

Identification of barriers and drivers for an inclusive digital mobility system from a stakeholders' point of view

Delaere, Hannes; Basu, Samyajit; Keserü, Imre; Macharis, Cathy

Published in:

Identification of barriers and drivers for an inclusive digital mobility system from a stakeholders' point of view.

Publication date:

2021

Document Version:

Final published version

[Link to publication](#)

Citation for published version (APA):

Delaere, H., Basu, S., Keserü, I., & Macharis, C. (2021). Identification of barriers and drivers for an inclusive digital mobility system from a stakeholders' point of view. In *Identification of barriers and drivers for an inclusive digital mobility system from a stakeholders' point of view*.

Copyright

No part of this publication may be reproduced or transmitted in any form, without the prior written permission of the author(s) or other rights holders to whom publication rights have been transferred, unless permitted by a license attached to the publication (a Creative Commons license or other), or unless exceptions to copyright law apply.

Take down policy

If you believe that this document infringes your copyright or other rights, please contact openaccess@vub.be, with details of the nature of the infringement. We will investigate the claim and if justified, we will take the appropriate steps.

Identification of barriers and drivers for an inclusive digital mobility system from a stakeholders' point of view.

Hannes Delaere¹

Samyajit Basu²

Imre Keserü³

Abstract:

The impact of digital mobility services on the mobility landscape is growing and users are increasingly having more options to choose from. There is however another side to this growth where vulnerable-to-exclusion groups do not have the possibility to equally benefit from these services. Therefore, it is necessary to understand what the drivers and barriers are for the development and deployment of inclusive digital mobility services. We tried to explore those drivers and barriers by performing semi-structured interviews with stakeholders involved in the development and day to day operations of 10 different European digital mobility services which served as case studies. As part of these case studies, a literature review and desktop research were performed, in combination with semi-structured interviews and a content analysis. Developers, operators, policymakers and user group representatives were interviewed. We concluded that there is a multifaceted problem; clear communications, collaboration and the related co-creation are not present in most services, no mobility or development related information is shared, and although the concept and importance of inclusion were known to the interviewees, only very few services take action towards providing an inclusive digital service.

Keywords: "Inclusive digital mobility", "vulnerable-to-exclusion groups", "case studies", "semi-structured interviews", "qualitative thematic analysis"

1. Introduction

The rise of the internet and shortly after the emergence of the mobile phone with internet access, have opened new possibilities for people to organise their travel. Since these technologies have become widely spread, personal mobility has changed dramatically: real time information has made it possible for people to adapt to our journey environment by having access to information about traffic jams, better routes, arrival times of public transport, location of shared mobility stations etc.

The digital transport system has a significant impact on our society, but it has not been used to its full potential. Technological adoption in combination with a change in behaviour takes time. An example to clarify: according to Eurostat data from 2019, on average 27% of the European inhabitants have no access to internet when on the move, 40% have never ordered goods or services using the internet and 14% have never used internet (Eurostat, 2020a, 2020b, 2020c). So, developers of mobility services need to be aware that a lot of people do not have the skills, financial tools or understanding of the digital system to use it. This results in the current development and operation of a high impact service that cannot be used by a significant number of people in Europe (Franckx & Mayeres, 2016).

¹ Mobility, Logistics and Automotive Technology Research Centre - Vrije Universiteit Brussel

² Mobility, Logistics and Automotive Technology Research Centre - Vrije Universiteit Brussel

³ Mobility, Logistics and Automotive Technology Research Centre - Vrije Universiteit Brussel

For this paper the focus was on the stakeholders involved in the development process of the digital mobility services. Four main groups are considered pivotal in this process: developers, operators, policy makers and user group representatives. Each of these groups can have a significant impact on the way digital mobility services are developed and by whom they can be used. What decisions are made, how do these stakeholders see the involvement of currently excluded groups, what initiatives have already been taken and what exactly are the barriers and drivers for the stakeholders to develop a more inclusive digital mobility service.

Concretely, we try to understand the process leading to the current digital transport services, how the development and deployment took place and if that process has resulted in the exclusion of several vulnerable groups in our society. Therefore the main research question in this paper is: "What are the main barriers and drivers during the development and deployment phase for an inclusive digital transport service?"

This paper contains 3 sections: the methodology, the results and the discussion. In the methodology the selection of cases, related stakeholders and the data-analysis method explained. In the results we discuss the four main digital transport service types: car- and ridesharing, micro mobility and bike sharing, smart logistics and the multimodal routeplanners and MaaS. The conclusion and relevant topics are presented in the discussion.

