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Carsharing as an Urban Mobility Solution
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Measures to establish sustainable business models through innovative concepts

A Master's Thesis submitted for the degree of
"Master of Business Administration"

supervised by

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Affidavit

I, Julian Merget, hereby declare

1. that I am the sole author of the present Master's Thesis, "Carsharing as an Urban Mobility Solution", 74 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master's Thesis as an examination paper in any form in Austria or abroad.

Vienna, 01.08.2015

Signature

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II. List of abbreviations

CAGR	Compound annual growth rate
IT	Information technology
KPI	Key performance indicator
OEM	Original equipment manufacturer (car manufacturer)
TCO	Total cost of ownership
TCU	Total cost of usage

III. Abstract

In urban areas, the growing vehicle population is leading to an increasing traffic density as well as a higher utilization rate of the existing public infrastructure, which is resulting in problems such as congestion, air pollution and insufficient parking spots. This development is exacerbated by the accumulative effects of urbanization, which is calling for a counter-control.

As an approach for making better use of the vehicles in urban areas, intelligent and fully-integrated mobility concepts – such as Carsharing – have been developed.

However, these concepts can only be a solution when they are widely disseminated and have been lucrative for the providers. Therefore, the business models need to gain sustainable profitability in the long-term, which is the major research obejective of the given thesis.

Hence, concrete measures to establish profitable mobility services will be determined by taking into consideration the following key trends:

1.: Urbanisation – highlighting the increasing share of urban population and its impact on straining the urban mobility infrastructure to the utmost

2.: Demographic Development – showing the ageing population and the stagnating population in Europe, resulting in the need for tailored mobility services

3.: Changing Consumer Behaviour – underlining the current shift in paradigm: “usage instead of ownership”, as well as the decreasing importance of the privately-owned vehicle as a status symbol

4.: Urban Infrastructure Restrictions – presenting the impact of inner-city restrictions, such as fees for private vehicles entering the city, on mobility concepts

5.: Social Responsibility – describing the increasing need for social and environmental responsibility in the population and their influence on urban mobility.

Besides this, the given MBA-Thesis further bridges the gap between scientific research and the long-term profitability of operating mobility service businesses by developing a profitability tool to reflect future business profits. Hereby, also different scenarios will be applied, to identify the relevant key drivers for profitability.

Finally both, the scientific trend analysis as well as the development and application of the profitability tool, will lead to a list of concrete measures to establish sustainable business models through innovative concepts.

IV. Main part

1. Theoretical (scientific) part

1.1. Introduction

Today, the average privately owned vehicle in Germany is only used for approximately one hour per day (Civity Management Consultants 2014: 25), which shows in reverse that the vehicle is not used for more than 90% of the available time. This leads to the fact that the private car is currently the biggest unused asset worldwide (cf. PwC Autofacts 2014: 3f), posting the following very simple question:

Should the automotive industry still try to sell a car to every single person worldwide?

No, definitely not - …but mobility!

- Modern mobility is defined by the availability of individual mobility solutions. This could on the one hand be the already mentioned privately owned car, but on the other hand this could also be the train, bus, taxi, bicycle or innovative mobility services, such as Carsharing.

Especially in urban areas, the modern mobility is starting to change, which is driven by socio-technological trends, such as increasing urbanisation (cf. Zukunftsinstitut 2011: 35ff), legislative requirements, changing consumer expectation, as well as the availability of mobile internet through smartphones, which enables location services via GPS (cf. PwC China 2015: 11). This leads to new and much more flexible mobility offers, which allow the customer to reorganize his entire mobility network by fulfilling his constant need for mobility.

When in 2014 the idea for this thesis was developed, automakers had already started to establish themselves in these urban mobility services as providers with innovative and flexible mobility offers such as Car2go (from Daimler/ Europcar) or DriveNow (from BMW/ Sixt) - and they started to play a new and major role in the urban mobility 2.0.

Following this, the most challenging question was not anymore how these automakers can successfully enter the markets, but how they could establish sustainable profitability through innovative concepts over the long-term. – And this is the focal point of research of the given MBA-Thesis:

Carsharing as an Urban Mobility Solution

Measures to establish sustainable business models through innovative concepts.

The thesis will therefore showcase how Carsharing and the potential development of these mobility offers to multi-modal offers can be used as business models to gain sustainable profitability by not only developing innovative concepts, but also further diversifying the existing product portfolios with new services. Therefore, the MBA thesis will not only take into account private and individual sharing models, but also corporate Carsharing models as well as integrated mobility concepts, offering door-to-door mobility through the implementation of further mobility services (taxi, bus, plane, train).

As a key part of the thesis, a profitability tool will be developed, which is an exemplary business case of a Carsharing company. This profitability tool will be developed to provide detailed insights into the entire business model, by taking into consideration all relevant input factors, which consist of market factors, as well as cost and revenue factors. After the scientific development and completion of this profitability tool, it will be used to simulate different business scenarios, by changing specific input factors. Hereby, the objective is to identify the key drivers for profitability, not only for Carsharing businesses but also for other urban mobility concepts.

Finally, the expected result will showcase concrete and specific measures, how current and potential future players in the area of urban mobility - especially Carsharing - are able to further establish their business models to gain sustainable profitability through innovative mobility concepts. This will be strengthened by analysing the current and future structure of urban mobility and by taking into account changes, challenges, opportunities as well as trends in the area of consumer behaviour, legislative environment, urban infrastructure trends and social responsibility.

1.1.1. Problem Definition and Research Objective

Fridays are the worst days in Germany. If you were to force a single driver to return all passenger-kilometers alone, which are run on an average Friday in Germany, he would drive 95,000 times around the earth. Because in 2008, every Friday were completed 3.8 billion passenger kilometers in Germany. No wonder, as on Fridays the Germans are looking forward to the weekend and escape from work in long columns from the desolate cities (cf. Zukunftsinstitut 2011: 6). This already covers three key factors that are relevant for the urban mobility:

1.: job-related mobility

2.: leisure mobility

3.: urbanization as a central transport driver.

These three factors have in common that they are covering the “basic need” (Zschocke 2005: 35) for the mobility of human beings.

But what exactly does it mean, if mobility is a basic need?

This means - for all mobility providers as well as all urban city planners - that the need for mobility will always be there, and cannot simply be reduced to get less crowded urban streets. In most of the megacities, there is no longer any room available for more roads and more cars. And this is not only true for megacities. When taking a look at the rush hours in German cities, the average speed of the vehicle in Munich is at just over 30 km/h, whereby more than 20% of the city’s streets are jammed. In Berlin’s rush hour the average speed of vehicles is even lower - at 25 km/h - by perceiving “only” just over 15% of the roads blocked (cf. Zukunftsinstitut 2011: 17).

This reflects the major challenge of the future, which will be to not create *less mobility*, but to create *more intelligent mobility*, for example through higher efficiency.

Following this, urban mobility should not be looked at separated, as for example a private car or a tram only. Urban mobility should instead be perceived as a whole and fully integrated system, with several modal splits within the system, able to cover the customer’s entire trip from door-to-door.

And hereby, the challenge will be to provide this mobility chain on the one hand for the customer at a cost and time minimum as well as a comfort and flexibility maximum - and on the other hand for the business at a profit maximum. So obviously, to achieve the maximum profit as a mobility provider, it is not only about being present in the mobility market, but about providing the exactly needed services at a reasonable quality.

Especially the "sharing economy" (PwC China 2015: 3) might play an important role in regards to this. While some of the urban infrastructure planners still try to find their way out of overcrowded roads by conceptualizing new urban infrastructures, which might not turn live within the next few decades, since a city structure is hard to change – some automakers developed themselves into the field of social innovations. These OEMs were keen to develop mobility services which do not only allow customers to use vehicles instead of owning them, but also to offer urban mobility services that connect different transport modes within an urban area. As the necessity and demand for these services rise, manufacturers are increasingly including them in their portfolios (cf. Civity Management Consultants 2014: 7).

This leads to the fact that in the near future, when the customer starts a journey, he might not even know yet, which transportation mode he will be using on his way. And the consumer might change them several times while travelling, firstly because of his high flexibility and secondly because of systems and apps, which make it possible to adjust the modal split of journeys just-in-time.

From another perspective, the point-of-view of a mobility business, this also leads to several challenges, which need to be addressed structurally to gain sustainable profitability. On the one hand, this could be the further diversification of the offers to gain coverage of the entire trip, so called "door-to-door services", and on the other hand this could also be the quality of the services provided, the costs of the service, the availability of the services, etc. .

In the following sections, all of the upper-mentioned factors will be scientifically analysed through the application of an integrated approach - and measures will be derived subsequently to gain sustainable profitability through innovative urban mobility concepts, especially Carsharing.

So to finally sum the aforementioned section up, the key challenge in urban areas is the high traffic density and the high vehicle population resulting in problems such as traffic jams as well as insufficient parking spots. This is exacerbated by the increasing urbanization, which calls for a counter-control. As an approach for making better use of vehicles in urban areas resulting in less problems (e.g.

overcrowded parking spots), intelligent Carsharing can be used. This can be a solution when it is widely disseminated and has been profitable for the providers.
In order to achieve this wider distribution, the business model needs to be profitable in the long-term, which is the major research objective of the given thesis.

Therefore, arising from challenges of business operations of urban mobility service providers, the given thesis will determine concrete measures to gain sustainable profitability, by taking into consideration the following key questions:

1.: Scientific analysis

a) What does the urban mobility landscape currently look like and how is it influenced by current and future trends as well as potential challenges?

b) Which are the key drivers for urban mobility concepts?

c) What does the cost and revenue structure of a Carsharing business consist of and which are the key factors for sustainable profitability?

2.: Derivation of measures

a) How can future trends and the key drivers for urban mobility concepts be systematically used to gain more profit?

b) What exactly needs to be considered in regards to the cost and revenue structure of a Carsharing business to gain sustainable profit?

c) Which are concrete measures to establish sustainable business models through innovative mobility concepts?

Hereby, Germany has been chosen as a regional focus, since it is the country with the most developed Carsharing market in Europe (PwC Online 2015). By taking into account specific regional factors, the insights of this MBA-Thesis can also be applied to other urban mobility markets within the EU-15, as this geographical region represents homogenous mobility behaviour as well as a similar urban transport infrastructure (Schnurr 2013: 3).

1.1.2. Structure of the thesis

The main part *(section V)* of the given MBA-Thesis is divided into two key chapters: (1) the theoretical part and (2) the practical part. The theoretical part (1) is covering the relevant scientific foundation of the thesis, by leading through the Introduction *(section 1.1)*, which is subdivided into the problem definition and research objective *(section 1.1.1)*, structure of the thesis *(current section 1.1.2)*, as well as the methodical approach of the given thesis *(section 1.1.3).* The second chapter of the theoretical part (1) will be leading through the role of mobility concepts in urban areas *(section 1.2)*, by providing an overview of the current status of mobility concepts and strategies for urban areas *(section 1.2.1)*, as well as the current status of research and literature *(section 1.2.2)*. The last chapter of the scientific part (1) starts by providing insights into the necessity for sustainable mobility concepts in urban areas *(section 1.3)*. Following this, all relevant key drivers for urban mobility concepts will be analysed in *section 1.3.1*, which are urbanisation, demographic development, changing consumer behaviour, urban infrastructure restrictions as well as social responsibility *(sections 1.3.1.1 to 1.3.1.5)*. This part is followed by the summary *(section 1.3.2).*

The practical part (2) focusses on bridging the gap between scientific research (part 1) and the long-term profitability of operating Carsharing businesses, by developing a profitability tool to reflect future business profits *(section 2.1)*. The development starts with the definition of the structure of the model *(section 2.1.1)* and goes into more detail in *section 2.1.1.1* by providing an overview of the key assumptions of the profitability tool. As several input factors need to be developed scientifically, *section 2.1.1.2* leads through the development of the market metrics, whereby *section 2.1.1.3* covers the development of the cost factors and *section 2.1.1.4* the revenue factors. The first output of the model, the business KPIs, are defined in *section 2.1.1.5* before the results of revenues, costs and finally the profit will be shown and pre-interpreted in *section 2.1.1.6*.

In the next step, different scenarios are simulated to identify the key drivers of profitability *(section 2.1.2)*. Therefore, three different scenarios are used, taking into account different market metrics and cost factors *(sections 2.1.2.1 to 2.1.2.3)*. Subsequently, a comparison of the scenario results and pre-identification of the key profitability drivers is completed in *section 2.1.2.4*, before in *section 2.1.3* an interpretation of the results of the profitability tool is presented.

In the second section of the practical part (2), the measures to establish sustainable business models through innovative mobility concepts are derived and analysed *(section 2.2)*. This chapter leads through the analysis and derivation of all the different measures, which have been identified through the course of the MBA-

Thesis *(sections 2.2.1 to 2.2.4)*. Finally, *section 2.3* presents an overview and the final list of the key findings in regards to the profitability measures.

Following this, in *section 2.4* the verification of target achievement and further results is performed, by validating the achievement of the objectives. Finally, s*ection 2.5* provides an outlook into the future of urban mobility concepts.

1.1.3. Methodical approach of the given thesis

The methodical approach of the given MBA-Thesis will be based on the analysis and derivation of measures, how to gain and keep sustainable profitability in the urban mobility sector. Therefore, it is key to thoroughly analyse the existing urban mobility landscape including all its existing business models, their key drivers, potential challenges as well as future mobility trends from all relevant point-of-views (customers, business providers, urban planning departments and legislative responsibilities). This will be performed by not only taking into consideration empirical studies and available literature as well as the internet, but also by scientifically developing a profitability tool, which will be enable the identification of all relevant drivers for sustainable profitability through the simulation of different scenarios. This will allow to get even better insights into the current situation of businesses and therefore identify these key drivers. In total, this will lead to an integrated approach, which enables the full consideration of all necessary factors in the given thesis.

1.2. The role of mobility concepts in urban areas

When looking back to the 1950s, less than 30% of the world's population lived in cities (cf. PwC US 2013: 8). In 2014, this proportion was accounting for 53% of the worldwide population, reflecting a total number of 3,820,000,000 inhabitants in urban areas (cf. Statista (2) 2015). And by 2050, the world's urban population will have increased to 72%, reflecting a total number of 6,696,000,000 inhabitants (cf. PwC US 2013: 8). This shows the speed of urbanization, which almost doubles the urban population between now and 2050.

Especially in developed economies with "mega-cities"[1] and developing regions with older cities, infrastructure will therefore be strained to the utmost - and likely beyond - as populations expand (PwC US 2013: 8). The result of this development is expected to be a higher vehicle density in urban areas, leading to a much higher utilization rate of the existing infrastructure, which will be reflected by overcrowded roads as well as limited availability of parking areas (cf. Zukunftsinstitut 2011: 17). Therefore not only existing cities, but also new and rapidly rising cities require massive investments in smart and fully integrated mobility concepts to accommodate the explosive growth (cf. PwC US 2013: 8).

Following this, at first the term "mobility concept" needs to be defined:
*"[A mobility concept] is primarily a demand-oriented approach to transport. Its aim is to support and encourage a change of attitude and behavior to reduce single car use and to strengthen sustainable modes of transport. Cooperation between public and private institutions enables solutions that fulfil public as well as individual objectives in mobility and transport. [Mobility concepts] are based on information, communication, organization, coordination and promotion. [According] measures need to be integrated into bundles of measures which can additionally include planning, construction and operating infrastructure, supplying mobility and further services, legal and regulatory measures, and/or pricing and fiscal approaches to gain enhanced synergistic impacts." (*European Union, MOMENTUM/MOSAIC 1999: 15f, reference "Mobility Management")

This definition reflects the complexity and the needed integration of mobility concepts into their environment, since especially in the upper-mentioned urban

[1] "Mega-cities" are cities with 10 million inhabitants or more (United Nations 2014). In 2014, there were 28 mega-cities worldwide, whereby Tokyo was the world largest with 38 million inhabitants. By 2030 the number of mega-cities is expected to increase to 41. (cf. United Nations 2014).

areas, but also in the rural areas, each individual has a basic need for mobility that needs to be fulfilled (Zschocke 2005: 35), leading to the fact that mobility concepts are becoming increasingly important. Therefore, particularly in the inner-city areas, mobility networks are getting more and more developed - driven by the higher traffic volume due to the mentioned increasing urbanization - and hence, these networks are getting also more complex compared to those in rural areas.

