▫ Google ▫ TomTom	Strategy TripService is developing their internal roadmap and they are looking for launching customers for the app	Core activities Provide online traffic management systems	External tests The services have been developed together with the key customers
Result phase	Determining impact ▫ Improve mobility streams and thereby reduce congestion which leads to less carbon emissions ▫ More reliable data by using various data sources ▫ Users are more informed before, during and after their trip		Value(s) creation Money for providing traffic management insights		

Table 13. The BMT of TripService. (source: TripService, online interview, October, 2020)

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[8] Disclaimer: An interview has been conducted with a representative from the company TripService to gather the necessary input for this handbook. The interviewee will remain anonymous, but it was agreed to have the company name present in this document.

LEARNING FROM SCOOZY – A SCOOTERS PROVIDER [9]

Scoozy offers a safer alternative to the traditional mobility scooter – a 4-wheel scooter. Part of the rationale is that Scoozy saw a lack of innovation in the aid sector and an opportunity to add value with a safer, electric and automotive solution. Other motives are the limited usage of the already existing mobility scooters and the stigma people perceive when driving a mobility scooter (see table 14).

The next step of the BMT is to turn these motives into a dream. The dream of Scoozy is to make independent, sustainable, and safe mobility possible for everyone. Scoozy`s electric vehicle has a range of 100km, a one hand-control, and can take users through harsh terrains because of the 4-wheel drive. However, turning this product into a financially viable business does not occur without challenges. The interviewee mentioned that the cycle of starting a hardware company is challenging, because to innovate, one needs capital which in most cases is received from bank loans. With the loan from the bank, a company can buy in bulk which decreases the cost price. However, banks see too many risks to provide a loan to hardware companies, as it takes a considerable amount of time to produce the products. This makes it a difficult puzzle to solve, according to the interviewee.

THE BUSINESS MODEL TEMPLATE OF SCOOZY

Definition phase	**Reason and context** ▫ Scoozy offers an alternative to the mobility scooter, so users can go out independently ▫ Lack of innovation in the automotive aid sector ▫ Unsafe alternatives ▫ Limited usage with the current mobility scooters	**Dream** Scoozy wants to make independent, sustainable, and safe mobility possible for everyone	**Proposition** Scoozy offers an electric vehicle which has a range of 100km. The one hand-controlled vehicle can take users through hard terrains because of the 4-wheel drive

Design phase	**Type of business model** Distributor selling to dealers, who sell to customers	**Involved parties** ▫ Bank (for loan) ▫ Design Bureau (vehicle designs) ▫ Other distributors ▫ Looking to make alliances with companies in the automotive sector	**Strategy** ▫ Looking for realistic national distributors and national coverage ▫ Expanding but doing it step by step ▫ Looking at and learning from competitors ▫ Seeing opportunities to expand to other segments e.g. golf carts ▫ Scoozy offers their service (buy/lease/rent) to consumers, companies, and other parties such as amusement parks, airports and cities	**Core activities** Let users go out independently in an outdoor environment with the electric vehicle	**External tests** ▫ Prototype testing with potential customers by visiting elderly homes and by going on tours with potential customers ▫ Working with pre-orders and financial commitment so the money that was paid in advance by the customers could be used for further development of the product

Result phase	**Determining impact** ▫ Scoozy plans to become more sustainable by redesigning the product ▫ Users of the products can go out independently ▫ Scoozy provides their users an increased travel range so they are more mobile	**Value(s) creation** Make users more mobile by selling electric scooters

Table 14. The BMT of Scoozy. (source: Scoozy, online interview, October, 2020)

The BMT can assist a company in thinking about how they want to test their business idea with the potential customers. Scoozy has tested their prototype with the potential customers as part of an iteration process. The company offered the option for potential customers to pre-order the product. That

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[9] Disclaimer: An interview has been conducted with a representative from the company Scoozy to gather the necessary input for this handbook. The interviewee will remain anonymous, but it was agreed to have the company name present in this document.

way, the pre-ordered products were paid in advance, and Scoozy was able to use that income to further improve the product before delivering it to the customer.