2. Methodology

This research focused on the collection of data by interviewing stakeholders involved in the development or operation of digital transport services, using semi-structured interviews. The analysis is based on the **case study method**. For socio-economic research case studies are one of the principal means used to collect data (Bates et al., 1998; Robinson et al., 2003). The **case studies** focus on the process of the deployment of the digital mobility services from the viewpoint of the different stakeholder groups. Concretely, with these cases we will try to understand and create an overview of the drivers and barriers, requirements and needs developers, operators and policy-makers experience when attempting to develop/deploy some form of digital mobility service.

For this research **three main stakeholder groups** are identified: developers, operators, policy makers and additionally some user representatives were also interviewed to have a better understanding of the different vulnerable to exclusion users. A 'trade-off' between an in-depth explanatory focus as a result of a restricted number of cases and the need for generalization provided by a larger sample, is needed. Both options have their (dis)advantages, but in line with the focus on specific stakeholder groups, a limited number of 10 cases with an in-depth approach is used. We have identified seven steps in the methodology: the first step is the selection of the 10 deployment case studies. Secondly, a desktop study is conducted, thirdly, for each pilot relevant stakeholders have to be identified. In step 4, semi-structured interviews (SSI) are developed and conducted with the stakeholders. Next the interviews are transcribed and analysed using the qualitative thematic analysis method. In step 6 the results of the case studies are consolidated and discussed with the stakeholders.

2.1. Identification 10 deployment case studies

The case studies have been selected taking into account the following criteria:

- Including digital mobility services that are already being deployed or are promising in terms of their future development
- Covering a great variety of digital mobility services so that we can highlight any similarities and differences in the barriers and drivers
- Having a coverage of multiple cities or regions
- Involving a variety of stakeholders

A first selection of cases is based on input from other projects, personal knowledge and networks and by an online research to contact services that comply with the criteria described above. The first contact with a potential case took place in July 2020, during the COVID-19 crisis, which possibly had a negative impact on the services willing to provide help for this research.

2.2. Identification of relevant stakeholders

In order to identify and contact the relevant stakeholders, a **definition for a stakeholder** must be integrated within the method. A stakeholder in the singular meaning is:

"Any group or individual who can affect or is affected by the achievement of the organization's objectives" (Freeman, 2010, p.46)

The responsibilities Freeman speaks of are in many cases self-imposed, meaning people impose themselves these responsibilities instead of them being imposed. For the identification of stakeholders, a **stakeholder analysis** was conducted. The stakeholder analysis is not a single tool used to identify stakeholders but consists of multiple different methodologies (Crosby, 1991). Two methods were used to identify the deployment case study stakeholders: the snowball-mapping method and the stakeholder-led categorisation (Brugha & Varvasovszky, 2000). In total 22 interviews were conducted, 5 with developers, 8 with operators, 9 with policy makers and one with a user group representative.

2.3. Development of interviews

The data collected from the interviews includes -several aspects of the digital mobility services:

- How inclusion and accessibility aspects were taken into account
- How the regulatory framework was taken into effect
- How the service or application were developed/deployed

During the development of the questions we decided that the use of semi structured interviews (SSI) is preferable for this research. The language barrier, in combination with unknown stakeholders and topics that are relatively new, which might require more elaborate explanations, make the SSI the more suited method.

We have developed the interviews based on existing literature (Goodwin, 2013; Pope, 2020; Schmeer, 1999; Wick, 2012). The questions were developed based on topics related to user involvement, the current regulatory framework in affect, how a planning was made and followed, how decisions were made, the barriers and drivers that were experienced and other relevant topics. Depending on the type of stakeholder (developer, operator, policy maker), the topics touched during the interview are slightly different.

2.4. Analysis of the interviews

The analysis of the interviews consists of different steps. The overall method used is the thematic analysis method, as explained by Braun and Clarke (2006, p. 79). The authors describe the thematic method as an independent qualitative method that can be defined as “a method for identifying, analysing and reporting patterns (themes) within data. It minimally organises and describes your data set in (rich) detail.”

2.5. Development of the thematic analysis codes

During the initial stage of the analysis, the desktop research was used to create a first summary of the context in each of the cases. This provided some of the initial information for the development of the semi-structured interviews and for the codes used within the thematic analysis. During the actual thematic analysis some additional codes were added to complement the predefined ones. In Table 1, all codes are split up in two categories: “primary coding topics” and “secondary coding topics” which are respectively the initial topics selected for the thematic analysis and the topics developed during the thematic analysis itself, based on new information collected during the analysis of the interview.

Primary coding topics	Secondary coding topics
Regulatory framework	Future ideas and concepts
Inclusion aspects	Financial aspects
Data-protection/-collection and privacy	Other drivers for development
Co-creation aspects	Other barriers for development
	Expectations of INDIMO Policy Evaluation Tool

Table 1: Thematic analysis codes

2.6. Co-creation workshop

After the initial results from the interviews, an online workshop was organised to consolidate and discuss the first results from the stakeholder interviews with external experts in mobility and logistics services consisting of transport and logistics service operators, software developers, policy makers, mobility researchers. In total, 36 experts participated in the interactive workshop. The objective of the workshop was to present and discuss the insights gathered in the case studies. The discussions were mainly used to validate the information that was collected from the interviews with the stakeholders.