When now taking a look at the modal split of an exemplary city in Germany, it can be distinguished between four major modes of transportation: (1.) Private vehicle, (2.) walk, (3.) bicycle as well as (4.) public transport:

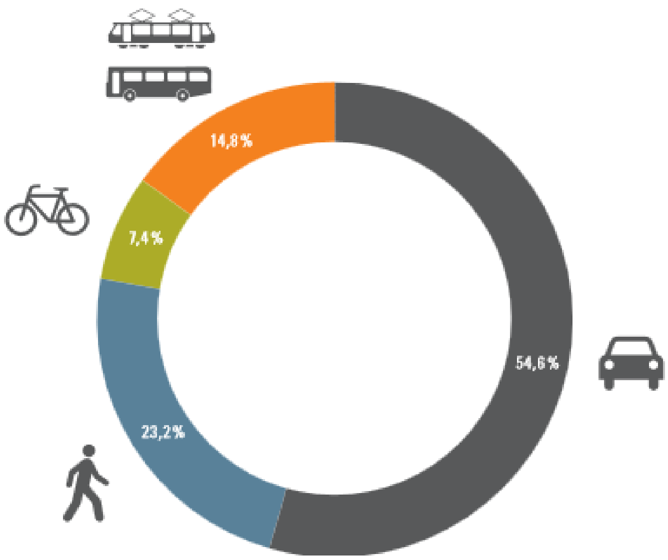

Chart 1: Overview of Modal Splits in an exemplary German city (Stuttgart)
Source: VVS 2011

It can clearly be seen that the private vehicle is the favorite mode of transportation, being used for 54.6% of the total transportation distance. This mode is followed by walking (23.2%) and the public transportation network (14.8%).

When taking a look at the favorite mode of transportation – the private vehicle – it is important to also analyze why this is the favorite mode. The key drivers for the decision of choosing one or the other transport mean can be distinguished between: capacity, speed, accessibility as well as level of comfort.

In regards to the capacity, it can be said that the private vehicle's transport capacity is not only driven by the vehicle itself (model, size, etc.) but also by the traffic management of the area, where it is being used. If the traffic management of the area, where the vehicle is used is insufficient, the transport capacity goes down significantly, e.g. through traffic jams and unavailable parking spots, which makes the usage less attractive. In regards to the transportation speed, the private vehicle is much more attractive than walking and using the bicycle. Taking a look at the accessibility, the vehicle has a high attractiveness in rural areas, as it can also reach locations, where the public transport is not available, whereby in urban areas, the accessibility can be limited (*see section 1.3.1.4 inner-city restrictions*). However, the level of comfort of a private vehicle is the highest throughout the four transport modes, as it can be used highly flexible while being able to transport through all weather conditions.

Following this, it can be easily understood that the privately owned vehicle is currently the favorite mode of transportation. However, due to several measures and trends, not only of the municipalities and the government, but also the customers (*see section 1.3.1 key drivers of urban mobility concepts*), the modal split is expected to shift in the future, while individuals are forecasted to spent more money for alternative modes of transportation:

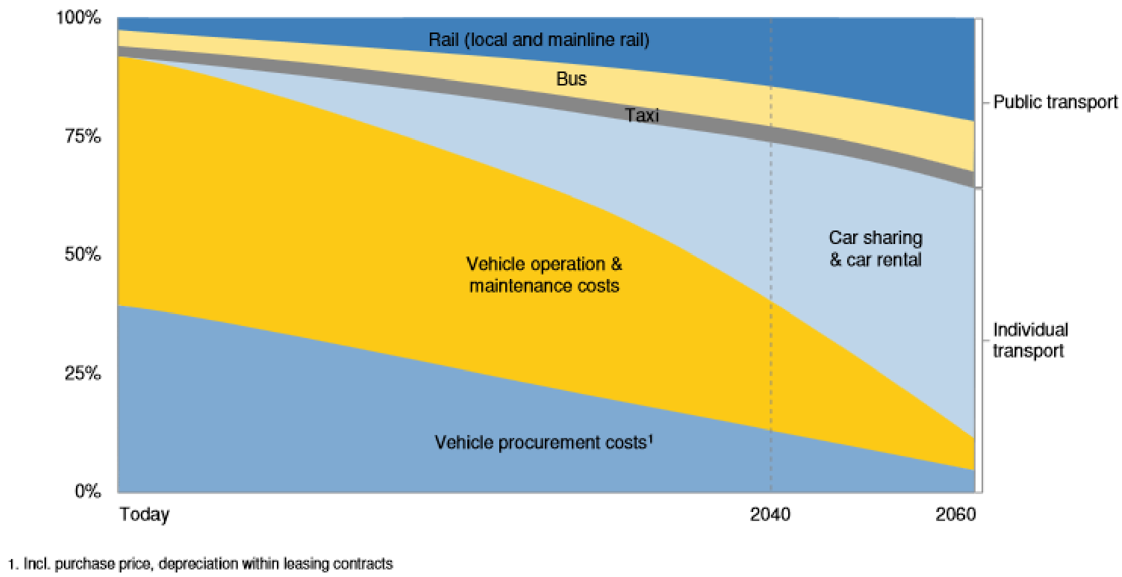

Chart 2: Budget expenditure for transportation in Europe
Source: Oliver Wyman 2011

Following the modal split, it is hard to talk about "the one" mobility network in a certain city, as it seems to be divided into several single systems, such as the private car network, the bus network, the tram network, the subway network, the railway network, the rental car network, the taxi system, the Carsharing system, the bicycle network and the pedestrian system – each of them offering different capacities and accessibilities.

- Let’s assume that there is a partly break-down in one of the upper-mentioned mobility systems in a chosen city. Due to technical problems, the subway network of one part of the city breaks down and is not expected to be running again within the next 60 minutes.

In the first phase, the result will be disappointed customers in regards to the mobility system, which is not running properly. In the second phase, the customers start to think of alternatives: How can the target location be reached, even if the chosen mode of transportation - the subway network - is not working anymore? And in the final phase, the customers start to shift their mobility needs into another transportation mode (from one transportation system to another) or in a timely manner (from now to a later point of time).

In this very simple example, it can already be seen that an integrated mobility concept within an urban area is highly important, as different modes of transport need to be connected and should be easily accessible to prevent the non-fulfillment of the customers mobility needs. But not only in the case of a break-down of one of the systems, the upper-mentioned requirement gets visible. Because further to this, fully integrated transportation systems in urban areas can be used to balance out traffic volumes and peak-usages of different transportation modes or to even direct traffic volumes to another transportation system on purpose, for example to relieve another part of the mobility network during the rush-hour.

So as shown before, there is a high complexity and key challenges within existing mobility networks. Therefore, it is key to develop fully integrated systems that can be perceived as *one* urban mobility system, covering and compressing all needed modes of transportation for the most comfortable usage of the customer. But in order to achieve a wider distribution of these integrated systems, they need to be profitable in the long-term, which is the major research objective of the given thesis.

1.2.1. Overview of the current status of mobility concepts in urban areas

The given thesis will specifically focus on the different mobility concepts of Carsharing, as otherwise it would exceed the scope of this thesis. Hereby, the thesis’ objective is to analyze those Carsharing models, which include the provision of (maintained, insured, serviced and cleaned) vehicles. This leads to the exclusion of social Carsharing (socalled “Peer-to-Peer”) models, in which members can bring their private cars to serve other users' mobility needs (e.g. Uber, WunderCar, BlaBlaCar, Mitfahrzentrale, Mitfahrgelegenheit, etc.), as again this would exceed the targeted scope of the given thesis.

Within the described scope of content, Carsharing is defined as "*a membership based service available to all qualified members […]. No separate written agreement is required each time a member reserves and uses a vehicle. All [Carsharing providers] offer members access to a dispersed network of shared vehicles 24-hours, 7 days a week at unattended self-service locations.*" (The Carsharing Association 2015).

As Carsharing is often being compared or even mixed up with the concept of car rental, the major differences of a Carsharing system need to be highlighted to structurally distinguish between the two systems:

- Only one registration with the Carsharing company necessary
- Long-term Membership with monthly/weekly/usage-specific invoicing
- Hourly-based or even minute-based rentals possible
- Vehicles are not attended and can be opened directly by the member (e.g. through member card)
- Reservation and pick-up of cars normally available 24h per day, 7 days a week
- Pick-up and drop-off for "free-floating" offers not station based
- Fuel costs and sometimes even parking costs are included in the price

(cf. Autozeitung 2013; Book-n-drive 2015).

In Germany, which is Europe's most developed Carsharing market (PwC Online 2015), more than 750.000 members were registered for the upper-mentioned services in 2014 (cf. Bundesverband Carsharing e.V. 2014: 2). The amount of members has therewith finally reached a significant proportion of more than 1% of the drivers-license-holding population of the entire country (1,13%; Bundesverband Carsharing e.V. 2014: 2). Hereby, Carsharing offers can be differentiated into three different concepts, based on the factors vehicle provision (station based / free floating) as well as the vehicle return options (A to A / A to B).

The first factor, the vehicle provision, defines if the vehicles of the Carsharing concept are located in fixed stations, where they have to be rented and to be returned to - or if they are free floating, which means, they can be rented and parked within a specified area (usually the inner-city), where the next Carsharing user can simply take the car again, without going to a station.

The second factor, the vehicle return options, classifies if the vehicles can be returned to another location than the point of the rental start, which is reflected in either an “A to A” or an “A to B” rental process.

The following chart provides an overview of the different concepts:

	Station based	Free floating
A to A	(1.)	
A to B	(2.)	(3.)

Chart 3: Overview of different Carsharing concepts
Source: Own illustration

Following this, there are three different Carsharing concepts, which need to be distinguished:

(1.) Station based, A to A

Carsharing concepts of the first classification offer vehicles in one or more stations, which have to be rented and returned to the very same station.

(2.) Station based, A to B

Carsharing concepts of the second classification provide vehicles in multiple stations, which can be exchanged between the locations. Therefore, they can be rented at “Station A” and can be returned to “Station B”.

(3.) Free floating, A to B

Carsharing concepts of the third classification offer vehicles not in stations, but in specified areas (usually within the inner-city), where they can be rented and returned (parked), which is called “free floating”. Some of these free floating providers even offer spaces in public parking garages, which can be used for free by the customers, if they are needed.

Following this, in Germany there are currently 3.900 stations providing 7.700 vehicles, while in the free floating system there are 6.250 vehicles available throughout Germany (cf. Bundesverband Carsharing e.V. 2014: 3).

When now taking a look at the modal splits of customers in an exemplary German city and the positive effect, which a Carsharing concept has, it can be distinguished between seven different modes: walk ("Fuß"), bicycle ("Rad"), public transport ("ÖPNV"), train ("Bahn"), Carsharing, private vehicle ("privates Auto") as well as co-driver or carpooling ("PKW mitfahrend"). On an average weekday (grey bars), most of the people are using walk as well as public transportation as their favorite mode of transport, followed by the bicycle.

Now offering these people proactively a Carsharing model in the given city (red bars), the modal splits are strongly changing: Carsharing is perceived as the favorite mode of transport, whereby this is followed by walk and public transport. However, the key effect can be seen in the mode of the private vehicle. As soon as Carsharing is used, the usage of the private vehicle almost goes down to zero, which is a very strong effect representing the influence of the Carsharing business onto the decreasing usage of the private vehicle.

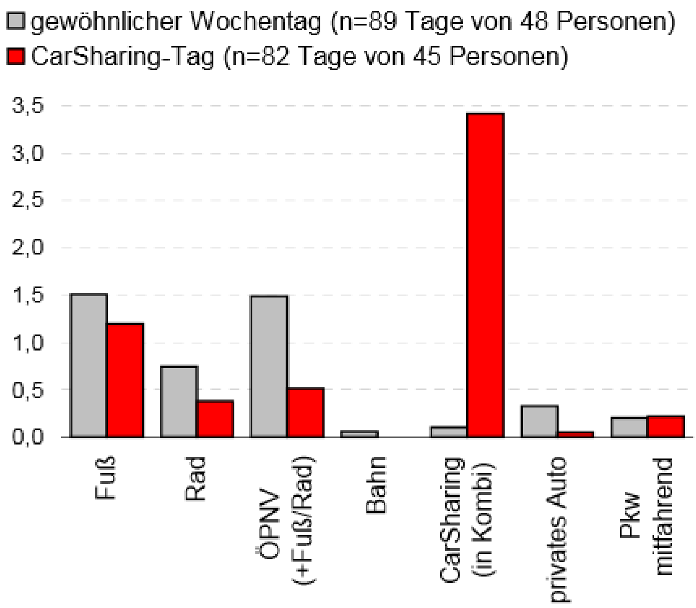

Chart 4: Overview of modal splits in an exemplary German City (Aachen)
Source: Huwer 2002

The underlaying key drivers for this effect will be analyzed later on in section 1.3.1.

Following this, the key advantages of the shift from a private vehicle to a Carsharing model are:

- On average one Carsharing vehicle replaces 15 personally owned vehicles (Frost & Sullivan 2010)

- Carsharing members drive 31 percent less than when they owned a personal vehicle (Frost & Sullivan 2010)
- This leads to a significant reduction in traffic as well as air pollution through emissions and increases the availability of parking spots within the city (Shaheen & Cohen 2006: 5)
- For 2013, carbon dioxide emission reduction from Carsharing was already estimated at 62,070 tons of CO_2 - and by 2020, emission reductions are predicted to increase further to 172,923 tons of CO_2 (cf. IJEST 2014).
- Thus, Carsharing is an innovative strategy for traffic demand management that can alleviate air pollution.

After having analyzed the different Carsharing concepts, the impact of Carsharing on the model split as well as the advantages of a Carsharing business, in the following, an overview of the German Carsharing landscape is provided, highlighting the biggest Carsharing providers, by taking into consideration their Carsharing concept as shown in the upper classification table (classification (1.), (2.) or (3.)):

Name	Amount of vehicles	Distribution	Cost	Classification
Book-n-Drive	450	5 cities	starting at 0.17 €/km	(1.)
Cambio	1,000 +	14 cities	starting at 0.23 €/km	(1.)
Car2go	3,500	8 cities	0.29 €/minute	(3.)
Car2go black	n/a	8 cities	14.90 €/h	(2.)
Citeecar	800	11 cities	starting at 0.22 €/km	(2.)
DriveNow	2,950	5 cities	starting at 0.24 €/minute	(3.)
Flinkster	3,100 +	150+ cities	0.18 – 0.20 €/km	(1.)
Ford Carsharing	70	30 cities	0.19 – 0.21 €/km	(1.)
Greenwheels	280	21 cities	0.10 €/km + fuel	(1.)
Multicity	350	Berlin	0.28 €/km	(3.)
Stadtmobil	2,000	100 cities	starting at 0.18 €/km	(2.)
Quicar	200	Hannover	0.20 €/km	(1.)

Chart 5: Overview of selected German Carsharing provider
Source: Own illustration, based on Wirtschaftswoche 2015

Out of the upper mentioned Carsharing provider in Germany, Flinkster (belongs to Deutsche Bahn) is the biggest station-based offer, with an amount of more than

3,100 vehicles in over 150 German cities. In the second classification of station-based providers with an “A to B” offer, Stadtmobil with more than 2,000 vehicles in 100 cities is the main provider. Finally, in the third classification free floating, Car2go is the main provider with 3,500 Smarts in 8 cities, followed by DriveNow with 2,950 BMWs and Minis in 5 German cities.

In Germany, 380 cities and villages are provided with station-based Carsharing offers, whereby free floating systems are available in 14 locations. This leads to a total amount of 33.35 million inhabitants reached by station-based offers (41.4% of the total German inhabitants) and 9.31 million inhabitants, which are reached by free floating offers, reflecting 11.6% of the total German inhabitants (cf. Bundesverband Carsharing e.V. 2014: 4).