Today, Scoozy is selling to distributors and not directly to the end users of the product. That way, they are able to focus on reaching the product improvement goals. The scooters provider has selected one distributor per country who supplies the products to the sellers. This allows them to have assurances for the future and to generate enough margin on their products. Next to that, they keep monitoring the competition to explore possible alliances for knowledge, experience and innovation exchange.

3. SUPPORTING MOBILITY PROVIDERS ON THEIR PATH TOWARDS SELF-SUSTAINABILITY

This handbook provided insights into the changing mobility market and the business tools that could support companies in altering or developing their business strategy to cope with the changes. Several interviews with professionals from the mobility sector have been conducted to formulate the presented insights. The conducted interviews bring relevant experiences and views of the mobility sector into play. The accumulated advice and insights fall under three action points mobility providers could look into for support in achieving self-sustainability, namely:

- o *Get a glimpse into the way mobility providers are adapting to the changing mobility market;*
- o *Delve into the way mobility providers improve operational performance; and*
- o *Explore financial support systems mobility providers use on the road to becoming financially self-sustainable.*

GET A GLIMPSE INTO THE WAY MOBILITY PROVIDERS ARE ADAPTING TO THE CHANGING MOBILITY MARKET

Chapter 1 brought to light that the mobility market is changing from an environment with limited accessibility, individualistic and polluting traits towards an automated, shared, low emission, diversified and inclusive mobility ecosystem. The interviewed professionals further elaborated on the global trends and challenges that are influencing their operations, and provided advice with regard to the way mobility providers could adapt to the changing market.

REGULARLY RE-ALIGNING THE BUSINESS STRATEGY WITH MARKET DEVELOPMENTS

Professionals from the field have highlighted the importance of being acquainted with the global trends and challenges which are influencing the mobility market. According to them, keeping up with the changing mobility market is a challenge, because of how dynamic the sector is.

> **"***What we saw was that almost every week there were new companies being formed or companies that were changing direction or product offering.***"**
>
> *- Representative from Skialabs, a data collection company (to find out more, please visit www.skialabs.com)*

These challenges were not only mentioned by smaller enterprises which often face more financial difficulties when introducing a new product/service, but also by established larger companies that have been on the market for decades. For instance, the public transport provider Arriva has decided to rethink its business model as a consequence of this rapidly changing market pushed and enabled by global trends, such as the changing customer demands. Arriva is currently investigating the added value of new mobility services, such as providing a seamless door-to-door journey by extending their traditional PT services with new offers like bike-sharing. Another new direction they are looking into is providing

more personalised and on-demand services, such as on-demand buses. As advised by the interviewee from Arriva, companies which are expanding into unknown territory will be more successful in adapting to the changing sector by researching the added value of new mobility services and partnering with companies that are already experienced with the development of such products and services.

> **"***...our core business is our train and bus services. We are trying to integrate new mobility solutions but that doesn`t mean that we need to do the operations. We are looking for partners.***"**
>
> *- Representative from Arriva, a public transport company (to find out more, please visit www.arriva.nl)*

NEW CONSUMER VALUES = BUSINESS OPPORTUNITIES AND CHALLENGES

Due to the rising importance of societal, liveability and sustainability values, mobility providers are increasingly integrating Corporate Social Responsibility into their business models. This has allowed start-ups offering products/services already integrating CSR to have a smoother entrance on the market. For instance, the interviewee from the bike-sharing provider Nextbike sees these developments as enablers of the new mobility market that will help cities transition towards sustainable mobility.