3. Results

3.1. Selection of cases and stakeholders

The results are presented in four different sections, based on the major categories in the digital transport system: first car- and ridesharing is discussed, followed by bike sharing and micro mobility, smart logistics systems and finally also multimodal routeplanners and MaaS. Over the period of half a year, 22 stakeholder organisations, linked to a mobility or logistics service, were contacted to participate in this project. Finally, 10 suited cases were selected with 22 interviewees willing to participate. The

synthesized results of the interviews are presented in a table for each of the service types, which show the most important aspects for the development of a more inclusive digital transport system.

3.2. Car-and ridesharing

The topic of car-and ridesharing is the first of four topics and is covered by two case studies, Cambio and Mobitwin, which respectively included two (developer/policy maker) and three (Developer, operator and user group representative) interviews. Cambio is a provider of station based shared cars in Belgium. The service was first introduced in Germany, but is also active in Belgium since 2002 and currently has more than 47 000 members. Mobitwin is a ride service for elderly people and people who experience difficulties with their mobility. For Cambio, a developer/operator and a policy maker from Brussels Mobility, the regional administration responsible for mobility were interviewed. For the Brussels Capital region, a framework was developed related to shared mobility, including only some general accessibility and inclusion-related remarks are included e.g. a clear and accessible subscription system should be in place, the operator can also choose to make the cars available without the need for a subscription (Belgisch staatsblad, 2016).

3.2.1. Interviews

The results from the interviews with the stakeholders from both Cambio and Mobitwin are present in table 2. Car- and ridesharing services are the oldest types of shared mobility studied in this project, resulting in a **regulatory framework** that is older and has been further developed and adapted compared to other services. Both services considered it important to develop a service that is accessible and inclusive, however this was out of their own volition and not because the national regulatory framework mandates it. The fact that these types services are already relatively old compared to others in the digital mobility market resulted in a more stable market and service. Because of that stability and the fact that carsharing is already quite popular, it has been present in all major Belgian cities for quite some time.

Several aspects related to **inclusion** have already been introduced within carsharing-services, mostly focusing on providing a service available in multiple neighbourhoods within the city. Much fewer adaptations have been made based on digital inclusivity, financial inclusivity etc. For Cambio, this is different, their main 'inclusivity'-aspect is embedded in the core of the service: the call service. On their website they also explicitly mention they want to provide a service that is affordable for all (Cambio Flanders, 2020). Especially the developers of the Mobitwin app have tried to develop an app that suits the needs and expectations of their elderly users, resulting in a service that operates similarly as the Cambio service, with a combination of the digital options (app and web browser) and the well known call-center. But as was mentioned above, none of these changes are integrated in a national or regional framework, and are therefore not introduced by the other providers. The stakeholders claimed this to be a necessity because of the lack of knowledge about vulnerable-to-exclusion groups and the experience they have in trying inclusivity measures, which were often unsuccessful. Both services would support a regulatory framework that proposed options to provide access to these services vulnerable-to-exclusion groups in society.

Co-creation or user involvement and the strongly related bottom-up method for development of services could lead to a more inclusive service. The issues of app development and co-creation are not that easily solved according to the stakeholders because of several reasons: first, it is very hard for developers to reach vulnerable to exclusion groups, secondly, there is lot of difficulty to find enough people to have a large enough group and thirdly, activating and persuading ‘vulnerable’ groups to participate in e.g. testing phases has proven a major issue. The interviewee from the Cambio operator also said that not only the digital exclusion of lower educated citizens is an issue to use their service, but general knowledge about carsharing is lacking: This shows that even though there is a lot of digital marketing for similar services, the vulnerable-to-exclusion groups are not reached.

For the **data collection, protection & privacy** of different partners in a digital environment there are several issues that can be addressed according to the stakeholders. First, it is important that the implications of data sharing are made available and understandable for all users. Elderly people do not have the knowledge about the amount of private data they share. Secondly, they are rather keen on personal connection which led in some cases in sharing too much personal information. The operators from Mobitwin complained in multiple cases about the users having access to personal phone-numbers of the voluntary drivers (which is sometimes allowed in case of emergency). The data that was collected related to both services did not serve a specific goal, rather than understanding the current situation of their service.

