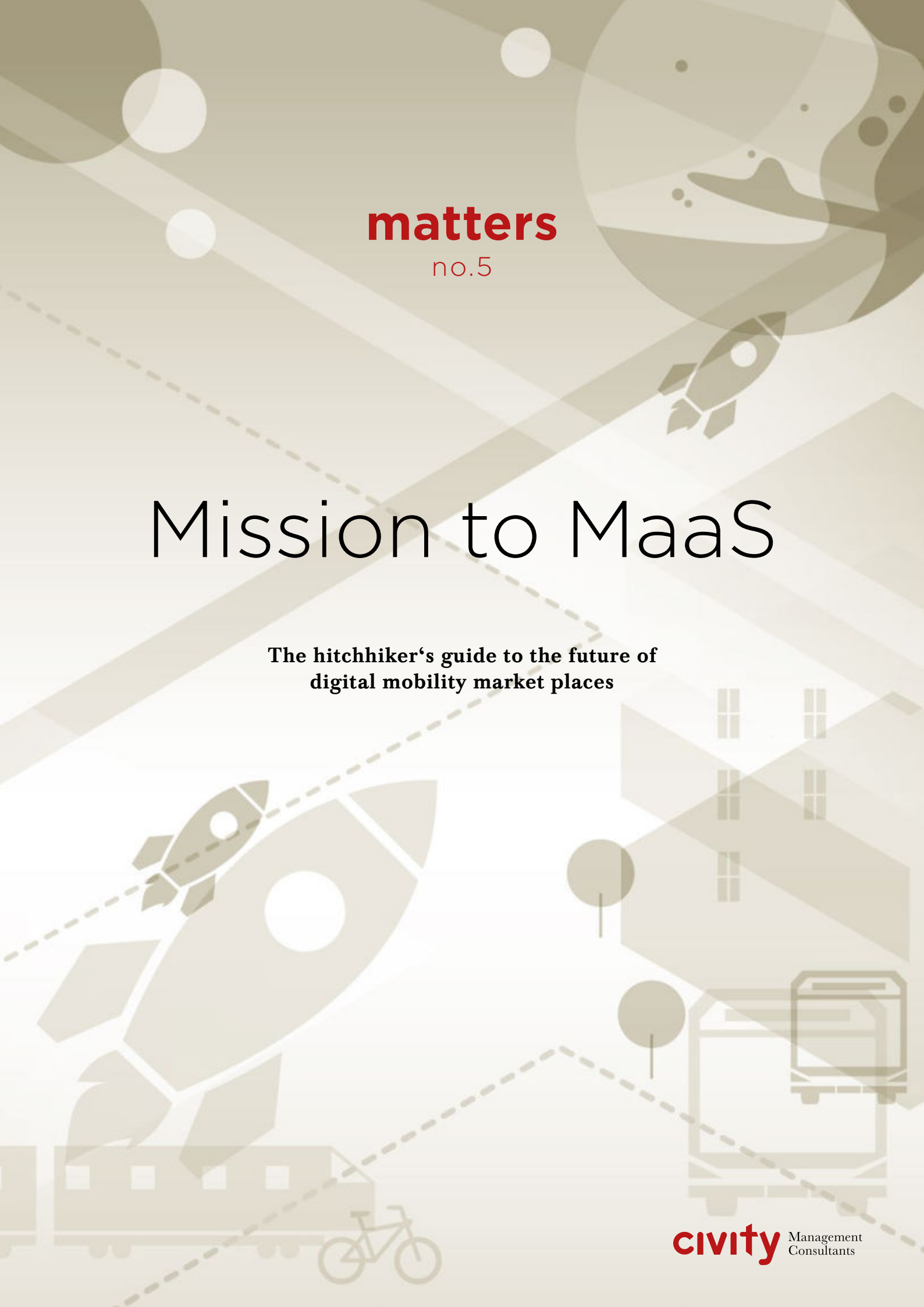

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Mission to MaaS

The hitchhiker‘s guide to the future of digital mobility market places

civity Management Consultants

Mission to MaaS

The hitchhiker‘s guide to the future of digital mobility market places

A discussion paper by civity Management Consultants

Editorial

Based on many years of consultancy experience for multi- and intermodal services, we have collected and extracted all our project experiences to write the hitchhiker's guide to MaaS for public transport operators, authorities, and technology service providers.

At the core of our understanding of Mobility-as-a-Service (MaaS) are the different use cases and target groups who are addressable with multi- and intermodal options. MaaS platforms need to be designed in such a way that those responsible can address the target groups with one product family of mobility apps.

The discussion paper will provide an overview of success factors derived from existing MaaS platforms and applications of different public transport operators in Europe. It will help to identify the right trajectory to MaaS - the primary objective being the extraction of transferable good practices for public transport operators

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Management Summary

For more than a decade, public transport operators around the world have been trying to reach for the stars to improve our multi- and intermodal travel experience.

However, none of the public transport operators, agencies and technology providers have landed on MaaS yet. Reasons for this are as varied as any failed space mission. One would think that the development of multi- and intermodal mobility solutions should not be rocket science. Nevertheless, it seems to be.

The paradox of choice in a sky full of stars

To solve the major challenges of CO_2 emission, noise pollution, and traffic congestion cities face, sustainable mobility solutions are required to divert commuters and travellers to environmentally friendly travel solutions. To make travellers aware of these travel alternatives, they need to be offered, promoted, and possibly bundled. Therefore, it sounds reasonable to integrate all the travel alternatives into one mobility app, allowing users to easily book them with one account and to receive their monthly invoice in addition to many other functionalities directly from the platform provider.

Only, potential users want to be informed, they want to be guided and taken by the hand to find the most suitable travel plan within their preferred mobility forms. Potential users do not want to be overwhelmed with travel options they never use or app functionalities they have never thought of. Consequently, it is essential to think of the users and their requirements as the centre of the solar system your MaaS platform will orbit.

Such user requirements vary depending on the local environment and the reasons for travel respectively, possibly presenting conflicting interests. Consequently, one needs to internalize that it cannot be one single mobility app that meets all the user needs, that addresses multimodal and intermodal transport, and that covers every geographical area. Rather, several mobility apps need to be established as a product family, while they all build on the same MaaS platform.

One small step for users, one giant leap for public transport operators

An urban MaaS revives the user need for multimodality in one place. Users want to be informed about the available transport modes in the urban area and the routing. They want to compare the search results and the alternatives shown with their preferred mobility form. Hence, transparency on the travel options is essential for a successful urban MaaS. To facilitate transparency, the different means of transport and the mobility service providers (MSPs) must be aggregated in the MaaS platform, following the principle of quantity of MSPs over their depths of integration in the MaaS platform.

MSPs encompass any means of transport, ranging from public transport and shared mobility to ride hailing and long-distance services. Complete aggregation can be achieved with increments, thus, integrating only certain transport modes at first. The more transport modes aggregated in the mobility platform, the more complex the offering will be.