The interviewee from the electric car-sharing company Buurauto further elaborated that to be future-proof, mobility players need to be aware of the changes happening in society and take them into consideration. Furthermore, it has been mentioned that new mobility services could help cities become less car-dominant and more inclusive, which could consequently make them more liveable. Therefore, for mobility providers it would be interesting to find out how to utilize the opportunities presented by these new developments. As a start, businesses need to be aware that people could be resistant to these offerings. Therefore, to be successful with introducing new mobility solutions, companies are advised to investigate strategies for behavioural change.

> "*If you want be future-proof, you must be aware of what is happening in society, take into consideration that sustainability is a big issue, that you have to be inclusive and you have to be aware that people are also quite resistant to change when It comes to the mobility world.*"
>
> "*In cities where the car is disappearing, the city becomes lively again.*"
>
> "*If we do not change the mindset of people, then shared mobility does not have a future.*"
>
> *- Representative from Buurauto, an electric car-sharing provider (to find out more, please visit www.buurauto.nl)*

In addition to start-ups, established businesses are also increasingly changing their business models by integrating corporate social responsibility aspects into their products/services to stay in line with the global and local developments. As an example, Arriva is replacing their diesel buses with electric ones. Before that, their operations were less complex, as they only had to focus on getting diesel fuel as cheaply as possible. Nowadays, they are facing new technology with a different supply chain behind it.

> "*Another factor which has a major impact is the transition to zero emissions. This has a huge impact on our bus services because we used to mainly have diesel busses and the business model was simple...*"
>
> *- Representative from Arriva, a public transport company (to find out more, please visit www.arriva.nl)*

IMPROVING RESILIENCE

The COVID-19 crisis has caused companies to rethink their business plan and strengthen themselves to become more future-proof, and it has allowed new opportunities to delve into. To become more future-proof, some companies have begun partnering. For instance, RET, a public transport company has established partnerships with bike-sharing and scooter-sharing companies. The bike-sharing provider netxbike has come up with innovative approaches allowing public transport users to use the bike-sharing service for free with the goal of supporting public transport companies in the first big wave of the pandemic. The crisis has further allowed companies like Nextbike and Arriva more time for the development of their product and research into additional programs and projects. Nextbike was not impacted as hard as Arriva, which was down to a fraction of their operations in previous years. Scoozy was also able to have Corona patients as a new form of customers who were able to use their mobility scooters in the time of their recovery period.

> "*COVID also allows for anticlockwise investment into research and internal programs which will provide a competitive advantage in the future.*"
>
> *- Representative from Arriva, a public transport company (to find out more, please visit www.arriva.nl)*

DELVE INTO THE WAY MOBILITY PROVIDERS IMPROVE OPERATIONAL PERFORMANCE

WORKING WITH THE BUSINESS MODEL

Chapter 2 discussed three strategic business tools as supporting tools to strengthen and guide companies within their operations, namely the business model canvas, business model template, and the lean canvas. Each of these business tools have strengths and weaknesses, and cater to different target audiences. Representatives from Arriva and Nextbike stressed the importance of adapting the business model to the local context of the solutions, meaning that, for instance, business models coming from the USA might not be applicable in the Netherlands, because of the big differences in behaviour.

A representative from Scoozy mentioned that, according to him, the most important part of the business model canvas is the value proposition. The interviewee further elaborated that once the value proposition is filled in, the rest is detail.

> **"***The most important part of the business model canvas is the value proposition - what kind of problem are you solving, for who and is it worth solving.***"**
>
> *- Representative from Scoozy, a scooters provider (to find out more, please visit www.scoozy.nl)*

STARTING AND SCALING UP

The momentum of the changing mobility sector makes it difficult for start-ups within the sector. As mentioned by the interviewee from Skialabs, large companies can be more flexible and have more capital, thus, allowing them to implement new aspects into their operations with ease, compared to start-ups. As the sector is extremely competitive, it is recommended to move faster with the development of ideas into products and services. Start-ups are further advised to be flexible and open to change in order to be successful.