Regulatory framework	<ul style="list-style-type: none"> • A regulatory framework is present in most cases, usually on a national level. • The framework is present due to stability market and is starting to push towards more inclusive services, but this is not mandatory in case of digital inclusivity.
Inclusivity	<ul style="list-style-type: none"> • Knowledge about vulnerable groups too limited • Depending on service different attempts: call center, cheap, personal approach, test-events. • Digitally contact with elderly is hard • Too fast, too soon for elderly people
Co-creation/user involvement	<ul style="list-style-type: none"> • Services are unknown among vulnerable to exclusion groups and not enough accessible communication. • Rather info-events and introductions. • Homogeneity of ‘test-groups’: highly educated and white. Post-development co-creation events are important.
Data collection/ protection and privacy	<ul style="list-style-type: none"> • Only mobility related data, with limited use, not especially about vulnerable to exclusion users • Lack of understanding ‘what data is collected’ among many vulnerable-to-exclusion groups

Table 2: Synthesis results Car- and ridesharing services Cambio & Mobitwin

3.3. Bike sharing and micro mobility

For the micro-mobility related services, three interviews were performed: two with stakeholders of the HIVE e-scooters in Lisbon (developer and policy maker) and one with a policy maker for micro-mobility services in Brussels (listed table 3). HIVE (part

of Free Now), a free-floating e-scooter service, started in Lisbon in 2018 and is part of the Daimler group. They introduced 600 shared e-scooters in the city and are even expanding, combined with the introduction of extra e-scooters, they also put a lot of effort in close collaboration with other local organisations and especially with local policy makers (Hinchliffe, 2018). Aside from Lisbon, HIVE-scooters are also available in cities across Europe (Vienna, Berlin, London, Manchester etc.). For the Brussels' case no provider of micro mobility was willing to take part in the research. During the interview with the policy maker, some questions related to the operation of a micro mobility or shared bike service were answered since the Brussels Region also has its own public shared bike scheme 'Villo'. Villo is a station-based bike sharing service provided by the Brussels municipality. The service currently offers about 5000 bikes stalled in 360 stations all over the Brussels Region. Villo is the best known providers of shared bikes, but other several other providers have been present as well over the years. Next to bike sharing schemes, there are also plenty of free-floating scooters present in the city such as Dott, Lime and Bird (Brussel Mobiliteit, 2020). Even though several other providers have left the city, the scooters are still widely used by more than 100 000 users, but there is also a lot of criticism because of their impact on the public space and especially related to safety issues when used on sidewalks, as they often are (Wallemacq, 2019).

3.3.1. Interviews

Although no actual bike provider was interviewed, the free-floating bikes have similar issues as the free-floating e-scooters. The experts in the workshop considered their barriers and strategies to overcome these barriers applicable to both e-scooters and shared bikes (table 3).

The first aspect discussed is the way in which the **regulatory framework** is being developed in the two cases and how this might impact the digital inclusivity of the service. The regulatory framework is often developed at a national level, but in many cases, also at a city-level (Eltis, 2020). Both for Brussels and Lisbon, a regional policy has been developed. This has not yet been fine-tuned so there are still a lot of gaps, which is for some part related to the limited knowledge policy makers often have about the types of services and because of. The accessibility-measures that were introduced are often based on physical accessibility rather than digital accessibility and inclusiveness. In Brussels and Lisbon, the regulatory framework was primarily developed for car- and ridesharing services, only later on micro mobility and bike sharing were added, which resulted in a framework that is not perfectly suited to these services.

Strongly related to the regulatory framework is the introduction of measures for a more **inclusive service**. The main issue the interviewees mentioned was the instability of the market and the fact that, although it evolves quickly, it is still a niche-product, which leads to the providers/developers wanting to develop the service in its totality, with only a (very) limited focus on the digital inclusivity of the service. For operators, developers and policy makers the development of a good 'general' service, within a reasonable regulatory framework that is financially stable is currently the main goal. Policy makers did acknowledge that research into more inclusive services is needed, but as stated before, it is currently not possible due to lack of knowledge and financial resources. It was considered as a failure of policy by both policy makers. Compared to the shared car market, it shows that financial and market stability leaves room for more inclusive

development. One potential reason for this is the age of the market, especially micro mobility came to life based on the widespread introduction and use of smartphone for subscriptions and payment.

User involvement and communication will result in better relations between the developers, operators and stakeholders, which has a positive impact on the service. In both cities, information events are organized by the local authority for people to learn about the new services and their digital aspects, but these were not considered to be very effective. There are two main issues concerning the co-creation or info-events, first there is the composition of the group knowing about and attending these events and secondly, many of these events, as described by the Brussels policy maker, are rather info-events, where information that has already been decided is shared with social organisations (e.g. unions, local social groups, neighbourhood groups, etc.). Certain groups in society (e.g. older people, migrants, people with limited education) are not as easily reached and as a result, their opinion and issues are not heard.