When taking a detailed look at the free floating systems, it can be said the major difference between the two market leaders Car2go and DriveNow – besides the product portfolio and prices – is the size of the business area. While Car2go offers in average an area of 122km^2, DriveNow focusses more on the inner city center with an average area of only 88km^2. This leads to the fact that in the business areas of DriveNow the density of inhabitants (7,061 inhabitants per km^2) is almost twice as high as in the business area of Car2go (4,719 inhabitants per km^2), which leads to a higher utilization rate of the DriveNow vehicles (cf. Civity Management Consultants 2014: 32).

Finally, when comparing these free floating providers to the station based ones, there is already a major competitive advantage for the free floating concepts, which can be stated at the end of this introductory part:

They are able to align their business areas to demand priorities and adapt them much more flexible!

1.2.2. Current status of research and literature

There are currently no specific up-to-date analysis on the derivation of measures for urban mobility providers to gain long-term profitability, by taking into account an integrated approach, focusing on the German mobility market.

However, there is plenty of literature available on (1) mobility services in general, (2) urban transport and planning as well as (3) the selected key drivers for the concepts.

The first topic **mobility services in general (1)** is framed by Leitschuh-Fecht (2002), who is setting innovative mobility offers, such as CarSharing of VW, Cash Car and “Call a bike” of Deutsche Bahn into a wider context of urban planning und future perspectives. Also Schwieger (2004) is taking a detailed look at global mobility services, by analyzing three specific Carsharing systems in Hamburg (Germany), Seattle (USA) and Yokohama/Tokyo (Japan), while Loose, Moor (2004) are focussing their analysis on a detailed overview of the (old 2004) CarSharing landscape, covering all relevant service offers. In 2005, Schöller started to analyze the multimodal traffic behavior of consumers in relation to urban mobility concepts, which can be seen as one of the most relevant sources for integrated mobility systems.

However, most of the mentioned literature on mobility services has its origin in accompanying research of mobility service projects as well as surveys and is not focusing on the profitability or even the economically sustainable business development of urban mobility providers. Further to this, most of the upper-mentioned literature clearly showed that mobility services were still a niche market in the early 21st century, which has started to change now. Therefore, a new analysis and definition of the urban mobility markets is needed in both primary and secondary research, which also takes into consideration the long-term profitability of the mobility services.

The second topic **urban transport and planning (2)** is covered by Pharoah (1995), who analyzed the transportation systems and the consumer behavior of ten different cities throughout Europe, by focusing on city-friendly transport concepts. In 1997, the author Hey showed different transportation concepts for urban areas in his work, while in 2002 Kagermeier et al. (2002) published their compendium of the analysis of the urban transportation system in Munich, by taking into account innovative service offers to build long-term customer relationships. Also Leitschuh-Fecht (2002), analyzed modern trends in urban transportation systems. This publication was followed by Schöller in 2005, who analyzed the integrated transportation policy of urban areas as a major step towards the shift in urban mobility. Most of these publications were focusing on the analysis and comparison of urban transportation systems in different cities, but didn’t fully cover integrated mobility approaches, by also taking into consideration innovative mobility services, such as Carsharing.

Following Schnurr (2013), the urban transport planning has developed a three-fold approach for achieving higher sustainability: “*Reduce, Shift, Improve*” (Schnurr

2013: 13). While *reducing* mobility needs is hereby mainly a task of urban planners and *shifting* transport modes the task of local transportation providers, vehicle manufacturers traditionally have focused on *improving* technology by increasing the general efficiency of their vehicles. However, the given MBA-Thesis criticizes that in the long-term it is provable possible to *reduce* mobility needs. Of course, these needs can be shifted from one transportation mode to another, but mobility is a basic need (see *section 1.1.1*) and therefore - over the long-term - it will not be possible to *decrease* these mobility needs. Therefore, the focus of this thesis is rather on "*Shift & Improve*" than on "*Reduce*". Nowadays, it is also possible that automakers can be engaged in the *shift* approach by offering integrated and non-integrated mobility services, as already shown by Car2go and DriveNow - and thus make a further contribution to the sustainable development of urban transport development (cf. Schnurr 2013: 13f).

The third topic **key drivers for urban mobility concepts (3)**, has been reflected in several publications, also in recent times. In 1997, Hey showed a detailed overview of different influences in the metropolitan transport development, which was followed by the work of Kagermeier et al. (2002), which named different key drivers for urban mobility concept, by taking a look at international mobility projects in the UK, Algier as well as Columbia. This was followed by Loose, Moor (2004), who presented an overview of potential development perspectives, which can be seen as a basis of the key drivers for urban mobility concepts of recent times. Also Schöller (2005) has analyzed the development perspectives of the public transport systems in urban areas. Teichler et al. (2011) analyzed mobility behavior of academic staff and students, by also taking into consideration recent trends and key drivers of urban mobility concepts. Further publications are from Beckmann, Klein-Hitpaß (2013), who defined external key drivers for mobility concepts and analyzed the foundations for innovative urban mobility concepts as well as changing consumer behavior. The most recent available publication in regards to this third topic, was from Winterkorn (2013), who took a detailed look at the key drivers of innovative and sustainable mobility solutions.

Summarizing the current status of research and literature, it needs to be said that currently, there are no specific up-to-date analysis on the derivation of measures for urban mobility providers to gain long-term profitability, by taking into account an integrated approach, focusing on the German mobility market. Also the fact that most of the literature still sees the innovative urban mobility in the early 21st century as niche market, needs to be updated urgently.

Further to this, most of the upper-mentioned literature clearly showed that on the one hand, mobility services were still a niche market in the early 21st century, which has started to change now and on the other hand, that it is possible, to reduce mobility needs, which is criticized extensively by the given thesis.

Therefore this MBA-Thesis aims at contributing to this void by presenting a new analysis and definition of the urban mobility markets, which also takes into consideration the long-term profitability as well as the strategic options of the mobility service providers, by assuming that mobility is a basic need, which cannot be reduced, but only shifted from one mode to another.

1.3. The necessity for sustainable mobility concepts in urban areas

There are different mobility concepts in different urban areas, driven by the specific mobility patterns. These urban mobility patterns can be divided into three different clusters, based on the travel distance. The farthest cluster within an urban mobility cluster is the “long-distance travel cluster”, which is at maximum 300 kilometres distance from the city centre. In this cluster, usually long-distance trains or busses, or even planes are being used to travel. The second cluster is the “sub-urban cluster”, which is (depending on the size of the city) at maximum 120 to 150 kilometres from the city centre. In this cluster, the private vehicle is used as the main transportation device for individuals, but also the urban public transportation system, consisting of medium-distance busses as well as trains is used in this cluster. The first and most central cluster is the “urban cluster”, which is at maximum 60 kilometres around the city centre. In this cluster, urban mobility concepts are mainly used, consisting of public and private transportation systems, taxi providers as well as micro-mobility, which is representing individual mobility solutions such as scooters, bikes or bicycles.

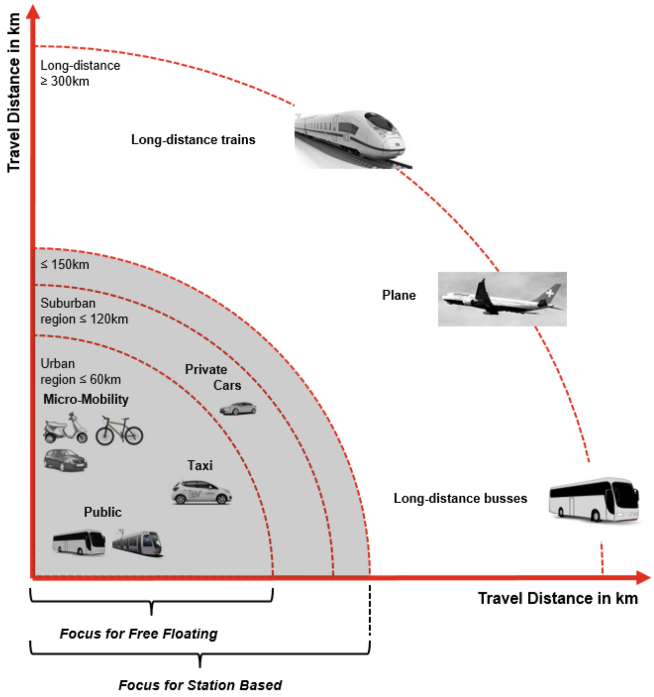

Chart 6: Overview of Urban Mobility Patterns
Source: Own illustration

Especially in this urban cluster, Carsharing systems are offered, whereby free floating systems usually focus on the urban areas and station based systems also cover the next cluster, the sub-urban areas.

But why is there a necessity for sustainable mobility concepts in urban areas at all?

The following section will lead through this question by presenting the major drivers as well as trends in regards to mobility concepts and will therefore result in a list of reasons for the necessity for sustainable mobility concepts in urban areas.

1.3.1. Key drivers of urban mobility concepts

The subsequent chapters scientifically analyse the key drivers of urban mobility concepts, whereby it is essential to not only show the comprehensive scope of these drivers, but to also present their impact on the urban mobility, causing the necessity for intelligent mobility concepts.

The following key drivers will be shown:

1.: Urbanisation – highlighting the increasing share of urban population and its impact on the urban transport infrastructure (*see section 1.3.1.1*)

2.: Demographic Development – showing the ageing population and the stagnating population development in Europe which is resulting in the need for tailored mobility services (*see section 1.3.1.2*)

3.: Changing Consumer Behaviour – underlining the current shift in paradigm: "usage instead of ownership", driven by consumers preferring Total Costs of Usage (TCU) over Total Cost of Ownership (TCO) (*see section 1.3.1.3*)

4.: Urban Infrastructure Restrictions – presenting inner-city restrictions, such as fees for private vehicles entering the city, and the impact on the increasing attractiveness of mobility concept in these areas (*see section 1.3.1.4*)

5.: Social Responsibility – describing the increasing need for social and environmental responsibility in the population and their influence on urban mobility concepts (*see section 1.3.1.5*).

1.3.1.1. Urbanisation

It was in 2007, when the share of the world's population living in urban areas surpassed 50% of the world's total population, reflecting a historic landmark in urbanization (United Nations 2014). In 2014, this proportion was already accounting for 53% of the worldwide population, showing a total number of 3,820,000,000 inhabitants in urban areas (cf. Statista (2) 2015). And looking into the future, by 2050, the world's urban population will have increased to 72%, reflecting a total number of 6,696,000,000 inhabitants (cf. PwC US 2013: 8). This shows the speed of urbanization within the 21st centure, which almost doubles the urban population between now and 2050.

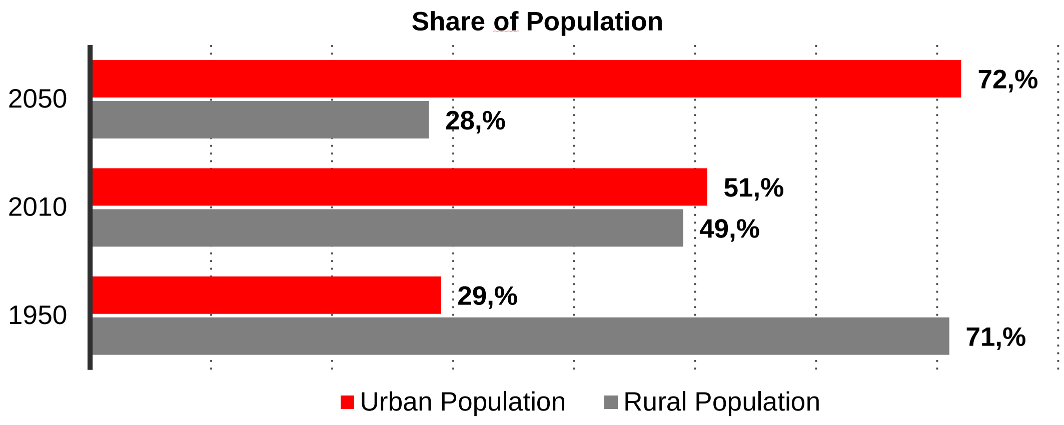

Chart 7: Share of population living in urban/rural areas from 1950 to 2050
Source: Statista 2015, IW Köln

Besides the trend of pure urbanisation, also the passenger travel distance itself is forecasted to double to over 70 trillion kms per year by 2050 (cf. Ernst & Young 2013: 2). So it is not only an increasing amount of people going to be living in urban areas, but also a much higher need for mobility of each of this individual, feeding into an increasing travel distance. Therefore, when taking a look at the urban mobility infrastructure, it is expected to be strained to the utmost.

The result of this development is going to be a higher vehicle density in urban areas, leading to a much higher utilization rate of the existing public infrastructure, which will be reflected by overcrowded roads as well as limited availability of parking areas (cf. Zukunftsinstitut 2011: 17). Already today, a lot of traffic- and environmental problems can be monitored, caused by the increasing extent of urban transportation. Thereof, the most significant one is traffic jam, leading to a major lose in time:

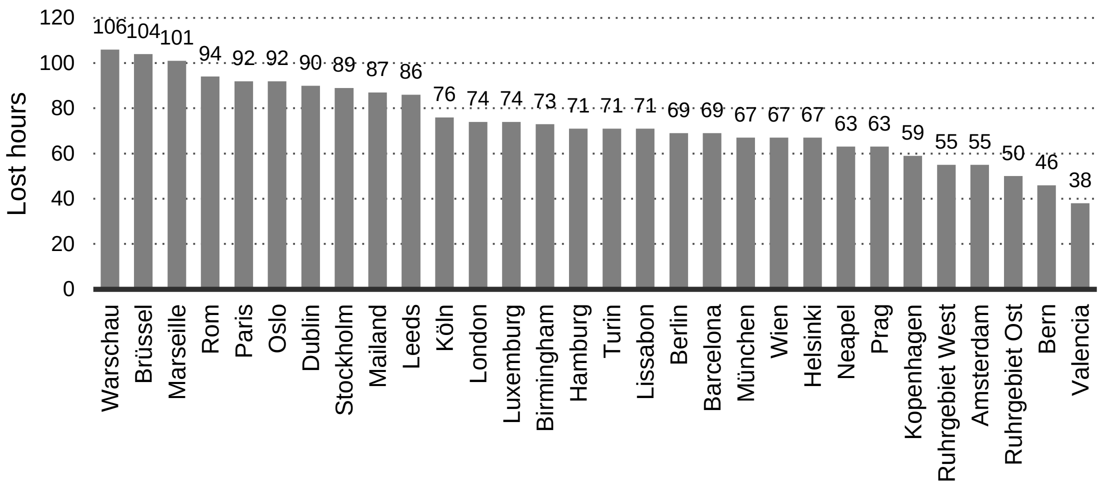

Chart 8: Average amount of time lost due to traffic jam in EU cities in 2012
Source: Statista 2015, IW Köln

But on the other hand, the development of urbanization and the increasing need for mobility will also lead individuals to make a higher usage of the public transportation systems, as urban densities make private car ownership less attractive.
Therefore, rapidly rising cities require massive investments in smart and fully integrated mobility concepts to accommodate the explosive growth (cf. PwC US 2013: 8), either driven by the increasing amount of individuals using private transportation or driven by those, using public transportation systems.

1.3.1.2. Demographic development

Besides the trend of urbanisation, the demographic development itself is also a key driver for urban mobility concepts. It is referring to changes in population quantity and population composition.

Within the focus area of the given thesis - the European Union - there are two major trends shaping the demographic development until 2020: Ageing population (1), as well as the stagnating population size (2).