An intercity MaaS can only be successful when the aspect of seamlessness is stressed in the solution design. Since it takes up the user need for inter-modality between several places, the MSPs need to be deeply integrated. Only with deep integration a seamless booking of the travel plan and payment of the mobility services used can be facilitated through the MaaS platform. Consequently, an intercity MaaS concentrates on the depth of technical integration of individual MSPs rather than the aggregation of such.

Complete technical integration is reached, when the platform providers themselves offer payment services and thus issue the regular invoice to the customers for their mobility services used. From a customer perspective, all services are offered from one single provider. On the way to complete technical integration, further increments can be identified, starting with information only, leading to the integration of booking either via deep link or API, eventually reaching the integration of payment services, either with separate accounts or a single account.

Ready for take-off?

For a successful mission to MaaS, it is essential to learn from the past, internalize the experiences other platform providers have made and take the success factors derived from past platform developments and app offerings:

- Set a clear focus on either aggregation or integration
- Consider MaaS platforms as an integrated system architecture
- Define a precise product, one app for one target group or one use case
- Develop an ecosystem of mobility apps
- Ensure the user experience with any decision on integration
- Identify the requirements for a mobility app based on the geographical area
- Determine a viable business case for integrating mobility services in the platform

By incorporating these principles, public transport operators, agencies and technology providers will finally be able to land on MaaS, and at last, the stars will be within their reach.

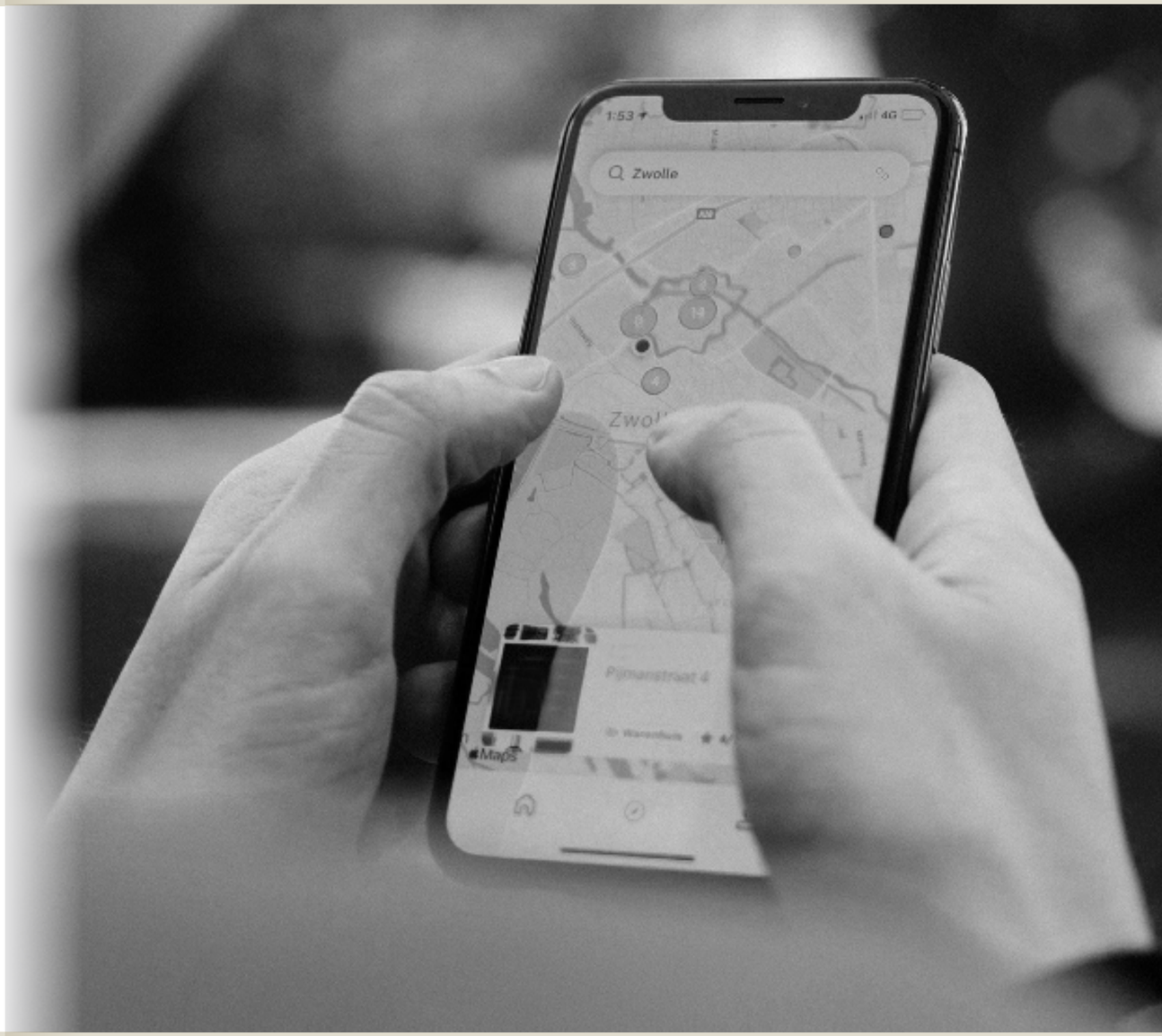
The mission to MaaS

Aiming to improve our day-to-day lives, to provide profound answers to the most imminent questions and to find solutions for challenges occurring, space missions are being initiated globally. Such space missions range from satellites in the atmosphere to space rovers on Mars. Nevertheless, before eventually reaching Mars, even before launching the space rocket, strategic mission planning is required.

When preparing for such a mission to Mars, the basics of space science are reconsidered, and new ideas conceived that invent tomorrow and invest in our future. Then the mission operation is designed, and, finally, applicable approaches are derived.

Such strategic planning is essential for any mission – regardless, if it is aiming for space or for a city, leading to Mars or offering a digital mobility platform also being known as Mobility-as-a-Service (MaaS). Consequently, the strategic approaches must be defined, before a MaaS platform can be successfully launched, before it meets its target group and accomplishes its underlying use cases, and particularly before its operation is rolled out.

In this regard, the strategic approaches include determining the underlying concept of offering mobility services, the geographical scope of the MaaS platform, and the main services and functionalities to be provided. This is where the Mission to MaaS begins.



Reasons for MaaS missions to fail

1.

For more than a decade now, transport operators, transport authorities and technology providers around the world have embarked on this mission. The belief in success and the intention are everlasting. Only, as of today, no one has really landed on MaaS, and integrated Maas applications have yet have yet to see any smashing success anywhere. So far, neither a city nor a transport operator have built a real MaaS lander, not to mention a viable commercial business case. What is actually the problem? Why do users not take the integrated solutions of information, booking and billing from a single source? Is not everything supposed to be so simple?

Mobility is a local business

What is the actual reason for MaaS missions to fail? The growth in mobility is a logical consequence of the global increase in population and prosperity. At the same time, mobility and especially individual automobility are two of the main drivers of resource consumption. Countries and particularly cities need to reduce their CO2 emissions by switching to renewable energies and „clean“ mobility solutions.