> **"***…for more mature companies it is very easy to add a small aspect [new product/service offer] into their business…***"**
>
> *- Representative from Skialabs, a data collection company (to find out more, please visit www.skialabs.com)*
>
> **"***…for us getting those first 100 units out onto the road and receiving customer feedback was very important.***"**
>
> *- Representative from Scoozy, a scooters provider (to find out more, please visit www.scoozy.nl)*

The interviewed professionals further suggest that keeping control of the growth scale of the product/service is extremely important. Therefore, keeping an eye on the pace at which one's product scales up is also recommended. Furthermore, they advise to have a clear vision on the future, goals and operations of the company, and that they are all aligned as efficiently as possible.

BOOSTING THE TEAM

The professionals also advised established companies to have a diverse team with a plethora of knowledge which could result in a better product/service, and in less costs for hiring external parties for opinions. For new enterprises, it could be an option to partner with established ones with the goal of trading innovation for their knowledge and experience.

> **"***In your company, you need to have different people with a variety of competencies.***"**
>
> *- Representative from Buurauto, an electric car-sharing provider (to find out more, please visit www.buurauto.nl)*

Additionally, RET, a public transport company, experiences challenges with their personnel, as an increasing number of employees are retiring and finding younger people for the drivers and maintenance positions proves difficult.

> **"***The average age of our employees is quite high so we have to deal with a lot of colleagues leaving for retirement… it is difficult for us to recruit young people as drivers or for maintenance***"**
>
> *- Representative from RET, a public transport company (to find out more, please visit www.ret.nl)*

FORMING STRATEGIC ALLIANCES

Strategic alliances are cooperative partnerships between two or more companies pursuing mutual benefits, which will be greater than those from individual efforts (Yu, Xu, & Dong, 2019). Typically, in strategic alliances, the partnering companies remain totally different entities. In contrast, a *joint venture* is when two or more companies sign a contractual agreement for the creation of a jointly owned business (Gustafson, 2019). Examples of strategic alliances are *horizontal strategic alliances* - formed by companies active in the same business area; and *vertical strategic alliances* - between a company its suppliers and distributors (Powerlinx,2020).

Scoozy, for instance, is looking for collaborations with companies from the automotive sector, so they could combine their innovation power with the strength and position these companies already possess. This, in turn, could help Scoozy to achieve a better margin, which is something distributors are valuing high. For now, Scoozy has one distributor per country who supplies the products to the sellers. From their experience, Scoozy recommends start-ups to establish marketing, sales and service strategic alliances with larger organizations that already have the distribution power to help newly established enterprises stay ahead of their competition. This could help speed up the process of identifying the right distribution channels, and when the company has achieved an improvement of margin, it could continue its established collaborations with distributors without relying on the resources of a third company. Scoozy is identifying the right partners by looking at their competitors` partnerships.

> **"***…to speed up … work with large organizations because they have the distribution power which is the way to beat competition and stay ahead.***"**
>
> *- Representative from Scoozy, a scooters provider (to find out more, please visit www.scoozy.nl)*

Established companies, such as the public transport providers RET and Arriva, are also forming strategic alliances. RET, for instance, has recently started partnering with bike- and scooter-sharing providers. Arriva is also partnering with new mobility service providers like bike-sharing companies. They are trying to understand the business models of these providers with the aim of adding a bike-sharing service as part of their door-to-door journey offer. In turn, this would help the partner bike-sharing company with much needed funding. Therefore, it could be beneficial for start-ups to partner with larger established companies to validate their products/services who could help them kick-start their operations by providing funding and infrastructures for testing.

In addition to partnering with new mobility providers, RET has started a joint venture with a few companies for the development of a Mobility-as-a-Service platform. They are further forming intersectional alliances like the one with the energy company Eneco, which would help RET achieve its goal to become carbon neutral and generate more energy than they consume by 2030.