(1.) Ageing population

Within the EU, the population is ageing more and more. Since 1950, the share of people older than 80 years, has been constantly increasing from 1.2% in 1950 and is predicted to further do so to 9.7% in 2050 (cf. European Commission 2015). Also the share of individuals in the age of 65 to 79 years is going to increase from 7.9% in 1950 to 18.5% in 2050, while the share of the population younger than 49 years has been constantly decreasing since 1950 and is forecasted to do so in the future (cf. European Commission 2015):

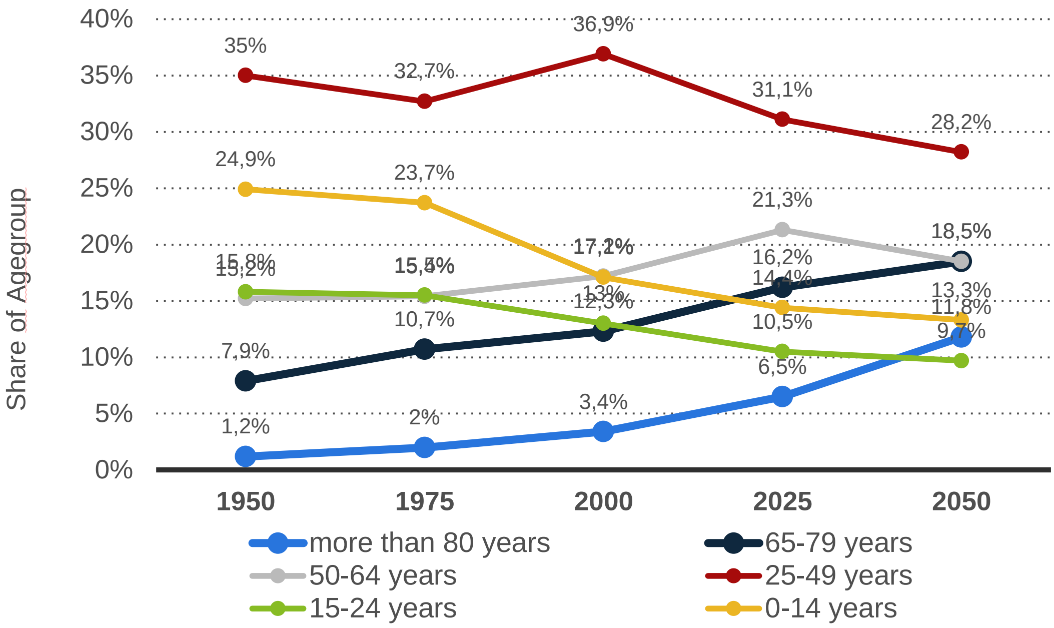

Chart 9: Allocation of agegroups within the EU 1950 to 2050
Source: European Commission

There are two drivers, causing this ageing development of the European population, which are low birth rates on the one hand, and an increasing life expectancy on the other hand.

Regarding birth rates, most industrialised countries have very low fertility rates of currently 1.7 children per woman in average, which is far below the needed replacement ratio of 2.1 (cf. Schnurr 2013: 89). Although this figure is expected to increase to 1.9 children per woman in 2050, it will not prevent the overall ageing and shrinking of the population.

Further to this, the life expectancy in developed regions, such as the EU, is going to rise from currently 76 years today to 83 years in 2050 (cf. Schnurr 2013: 89).

<u>(2.) Stagnating population size</u>

Besides the increasing age of the population within the EU, the total population is expected to stagnate and only grow at an average rate of 0.11% per year until 2050 (cf. Eurostat 2015). The reason for that are major countries within the EU, representing a declining population until 2050:

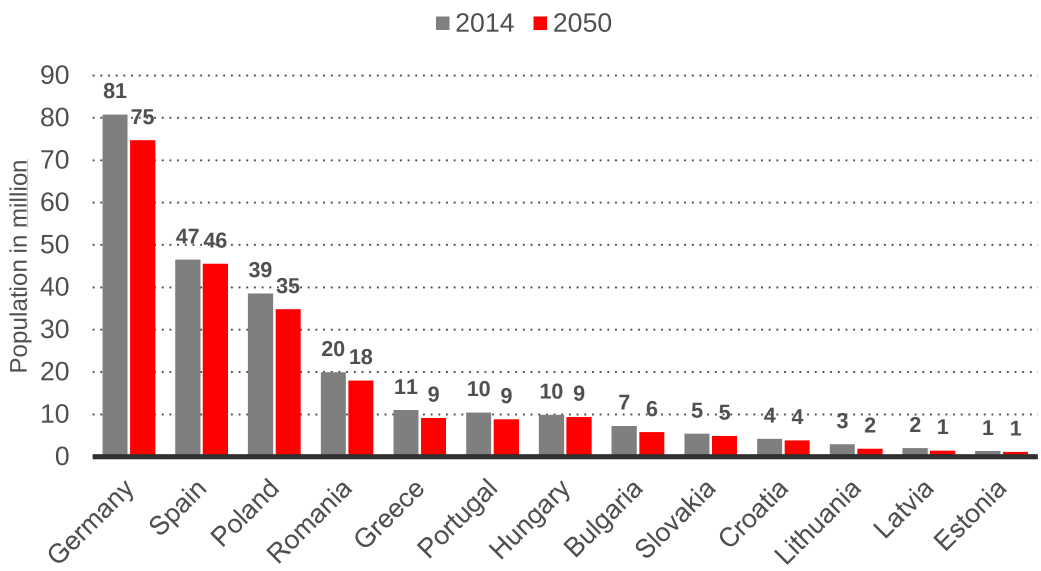

Chart 10: Overview of EU countries, reflecting a declining population until 2050 *Source: Eurostat 2015*

Especially in Germany, the population is expected to decline by approx. 6 million inhabitants from 2014 until 2050.

Impacts on urban mobility:

Both these factors: Ageing population (1), as well as the stagnating population size (2) are expected to have a significant impact on urban mobility concepts.
On the one hand, due to the increasing share of the older population, of which a key characteristic is the usage of private vehicles, cars will remain a stable element of urban transportation in the future. Further to this, future mobility concepts need to respond to the requirements of the older generation by offering tailored mobility services, covering the entire mobility chain from A to B.
On the other hand, the total population within the EU is expected to stagnate, by even declining in some countries. However, this is not expected to have a capacity-lowering effect on urban transportation systems, as in contrast to the stagnating population, the increasing urbanisation (*see section 1.3.1.1.*) is outpacing this effect.

1.3.1.3. Changing consumer behaviour

Besides the demographic development, another trend on the consumer side has been identified as a key driver for urban mobility concepts: the changing consumer behaviour. There are several aspects of changing consumer behaviour, of which the most important one regarding urban mobility concepts is “usage instead of ownership” or “the sharing economy” (PwC China 2015: 2). This concept prioritises providing consumers with access instead of ownership to a particular product.

This method leads to the result that the Total Cost of Ownership (TCO) of the product can be saved (cf. PwC China 2015: 3) and partly transferred into the Total Cost of Usage (TCU). Regarding the mobility market, this concept can be explained, by using the example of the possession and usage of vehicles, to present the net effect of the shift from TCO to TCU:

The **TCO** of a vehicle is regarded as the total cost of the vehicle possession over the ownership lifecycle, taking into account the sum of all vehicle-related costs: the vehicle purchase costs, maintenance and service costs, repair costs, fuel costs as well as insurance and tax costs. The sum of these costs is generally not very transparent over the duration of the entire lifecycle and usually requires a big investment in the beginning of the lifecycle to purchase the vehicle. Following this, the private purchase and possession of a vehicle (without leasing contract) would reflect the scope of TCO.

In contrast, the **TCU** is only focussing on the usage of the vehicle, rather than the possession. So the TCU brings the TCO value down to the yearly, monthly, weekly, daily, hourly or even shorter usage, which makes it much easier to have the overview of the costs. Furthermore, there is no (or at least a reduced) one-time payment in the beginning needed, which makes it more attractive. Following this, for example a car-leasing contract or the usage of a carsharing vehicle with pay-by-minute pricing is a typical scope of TCU.

Historically, the total cost of ownership of private vehicles has been increasing by more than 25% since 2000 (cf. Zukunftsinstitut 2011: 18), driven by growing fuel costs, as well as increasing taxes and environmental duties. This makes the private possession of a vehicle more expensive and therefore ever more unattractive for consumers. - Of course this is one of the key drivers, why also the consumer behaviour has changed historically: since 1970, the perception of the possession of a car as a status symbol has decreased from 50% to less than 20% in 2010 (PwC Autofacts 2014: 7). Nowadays, three out of five respondents even value their mobile phone higher than an own vehicle (Studie Life 2012), also reflecting the shift in paradigm.

So to sum it up, the increasing TCO of a vehicle as well as the decrease in the perception of a car as a status symbol are leading to customers preferring the usage of cars over the possession.

Impacts on urban mobility:

Following this, the consumer demand for the pure vehicle “usage” (instead of possession) is increasing. Therefore, urban mobility concepts should ideally make use of this effect by connecting available capacity of vehicles for “usage” with the customer’s demand – eg. through carsharing.

1.3.1.4. Urban infrastructure restrictions

As already shown in section 1.3.3.1, by 2050, the world’s urban population will have increased from currently 53% to more than 70% (cf. PwC US 2013: 8). This reflects a tremendous increase in inner-city population, which is expected to also lead to a significant growth in passenger car density in these urban areas.

Following this, municipalities are facing increasing danger of overcrowded infrastructure, network breakdowns, gridlocks and pollution issues in urban areas, which are driving the need to interfere with programmes to counter these developments.

It was in 1975, when Singapore as the first city ever, introduced a fee for entering the inner-city of an area of 6 square kilometres (Ly et al. 2011: 217). This was the first urban traffic congestion pricing scheme to be successfully implemented in the world, targeting at managing traffic demand in the city. Since that day, further cities started to implement traffic management systems, leading to fees for private vehicles, which enter these areas. These fees can be applied as a fixed price, for example 1.50€/day or based on a flexible pricing system as in Singapore (entering the city during rush hours is more expansive than during the rest of the day). However, the key purpose of these fees is to restrict the inner-city access to private vehicles.

Besides a fee-based inner-city restriction, the urban access can also be restricted by vehicle characteristics, such as Euro-Norms or the size/ weight of a vehicle (cf. Ly et al. 2011: 178).

Only in Germany, there are already more than 60 cities (Umwelt Bundesamt 2015), which have applied inner-city restrictions - and even more in Europe.

Impacts on urban mobility:

Since the usage of private vehicles in these restricted inner-city areas is limited and/or applied with a fee, urban mobility concepts can be an attractive alternative for the individual's mobility need.

For example, if there is a vehicle fee for the inner-city usage, this fee can be divided by much more individuals, when using a Carsharing concept. Further to this, in other areas, in which the access is based on specific characteristics of the vehicle (e.g. Euro-Norms) offered Carsharing vehicles need to align to these requirements and can offer an alternative to those individuals, which are not able to enter the restricted area due to unfulfilled requirements of their private vehicles.

In the future, these inner-city restrictions are expected to increase in order to optimize traffic managment, which could lead to an increased restriction of private vehicles in these areas, or even a full block, which will further drive the attractiveness of urban mobility concepts in these areas.

1.3.1.5. Social responsibility

As the last trend, social responsibility and its impact on urban mobility will be analysed. Within recent years, the environmental awareness of the population has grown significantly (cf. Rothlauf 2014: 623), resulting in the trend of an increased social responsibility within the European society. This social responsibility has become a key element of the customer's everyday life, leading to an increased attention and preference for those offers and services to customers, which are "green" (cf. Zukunftsinstitut 2011: 6).

Especially in the mobility market, this trend has a strong impact, as in this sector the environmental sustainability has a much stronger impact than in other industries. This is the case because within the EU, the road transport contributes for approx. 20% of the EU's total emissions carbon dioxide and is the only major sector in the EU where greenhouse gas emissions are still rising (cf. European Commission 2014).

Following this, the EU legislation sets binding legislations, of which one is the emission targeting for new car and van fleets. Since the automotive industry works towards meeting these targets, average emissions are falling each year.

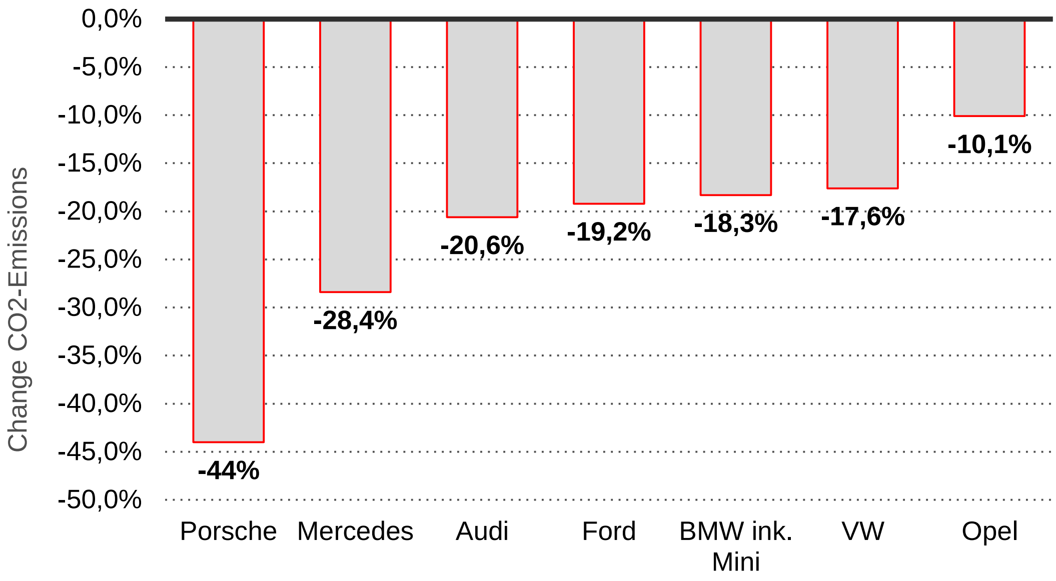

Chart 11: Change of CO2-Emissions of German automaker's fleets between 2010 and 2014

Source: KBA, Center of Automotive Management

However, the aim is to cut emissions further while giving the automotive industry the certainty it needs to carry out long-term investments and develop innovative technologies (cf. European Commission 2014).

Impacts on urban mobility:

As already highlighted, the customers get more sensitive for environmental sustainability. Now taking into consideration that this trend is increasing in the future, it will be essential to base the future mobility on an ecologically sustainable fundament. There are several measures, which can be taken to fulfil the customer's requirements and make use of this key driver "social responsibility":

Taking into account that on average one Carsharing vehicle replaces 15 personally owned vehicles and Carsharing members drive 31 percent less than when they owned a personal vehicle (cf. Frost & Sullivan 2010), this leads to a significant reduction in air pollution through emissions. Therefore, recent Carsharing studies in Europe estimate this reduction of carbon dioxide emissions per average user ranging between 39% to 54% (Shaheen & Cohen 2006: 5).

For the year 2013, carbon dioxide emission reduction from Carsharing was already estimated at 62,070 tons of CO2 - and by 2020, emission reductions are predicted to increase further to 172,923 tons of CO2 (cf. IJEST 2014). Thus, Carsharing is an innovative strategy for traffic demand management that can alleviate air pollution.

In addition, many Carsharing organisations include lower emission vehicles, such as hybrid or even electric cars in their fleets, which further contribute to social responsibility. And moreover Carsharing members also report a higher degree of environmental awareness after joining a Carsharing program (Shaheen & Cohen 2006: 5).

So finally, a fully integrated mobility concept in the city integrating Carsharing businesses and the resulting reduction in vehicle ownership is able to fulfil the customer's need for social responsibility and lower emissions, as trips are shifted from the privately owned vehicle to more sustainable transport means, such as a shared vehicle or transit, biking, and walking.

1.3.2. Summary

The analysis of the key drivers clearly showed the increasing demand and feasibility of urban mobility services, as well as the growing importance in the future. Not only the demand for alternative transport modes will be increased, but also for services which assist people in managing their intermodal mobility lifestyle. Another group of factors will result in a decline of the conventional car ownership model and will give rise to "usage instead of ownership" concepts.

Following this, the reasons for increasing demand of urban mobility services are:

- The increasing amount of urban population, increasing car density in cities as well as higher utilization rates of public infrastructure,
- The growing need for individual mobility due to increasing passenger travel distance,
- The ageing population requires tailored mobility services,
- European's stagnating population, which is not leading a capacity-lowering effect in infrastructure, due to increasing urbanization,
- The changing consumer behaviour will change from possession of vehicles to usage of mobility,
- The rising environmental awareness and consumer education,
- The governmental legislation to reduce vehicle emissions,

- The increasing car ownership cost, which make the private vehicle less attractive,
- Inner-city restrictions and environmental impacts (such as pollution), which are causing smart mobility solutions.