We need to solve the mobility problem in our cities and suburbs, since mobility is the lifeblood of a city. Smart solutions are the key to tackling the major challenges cities and urban areas are facing. Therefore, it sounds reasonable to integrate all transport alternatives to the car into an app, informing users on the availability of different transport modes and routing options, allowing the means of transport to be easily bookable with a single sign-on and having them billed once a month in a very practical way.

Whole armies of employees in the research and innovation departments of our transport operators and authorities, supported by consultants and software development service providers, are working on these solutions that provide information about everything, facilitate booking of everything and allocate a bill for everything. But why do users not love these solutions? Why is the disruption not yet happening?

There are two very simple truths: First, mobility is a local business. Second, mobility is an everyday business.

Let us engage in a simple thought experiment on this: If we assume that 95% of all people take the same routes every day to work, school or university, to their sports, family or friends, these routes are local, known, and trained by frequent use. Moreover, they are optimised against the background of individual preferences such as speed, privacy, or convenience. This means that this group of people does not actually want to make a choice of transport for the essential part of their mobility, but merely wants to know whether their means of transport works as they expect it to.

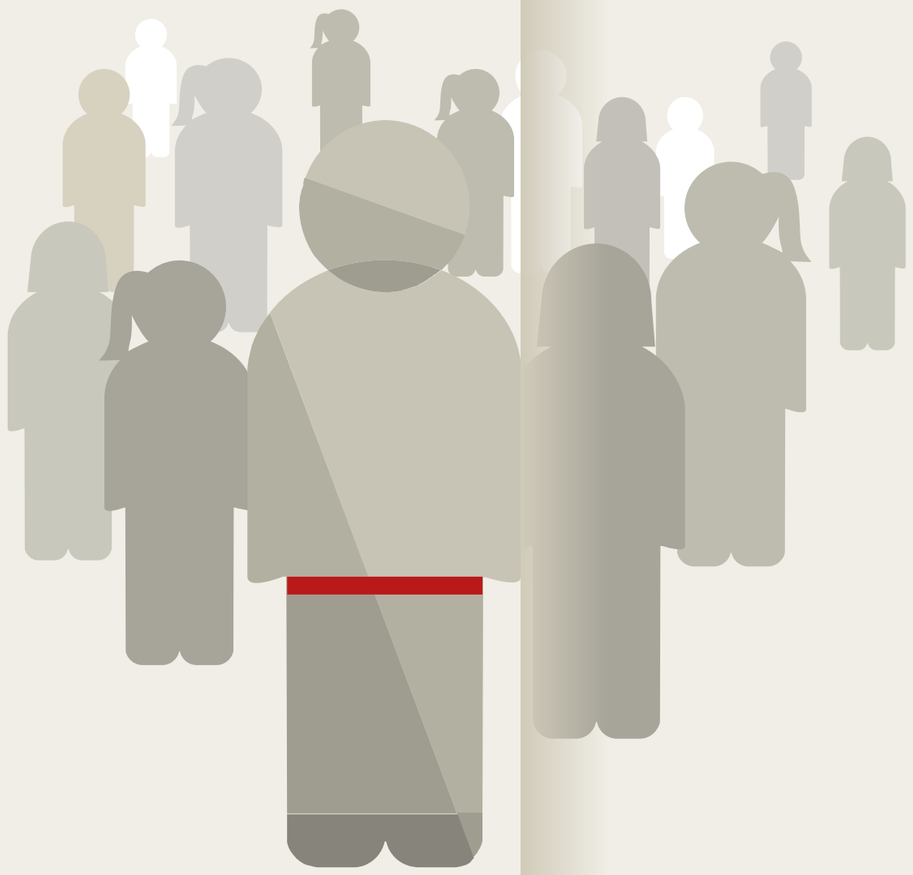
95% of all people always take the same routes

↓

95% optimised and trained trips

↓

5% easy adressable trips, when being on vacation



5%  Mobility nomads

Consequently, we do not need to tell this group of people what options they have but show them whether their preferred transport mode works and whether it is on time. If we want to inspire this group of people to use public transport and shared mobility at the expense of individual automobility, we need to either make public transport better or the use of the individual car worse. Nevertheless, better or worse will be addressed more towards the dimensions of speed, privacy, price, or comfort, than in the dimensions of booking and billing.

These 95% of all people still make journeys outside their local environment, for example on holiday, on business trips or when visiting friends and relatives. These 5% of trips are neither trained nor optimised, hence, there is a need for information and transparency about the availability of MSPs and travel options. The rationale behind this is that these journeys take place almost exclusively not in their hometowns, but in other places or en route to them.

In addition, there are those 5 % who make different journeys every day – the mobility nomads. The countless consultants, sales representatives and all those others who wake up in a different city every day, just like the authors of this discussion paper. These people require solutions for their mobility needs, they need transparency, and they need a simple booking and billing process due to low time autonomy and high time-opportunity costs.

What implication does this have for our Mission to MaaS? It means that we must think about our mission starting from our target groups and from our use cases. Instead of thinking merely about processes and applications, we need to start thinking from user needs and potential demand. Thus, it is not about the one size fits it all super-duper mobility app. It is about addressing the multi- and intermodal mobility needs of the users.

Strategic approaches launching the mission

2.

The decision to set-up a MaaS platform requires a strategic focus. The strategic approaches to launch a MaaS platform typically concentrate on either Integration or Aggregation. Many operators try both at the same time, but history tells us that they all failed. Every operator of a platform must first decide whether to start with integration or aggregation. Integration First focuses on a deep embedding of information, booking and payment functionalities of few mobility service provider (MSP) in the platform. In turn, Aggregation First considers merging as many different MSPs as possible with rather few functionalities in the platform. You must decide whether to be a Mobility Integrator or a Mobility Aggregator. Being both at the same time has proven to not be a reasonable strategy in the beginning.

Do not reach for the stars from the beginning – instead set a clear focus on either aggregation or integration

Once it was agreed to start a mission to MaaS and hence, offering a multi- or intermodal service offering, a decision on the strategy must be made. Doing so, several key questions need to be dealt with: Who are our users? Who needs multi- and intermodal services? Which use cases do we want to address? What is our value proposition? Do we have a business case? And most important, are we the right institution to setup such service offering?

Once the decision to setup a mobility platform has been made, a decision on the underlying strategic approaches is required.

Aggregation First

The approach of Aggregation First focuses on the collection of multiple MSPs in the MaaS platform. In this discussion paper, MSPs refer to all service provider that offer passenger transport solutions, providing such solutions either themselves or through third parties. These service providers encompass all means of transport, ranging from public transport underground or above, from long-distance services on the roads to those on the tracks, from micro-mobility solutions on two wheels to shared mobility on four wheels.