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BATTLING COMPETITORS

As explored earlier, the mobility market is dynamic, which makes it difficult for some companies to adapt to the changes to stay relevant and on top of their competitors. For this, professionals from the field recommend that keeping track of competitors could be of great value. For instance, Scoozy investigates competitors in the view of possible alliances in which knowledge and experience can be traded with innovation. Skialabs also keeps track of their competitors` developments to explore where they could have a competitive advantage.

> **"***I also have a huge document where I keep track of companies, which are competitors in a way - what are their strong sides and weak sides. We try to have a very complete view of the product of other related parties. The industry is very dynamic and keeping up is a challenge in itself.***"**
>
> *- Representative from Skialabs, a data collection company (to find out more, please visit www.skialabs.com)*

Another way to secure competitive advantage is by winning tenders and securing contracts for longer periods of time. Tenders within the mobility sector range from 5 to 10 years, as mentioned by some of the interviewees. Companies compete and win a contract and secure their services for that period of time, thus, allowing themselves a secured and allocated environment to operate in. These tenders also allow companies to have financial stability, as they are able to predict their operations for the coming few years. However, the representative from TripService, for example, mentions that larger companies will often receive the contracts and that tenders usually start after a period of time, so they do not guarantee immediate income. Therefore, tenders are typically a more attractive option for established companies than start-ups.

Exploring the added value is another method that could help to beat competitors. Added value ensures that customers choose one product or service over another and allows for competitive advantage. This can again be seen in the way Arriva works towards the creation of personalized services and the implementation of customer-focused services to satisfy the last mile transportation demands.

EXPLORE FINANCIAL SUPPORT SYSTEMS MOBILITY PROVIDERS USE ON THE ROAD TO BECOMING FINANCIALLY SELF-SUSTAINABLE

Within the innovative world of today, start-ups have many opportunities for guidance throughout their lifecycle - from ideation to realization and success. At supranational level, the European Commission`s objective is to reduce the burden of administrative procedures often discouraging potential entrepreneurs from setting up their own businesses, encourage more people to become entrepreneurs, create new jobs, and improve Europe's economic performance (European Commission, n.d.). On that account, examples of the funding opportunities the European Commission offers for start-ups include:

o   COSME Programme - The EU programme for the Competitiveness of Enterprises and SMEs, running from 2014 to 2020, with a budget of €2.3billion. COSME supports SMEs in the following areas - facilitating access to finance (mainly up to EUR 150 000); supporting internationalisation and access to markets; creating an environment favourable to competitiveness; and encouraging an entrepreneurial culture. (to find out more, please visit www.ec.europa.eu/growth/smes/cosme_en)

o   InnovFin Programme – EU financing tools that cover a wide range of loans, guarantees and equity-type funding, which can be tailored to innovators' needs. Financing is provided starting at EUR 25 000 for investments in research and innovation (R&I). InnovFin is available across all eligible sectors in EU Member States and Associated Countries, under the EU Research and Innovation programme Horizon 2020. (to find out more, please visit www.eib.org/en/products/mandates-partnerships/innovfin)

o   EIC Accelerator – The EIC Accelerator (previously the SME Instrument) provides funding opportunities and acceleration services to start-ups and small and medium-sized enterprises. The EIC Accelerator focusses on high-potential businesses with marketable products and services, a strong business plan and ambitions to scale up. Participants have the opportunity to receive up to €2.5 million in grants and €15 million in blended finance, while the acceleration services include coaching and mentoring, as well as opportunities to connect with international corporates, investors and entrepreneurs. (to find out more, please visit www.ec.europa.eu/easme/en/eic-accelerator)

o   EIT Knowledge and Innovation Communities – The Knowledge and Innovation Communities, led by the European Institute of Innovation and Technology (EIT), bring together businesses, research centres and universities to collaborate in an environment that allows creative ideas and innovations to flourish. For start-ups in the mobility sector, EIT Urban Mobility could be of particular interest. (to find out more, please visit www.eit.europa.eu/our-communities)

o   Eureka-Eurostars – Eurostars, a joint programme between EUREKA and the European Commission, provides funding to small- and medium-sized enterprises involved in research and development. Its particular focus is on supporting SMEs in the development of rapidly marketable, innovative products, processes and services that help improve the daily life of people around the world. In order to receive funding for their project, start-ups and SMEs must complete an online application. (to find out more, please visit www.eurekanetwork.org/eurostars-select-country)