Following this, today there is already a high necessity for intelligent and sustainable urban mobility concepts, which will increase strongly over the future, driven by the correlation of the above-mentioned factors.

2 Practical part

2.1 Development of a profitability tool to reflect future profits of urban mobility concepts

As shown in the sections above, the major challenge in urban areas is the high traffic density and the high vehicle population resulting in problems such as traffic jams as well as insufficient parking spots. This is exacerbated by the increasing urbanization, which calls for a counter-control. As an approach for making better use of vehicles in urban areas resulting in less problems (e.g. overcrowded parking spots), intelligent mobility concepts, such as Carsharing, can be used, but only when it is widely disseminated and therefore the business model needs to be profitable in the long-term, which is the major research objective of the given thesis.

Therefore, after having explained the necessity for sustainable mobility concepts in urban areas as well as a scientific analysis of the key drivers and their impact on urban mobility, the following section will present how sustainable profitability can be achieved with exactly these concepts. Hence, a Microsoft Excel based business case will be developed step by step, resulting in an exemplary profitability tool for a Carsharing company, by taking into account all relevant cost and revenue factors. The objective of the tool is to identify the relevant key drivers for profitability, while it can also be used for other urban mobility concepts, by changing certain input factors.

Before the structure of the model as well as the key assumptions, market metrics, cost and revenue factors and finally the results and potential scenarios will be explained, it needs to be defined, what exactly is a “business case” (De Stricker 2008: 1):

A business case takes into consideration all relevant cost and revenue factors to compare the profitability of alternative options, as well as to provide detailed insights into the future profit development of businesses, by featuring different assumptions or scenarios for future projections of single or multiple input factors (cf. Harvard Business Press 2011: 4).

Therefore, the output and aim of a business case is to provide on the one hand recommendations for investment decisions as well as on the other hand to identify the most profitable future development scenario for the selected business.

In the subsequent business case for a Carsharing company, the calculations and results of the business case will also be used to compare the profitability of several alternatives, by changing different input factors to identify the relevant key drivers.

2.1.1 Structure of the model

The profitability tool takes into consideration all relevant cost and revenue factors resulting in the total profitability on a yearly basis. The reflected exemplary case for a free-floating model is based on a German Carsharing city, Stuttgart, with currently 593.000 inhabitants and an urban area of 207.35 km^2 (Stadt Stuttgart 2015). The tool will be developed for a time period of five years, as the break-even (Norman 2006: 43) of a new Carsharing city should be reached within "24 to 36 months" (Wirtschaftswoche 2014), and can therefore be reflected in the time period of the profitability tool.

Further to the already mentioned basic information, also the input factors are important for the structure of the model. These factors need to be selected carefully, as they should represent the full spectrum of all turnover and expense factors, which lead to the total profitability. In a first step, these factors can be derived by using the "DuPont Method" (Warren et al. 2013: 1116ff), which is named after the chemical company DuPont (full company name: E. I. du Pont de Nemours and Company), in which F. Donaldson Brown developed this model in 1919 (cf. Warren et al. 2013: 1116ff). The DuPont method breaks down the profitability into different levels. Each level shows more drivers of profitability, where measures can be applied to gain more profit (cf. Guerard & Schwartz 2007: 90f). The following graph shows the DuPont system for a Carsharing company, which is used as a first step for the derivation of the profitability key drivers within the business case:

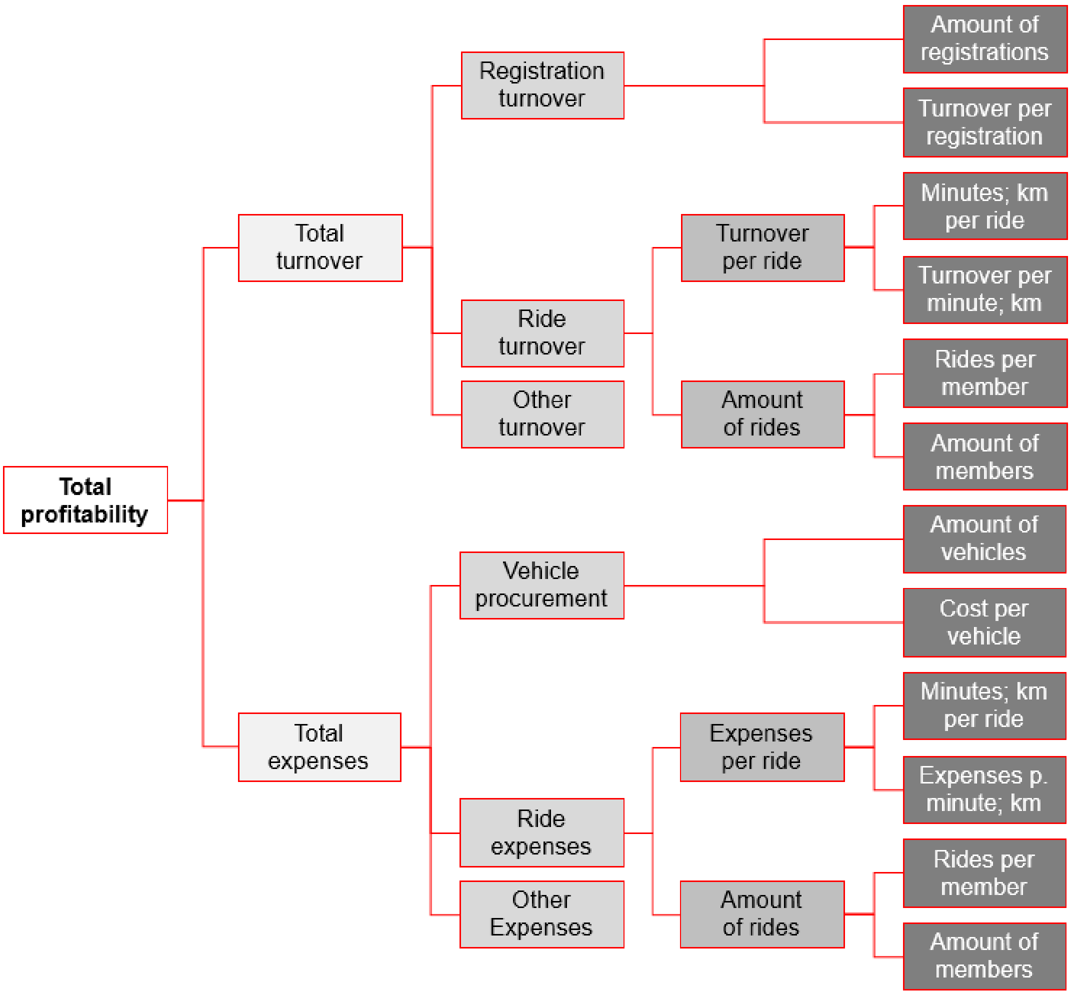

Chart 12: Exemplary DuPont methodology for a Carsharing company
Source: Own illustration

In the next step, each of the factors within the last level (dark grey) needs to be further analyzed to define, which specific cost and revenue factors are affecting them (for example “Expenses per minute; km” are affected by fuel costs, transfer and washing costs as well as other operating vehicle costs). This further derivation of the key drivers will be developed in the appropriate sections *2.1.1.3 Cost factors* and *2.1.1.4 Revenue factors*.

Besides the input factors “Cost” and “Revenue”, there are also the “Market Metrics”, which are affecting both the cost and revenue factors. These are for example the amount of Carsharing members per year or the amount of vehicles, which are in operation. Further details of these factors will be shown in section *2.1.1.2 Market Metrics.*

Finally, the profitability tool will not only show the final results, which will be walked through in detail in section *2.1.1.6 Results: Revenues, Costs, Profit,* but also the tool will calculate Business KPIs, for example the utilization rate per vehicle (in %). These business KPIs will be shown in section *2.1.1.5 Business KPIs*.

Following this, the structure of the model will look as shown below (simplified), for each of the years 1 to 5:

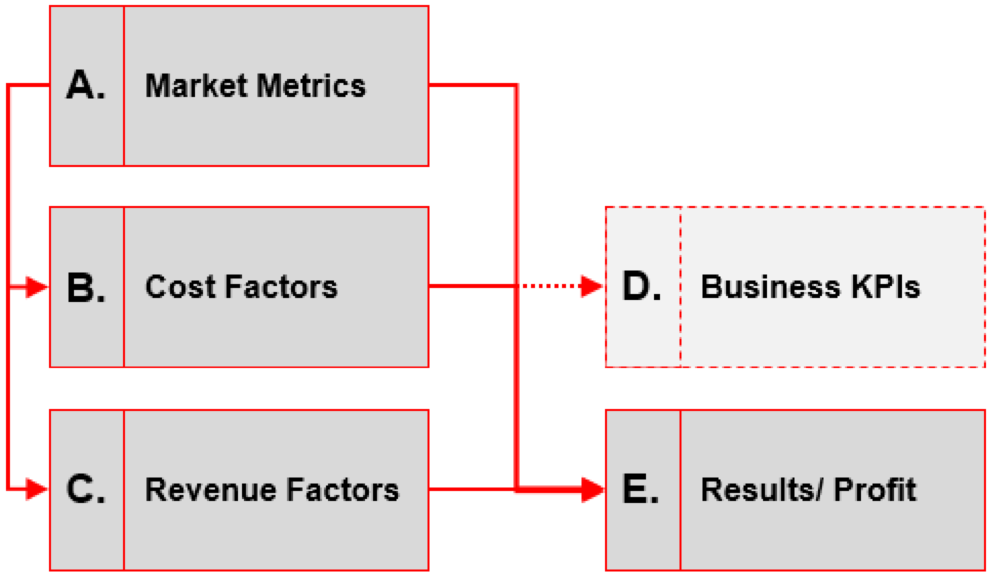

Chart 13: Overview of the flow structure of the profitability tool
Source: Own illustration

2.1.1.1 Overview of key assumptions

Before going into the details of the input factors, the key assumptions of the model need to be defined. As already mentioned, the development of the profitability tool will be based on a German Carsharing city, Stuttgart, with currently 593.000 inhabitants and an urban area of 207.35 km^2 (Stadt Stuttgart 2015) for a free-floating model. The Carsharing business will consist of average small cars only (consuming petrol) which are provided in a leasing contract by an automaker and need to be paid on a yearly basis. Further to this, the IT systems and telematics of the cars are not developed in-house, but rented from a professional IT provider for a weekly charge per vehicle (incl. Callcenter support), which leads to the possibility of shifting the IT-costs for arithmetical reasons from fix costs to variable costs. The costs are therefore included in other operating costs, as shown in section 2.1.1.3.

Considering that the free-floating Carsharing model was introduced into Stuttgart in 2012 (cf. Stuttgarter Nachrichten 2013), 2012 will be taken as year 1.

2.1.1.2 Market Metrics

Following the key assumptions of the profitability tool, in the following step the market metrics need to be defined in greater detail. The metrics are influencing both, cost and revenue factors as well as the total result. Therefore, it is important to have all of them based on realistic and sophisticated information. In the following, an overview of the relevant market metrics is shown:

Market Metrics	Year 1	Year 2	Year 3	Year 4	Year 5+
Amount of members (total members)					
Average rentals per member per week					
Average driving time per rental in minutes					
Average parking time per rental in minutes					
Average km per rental					
Amount of vehicles (total fleet)					

Chart 14: Overview of empty market metrics for the profitability tool
Source: Own illustration

To develop the needed input of the market metrics, this section will lead through each of the market metrics, starting with

1. Amount of members (total members)

The amount of members represents the number of registered Carsharing users for the company in the exemplary city per year. In average, the Carsharing company is assumed to have 8,500 registered members (cf. Stuttgarter Nachrichten 2013) within the first year of business, which is increasing to 28,000 in the second year (cf. Carsharing-Experten 2013). The member development is assumed to be further positive, driven by strong marketing activities and an increasing perception of Carsharing in Stuttgart, which is assumed to lead to 40,000, 45,000 and 48,000 members in year 3 to 5 (cf. Von Leszczynski 2014).

2. Average rentals per member per week

The average rental per member per week is set to 1 in the first year and then slightly increase to 1.2 in year 2 and staying constantly at 1.4 for the last 3 years. The increase in the number of rentals per week in year 2 and 3 is based on the increase of the total amount of available vehicles (see 6.) as well as on the extension of the available area for Carsharing (cf. Stuttgarter Nachrichten 2013).

3. Average driving and parking time per rental in minutes

The average time of a rental in the free-floating system is between “20 and 40 minutes” (Car2go Europe GmbH 2012: 9). Assuming the most pessimistic usage in the first year of a total of 20 minutes per rental, this figure is supposed to increase slightly to 21 minutes in year 3, and again to 22 minutes in year 4 and 5. The increase is driven by the inclusion of the airport into the available Carsharing area, which is located approx. 15 kilometers outside the city center and therefore increasing the average amount of rental in minutes (cf. Stuttgarter Nachrichten 2013), due to the longer distance, which can be driven starting in year 3.

Of this total rental time, the parking time needs to be separated from the driving time, as both times cause different turnovers and costs.

The parking time during each rental is assumed to be at 20% of the total rental time, leading to 4 minutes in each of the years. This is assumed to be driven by 1 minute of parking at the beginning (when entering the car and getting ready). Another minute is assumed to be caused at the end of the rental (when the car is parked and everything needs to be checked). The remaining 2 minutes are a realistic estimation of parking times during the rental, for example at traffic lights, when the engine has been turned off.

4. Average km per rental

Assuming an usage of the Carsharing vehicles, which is mainly inside the free-floating area, the so-called inner-city area, in 20 to 22 minutes rental time, it can be completed in average 10 to 13 kilometers. This assumption is aligning with the official statement of a distance of “10 – 15 kilometers” per ride (Car2go Europe GmbH 2012: 9). Again the linear increase from 10 kilometers (year 1) to 11 kilometers (year 2), 12 kilometers (year 3) and finally 13 kilometers (year 4 and 5) is driven by the inclusion of the airport, which is increasing the average driving distance (cf. Stuttgarter Nachrichten 2013).

5. Amount of vehicles (total fleet)

Starting with an amount of 300 vehicles in year 1 (Car2go Europe GmbH 2012: 13), the amount increases due to the expansion of the Carsharing area and the increasing members to 450 vehicles in year 2 and again to 500 vehicles in year 3 (cf. Carsharing-Experten 2013). Due to the further increasing number of members, this trend is expected to continue into year 4 (550 vehicles) and year 5 (600 vehicles). One of the subsequent shown Business KPIs (section 2.1.1.5), is the “number of members per vehicle”. This KPI, which is for free-floating systems in Germany at an average of 69.9 members per vehicle (Bundesverband Carsharing e.V. 2014: 3), will be kept (+/- 15%) with the mentioned amount of members (see 1.) as well as the amount of vehicles. Hence, it validates the upper-mentioned assumptions of the figures.

Following this, the developed market metrics for the profitability tool are the subsequent ones:

Market Metrics	Year 1	Year 2	Year 3	Year 4	Year 5+
Amount of members (total members)	8.500	28.000	40.000	45.000	48.000
Average rentals per member per week	1,0	1,2	1,4	1,4	1,4
Average driving time per rental in minutes	16	16	17	18	18
Average parking time per rental in minutes	4	4	4	4	4
Average km per rental	10	11	12	13	13
Amount of vehicles (total fleet)	300	450	500	550	600

Chart 15: Overview of market metrics for the profitability tool
Source: Own illustration

2.1.1.3 Cost Factors

In the following section, the input parameters of the cost (or expense) factors will be defined. As this information will have a direct influence on the profitability of the business, also here it is important to have all of the factors based on realistic and sophisticated information. Following the DuPont methodology (see section *2.1.1 Structure of the model*), the subsequent cost factors have been identified to influence the cost per vehicle, expenses per ride and other expenses:

Cost Factors	Year 1	Year 2	Year 3	Year 4	Year 5+
Vehicle provision costs per year in €					
Fuel costs per km in €					
Other operating vehicle costs per car per week in €					
Parking costs per car per week in €					
Amount of fix employees (HR, Controlling, Management)					
Average cost per fix employee per year in €					
Amount of variable employees (Location Manager, Service)					
Average cost per variable employee per year in €					
Marketing cost per year in €					
Set-up cost per new member in €					

Chart 16: Overview of empty cost factors for the profitability tool
Source: Own illustration

Also in this section, the needed input for the cost factors will be developed by leading through each of the mentioned factors:

1. Vehicle provision costs per year

Assuming that the Carsharing company is mainly using small cars, the average vehicle price is 14,000€ (Center of Automotive Research 2011). Since most of the free-floating Carsharing companies belong to automakers, it would not be very profitable to fully buy the cars and sell them again after the usage, they would ideally lease the cars from the OEMs at the depreciable amount. This amount is the vehicle price divided by the usage (in years) as of the depreciation table, which is in Germany 6 years (Bundesministerium der Finanzen 2000: 24). So the yearly vehicle provision costs through leasing are 14,000 € / 6 years = 2,333.33€.