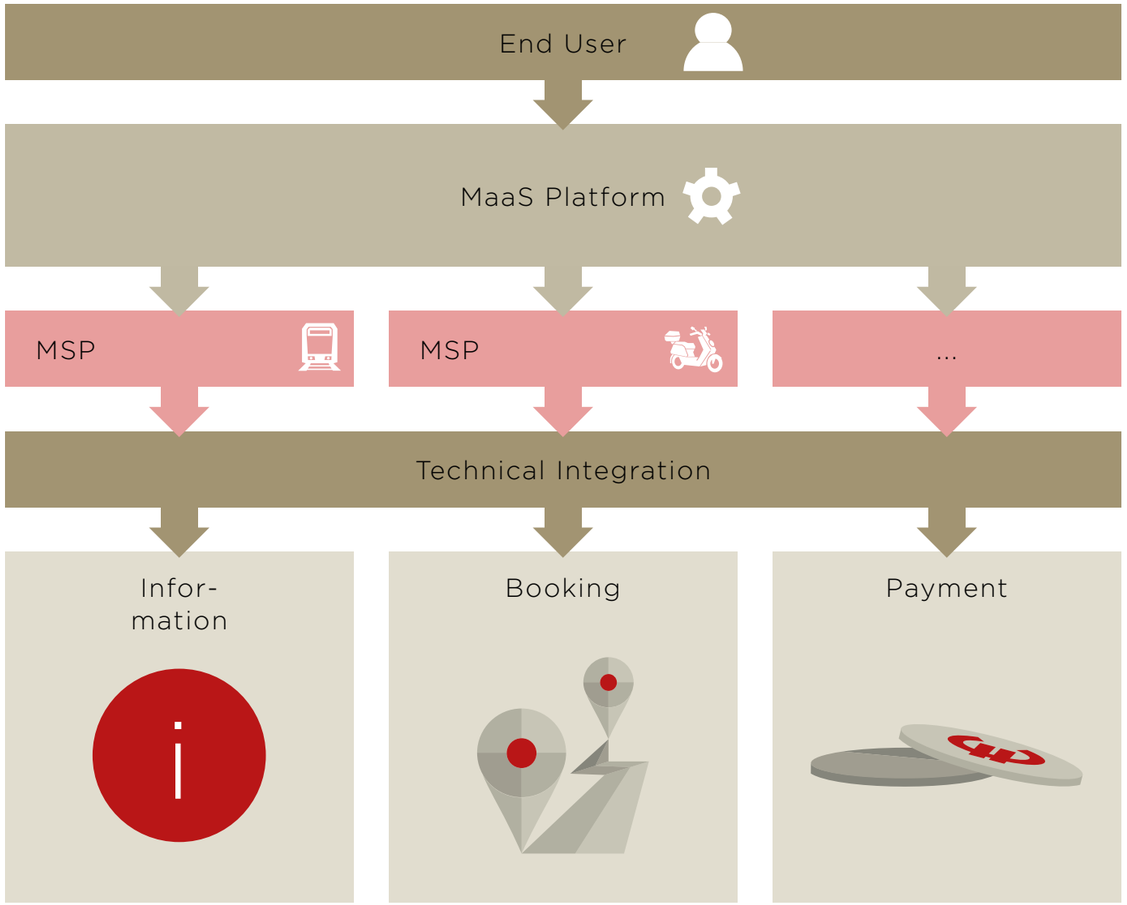
By aggregating multiple MSPs, the respective MaaS platform aims for a full coverage of all different modes of transport and possibly all different MSPs operating in the geographical area. Doing so, it neglects the depth of integration of any MSP at first. As a result, the user typically receives elaborate information on routing and availability of different transport modes for their requested journey. However, once the user selected a travel plan, they are usually forwarded to the website or app of the respective MSP to continue booking and eventually payment of the journey.

Full aggregation is achieved when all transport modes are presented in the MaaS platform. Since the effort for integration differs between transport modes, the degree of aggregation also represents the underlying complexity of the MaaS platform. In context of this paper and the MaaS platforms examined, as a first level, public transport is usually included in the digital marketplace, continuing with sharing solutions like micro mobility as the second degree of aggregation and carsharing as the third level. The fourth degree of aggregation leads to demand responsive transport and pooling solutions. Complete aggregation is being achieved when long-distance services are included as well. For each means of transport and each MSP aggregated into the platform, the functionalities offered can differ.

Merging multiple MSPs in a MaaS platform is particularly relevant for larger cities with surrounding municipalities, where multiple transport modes can be found, and several intramodal competing MSPs offer their transport services. Consequently, a MaaS platform following the strategic approach of Aggregation First seems to have no value proposition for rural areas or smaller cities with few transport mode choices and no directly competing MSPs. Rationale behind is public transport being the dominant means of transport and only few MSPs offering their services.

Fig.
1

TECHNICAL INTEGRATION



A business case for brokering shared mobility services does not exist

The main functionalities of a MaaS platform focusing on Aggregation First are information and routing. Thus, a high user adaption rate in urban areas is expected, resulting in higher visibility and higher user traffic on the platform. The focus on information and routing as the main functionalities of such MaaS platform supports a non-discriminatory business model. Since it dispenses with ticket sales and resulting transactions, also complicated contractual agreements with the participating MSPs can be waived. On the other hand, this also leads to the fact, that at most a weak commercial business case can be established for the provider of the MaaS platform, for example municipal transport operators.

Integration First

The focus on a deep technical integration of the participating MSPs is the main characteristic of the strategic approach of Integration First. Therefore, Integration First targets the MSPs' complete technical integration resulting in the user being required to merely have one account with the MaaS platform when using the functionalities of information, booking, and payment. At the same time, both the variety of transport modes and diversity of MSPs are neglected at first.

In context of this paper and the MaaS platforms examined, complete technical integration encompasses information on routing and availability of different transport modes for a requested journey, booking of the selected travel plan and MSP, and finally payment of the services used. Complete technical integration can be achieved over different increments that represent the underlying complexity of a MaaS platform following Integration First. The first increment and thus, the first degree of integration, focuses on the functionality of

Fig. 2

TECHNICAL INTEGRATION

Degree of Integration

5	**Integration of Payment Services** with platform provider (single account)	BVG Jelbi, hvv switch
4	**Integration of Payment** Services with MSP (separate account)	
3	**Integration of Booking** via API	FMN
2	**Integration of Booking** via Deep Link	Google Maps
1	**Integration of Information**	Maps

information including routing and availabilities. Further, the integration of booking functionalities either via deep link or deep integration are considered. The integration of payment functionalities is the last increment, allowing for payment of the services with either different accounts or one single account, the latter representing the highest degree of integration. The level of technical integration can vary between each means of transport and MSP connected to the MaaS platform.

Due to the holistic functionalities offered, MaaS platforms focusing on Integration provide a valuable service offering for digital non-commuting passengers. Focusing on the target group's first and last mile, such MaaS platforms can enhance the feeding area of railway stations and bus terminals. However, due to this focus, the target group is rather narrow, possibly leading to less user traffic on the MaaS platform and subsequently less visibility of the mobility App in the established App Stores. The complete integration of MSPs in the mobility platform, hence, the commercial handling of booking and payments in the platform solution, requires

thorough contractual agreements with the participating MSPs. These contractual agreements on revenue and cost sharing however allow the platform provider to set up a viable business case for a MaaS platform. The provider of such MaaS platforms establish a feeder network, for example for long distance bus or rail operators.