According to the Brussels policy maker, the concept of **data collection, protection & privacy** will also become an important matter for the creation of better digital mobility services. He considered the main issue to be the lack of trust between public and private organisations, which is needed if they are to share data. Data collection on a large scale is already taking place, but not everyone is as positive about this. The Lisbon operator considered data-collection to be beneficial, but not as it is performed now, without clear vision on what use the collected data has. Similar issue came up in each of the interviews, data-collection is hard, the advantages are not always very clear, lack of trust, lack of knowledge, not enough resources for specific data collection.

Regulatory Framework	<ul style="list-style-type: none"> • Regulatory framework is regional and based on carsharing framework, so not always suited to micro mobility. • Knowledge about service among policy makers is too limited. • Both hard or soft regulations are adopted to control micro mobility.
Inclusivity	<ul style="list-style-type: none"> • Small steps are taken towards a more inclusive service, but no regulations are present to push towards more inclusivity. • Need for smartphone and credit card in almost all cases. • Link with public transport and use of one payment method
User involvement/co-creation	<ul style="list-style-type: none"> • Lack of funding and instability of market make providers focus on 'easy to reach' users, in order to be financially feasible. • More frequent and intensive communication between stakeholders and with users. • In most cases there is a lack of communication with local authority
Data collection/protection and privacy	<ul style="list-style-type: none"> • Data collection is very limited and is not really used for analysis. • Contradicting vision on use of data: in detail or rather a general approach. • Data is needed to address impact on public space

Table 3: Synthesis results bike sharing and micro mobility services, HIVE & Brussels Mobility

3.4. Smart logistics services

Two types of logistics are studied, first there are smart lockers, in Valencia and the 'Mobile Lockers' in Flanders, and the delivery of goods using (cargo)bikes in Madrid

The Coopcycle case is a cooperative service, focusing on food delivery using (cargo)bikes. For this case the three main stakeholder groups were interviewed. Some of the issues related to the delivery of food in cities, which has grown exponentially over the years, were dominating the news for quite some time, especially related to the Coopcycle case in Madrid. La Pajara started working on their first collaboration projects and helped customers to fight against the working conditions of mainstreaming platform models (security, abuse, holidays, sick pay) inside national and international networks and associations. The second case study is also based in Spain and was developed as part of the European Horizon2020 project SPROUT in the city of Valencia. We performed an interview with a policy maker of the city. The use of smart lockers, provided by Citypack, for the last-mile delivery give operators more flexibility as it decreases the operational costs and reduce the failed home deliveries. Since the lockers have only been installed for a limited time, no data about use or the type of users is available. The third and last logistics service is a Flemish private locker service named Mobile Locker, providing very large variety of smart lockers since 2012. For this case a developer/operator and policy maker were interviewed. The lockers are permanent and provide, next to the logistic aspect, also some extra services, such as WIFI, cell phone charger on solar energy, etc. For the use of a locker, not even an application is needed. Just by scanning the QR (quick response) code, someone can use the service.

3.4.1. Interviews

Table 4 shows the main results for the logistics-related case studies. For logistics services, the development of a **legal framework** is less clear compared to the mobility cases. There have been problems with the status of riders, their pay and the social and job protection they enjoyed while working (Gómez, 2020). Although some form of legal framework is present in any of the cities where these services are active, none of the interviewees could give a clear answer on the content of that framework. The Madrid policy maker claimed that there was a plan for a decent regulatory framework to protect the riders but could not go into detail about the content or when this framework might be ready. Except for a potential regulatory framework to protect the drivers, there is no such framework to protect the customers, no rules were mentioned in order to be able to access vulnerable to exclusion groups. The Belgian policy makers did not mention the existence of a legal framework related to goods delivery by using lockers, they provide a rather supportive role without too much interference in the way the market is run. The developer of the Mobile Locker system claimed that, with the current status of the market the government shouldn't impose rules on the market at this point.

Often closely related to the lack of a regulatory framework is the limited factors promoting (digital) inclusiveness. Efforts in order to develop a **digital inclusive** service are very limited from a policy point of view, in both the Spanish and Belgian cases (and this is applicable in Europe) there were some efforts toward inclusion, but these were mostly related to the accessibility of buildings and services (e.g. screen displays should be accessible for people in a wheelchair). Coopcycle, being a quite inclusive organisation, has some aspects they are working of in order to create a more inclusive service. The other services do not have the same vision on the inclusivity of the service, except for acknowledging the issue, nothing much is happening to solve it. Based on

the inputs it could be concluded that there is a structural problem, rather than only the lack of funds and initiatives. Initiatives for a more digital inclusive system are not mandatory and not really promoted as well

User involvement such as co-creations could be a potential solution for some of the earlier mentioned issues, keeping in mind that for a more elaborate and better regulated framework, user involvement solely with potential users will not suffice. A bottom-up approach, combined with close collaboration with developers, operators and especially the policy makers (both at local level and above) are necessary to achieve an inclusive regulated service. The issue here, is that during the development of the services, certainly the lockers, a very limited amount of co-creation is part of the development process. The Madrid case can, based on these results, be considered as an exception.