2. Fuel costs per km

As already stated in the key assumptions (section 2.1.1.1), the exemplary Carsharing company is using average small cars only, consuming petrol. The average small car in Germany has a consumption of 4.53 liters per 100 kilometers. (ADAC 2015:1; inner-city average consumption of all listed vehicles is taken). So assuming the average petrol price for 2012 of 1.598€/l (ADAC Online 2015), the fuel cost per kilometer in year 1 is 0.0724 €/km (1.598€ * 4.53l / 100km). Based on the fact that 1 liter of petrol was at 1.549€ in 2013 (ADAC Online 2015), the fuel cost per kilometer is at 0.0702 €/km in year 2 (1.549€ * 4.53l / 100km). Since the petrol price was in average at 1.493 €/l in 2014 (ADAC Online 2015), the fuel cost per km is 0.0676 € in year 3 (1.493€ * 4.53l / 100km). For year 4 it is assumed that the petrol price goes down to 1.292€/l after its peak in this year (Statista 2015), which is resulting in fuel costs per km of 0.0585 € (1.292€ * 4.53l / 100km). The future assumption is, that the petrol price increases again in average 10% per year, which leads to fuel costs per km of 0.0643€ in year 5.

3. Other operating vehicle costs per car per week

The other operating vehicle costs per car includes the following:

- (40%) transfer & washing costs of the Carsharing fleet

- (25%) maintenance cost (electronics/ GPS, wheels, glass, engine, etc.)

- (20%) telematic & IT costs (incl. Callcenter)

- (15%) insurance and accident management

The other operating vehicle costs are assumed to be at 100€ per vehicle per week (cf. PwC Autofacts 2014: 16f), and are inflated by an average inflation rate of 1.5% per year (Statista GmbH; average of year 2012 - 2014 has been taken), to 101,50 € (year 2), 103,02 € (year 3), 104,57 € (year 4) and 106,14 € (year 5).

4. Parking costs per car per week

As the vehicles are part of a free-floating system, they can be parked on every public parking lot within the inner-city area, including pre-reserved parking lots in three major parking garages. As the daily flat rate in Stuttgart is generally at 6.50€ on public lots (Stadt Stuttgart Online 2015), this would lead to a weekly amount of 45.50€ (6.50€ * 7 days). Adding a 10% surcharge for the usage of the parking garage on top, this results in a total amount of 50€ per car per week. (As in some areas in Stuttgart parking is even for free during some hours and in some areas the parking lots are slightly more expensive, this is assumed to even out over the long term.)

The parking costs are assumed to increase by an average inflation rate of 1.5% per year (Statista GmbH; average of year 2012 to 2014 has been taken), to 50.75 € (year 2), 51.51 € (year 3), 52.28 € (year 4) and 53.07 € (year 5).

5. Amount of fix employees

The amount of fix employees represents the number of centralized full-time employees (mainly located in the headquarters), which are paid 100% by the Carsharing company. In the beginning, this includes 8 employees (2 management positions, 1 marketing position, 1 customer relationship position, 1 tax & accounting position, 1 controlling position, 1 other operations position and 1 HR position). As the business is assumed to grow over the next 4 years, the amount of fix employees is also increasing to 12 (year 2), 13 (year 3), 14 (year 4) and 15 (year 5). The 50% increase between year 1 and 2 is driven by the start-up character, which generally has a high personnel growth in the first two years of operation, as responsibilities and personnel requirements become much clearer than in the beginning.

Again, as already stated in the key assumptions (section 2.2.1.1), there is neither any need for in-house IT or telematics development, nor for Callcenter employees, as both these services are supplied by the professional IT provider for a weekly surcharge per vehicle – and is already included in the other operating vehicle costs per car per week.

6. Average cost per fix employee per year

The average cost of a fix employee in the German automotive industry is set to 50,000 € (Spiegel 2012), whereby the higher salary of the management evens out the lower salary of the operations position. The salary is assumed to increase by an average inflation rate of 1.5% per year (Statista GmbH; average of year 2012 to 2014 has been taken), to 50.750 € (year 2), 51.511 € (year 3), 52.284 € (year 4) and 53.068 € (year 5).

7. Amount of variable employees (Location Manager, Service)

The amount of variable employees reflects the decentralized positions, which are needed for each Carsharing location of the company. In the first year it is assumed to be in total 3 positions: 1 location manager position for Stuttgart, 1 fleet and operations manager position as well as 1 service employee position. As the members and the fleet of the exemplary Carsharing business are increasing over the years, also the amount of variable employees is growing from 3 positions in year 1 to 4 (year 2), 5 (year 3) and 6 (year 4 and 5).

It needs to be considered, that neither transfer & washing costs of the cars, nor the maintenance or accident management costs need to be included in this part, since they are already reflected in the other operating vehicle costs per car per week (see 3.), which is paid to a third party service provider, dealing with all these aspects.

8. Average cost per variable employee per year

The average cost of a variable employee is set to 40,000 €, as they do not need to be as highly qualified as the centralized position, which leads to a cost reduction of 20% (cf. Spiegel 2012; reduced by 20%). The salary is assumed to increase by an average inflation rate of 1.5% per year (Statista GmbH; average of year 2012 to 2014 has been taken), to 40.600 € (year 2), 41.209 € (year 3), 41.827 € (year 4) and 42.455 € (year 5).

9. Marketing cost per year

The marketing cost per year is reflecting the total amount of marketing expenses for the Carsharing business. As the general perception of the company by the customer needs to be created at first in year 1, the marketing cost is at its relatively high peak of 650,000 € (PwC Autofacts 2014: 16f). This amount is assumed to decrease, as once a high customer perception of the brand is given, the marketing costs can be reduced, to 350.000 € (year 2), 300.000 € (year 3), 300.000 € (year 4) and to 200.000 € (year 5).

10. Set-up cost per new member

The set-up cost of a new member is mainly driven by the process costs for setting up the members in the system, as well as the costs for the member cards. The total cost for the set-up is assumed to be at 12 € in the first year and then slightly decreasing due to economies of scale and scope (cf. Hutzschenreuter 2009: 390) to 11 € in year 2 and 10 € as of year 3.

In conclusion, the developed cost factors for the tool are the subsequent ones:

Cost Factors	Year 1	Year 2	Year 3	Year 4	Year 5+
Vehicle provision costs per year in €	2.333 €	2.333 €	2.333 €	2.333 €	2.333 €
Fuel costs per km in €	0,07 €	0,07 €	0,07 €	0,06 €	0,06 €
Other operating vehicle costs per car per week in €	100,00 €	101,50 €	103,02 €	104,57 €	106,14 €
Parking costs per car per week in €	50,00 €	50,75 €	51,51 €	52,28 €	53,07 €
Amount of fix employees (HR, Controlling, Management)	8	12	13	14	15
Average cost per fix employee per year in €	50.000 €	50.750 €	51.511 €	52.284 €	53.068 €
Amount of variable employees (Location Manager, Service)	3	4	5	6	6
Average cost per variable employee per year in €	40.000 €	40.600 €	41.209 €	41.827 €	42.455 €
Marketing cost per year in €	650.000 €	350.000 €	300.000 €	300.000 €	200.000 €
Set-up cost per new member in €	12,00 €	11,00 €	10,00 €	10,00 €	10,00 €

Chart 17: Overview of cost factors for the profitability tool
Source: Own illustration

2.1.1.4 Revenue Factors

Besides the market metrics as well as the cost factors, also the revenue factors need to be defined as input parameters for the profitability tool. Therefore, the following section leads through the development of these revenue factors. Hereby, it is highly important that the exemplary company is fully focusing on the core business of Carsharing - and has consequently neither revenues from placing advertisements in the vehicles, nor from partners (for example through cooperation). If this would be the case, the profitability tool would give a distorted result, as partnerships or advertisements cannot be ensured and might lead to a slightly more positive result than only focusing on the core business of Carsharing.

The following revenue factors have been identified by using the DuPont methodology as described in section 2.1.1:

Revenue Factors	Year 1	Year 2	Year 3	Year 4	Year 5+
Revenue per new member registration in €					
Revenue per driving minute in €					
Revenue per parking minute in €					

Chart 18: Overview of empty revenue factors for the profitability tool
Source: Own illustration

1. Revenue per new member registration

The revenue per new member registration is equal to the registration price less the cost of possible “free driving minutes”, which are often given with the registration.

If for example the registration cost is 19.99 €, including 25 free minutes, the revenue per new member registration is 12.74 € (19.99 € - 25 * 0.29 €). Since especially in the beginning, the revenue is often taken down by special starter discounts, the revenue per new member registration is set to 10 € in the first year and then increasing to 12 € in year 2 and 12.50 € in year 3 to 5.

2. Revenue per driving minute

The revenue per driving minute reflects the price a member has to pay for the usage of a Carsharing vehicle per minute. The assumed price per driving minute for all five years is at 0.29 €, which reflects the current market prices (PwC Autofacts 2014: 16f).

3. Revenue per parking minute

The revenue per parking minute needs to be separated from the revenue per driving minute, as also the cost for this service is a different one than for driving. Currently, all free-floating provider in Germany have separated prices for driving and parking (see section *1.2.1 Overview of the current status of mobility concepts in urban areas*). The assumed price per parking minute for all five years is at 0.19 €, which reflects the current market prices (PwC Autofacts 2014: 16f).

To sum it up, the developed revenue factors for the profitability tool are the following ones:

Revenue Factors	Year 1	Year 2	Year 3	Year 4	Year 5+
Revenue per new member registration in €	10,00 €	12,00 €	12,50 €	12,50 €	12,50 €
Revenue per driving minute in €	0,29 €	0,29 €	0,29 €	0,29 €	0,29 €
Revenue per parking minute in €	0,19 €	0,19 €	0,19 €	0,19 €	0,19 €

Chart 19: Overview of revenue factors for the profitability tool
Source: Own illustration

2.1.1.5 Business KPIs

Before going into more detail in regards to the Business KPIs in the profitability tool, at first, a general understanding of KPIs and their usage needs to be generated. KPI is the abbreviation for Key Performance Indicator, which is a metric representing how a business is performing at a specific action to achieve a targeted outcome (cf. Parmenter 2011: 16).

This is also true for the profitability tool, where the Business KPIs are for monitoring and controlling purposes and can give a quick and easy overview of the entered parameters for the business. The KPIs are calculated by taking into consideration the market metrics, the cost factors as well as the revenue factors. Following this, the KPIs, which are calculated in the profitability tool are:

Business KPIs	Year 1	Year 2	Year 3	Year 4	Year 5+
Members/ vehicle	28	62	80	82	80
Utilization per vehicle in %	5,6%	8,5%	13,3%	14,3%	14,0%
Marketing costs per new member	76,47 €	17,95 €	25,00 €	60,00 €	66,67 €
Marketing costs/ Revenue in %	26,3%	3,6%	1,8%	1,5%	1,0%

Chart 20: Overview of Business KPIs for the profitability tool
Source: Own illustration

1. Members per vehicle

The KPI "members per vehicle" shows the relation of total members to the total available Carsharing vehicles. This KPI, which is for free-floating systems in Germany at an average of 69.9 members per vehicle (Bundesverband Carsharing e.V. 2014: 3), will be kept (+/- 15%) with the mentioned amount of members. Following this, the KPI is important to keep the right amount of vehicles in the fleet according to the number of members.

2. Utilization per vehicle in %

The utilization rate of the vehicle represents the total time of usage (driving and parking) compared to the total available time of a Carsharing vehicle. The utilization rate is calculated by dividing the total usage by the total availability.

Total usage =	Amount of members * average rentals per member per week * (average driving time per rental + average parking time per rental) * 52 weeks
Total availability =	Amount of vehicles * 52 weeks * 7 days * 24 hours * 60 minutes

As a result, the Business KPI shows the utilization rate per vehicle in %.

To give a reference, in the first years, the utilization rates of the free-floating Carsharing systems in Germany were at 4.03% (58 minutes per day) for DriveNow as well as 3.75% (54 minutes per day) for Car2go (cf. Wirtschaftswoche 2014). This is expected to increase due to a growing amount of members and an increasing usage in the future.

3. Marketing costs per new member

The marketing costs per new member reflects the amount of total marketing costs per year divided by the new members per year (for example: total members of year 2 – total members of year 1 = new members of year 2). This KPI shows how much in average each newly acquired member costs.

4. Marketing costs/ Revenue in %

The last Business KPI show the relation of the total marketing cost per year divided by the total revenue and therefore provides the result how many percent of the revenues are spent in marketing per year.

2.1.1.6 Results: Revenues, Costs, Profit

After having developed all relevant input factors and Business KPIs in the sections above, the profitability tool has the ability to calculate the final results. These results are divided into three sets of (1) revenues, (2) costs and (3) profit, as shown below:

Revenues	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5+**
New member revenues					
Rental Revenues					

Costs	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5+**
Vehicle costs					
HR costs					
Other costs					

Profit	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5+**
Operating Profit					
Cumulated Operating Profit					

Chart 21: Overview of the empty profitability tool results
Source: Own illustration

1. Revenues

The revenues are split into new member revenues (a) as well as the rental revenues (b). The sum of these two leads to the total revenues. Firstly, the new member revenues are calculated by multiplying the “amount of new members per year” by the “revenue per new member registration”. Secondly, the rental revenues consist of the sum of total driving revenues and total parking revenues.

Total driving revenues = Amount of members (total members) * average rentals per member per week * 52 weeks * average driving time per rental in minutes * revenue per driving minute

Total parking revenues = Amount of members (total members) * average rentals per member per week * 52 weeks * average parking time per rental in minutes * revenue per parking minute

Based on the developed input factors, the total revenues per year, divided into the new member revenues and rental revenues, are the following:

Revenues	Year 1	Year 2	Year 3	Year 4	Year 5+
New member revenues	85.000 €	234.000 €	150.000 €	62.500 €	37.500 €
Rental Revenues	2.386.800 €	9.434.880 €	16.569.280 €	19.590.480 €	20.896.512 €

Chart 22: Overview of the profitability tool revenues
Source: Own illustration

2. Costs

The costs are divided into three subdivisions of vehicle costs (a), HR costs (b) and other costs (c). The sum of all three leads to the total costs. The vehicle costs (a) represent all costs which are caused by the vehicles of the Carsharing business. They consist of four parts, which are:

Vehicle provision costs = Vehicle provision costs per year in € * amount of vehicles (total fleet)

Fuel costs = Amount of members (total members) * average rentals per member per week * 52 weeks * average km per rental * fuel costs per km in €

Other operating costs = Amount of vehicles (total fleet) * other operating vehicle costs per car per week in € * 52 weeks

Parking costs = Amount of vehicles (total fleet) * Parking costs per car per week in € * 52 weeks

The HR costs (b) show all costs which are caused by the employees. They are calculated in the following way:

HR costs = Amount of fix employees * average cost per fix employee per year + amount of variable employees * average cost per variable employee per year

And finally the other costs (c) consist of the two blocks marketing cost per year as well as set-up cost per new member * new members per year.