Excursus

Excursus to the universe of mobility apps

Have you ever typed in mobility in the search field of your App Store? The list of mobility apps with all different types of focuses and additional service offerings seems to be endless.

Finally, of course MaaS apps can be spotted in the endless list of mobility apps as well. These MaaS apps at least provide information on not less than two means of transport.

Categories of mobility apps

For the German speaking area different categories of mobility apps can observed. The category of public transport apps like Smart Ride in Austria, BVG Tickets in Berlin or cleVVVer mobil in Austria, focus on information and ticketing services of a city's public transport.

The category of intercity apps, such as FlixBus & FlixTrain, ÖBB Scotty in Austria or DB Navigator in Germany, offers the same functionalities as the public transport apps, however rather for long-distance services across cities.

On-demand apps and apps for shared mobility both build another category of mobility apps. They offer the information, booking and usually payment services of the individual MSPs offering on-demand or sharing services. Successful examples include HeinerLiner Darmstadt, MOIA Hamburg und Hannover and Hol mich! from Via Transportation, all three in Germany, as well as MILES Carsharing, Uber and Bolt operating internationally.

Top 5 MaaS apps

To identify the Top 5 in the German speaking area, a scoring model was determined that considers the user ratings in both established App Stores, the number of downloads in the App Store Google Play, and the number of residents in the area of business of the MaaS app.

Among the Top 5 of MaaS apps in the German speaking area, four MaaS apps provided by public transport operators can be found. The second place in the Top 5 goes to the app Freenow. While the four MaaS apps offered by public transport operators reach the download category of 100,000 to 500,000 each, the MaaS app Freenow shows a number of downloads in the category of more than 10 million.

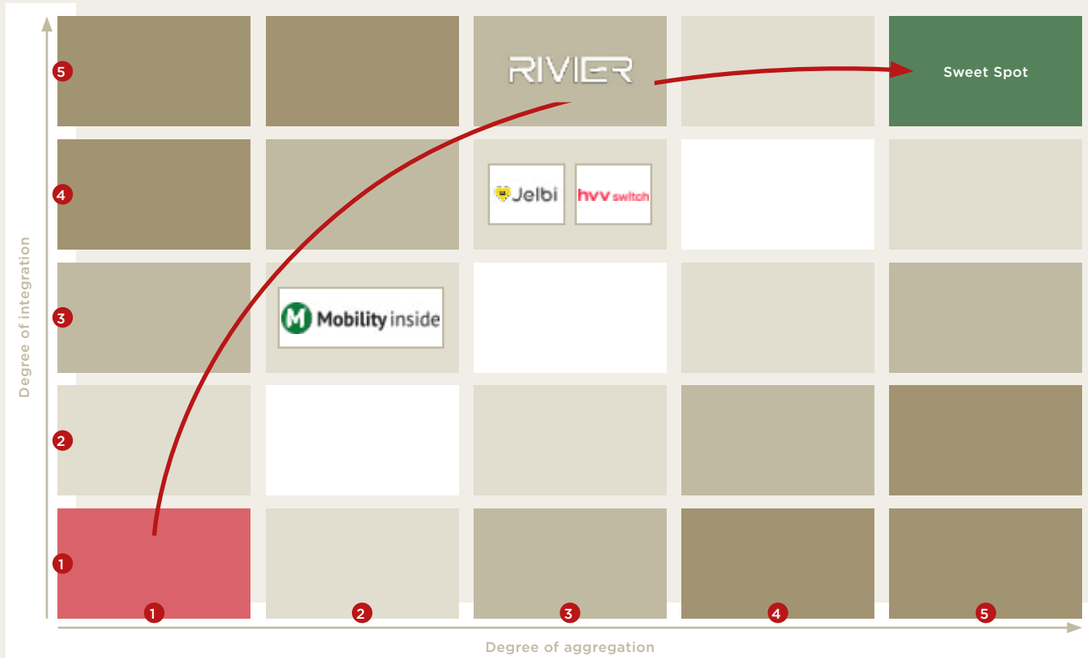
Fig. 3

TOP 5 MAAS APPS IN GERMAN SPEAKING AREA

MaaS Plattform	Plattform Provider	Download Category (App Store, Google Play)	User Rating (App Store, Google Play)
BVG Jelbi	Berliner Verkehrsbetriebe (BVG) Anstalt des oeffentlichen Rechts	100,000+	4.4
FREENOW (ex mytaxi)	Intelligent Apps GmbH	10,000,000+	4.3
hvv switch. Flexibel unterwegs	Hamburger Hochbahn AG	100,000+	4.3
LeipzigMOVE	Leipziger Verkehrsbetriebe GmbH (LVB)	100,000+	4.1
MVGO	SWM Services GmbH	100,000+	3.7