The fourth main aspect is **data collection, protection & privacy**, which is very different for the bike delivery and the lockers. In the case of the lockers, the collected personal data in both cases is rather limited and mostly focused on the use of the lockers and the efficiency of the service. Coopcycle was not that busy with data collection, their focus was primarily on the creation of a fair system for the drivers and customers. When providing home deliveries some basic information is necessary for the services to run. That information was collected, but not shared or used for any reasons except for the delivery of the goods

Regulatory framework	<ul style="list-style-type: none"> • No national regulatory framework for the protection of couriers, initiative by organisations themselves (goods delivery) • No consensus on need and purpose of regulatory framework among different services (smart lockers)
Inclusivity	<ul style="list-style-type: none"> • Acknowledgement of need for more inclusive services, but lack of funding and knowledge. • Similar to the regulations, there are no rules to make the service more inclusive. • If inclusivity is not introduced by the developer/operator, it is not present in the service.
User involvement/co-creation	<ul style="list-style-type: none"> • Co-creation during development with riders created more fair value sharing (goods delivery) • All neighbourhoods are provided for without extra cost (goods delivery) • Except for the location, there are no user info-events (Smart lockers) • No collaboration with users or other organisations present. (Smart lockers)
Data collection/protection and privacy	<ul style="list-style-type: none"> • Only information relevant to delivery is stored, but not used for any other purpose (goods delivery) • Information about efficiency/use of the lockers is collected and used to find most profitable location (Smart lockers)

Table4: Synthesis results bike sharing and micro mobility services, La Pajara bike delivery& Smart lockers

3.5. Multimodal routeplanners and MaaS

For this part focusing on multimodal routeplanners and Mobility as a Service or MaaS systems four cases are studied, the BKK FUTAR app Budapest (developer & operator/policy maker), the HVV Switch app, used in Hamburg (policy maker), the HSL MaaS app from Helsinki (operator/policy maker) and Jeasy, a new MaaS developer active in Belgium (developer). The first case is a multimodal application for the city of Hamburg. It is a mobile app, named Switch, operated by Hamburger Hochbahn AG and the 'Hamburger Verkehrsverbund' (HVV), the local Transport Association. With HVV tickets it is possible to avail and transfer between rail, bus and ferry services. The full application was only available from 2020 onwards, in German and English. The two payment options: PayPal and a paper ticket. The second case study took place in Budapest (Hungary) where the BKK FUTAR service was studied by interviewing a developer and the policy maker/operator of the application. The application is a multimodal route-planning service mainly focusing on tram- and bus-use, but it can be used also for subway. For each of the modal options, real-time information has been integrated in the application and webservice, a main difference with the 'Switch'-app is the lack of an integrated payment option. The third service is HSL (Helsingin Seudun Liikenne or Helsinki regional transport) Public transport application used in the city of Helsinki and the surrounding areas. The HSL app is a good example of how apps can be developed and how other services are integrated: the app contains fully integrated real time information and payment systems (debit- or credit card or by using your phone bill). The application is not a full-option MaaS app because of its focus on public transport (e.g. in comparison with Whim from MaaS Global). The last service is the multimodal routeplanner Jeasy which is currently only available in the Belgian B2B market, focusing on multimodal commuting. Jeasy has developed an application that, based on preferences (e.g. shortest route, cheapest, environmentally friendly) from the user, presents a multimodal route for commuters. While they are currently only working with companies or organisations, there is already a beta-testing version for users available on the website.

3.5.1. Interviews

For these types of service more barriers/drivers are present because of the recent and fast development of MaaS-like systems, the large amount of data and information that is needed and because of strong debates about the development of new tools. Another point of discussion is the relationship between public and private initiatives. A synthesis of the results is presented in table 5

The **regulatory framework** for routeplanners or MaaS varied strongly in different cities and between the organisations. None of the operators mentioned a strict regulatory framework which they had to take into account. For the three (semi-) public organisations (BKK FUAR, Switch and HSL) there were however some general rules, mostly focusing on providing a service for 'everyone', 'the general or broad public', although this was not always supported by other claims about their target groups. Their approach is in line with the comments about the lacking regulations about the expectations from the city, regions they are operating in, the lack of (inter)national regulations about data sharing and the lack of standards. The Jeasy app tries to overcome this issue by using API's (Application Program Interface) to introduce their service into other applications. HSL tries to solve part of this issue by releasing licenses for limited time with some aspects of control (similar to KPI's). If providers of mobility services do not meet these predetermined KPI's, they are no longer allowed to work within the city or region.