This cost calculations leads to the following results in the profitability tool:

Costs	Year 1	Year 2	Year 3	Year 4	Year 5+
Vehicle costs	3.359.908 €	5.961.688 €	7.546.592 €	8.260.508 €	9.287.950 €
HR costs	520.000 €	771.400 €	875.691 €	982.938 €	1.050.750 €
Other costs	752.000 €	564.500 €	420.000 €	350.000 €	230.000 €

Chart 23: Overview of the profitability tool costs
Source: Own illustration

3. Profit

The last part of the results is the profit, which is the sum of the revenues per year minus the sum of the costs per year. It leads to the following result:

Profit	Year 1	Year 2	Year 3	Year 4	Year 5+
Operating Profit	- 2.160.108 €	2.371.292 €	7.876.997 €	10.059.534 €	10.365.312 €
Cumulated Operating Profit	- 2.160.108 €	211.184 €	8.088.181 €	18.147.715 €	28.513.027 €

Chart 24: Overview of the profitability tool profit
Source: Own illustration

So finally to sum it up, the Carsharing business will realize the first profit in year 2 and will close the business year 2 by having realized a cumulated operating profit of 211,184 € already. Again, it needs to be stated, that this exemplary Carsharing business is based on all the upper-mentioned assumptions, whereby the most important one is that the cars, which are used for the business, are paid through leasing contracts. Therefore, no one-time off need to be considered (which would bring a much higher loss in the first years) and no residual value of the cars (which would bring a much higher profit in the last years) has to be considered.

Following this, the final overview of the results of the profitability tool is:

Revenues	Year 1	Year 2	Year 3	Year 4	Year 5+
New member revenues	85.000 €	234.000 €	150.000 €	62.500 €	37.500 €
Rental Revenues	2.386.800 €	9.434.880 €	16.569.280 €	19.590.480 €	20.896.512 €

Costs	Year 1	Year 2	Year 3	Year 4	Year 5+
Vehicle costs	3.359.908 €	5.961.688 €	7.546.592 €	8.260.508 €	9.287.950 €
HR costs	520.000 €	771.400 €	875.691 €	982.938 €	1.050.750 €
Other costs	752.000 €	564.500 €	420.000 €	350.000 €	230.000 €

Profit	Year 1	Year 2	Year 3	Year 4	Year 5+
Operating Profit	- 2.160.108 €	2.371.292 €	7.876.997 €	10.059.534 €	10.365.312 €
Cumulated Operating Profit	- 2.160.108 €	211.184 €	8.088.181 €	18.147.715 €	28.513.027 €

Chart 25: Overview of the profitability tool results
Source: Own illustration

After the full completion of the profitability tool, in the next step it will be used to simulate different scenarios (eg. an ultimate growth of memberships during the first 2 years or an severe increase in the cost factors such as fuel price) to identify the key drivers for profitability, which is shown in the following section.

2.1.2 Simulation of different scenarios to identify key drivers of profitability

After the structure as well as the basic input information of the profitability tool have been developed in the sections above, the following sections will show how the tool will be used to identify key drivers of profitability. Therefore, it is necessary to develop different scenarios, highlighting the relation between input factors and the result in operating profit per year. There will be three separate simulations, one for each of the input sections: cost factors (*see section 2.1.1.3*), market metrics (*see section 2.1.1.4)* as well as revenue factors (*see section 2.1.1.2):*

Scenario 1: 10% fuel price increase per year – *Input section: Cost Factors*

Scenario 2: 10% member decrease per year – *Input section: Market Metrics*

Scenario 3: 10% price increase per year – *Input section: Revenue Factors*

The reason for the selection of these three scenarios is to clearly show the isolated impact of each input factor section on the total profitability. Another reason for the selection is to highlight how and to which extent the risk of external factors (for example “fuel price” or “amount of members”) can be balanced out through internal factors (for example “rental price”).

After the completion of the three different scenarios (sections 2.1.2.1 to 2.1.2.3) the results will be analysed in detail in section *2.1.2.4 Comparison of scenario results and pre-identification of key drivers of profitability*.

2.1.2.1 Scenario 1 (10% fuel price increase)

The first scenario will be used to simulate the impact of a fuel price increase of +10% per year (cet. par.[2]) on the profitability.

The fuel price is an external variable cost factor, which cannot be directly influenced by the business. Therefore, it needs to be watched and analysed carefully, as the impact on the development of the business can be comparably strong. To reflect

[2] cet. par.: “Ceteris Paribus” is a latin phrase that translates to "holding other things constant" and is rendered in English as "all other assumptions held constant". In economics and finance, the term is used as a shorthand for indicating the effect of one economic variable on another, holding constant all other variables that may affect the result or other variables (Investopedia 2015).

this, the following scenario takes into consideration a fuel price increase of +10% per year (cet. par.).

Following this, the fuel costs (*see section 2.1.1.3 Cost Factors*) per year are increased to the following costs:

Cost Factors		Year 1	Year 2	Year 3	Year 4	Year 5+
Fuel costs per km in €	*initial*	0,072 €	0,070 €	0,068 €	0,059 €	0,064 €
Fuel costs per km in €	***10% increase***	0,080 €	0,077 €	0,074 €	0,064 €	0,071 €

Chart 26: Fuel price increase by 10% (Scenario 1)
Source: Own illustration

The price increase of 10% per year leads to a decrease in the operating profit between 1.5% and 5.7% (see Chart below). The lower amount of -1.5% in the first year is driven by the fact that other cost factors (for example marketing costs) are much higher in this first year - and therefore the effect of the fuel price increase is reduced, due to a lower share of the fuel price within the total costs. In the second business year the decrease is at its negative peak of -5.7%, due to the fact that the share of vehicle costs (which include the fuel price), has a much higher proportion of the total costs (*see section 2.1.1.3 Cost Factors*). In the business years three to five, the Delta is at a more stable level between -2.5% and -3.0%, due to the regular development of the business (initial starting phase has been completed).

Profit		Year 1	Year 2	Year 3	Year 4	Year 5+
Operating Profit	*initial*	- 2.160.108 €	2.371.292 €	7.876.997 €	10.059.534 €	10.365.312 €
Operating Profit	***10% increase***	- 2.192.109 €	2.236.373 €	7.640.775 €	9.810.394 €	10.073.215 €
Delta		- **32.001 €**	- **134.919 €**	- **236.221 €**	- **249.140 €**	- **292.097 €**
Delta (in %)		**-1,5%**	**-5,7%**	**-3,0%**	**-2,5%**	**-2,8%**
Cumulated Operating Profit	*initial*	- 2.160.108 €	211.184 €	8.088.181 €	18.147.715 €	28.513.027 €
Cumulated Operating Profit	***10% increase***	- 2.192.109 €	44.265 €	7.685.040 €	17.495.434 €	27.568.649 €
Delta		- **32.001 €**	- **166.920 €**	- **403.141 €**	- **652.281 €**	- **944.378 €**
Delta (in %)		**-1,5%**	**-79,0%**	**-5,0%**	**-3,6%**	**-3,3%**

Chart 27: Overview of the total profitability (Scenario 1)
Source: Own illustration

Following this, after the duration of five business years, the total cumulated operating profit is 944,378€ lower (reflecting -3.3%).

2.1.2.2 Scenario 2 (10% membership decrease)

In the second scenario the simulation will be used to reflect a potential decrease in the amount of new members per year. Also this factor is an external variable, which needs to be considered carefully. Of course, it can be influenced through marketing activities, but however, recent studies have shown (cf. Carsharing-Experten 2013 / Civity Management Consultants 2014) that in some cities the acceptance of Carsharing concepts is much lower than in other cities, which leads to a volatility in memberships from city to city. Therefore, this scenario is used to show the impact of a decrease in memberships on the total profitability of the business model.

Following this, the amount of new members (*see section 2.1.1.2 Market Metrics*) per year is decreased by 10% (cet. par.) per year as shown below:

Market Metrics		Year 1	Year 2	Year 3	Year 4	Year 5+
Amount of members		8.500	28.000	40.000	45.000	48.000
Amount of members	***10% decrease***	7.650	25.200	36.000	40.500	43.200

Chart 28: Member decrease by 10% (Scenario 2)
Source: Own illustration

The decrease of 10% per year in memberships (cet. par.) leads to a strong decrease in the operating profit between 9.5% and 34.2% (see chart below). Also in this scenario, the comparably lower amount of -9.5% decrease in the first year is driven by the fact, that the share of revenues, which are caused by the actual Carsharing business are much smaller than in the following years. This is driven by the lower amount of rentals in the first year, as well as the set-up costs (for example marketing costs), which are lowering the impact of the membership decrease in the first year.

As already described in scenario 1, in the second business year the decrease is again at its negative peak of 34.2%, due to the fact that the share of the operating business (the actual rental of the vehicles, driven by memberships) has a much higher proportion of the total revenues (*see section 2.1.1.2 Market Metrics*). In the next three business years, the Delta is at a more stable level between -17.0% and -18.1%, due to the regular development of the business (initial starting phase has been completed).

Profit		Year 1	Year 2	Year 3	Year 4	Year 5+
Operating Profit	*initial*	- 2.160.108 €	2.371.292 €	7.876.997 €	10.059.534 €	10.365.312 €
Operating Profit	***10% decrease***	- 2.365.087 €	1.560.773 €	6.453.290 €	8.348.376 €	8.567.007 €
Delta		**- 204.979 €**	**- 810.519 €**	**- 1.423.707 €**	**- 1.711.158 €**	**- 1.798.304 €**
Delta (in %)		**-9,5%**	**-34,2%**	**-18,1%**	**-17,0%**	**-17,3%**
Cumulated Operating Profit	*initial*	- 2.160.108 €	211.184 €	8.088.181 €	18.147.715 €	28.513.027 €
Cumulated Operating Profit	***10% decrease***	- 2.365.087 €	- 804.314 €	5.648.976 €	13.997.352 €	22.564.359 €
Delta		**- 204.979 €**	**- 1.015.498 €**	**- 2.439.205 €**	**- 4.150.363 €**	**- 5.948.667 €**
Delta (in %)		**-9,5%**	**-480,9%**	**-30,2%**	**-22,9%**	**-20,9%**

Chart 29: Overview of the total profitability (Scenario 2)
Source: Own illustration

Following this, after the duration of five business years, the total cumulated operating profit is 5,948,657€ lower (reflecting -20.9%).
At this stage, it can already be said that a 10% decrease in members per year (cet. par.) has a much higher impact on the total profitability (-20.9% cumulated operating profit in year 5) than a 10% increase in fuel costs per year (cet. par.), which results in -3.3% cumulated operating profit in year 5.

2.1.2.3 Scenario 3 (10% price increase)

The third scenario will be used to show the possibility of balancing out the external effects by a potential price increase, some of which have already been shown in scenario 1 and scenario 2. Following this, scenario 3 simulates the impact of a price increase (in both parking and driving minutes) of 10% (cet. par.) per year on the total profitability. The revenue factors have therefore been adjusted as shown below:

Revenue Factors		Year 1	Year 2	Year 3	Year 4	Year 5+
Revenue per driving minute in €		0,29 €	0,29 €	0,29 €	0,29 €	0,29 €
Revenue per parking minute in €		0,19 €	0,19 €	0,19 €	0,19 €	0,19 €
Revenue per driving minute in €	***10% increase***	0,32 €	0,32 €	0,32 €	0,32 €	0,32 €
Revenue per parking minute in €	***10% increase***	0,21 €	0,21 €	0,21 €	0,21 €	0,21 €

Chart 30: Price increase by 10% (Scenario 3)
Source: Own illustration

The price increase of 10% per year (cet. par.) leads to a strong increase in the operating profit between 11.0% and 39.8% (see Chart below). As already discussed for the former two scenarios, also in this scenario, the comparably lower amount of the increase in the first year is driven by the fact, that the share of revenues, which are caused by the actual Carsharing business are much smaller than in the following years. This is driven by the lower amount of rentals in the first year, as well as the set-up costs (for example marketing costs), which are lowering the impact of the price increase in the first year. However, in the second business year the increase is at its positive peak of 39.8%, due to the fact that the share of the operating business (the actual rental of the vehicles in combination with the 10% price increase) has a much higher proportion of the total revenues (*see section 2.2.1.2 Market Metrics*). In the next three business years, the Delta is at a more stable level between 19.5% and 21.0%, due to the regular development of the business (initial starting phase has been completed).

Profit		Year 1	Year 2	Year 3	Year 4	Year 5+
Operating Profit	*initial*	- 2.160.108 €	2.371.292 €	7.876.997 €	10.059.534 €	10.365.312 €
Operating Profit	***10% increase***	- 1.921.428 €	3.314.780 €	9.533.925 €	12.018.582 €	12.454.963 €
Delta		**238.680 €**	**943.488 €**	**1.656.928 €**	**1.959.048 €**	**2.089.651 €**
Delta (in %)		**11,0%**	**39,8%**	**21,0%**	**19,5%**	**20,2%**
Cumulated Operating Profit	*initial*	- 2.160.108 €	211.184 €	8.088.181 €	18.147.715 €	28.513.027 €
Cumulated Operating Profit	***10% increase***	- 1.921.428 €	1.393.352 €	10.927.277 €	22.945.859 €	35.400.822 €
Delta		**238.680 €**	**1.182.168 €**	**2.839.096 €**	**4.798.144 €**	**6.887.795 €**
Delta (in %)		**11,0%**	**559,8%**	**35,1%**	**26,4%**	**24,2%**

Chart 31: Overview of the total profitability (Scenario 3)
Source: Own illustration

Following this, after the duration of five business years, the total cumulated operating profit is 6,887,795€ higher than in the initial business case (reflecting +24,2%).

Therefore, it can already be stated that a 10% increase in price per year (cet. par.) has a positive impact on the total profitability and can theoretically be used to balance out other external effects, which are decreasing the total profitability. But hereby, the price elasticity[3] needs to be considered, which could also be an influencing factor on the total amount of revenues. That means, if for example the price increases, there could be less members using the Carsharing concept, leading to a different result of the profitability. To avoid this, the price elasticity (which might be different for each of the cities, customer groups and different Carsharing concepts) need to be analysed and defined in advance.

[3] Price elasticity: The ratio of the proportionate change in demand quantity to proportionate change in price is called the price elasticity of demand (Hirshleifer et al. 2005: 133).

2.1.2.4 Comparison of scenario results and pre-identification of key drivers of profitability

After the completion of the three scenarios, which have been used to simulate the impact on the total profitability through the change in different external (cost factors, market metrics) and internal (revenue factors) metrics, the following results of the business model simulation can be shown:

Scenario 1: 10% fuel price increase per year (cet. par.) – Cost Factor

The simulation of scenario 1 led to an operating profit, which was decreased between 1.5% and 3.0% per year and led to a reduction in the cumulated operating profit after five business years of 944,378€ (reflecting -3.3%).

Scenario 2: 10% member decrease per year (cet. par.) – Market Metric

The simulation of scenario 2 led to an operating profit, which was increased between 11.0% and 39.8% per year and led to a reduction in the cumulated operating profit after five business years of 5,948,657€ (reflecting -20.9%).

Scenario 3: 10% price increase per year (cet. par.) – Revenue Factor

The simulation of scenario 3 led to an operating profit, which was increased between 9.5% and 34.2% per year and led to a surplus in the cumulated operating profit after five business years of 6,997,795€ (reflecting +24.2%).

Following the above-mentioned results of the simulation, it can be said that the impact of an increase in fuel costs is much lower than the impact of the decrease in members as well as the impact of a price increase in driving/parking minutes. This is due to the fact that the fuel costs are only accounting for a lower share within the total costs (which also include the vehicle provision costs, the other operating vehicle costs, the parking costs, the marketing costs, as well as the HR costs - *see section 2.1.1.3 Cost Factors*). In contrast to this, the amount of members as well as the price per minute has a much stronger influence on the total profitability, as these factors are direct multipliers of the rental revenue, which is driving the profitability.

To sum it up, adjustments in factors, which are direct multipliers for either revenues or costs, have a much higher influence on the total profitability than other factors. Therefore, each potential risk for a Carsharing business need to be watched carefully and the impact of the risk needs to be analysed, as well as potential measures (such as rental price increase), which need to be taken to keep the long-term profitability at a sustainable level.