Fig. 4

STRATEGIC APPROACHES

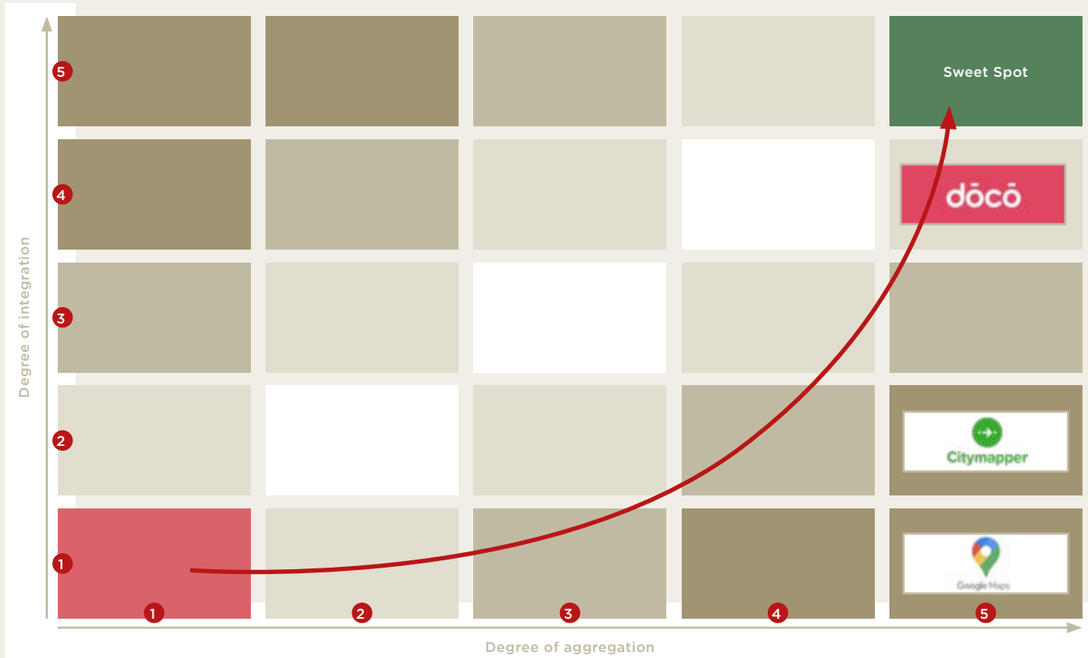


Practical Examples on Integration First

When looking at existing platform solutions, Integration First can be identified as the predominant strategic approach. Thus, most platform provider focus on integrating selected MSP rather deeply in their MaaS platform, before adding further. For example, Jelbi the B2C MaaS platform offered by the Berlin public transport operator, has integrated all incremental functionalities of information, booking and payment. Payment is being undertaken with the designated account of the MSPs included, consequently, resulting in the fourth degree of integration. The means of transport included in Jelbi encompass public transport, sharing solutions and demand-responsive transport. While the same applies for HVV switch from the public transport operator in Hamburg, Jelbi is considered as the first successful MaaS platform offered by a public transport operator in Germany based on the number of app downloads in the download category of 100,000 to 500,000 (Google Play). As a second example, the Dutch MaaS platform RIVIER focuses on complete integration already prior to their Go-Live and will include payment functionalities with one single account. RIVIER is a country-wide platform solution to be launched by the two major cities Den Hague and Rotterdam, and NS the national rail operator in the Netherlands, serving as a B2B platform solution.

Fig. 5

STRATEGIC APPROACHES



Practical Examples on Aggregation First

The most famous and most successful example of a MaaS platform following the strategic approach of Aggregation First is Google Maps. At first, the core functionalities offered by Google Maps used to be information and routing across different means of transport and respective MSP. Thus, public transport operators, shared mobility and pooling solutions, long-distance bus and rail operators are all included in the routing information offered by Google Maps, next to other forms of mobility such as private car, ride hailing, biking, and walking. Nowadays, some transport modes are sustained with deep links. Thus, once the user has selected a travel plan, they are usually forwarded to the website or app of the respective MSP to continue booking of the journey. The same approach applies to the mobility information platform citymapper, although less successful compared to Google Maps' unique market penetration.

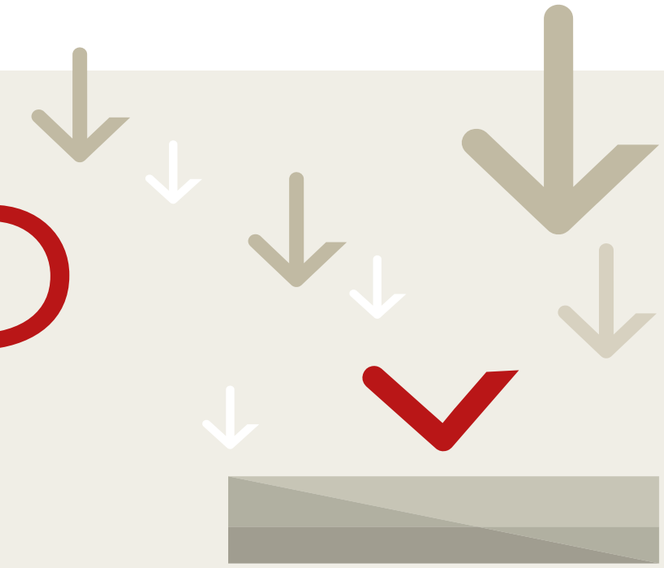
Due to its unique business model, the platform solution dócó is close to reaching the sweet spot of MaaS platform by full integration and complete aggregation. dócó is the country wide MaaS platform offered by the Spanish long-distance rail operator Renfe. It focuses on non-commuting rail passengers and their requirements for the first mile to the railway station and respectively the last mile from the railway station across the country. Doing so, all means of transport are included in the MaaS platform, ranging from public transport to long-distance rail services.

Success factors for entering MaaS

3.

Looking back to the future of MaaS allows identifying both success stories and failure modes. Analysing both will help the individual mission to MaaS to be successful - not only for the launch of the mission, but for sustainably entering the market. Success factors that have been derived include the strategic focus of a MaaS platform and the sustainable decision for a geographical area that covers the MSPs and respective target groups. Moreover, the mutual understanding must be achieved, that not one mobility application needs to map all user requirements. Instead, by building on the same MaaS platform as the backbone, different mobility apps service the differing requirements of individual target groups.

What is needed ?



MaaS platform is not an app – MaaS platform means integrated system architecture

LLow to no marginal cost of information and possibility for transparency are aspects incurred by digitalization. Currently, individual MSP including public transport operators have internalized these aspects in both their mobility apps and their digital platform solutions. However, from a user perspective this often results in an overload of information and excessive demand, which in turn users demonstrate by not using the mobility apps.

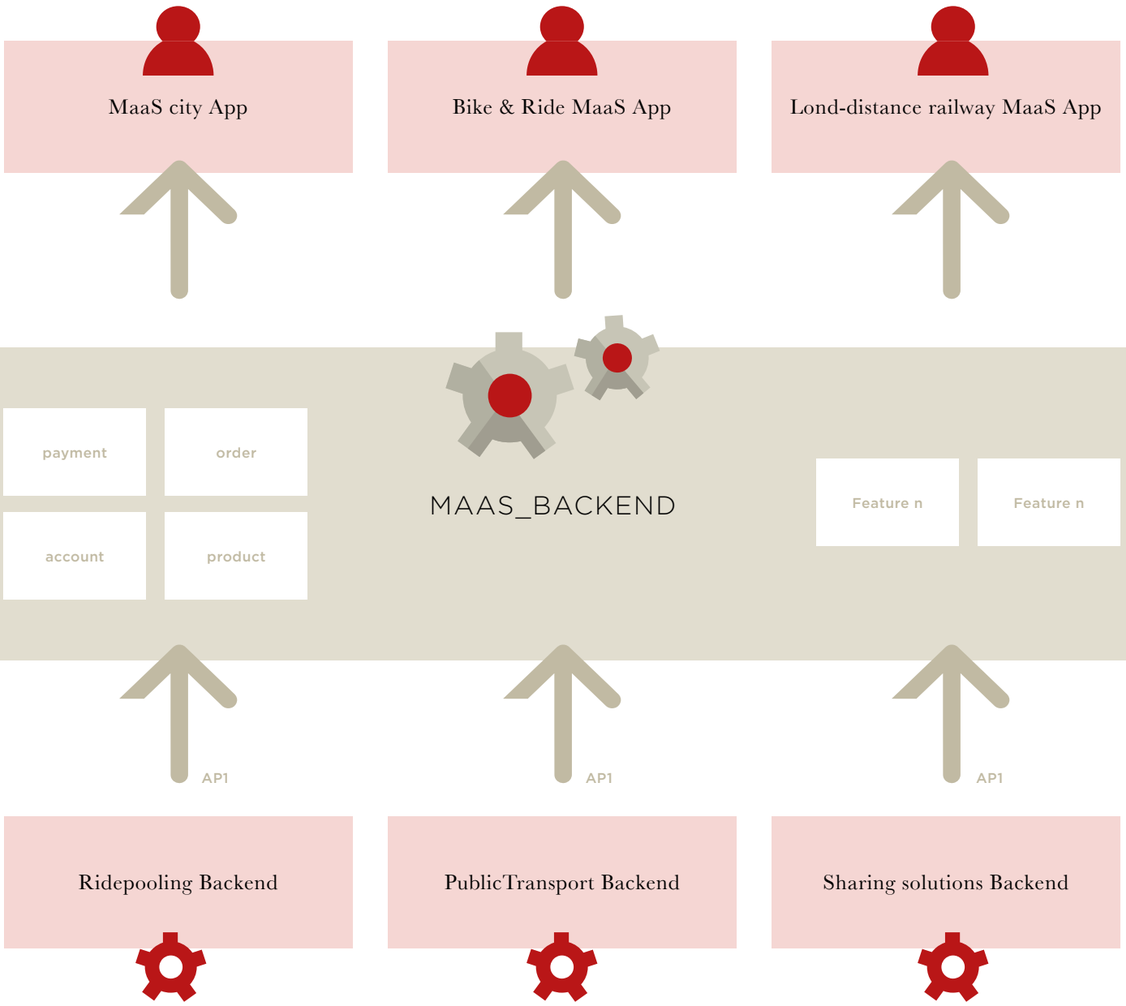
To enter Maas sustainably, a mobility app needs to reduce complexity by focusing on user centricity. This user centricity is being achieved by offering digital mobility solutions that are both use-case oriented and mode-specific. Instead of offering one single mobility app that is overloaded with premature functionalities, addressing multiple use cases, platform providers are recommended to undertake a fundamental shift towards either main mobility apps or multiple mobility apps as their platform solution.