Inclusion seems to be quite the challenge for multimodal routeplanners and MaaS-systems. None of the interviewees could indicate that they were considering specific groups of people vulnerable to exclusion. The developer from Jeasy approached inclusive design in another way, they considered inclusivity measures as part of a stepwise evolution of their service.. Also, the stakeholder considered it very important to collect information about excluded groups and to broaden their knowledge about the excluded groups and how they can be approached.

User involvement is present in a very limited manner for the development of routeplanners and MaaS-systems. According to the Helsinki policy maker it is a very competitive market where both private and public organisations are active. The severe competition and newness of the service and market push operators towards a type of service suited for the general public so revenue can be secured, only when the service is stable would steps be undertaken to make it more inclusive. In all the cases it was also clear that co-creation with potential end users was not really considered, rather they did interviews and surveys to see how many people were using a service, how often and how satisfied people were using the service. Jeasy however, did claim they work together with other organisations to provide API's (e.g. representing vulnerable user groups) in order for them to use the MaaS application in combination with the app for the vulnerable users.

Data collection, protection & privacy are very relevant in the case of multimodal routeplanners and MaaS-systems, similar to data collection, protection & privacy when providing door to door logistics services. In order for these services to work at their best, a lot of personal information is needed: preferences, skills, needs, expectations etc. This was also acknowledged by the stakeholders as described above. For MaaS systems to be efficient, a lot of data needs to be collected, resulting in a more urgent need for a very elaborate framework regarding this topic. One other significant aspect pointed out by the HSL policy maker and Jeasy developers is the need for shared data and information about routeplanners and MaaS-systems. When asked about European guidelines, almost all interviewees confirmed that if the EU wants decent MaaS systems, there is a need for standardised data sharing. Currently, data sharing is already present and is performed according to the EU-regulations, but in many cases this framework needs to be elaborated. In the Hamburg case the importance of data protection was also confirmed, but they considered the isolated, simultaneous development in different cities one of the major issues related to general development and sharing of data.

Regulatory framework	<ul style="list-style-type: none"> • No relevant regulatory framework was present • Isolated development simultaneously in different cities
Inclusivity	<ul style="list-style-type: none"> • Different development speed in private vs. public organisations. • Closer cooperation with users necessary
User involvement	<ul style="list-style-type: none"> • No measures were mentioned by operators or developers. • Public organisations develop services for all inhabitants, but this goal is not often reached. • Service still unknown the majority of the population
Data collection/ protection and privacy	<ul style="list-style-type: none"> • Fear that sharing data will lead to advantage for competitors • Lack of trust in public services handling data.

Table 5: Synthesis results multimodal routeplanners and Maas

4. Discussion

From the significant drivers and barriers described above, four topics were discussed more frequently and more elaborately during the interviews and thus, were considered to have a bigger impact on the development and implementation of an inclusive digital transport system. First, the need for a **regulatory framework on multiple levels** is clear, for both developers and operators, but also for cities and regions, so that there is a clear vision of what is needed and expected when services want to operate in a designated area. The framework should also address specific aspects such as accessibility, availability, inclusivity, sharing of data, collaboration between the private and public sector. Such a regulatory framework would push for more initiative towards the development of inclusive transport services and would therefore also have a positive impact on the number people making use of a more inclusive digital transport system. Secondly, there is a need for **collaboration and open communication** during and after the development phase on several levels. Firstly, operators and developers should have open communication so change happens faster and more efficiently, secondly they should be in close contact with the policy makers in the regions they are active in. In combination with a regulatory framework stating the needs and expectations from the service this would create a more stable market situation. We concluded that fluctuation in the market results in operators and developers focus on the general population without keeping in mind the vulnerable to exclusion groups and any measures to include these groups such as co-creation events. Market stability results in a more steady revenue stream, resulting in services taking time for co-creation with and input from vulnerable to exclusion groups. A third important aspect of communication is the need for **user involvement** and co-creation between all stakeholders and the (potential) users of their service, keeping in mind the need for heterogeneous groups when organising co-creation events. User involvement needs to be focused on the people vulnerable to exclusion and not on those already making use of the service. A major issue is the lack of knowledge among the stakeholders about vulnerable to exclusion groups, which makes reaching them very hard. This often results in events with very homogenic groups: highly educated, white, middle-class people who already have the means, skills and knowledge to make use of these services. A last pivotal topic for further development of the digital transport system is the **collection, management and sharing of mobility related data**. Shared knowledge and experience would be a massive boost for the development of services, which are now happening horizontally by developers and cities, with multiple developments experiencing the same issues and barriers. Apart from sharing knowledge and experience, sharing data, by the introduction of KPI's, would have a major impact on the efficiency for users. It is no surprise that the MaaS-like services already collect a lot of information, several of these services are in favour of sharing information, operators and developers are a bit more concerned. Sharing of relevant information could result in a disadvantage compared to the competition. Another aspect the operators and developers were concerned about is the management of data, they do not trust governments have the skills to collect, manage and share the data so that it creates advantages for all parties.