Through the completion of the simulation above, there could be already pre-identified two key drivers, which have a strong impact on the long-term profitability. These are membership development as well as rental price development (*see section 2.3.*).

2.1.3 Interpretation of the results of the profitability tool

The first reason to develop the profitability tool was to provide economic insights into the cost and revenue structure of a Carsharing business, as well as to provide detailed insights into potential future profit developments. Further to this, another reason for the development of the tool was to identify key drivers of profitability through the usage of three isolated scenario simulations, highlighting the relation between input factors and the result in operating profit per year.

The results of the initial business case present exactly these needed insights into potential future developments, based on a first scientific assumption, which has been proved by scientific research.

In the second step, through the usage of the three different simulations, the profitability tool was able to show that factors, which have a direct impact on either the revenues or the costs, also directly translate into the profitability, with a much higher impact on the result than factors, which only have an indirect impact.

And finally, through the deep analysis and application of the profitability tool in the different scenarios, there have already been two key drivers been pre-identified, which can be seen as measures to establish sustainable business models through innovative mobility concepts (see section 2.3.):

1.: Development of members,

2.: Consideration of external factors (eg. oil price development).

2.2 Definition of measures to establish sustainable business models through innovative mobility concepts

After having analyzed both, the key drivers for mobility concepts *(see section 1.3.)*, as well as the developed profitability tool *(see section 2.1.)*, the results of both sections can be used to finally define measures to establish sustainable business models through innovative mobility concepts, by taking into consideration all relevant factors within an integral contemplation.

The following measures will be defined in the following section:

1.: Implementation: Optimize time to market,

2.: Utilization Rates: Grow with the market,

3.: Consideration of external factors,

4.: Product diversification: Provision of a door-to-door offer.

2.2.1 Implementation - Optimize time to market

The first measure, which is essential for the establishment of a sustainable business model is the time, which is needed to bring a mobility concept to the market.

As shown in *section 1.3.1.3*, the consumer behavior is constantly changing, which leads to the challenge that a mobility product might be already “too late” for a market, when it is introduced.

Every product needs a certain development period, during which also the customer requirement analysis is being performed. This analysis defines the needs of customers and how to perfectly fit the product to exactly these needs.

If now a product is for example introduced 12 months after this mentioned start of product development, it might theoretically still be based on the customer requirements from 12 months ago.

Although in a modern product development cycle this should not be the case anymore - and the customer requirements should constantly be monitored to adjust the product accordingly - history has shown that especially in the beginning of the product development, the monitoring of the customer needs is much more intense than in the end, where the focus is rather on launching the product than on further customer analysis. Therefore, the “Time to Market” is key for a successful start of a sustainable business model.

This has also be proven by the profitability tool: as presented in *section 2.1.1.2* as well as in the second scenario of the tool (*see section 2.1.2.2*), it is necessary to have a strong ramp-up phase of the new business – of course supported by marketing activities. If the business model is not accepted by the market, because it might not be fitting to the customer requirements, since it was introduced too late, even the best marketing activities are not expected to have a sustainable influence on the business development.

Following this, the “Time to Market” should be proactively managed, taking into consideration the following metrics: A pilot (test phase) of a new mobility concept should ideally be introduced at maximum 18 months after the start of the product development, whereby the first market should be officially entered not later than 24 months after the start of the product development. Otherwise the risk will be too high, that the consumer sentiment has already changed and the product will not be accepted as good, as it would be when entering the market rather soon.

So finally, the “Time to market” needs to be optimized according to the customer needs as well as to the market sentiment, to have a strong and successful business ramp-up and therefore the basis for a profitable business model.

2.2.2 Utilization rates - Grow with the market

The second measure, which is essential after the ideal development and start of the mobility concept, is the business development and growth of the Carsharing concept. Hereby it is important to grow with the market, rather than pushing the business model more and more, without having the acceptance from the market. The utilization rate of the mobility concept can serve as a key indicator for the appropriate growth, by representing the total time of usage (driving and parking) compared to the total available time of a Carsharing vehicle.

The subsequent key drivers are directly influencing this rate (*see section 2.1.1.5*):

- Amount of members
- Average rentals per member per week
- Average driving time per rental
- Average parking time per rental
- Amount of vehicles in the Carsharing fleet

Therefore, it is indispensable to optimize the following factors, by taking into consideration the specific characteristics of each Carsharing business model:

- Size and focus of the operating business area:

  Only focus on cities with at least 300,000 to 500,000 inhabitants and a well-developed public transportation network; include city-center and focus on city areas with high population density; also inclusion of mobility spots, such as central stations (railway/ bus) and airports, initial operating business area should be rather too small than too large (later extension is always possible).

- Vehicle density within the operating business area:

  For free-floating Carsharing concepts, the vehicle density should be based on two factors: the size of the business area as well as on the amount of registered members. The target should be 3 to 5 vehicles per square kilometer and one vehicle per 70 registered members (*see section 2.1.1.5*).

- Utilization rate:

  The average utilization rate per vehicle should be exceeding 5% (*see section 2.1.1.5*) after the first 12 months of operating business. Otherwise either the amount of available vehicles needs to be reduced or the amount of members or the driven distance needs to be increased (for example through a reduced operating area or strengthened marketing activities)

So to sum it up, for each Carsharing business, it is important to grow with the market and registered members, rather than developing the business too strong, without having the acceptance from the market. Otherwise it will be hard to gain a sustainable profitability of the mobility concept.

2.2.3 Consideration of external factors (eg. oil price development)

In parallel to the business development of the Carsharing concept, external factors need to be carefully watched and taken into consideration regarding the business model, as they cannot be directly influenced. As shown in the first scenario of the profitability tool (*see section 2.1.2.1*) the influence of an oil price increase of 10% on the total profitability is rather small. However, also small potential impacts need to be monitored and included in the future risk planning, to ensure a sustainable business model.

Besides the external factors which can drive up the costs, there are also several other external factors which have to be taken into consideration, as they might even be limiting the Carsharing business.

For example the already mentioned Urban infrastructure restrictions (*see section 1.3.1.4*) might be a limiting factor for the business model, if for example the Carsharing vehicles do not align with the requirements. Besides this, there are several factors, which could have a significant positive or negative impact on the business model, and at least the following should therefore be constantly watched:

- Oil (or electricity) price development
- Price development of the public transport network
- Legislative regulations (for example regarding the city, vehicles or marketing)
- Specific urban developments (for example creation of new shopping malls, or development of new city districts)
- Future plans of the municipalities in regards to the public transport network
- Development and appearance of new mobility hot-spots
- Other urban infrastructure developments
- Specific habits of the population
- Competitor developments

So finally, the specific external factors of each market need to be analyzed according to each business model and closely monitored to ensure a sustainable profitability.

2.2.4 Product Diversification – Provision of a door-to-door offer

Besides the already mentioned measures to gain sustainable profitability, the offered product can also be linked to further mobility to services to provide a fully integrated door-to-door offer, according to *sections 1.3.1.1 to 1.3.1.3*.

In this case, a person with a need for mobility can set a starting point as well as a target point for the wanted route. For example, Hauptstrasse 3 in Stuttgart, Germany to King’s Cross Square in London, UK. The door-to-door offer, which can be reflected e.g. by a website or an app, is now able to show all integrated modes of transport from the starting point to the target. The travel could start by a walk to the next Carsharing vehicle, which then takes the individual to the airport, where the travel mode changes to a flight. Arriving at the target Airport in London, a bus will directly take the individual to the target point King's Cross Square in London. So the mobility chain will represent four different modes: walk, carsharing, flight, bus.

The advantage for the customer is, that the entire needed mobility chain is presented by only one provider and most of the mobility management (e.g. comparison of train-, bus- and flight-schedules) is also completed by the website/app. In an ideal case, also the payment for the entire mobility chain can be completed via the website/app. In this case, there would be also an additional advantage in regards to the profitability for the mobility provider (even if these services as bus or train do not directly belong to the own business), as the mobility provider is able to gain additional revenue through provision. If a customer for example successfully books a bus-ticket through the website/app, the mobility provider could take a provision for this transaction.

Following this, the product "Carsharing" will not be seen any more as a separate mobility service, but additionally as an offer in the entire A to B mobility chain – and is therefore fully integrated. Especially, when taking into consideration the demographic changes (*see section 1.3.1.2*), particularly for the ageing population, a fully-integrated door-to-door offer is expected to have a high business potential, as it responds to the requirements of the older generation by offering tailored mobility services by covering the entire mobility chain from A to B.

2.3 Overview of key findings

The results of the analysis of both, the key drivers for mobility concepts *(see section 1.3.)*, as well as the developed profitability tool *(see section 2.1.)*, have been used to define four measures to establish sustainable business models through innovative mobility concepts, by taking into consideration all relevant factors within an integral contemplation.

The derived key findings are:

1.: Implementation: Optimize time to market

The "Time to Market" needs to be managed proactively and optimized according to the customer needs as well as to the market sentiment, to have a strong and successful business ramp-up and therefore the basis for a profitable business model.

2.: Utilization Rates: Grow with the market

For each Carsharing business, it is important to grow with the market and registered members, rather than developing the business too strong, without having the acceptance from the market. Otherwise it will be hard to gain a sustainable profitability of the mobility concept. Therefore, the size and focus of the operating business area as well as the vehicle density within this area needs to be optimized to gain an ideal utilization rate.

3.: Consideration of external factors

To gain sustainable profitability, it is important to also consider the specific external factors of each market, which need to be analyzed according to each business model and closely monitored during the course of the business. A list of these factors can be found in *section 2.2.3.*

4.: Product diversification: Provision of a door-to-door offer

In order to gain additional profitability, the offered Carsharing product can also be linked to further mobility to services within a fully integrated door-to-door offer, covering the entire mobility chain from A to B.

2.4 Critical appraisal of the results and target achievement

In accordance to the target setting in section 1.1.1, through the course of the given MBA thesis, it was possible to perform a scientific analysis on the current state of the urban mobility landscape (see section 1.2.1), current and future trends as well as potential challenges (see section 1.3 ff). Besides this, also the analysis of key drivers for urban mobility concepts has been presented (see sections 1.3.1.1 to 1.3.1.5).

In the next step, a tool has been developed (see sections 2.1.1.1 to 2.1.1.6), which was able to give detailed insights into the cost and revenue structure of a Carsharing business, by taking into account all relevant factors. Further to this, the tool enabled highlighting the impact of three different scenarios onto the total profitability of this business (see sections 2.1.2.1 to 2.1.2.4).

As a final result, the combination of both (firstly, the scientific analysis and secondly, the profitability tool) led to the derivation of concrete measures (see sections 2.2.1 to 2.2.4), how on the one hand future trends and key drivers for urban mobility concepts can systematically be used to gain more profit, as well as on the other hand what exactly needs to be considered in regards to the cost and revenue structure of a Carsharing business to gain sustainable profit.

Following this, the given thesis is able to bridge the gap between scientific research in regards to urban mobility concepts and the impact of different factors onto the long-term profitability, completed by the application of the profitability tool. So finally, it was possible to fulfil the full scope of the stated research objective.

As a critical appraisal of the shown results in this thesis, it is important to highlight that the derived measures as well as the developed profitability tool cannot be simply applied to any Carsharing business in the world. For both, it is key to always take into consideration the specific market and customer requirements in the given local marketplace and transfer these factors into the business environment as well as into the profitability tool, to reflect the full picture of the targeted market within a fully integrated profitability approach.

2.5 Outlook

Looking into the future, the need for mobility services will grow – and therewith the opportunities for future business models. This is on the one hand driven by the increasing travel distance itself (cf. Ernst & Young 2013: 2) and on the other hand by the growing need for integrated mobility services, as show in the prior chapters.

In the future, one of the most challenging developments of transportation is expected to be the mentioned increase of traffic volumes, especially in urban areas. This challenge calls for a full integration of mobility services into urban transportation concepts, targeting at the reduction of traffic volumes, by shifting transport modes from private to public - and by linking different mobility services to an integrated mobility network at the very same time.

Due to the fact that the usage of private vehicles is the main contributor to urban traffic volumes, the government and municipalities are likely to focus on the reduction of vehicle use in the near future, either by encouraging the use of alternative modes or by regulating it, e.g. via inner-city restrictions (*see section 1.3.1.4*).

Since innovative mobility services are able to contribute to this by either directing customers to a modal shift or to the deprivatization of vehicles through Carsharing concepts, the business models of mobility services are expected to be even more attractive in the future. Following this, it is not only expected, that more businesses enter the mobility service sector, but also that existing businesses develop themselves within the sector from a pure "Transport Navigator" to a "Mobility Integrator" (cf. Ernst & Young 2013: 4) as shown in the following overview:

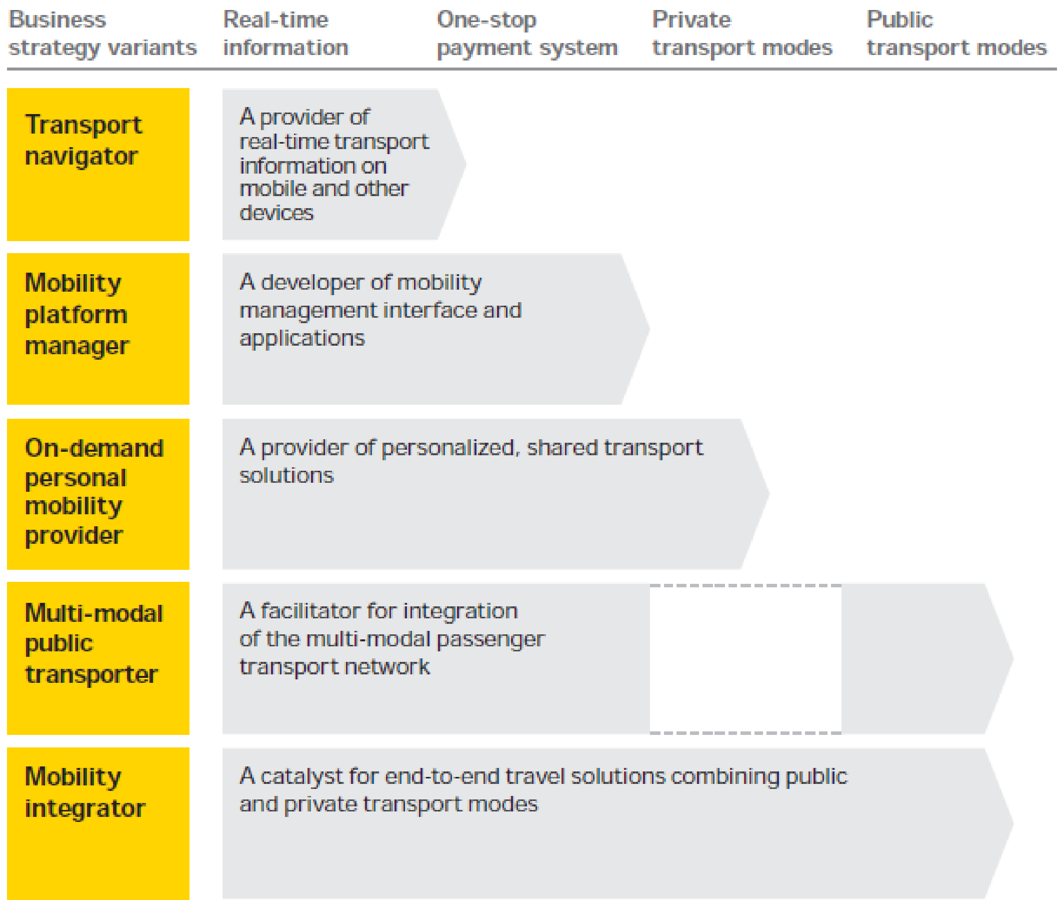

Chart 32: Different integration levels of mobility service providers
Source: Ernst & Young 2013

So finally, the sector of urban mobility services will definitely develop over the coming years. But benefiting from these large development opportunities will depend on the quality of the mobility services (e.g. quality of product itself, quality of integration into a mobility network, quality of app/website) they will offer – and on taking into consideration effective measures to gain long-term profitability, which have been in the course of this thesis.

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VI. List of tables and figures