Applications are not a vague product – instead, one app for one target group or one use case

Within the approach of a main mobility app, key functionalities, hence, information, booking and payment are included in one main app. To complement these services, substantial apps are being offered for specific use cases. Doing so, this approach fosters individual mobility apps for specific target groups and their respective primary mode of transport in addition to the main mobility app with its key functionalities. For example, users whose primary transport mode is the bike, are interested in routing with navigation on bike paths, but supplementary require information on bicycle stands or facilities for bike & ride. Since this is only applicable for this user group, the functionalities are not integrated into the main mobility app. Rather, an additional bike-centric mobility app is being developed. In contrast to the approach of main mobility apps, where the main app is considered as most relevant for the providers' mission to MaaS, an even distribution of the apps' weighting is supported by the approach on multiple mobility apps.

Fig.
6

SCHEMATIC MAAS STRUCTURE



A one size fits all super app is not required – but an ecosystem of apps is

The basic prerequisite for main or multiple mobility apps is a stable backend. By integrating relevant functionalities like order management, payment services, or account management in the backend, these can be used for any further app. Moreover, integrating application programming interfaces (API) from MSPs allows including these services in the backend and eventually in the user apps that demand for the respective MSP. Thus, building on a well-designed MaaS backend, not only allows for a main or multiple app approach serving user needs, but facilitate significant cost savings for development, maintenance, and support.

Consequently, MaaS platforms are about creating an ecosystem of apps that include mobility services for a primary means of transport along with support measures and additional experiences.

Not every MSP in the MaaS platform requires the same integration depth – but user experience needs to be ensured

The technical integration of individual MSP can vary with each one connected to the MaaS platform. Nevertheless, when differing in the depth of integration, user experience must be kept in view. A beneficial user experience is also essential to foster the platform solution being the source of information for any routing query.

Not every city has the same needs – instead, different geographical areas require different mobility apps

MaaS platforms aim for improving the users' travel experience in a certain area. While they were originally focusing on large cities, recent developments show a geographical scope expansion towards intercity solutions or even countrywide mesh network structures.

Multiple different means of transport and respective MSPs are present in large cities and urban areas. To create a meaningful benefit for the users, the range of MSPs needs to be covered by the platform solution, establishing MaaS apps as the primary choice for information on availabilities and routing. The MaaS apps target multimodal mobility users in a fixed perimeter, for example a metropolitan area, whose demand for transparency and comparison of transport modes is being met. Consequently, Aggregation First tends to be the strategic approach for urban MaaS platforms.

In turn, Integration First tends to be the strategic approach for intercity MaaS platforms. Instead of merging MSPs in the platform solution, intercity MaaS platforms focus on the collection of places, enhancing the connection between cities and urban areas. In particular for long-distance bus and rail operators as platform providers, the complete integration of relevant MSPs in cities linked to their network, allows enhancing their value proposition towards their user group. Consequently, from the perspective of intermodal mobility users, the MaaS platform needs to support a seamless booking and payment of the mobility services used. Therefore, the MSPs completely integrated in the MaaS platform are typically those that are available in all linked cities and urban areas. Due to the limited number of MSPs meeting this criterion, the endeavour of complete integration requires less efforts and fewer costs for the platform provider.

Fig. 7

SUCCESS FACTORS FOR YOUR MISSION TO MAAS

- Do not reach for the stars from the beginning – instead set a clear focus on either aggregation or integration
- MaaS platform is not an app – MaaS platform means integrated system architecture
- Apps are not a vague product – instead, one app for one target group or one use case
- A one size fits all super-duper app is not required – but an ecosystem of apps is
- Not every MSP in the MaaS platform requires the same integration depth – but user experience needs to be ensured
- Not every city has the same needs – instead, different geographical areas require different mobility apps
- A business case for brokering shared mobility services does not exist – but it does for fully integrating mobility services in the platform

Fig. 8

STRATEGIC PARAMETERS OF MAAS STRATEGIES

Intercity MaaS	Urban MaaS
Integration First	Aggregation First
Intermodal	Multimodal
Seamlessness	Transparency and Comparison
Booking and Payment	Availabilities and Routing
Several Places / Perimeters	One Place / Perimeter

Fig.
9

GEOGRAPHICAL SCOPES

Excursus

Excursus to successful integrated system architectures

If we say no one landed on MaaS yet, is this really the case? Is there not any successful example that already considered the success factors described before?

In fact, three successful examples for MaaS platforms can be identified in Germany (based on the number of app downloads in the App Store Google Play) that follow the approach of an integrated system architecture, offering multiple mobility apps based on one platform solution. These examples are the MaaS platform of the public transport operators in Berlin (BVG), Hamburg (HVV) and Munich (MVG).

By building on one platform solution, each of the public transport operators have developed use-case specific mobility apps. These apps encompass digital solutions for information on the availability and punctuality of public transport. They include ticketing apps for public transport as well as apps for only booking bike-sharing services. And of course, MaaS apps are being offered that have aggregated at least the transport modes of public transport and sharing solutions.

Each of the individual mobility apps targets a different user group, consequently providing the functionalities the particular target group requires – not less, but also not more. The user of each individual mobility app is guided through the mobility options, hence, complexity is reduced and the users' actual requirements are taken seriously.