Start-ups could also be supported by national governments. When starting a company in the Netherlands, for example, there are many opportunities, policies and funding options laid before a start-up. These options range from financial support for a company through loans or subsidies to allowing foreign entrepreneurs to start their company in the Netherlands with guidance (Government of the Netherlands, 2020). However, once the subsidies and funding stops, many companies lose essential income and are not self-sufficient yet, therefore, causing many companies to collapse in that particular period. For this reason, one of the aims of start-ups is to be self-sufficient and in control of their own company. This means that start-ups are sometimes more resistant to accept funding from investors, as this usually means that they accept capital in exchange for equity or have a large debt to carry as it may be a loan. Skialabs, for example, are resistant to accept funding from an investor as they would like to keep control over their company.

> **"**_We decided not to raise funding initially because we wanted to do everything ourselves to keep control over the product that we are making instead of having a lot of people involved in the decision-making._**"**
>
> _- Representative from Skialabs, a data collection company (to find out more, please visit www.skialabs.com)_

However, this may vary depending on whether the company is a hardware or a software company. According to the interviewee from Scoozy, hardware companies need more funding from the start for the research and development of the products which they will offer, thus, making funding essential for the success of their business and them being more open to funding as it is needed more.

When introducing a product or service to the market, timing plays an important role. There are many funding instruments and projects in play which can be taken advantage of as a company having the ambition to introduce a new product or service. For example, governments still offer funding under the HORIZON 2020 initiative to innovative companies that meet certain requirements. As an example, TripService was able to take part in the support projects when starting up and was not committed to the projects for a long time. This allowed them to get a boost in the starting periods of their company without having the commitment of being part of an organization for a long period of time.

Along with taking part in support projects, there are also other methods that could help a company become stronger. One interesting method recommended by TripService was to not write off costs made in the first few years and wait with paying them back, so that the company can gain capital and market share and then have enough capital to write off the costs with ease at a later date.

CONCLUSION

This handbook aimed to inform new and existing players in the changing mobility ecosystem about the tools that could support them in becoming self-sustaining in the long run. To do so, chapter 1 sketched a picture of the changing mobility market where cities are increasingly investing in making transportation more multimodal, sustainable, efficient and convenient, and mobility providers – introducing new mobility options and services contributing to the reduction of the parking demand, pollution and congestion. The findings revealed that this transformation is not only about the appearance of new mobility providers, but also about the way established companies are redefining their business models.

As suggested by this handbook, to be able to keep up and stay (or become) relevant on the changing market, mobility providers need to be aware of the trends and developments driving its transformation, and of the way competitors are responding to it. For this, 'new mobility' business strategies of diverse providers (e.g. scooters- and bike-sharing companies) were presented in chapter 2. This collection of business strategies could support and serve as an inspiration to established and starting companies in the mobility field, especially with regard to understanding their added value and choosing strategies they could apply to cope with the changing sector. Knowing this could help providers to come up with offers that would lead to self-sustainability.

In addition to the supporting tools presented in chapter 2, the handbook further aimed to elaborate on the experiences of several interviewed new mobility providers and established companies redefining their strategy. As advised, to secure competitive advantage, mobility providers do not only need to be able to cope with the changes in the sector, but they also need to, for instance, keep track of the competition, form strategic alliances, and utilise the many financial (and other) support systems available out there.

This overview should serve as a useful thought-provoking starter for new and existing mobility providers who seek to understand what the mobility market transformation could mean for them, and how they could seize the right opportunities in order to remain (or become) relevant and self-sustaining.

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