A regulatory framework related to inclusive development, data collection, data-management and sharing and collaboration, in combination with the growth towards a more stable market could have a positive effect on the inclusivity and accessibility of a mobility or logistics service. These topics will be key during the development of the INDIMO Policy Evaluation Tool.

5. References

- Brugha, R., & Varvasovszky, Z. (2000). Stakeholder analysis: A review. *Health Policy and Planning*, 15(3), 239–246. <https://doi.org/10.1093/heapol/15.3.239>
- Bates, R. H., Greif, A., Levi, M., Rosenthal, J.-L., & Weingast, B. R. (Ed.). (1998). *Analytic narratives*. Princeton University Press.
- Belgisch staatsblad. (2016). Wet van 28 april 2016 betreffende de houdende voorwaarden voor het gebruik van voorbehouden parkeerplaats aan operatoren van gedeelde voertuigen. http://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=nl&la=N&cn=2016042817&table_name=wet
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Brussel Mobiliteit. (2019). *Deelstepvloot dunt uit: Hive, Wind en Tier trekken weg*. <https://www.bruzz.be/mobiliteit/deelstepvloot-dunt-uit-hive-wind-en-tier-trekken-weg-2019-08-14>
- Cambio Flanders. (2020). *Voordelen | Cambio autodelen | Vlaanderen*. <https://www.cambio.be/nl-vla/voordelen>
- Crosby, B. L. (1991). Stakeholder Analysis: A Vital Tool for Strategic Managers. *USAID Implementing Policy Change Project*, 2, 6.
- Eurostat. (n.d.). *Internet access and use statistics—Households and individuals*. Eurostat Statistics Explained. Retrieved 15 January 2021, from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Archive:Internet_access_and_use_statistics_-_households_and_individuals&oldid=379591
- Eurostat. (2020a). *Digital economy and society statistics—Households and individuals*. Eurostat Statistics Explained. https://ec.europa.eu/eurostat/statistics-explained/index.php/Digital_economy_and_society_statistics_-_households_and_individuals
- Eurostat. (2020b). *Individuals using mobile devices to access the internet on the move* (Dataset No. tin00083). <https://ec.europa.eu/eurostat/tgm/table.do?tab=table&plugin=1&language=en&pcode=tin00083>
- Eltis. (2020). *Overview of policy relating to e-scooters in European countries*. <https://www.eltis.org/resources/case-studies/overview-policy-relating-e-scooters-european-countries>
- Franckx, L., & Mayeres, I. (2016). *Future trends in mobility: The rise of the sharing economy and automated transport-Annex A* (Deliverable D3.3; *Mind-Sets*, p. 113). European Commission.

Freeman, R. E. (2010). *Strategic Management: A Stakeholder Approach*. Cambridge University Press. <https://doi.org/10.1017/CBO9781139192675>

Gómez, M. V. (2020, September 24). *Spanish Supreme Court rules food-delivery riders are employees, not self-employed*. EL PAÍS. https://english.elpais.com/economy_and_business/2020-09-24/spanish-supreme-court-rules-food-delivery-riders-are-employees.html

Goodwin, K. (2013, January). *A Stakeholder Interview Checklist*. Boxes and Arrows. <https://boxesandarrows.com/a-stakeholder-interview-checklist/>

Hinchliffe, T. (2018, November 28). *mytaxi Launches 'hive' E-scooter Pilot Program in Lisbon—Portugal Startups*. <https://portugalstartups.com/2018/11/mytaxi-hive-e-scooters-lisbon/>

Pope, L. (2020). *Stakeholder interviews: What to ask and how to ask it*. <https://gathercontent.com/blog/stakeholder-interviews-what-to-ask-and-how-to-ask-it>

Robinson, J., Acemoglu, D., & Johnson, S. (2003). *In Search of Prosperity: Analytic Narratives on Economic Growth*. Princeton University Press.

Schmeer, K. (1999). *Stakeholder Analysis Guidelines*. 48.

Wallemacq, T. (2019, May 7). *De verborgen kant van elektrische deelsteps | Metro*. De Verborgene Kant van Elektrische Deelsteps. <https://nl.metrotime.be/2019/05/07/must-read/de-verborgen-kant-van-elektrische-deelsteps/>

Wick, A. (2012). *Six Effective Elicitation Questions to Ask Your Stakeholders*. BA Times. <https://www.batimes.com/articles/six-effective-elicitation-questions-to-ask-your-stakeholders.html>