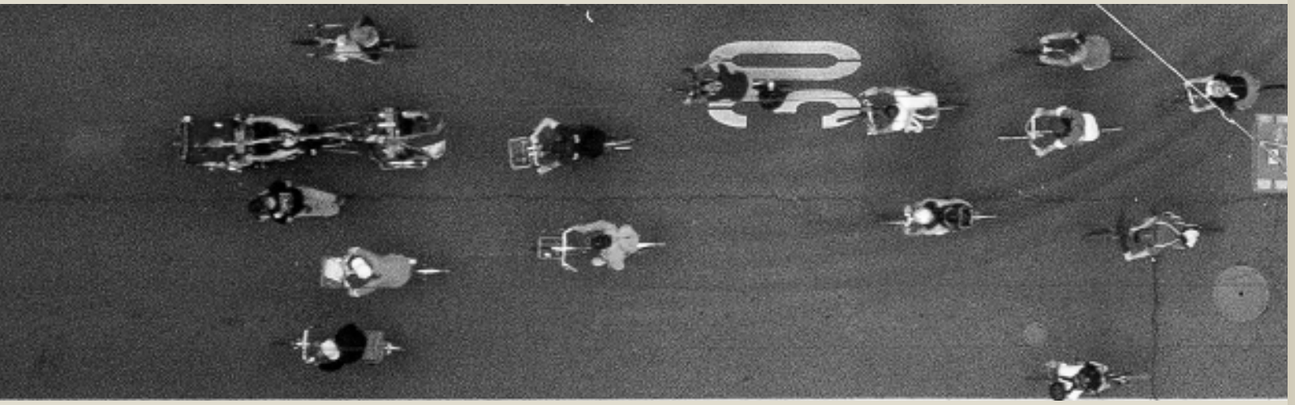


Fig. 10

SUCCESS STORIES OF INTEGRATED SYSTEM ARCHITECTURES

MaaS platform

BVG MaaS Platform (Berlin)	HVV MaaS Platform (Hamburg)	MVG MaaS platform (Munich)
	MaaS Apps	
ÖPNV Berlin **Download Category:** 1m+ **Score:** 3.8	Hamburg Bus & Bahn **Download Category:** 1m+ **Score:** 4.2	MVG Fahrinfo München **Download Category:** 1m+ **Score:** 4.2
BVG Tickets Bus & Bahn Berlin **Download Category:** 1m+ **Score:** 4.5	StadtRad Hamburg **Download Category:** 100,000+ **Score:** 2.4	MVG Tickets **Download Category:** 1m+ **Score:** 3.8
Jelbi **Download Category:** 100,000+ **Score:** 4.4	MOIA Hamburg & Hannover **Download Category:** 100,000+ **Score:** 4.5	MVgo **Download Category:** 100,000+ **Score:** 3.7
Muva: Mobiltät für alle **Download Category:** 10.000+ **Score:** 3.0	HVV switch **Download Category:** 100,000+ **Score:** 4.3	MVG Deutschland **Download Category:** 1,000+ **Score:** 4.0
	hvv Any **Download Category:** 10,000+ **Score:** 3.4	

Recommendations for future missions to MaaS

4.

Before successfully building a real MaaS lander and launching the mission to MaaS, the underlying strategic framework must be defined. In addition to the everlasting belief in success and intention, thorough decisions on the strategic approach and the geographical scope of the MaaS platform are required, based on the underlying business model and profitability assessment.

To make users love the platform solution, the two elementary principles of mobility must be recalled: Mobility being a local business and mobility being an everyday business.

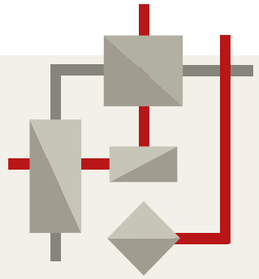
This leads to the fact that user-centricity must be maximized when designing a MaaS platform. The individual use cases must be determined to identify the system architecture and the MaaS apps required, avoiding information overload and increased complexity. Integrating functionalities and MSPs in one comprehensive MaaS backend can therefore result in a variety of MaaS apps based on specific use cases. Consequently, a MaaS platform does not necessarily have to result in one app only.

Moreover, the travel patterns and radius of movement of potential users must be examined to determine the geographical scope and the resulting strategic approach for market entry. The users of a long-distance rail or bus operator more likely travel between cities, requiring a MaaS platform that supports seamless booking and payment of the mobility services on the main route and for the first/last mile. In turn, users of a public transport operator travel within the operator's perimeter. Thus, transparent information on available transport modes and routing are the main user demands. In addition, the possibility of aggregating a variety of MSPs in a MaaS platform as a matter of course depends on the number of MSPs present in an urban area and decisively determine the strategic approach of Integration First or Aggregation First.

In addition, a sustainable business case must be elaborated, representing a viable cost and revenue sharing model within the commercial design. The approach of Integration First rather presents a commercial business case, while integration of information and availabilities of MSPs via deep-link in the MaaS platform offers the best value-to-cost benefit for the platform provider.

By internalizing user-centricity and commercial design the multimodal and intermodal mobility demands can conclusively be addressed in the MaaS platform, fostering the strategic and operational success of the mission to MaaS.

Develop the underlying business model



Before developing the MaaS platform, the underlying business model must be elaborated. Doing so, among others the target group that shall be addressed with the MaaS platform needs to be defined. Moreover, the target group's use cases to be supported with a platform solution need to be described, aiming to solve the users' challenges and meet the user requirements with the MaaS platform. Developing the business model provides for the determination of the system architecture and MaaS apps required.

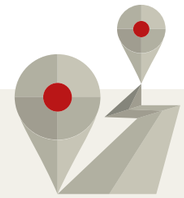
Derive the strategic approach

Based on the central service offerings of the platform provider, the previously determined target group and the respective use cases, the geographical scope of the MaaS platform can be derived. This enables the decision whether the MaaS platform shall focus on one place (urban MaaS), or several places (intercity MaaS). Thereupon, the strategic approach for launching the MaaS mission can be deduced, focusing either on Integration (intercity MaaS) or Aggregation (urban MaaS) at first.

Verify the business case

Identifying the cost structure and the revenue streams of the MaaS platform and subsequently, creating a sustainable cost and revenue sharing model between the platform provider and the MSPs embedded in the MaaS platform, enables a long-term offer of the platform solution. When following the strategic approach of Integration First, the cost and revenue sharing model is a central component of the commercial agreement.

Define the trajectory



To encounter the market and possibly extend MaaS operations at a later point, a feasible trajectory needs to be defined. The trajectory entails work streams and objectives and key results. The work streams need to be broken down into manageable, trackable work packages that can be completed consecutively, following the phases of any successful space mission: mission preparation, mission launch, encounter space and finally, extend operations.

Previous publications

5.

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citation note: civity Management Consultants (Hrsg.): Mission to MaaS – The hitchhiker‘s guide to the future of digital mobility market places, Hamburg und Berlin, 05/2023

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