



AVENUE

Autonomous Vehicles to Evolve to a New Urban Experience

D2.7 First Stakeholder Analysis and AVENUE strategies

Transport operators' perspectives and research agenda

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Executive summary

The report presents expectations and opinions of the four AVENUE demonstration cities' transport operators. It focuses on expected drivers and barriers for establishing autonomous vehicles in the respective public transport systems and analyses the roles of various stakeholders within this process. The report highlights stakeholder expectations and involvement, common and/or conflicting interests, as well as communication and coordination demands with regard to the variety of stakeholders.

1 Introduction

The purpose of the AVENUE project is to demonstrate and pilot the adaptability and efficiency of the deployment of small and medium autonomous vehicles (AV's) in Lyon, Luxembourg, Geneva, Copenhagen and 2-3 replicator cities as of the 3d year of the project. The AVENUE vision for future public transport in urban and suburban areas, is that autonomous vehicles will ensure safe, rapid, economic, sustainable¹ and personalized transport of passengers, while minimizing vehicle changes. The goal is to provide door to door autonomous transport allowing commuters to benefit from autonomous vehicles.

At the end of the AVENUE project - 4 year period - the mission is to have demonstrated that autonomous vehicles will become the future solution for public transport. The AVENUE project will demonstrate the economic, environmental and social potential of autonomous vehicles - for both companies and public commuters - while assessing the vehicle road behaviour safety.

1.1 Background

The AVENUE project aims at full scale demonstration of urban road transport automation with particular focus on autonomous vehicles in public transportation systems. The elaboration of requirements and use cases for such vehicles and systems is an integral part of the project and crucial for the future success of these operations. This includes state of the art of technology studies, user requirement studies, evaluations of legal requirements and various other assessments conducted within work package 2 of the project. To better understand the expectations and roles of a multitude of organisations, networks and institutions involved in realizing public autonomous transportation systems, a stakeholder analysis is one task (2.3) within the work package. The analysis is conducted in several phases and this report summarizes the insights from its initial phase.

1.2 Methodology

A stakeholder analysis is important for the identification of public interest and concern, and becomes even more important due to increasing interconnectedness of today's world². A stakeholder can be defined as *"any group or individual who can affect or is affected by the achievement of the organization's objectives"*³

A first and crucial step in a stakeholder analysis is the identification and selection of stakeholders relevant to the research domain. There are a number of different techniques available to select the

¹ Within urban transportation sustainable most often refers to electric vehicles.

² Bryson, J.M. 2004. What to do when stakeholders matter: stakeholder identification and analysis techniques. *Public Management review* 6(1), 21-53.

³ Freeman R. E. (1984). *Strategic Management: A Stakeholder Approach*. Boston: Pitman.

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appropriate actors, such as an identification based on involvement, interests, or participation.⁴ The starting point in this study are the actors involved in the AVENUE research project.

Methodically, this study relies on a qualitative research design⁵. A qualitative research design has been selected due to the explorative nature of this study. The analytical part of this study relies on Qualitative Content Analysis⁶. The empirical basis of this study relies on 4 semi-structured in-depth interviews with the AVENUE demonstration cities' transport operators. An interview guideline was developed to structure the interviews. This topic-list consisted of five central topics (please find the full interview guideline in appendix):

1. Involvement, Attitudes, Expected Trends
2. Information behaviour
3. Focus on autonomous e-busses
4. Role of the interviewees' organisation.
5. Identification and perception of other stakeholders

The data analysis procedure reflects the exploratory nature of this study. The data is analysed following theoretical propositions that underpin this research - hence the topics central in this report. This is an iterative strategy, that is designed to minimize potential loss of context in case study designs (with this strategy, we follow Yin 2009⁷). In a next step, transcripts of the interviews will be made, coded and interpreted following Mayring⁸.

⁴ Hermans, L.M. & Cunningham, S.W. 2018. *Actor and Strategy models. Practical applications and step-wise approaches*. John Wiley & Sons, Inc.

⁵ Lamnek, S./Krell, C. (2016): *Qualitative Sozialforschung*. 6. überarbeitete Auflage, Beltz-Verlag, Wiesbaden

⁶ Mayring, P. 2008. *Qualitative Inhaltsanalyse. Grundlagen und Techniken*. Beltz Verlag. Weinheim und Basel. ISBN 978-3-407-25501-3; see also Mayring, P. 2014. *Qualitative content analysis: theoretical foundation, basic procedures and software solution*. Klagenfurt, 2014, URN: <http://nbn-resolving.de/urn:nbn:de:0168-ssoar-395173>.

⁷ Yin, R.K. 2009. *Case Study Research; Design and Methods (4th edition)*. London: Sage.

⁸ Mayring, P. 2008. *Qualitative Inhaltsanalyse. Grundlagen und Techniken*. Beltz Verlag. Weinheim und Basel. ISBN 978-3-407-25501-3

2 Transport operators' perspectives

Transport operators are identified as key stakeholders in the actor network on autonomous bus shuttle development. Transport operators link the (potential) users of the system, with the developers of the system. The transport operator furthermore both have an interest in developing autonomous shuttle systems and have to power to implement the system. Therefore the first step focussed on this target group. In the subsequent sections, we will discuss the self-perception of the transport operators, their perceptions on the users of the system, their perception on the barriers and challenges to implementation. Based on these assessments we present the stakeholder map in the next chapter, indicating important stakeholders and their interests from the perspective of the transport operators.

2.1 Self-perception: Responsibilities and self-conception

The primary role of the transport operators is providing public transport services. All respondents stress that they feel a strong need to be competitive in the future. From their own personal as well as from their company's perspective respondents expect autonomous public transportation to contribute to societal benefits such better quality of life and improved health and environmental conditions due to reduced pollution. They perceive autonomous vehicles as a *"key topic for the future"* of society and their companies and as a decisive element of competitiveness in markets where completely new players (e.g. google as an operator) could emerge.

Concerning the transport operators' overall attitude towards autonomous vehicles, it is important to make a distinction between two groups of operators in our sample. A first group of operators has the sole task to develop autonomous shuttle systems. As a strong proponent of this new transportation mode, there is a strong match between the positive personal views on the development of autonomous shuttles, and the company's view. A discussion here is whether they will continue with the role of operating the autonomous vehicle systems, or whether this role will be transferred to public transportation operators.

The second group develops this system in conjunction with the operation of traditional public transport systems. In this group of companies, the development of autonomous shuttle systems needs to be balanced with the company's other responsibilities. In these companies, certain individuals and functions are interested in the development of this innovative system while others are still hesitant or not willing to support this development as they do not see personal or corporate benefits in the near future. Within larger transport operation companies, the attitude towards autonomous vehicle operation vary from enthusiasm, pride, and positive curiosity on one side to jealousy and reactance on the other. This is a rather common dichotomy in innovation processes in general. Bus drivers are an important internal stakeholder group that might be substantially affected by autonomous vehicles. Currently, autonomous vehicles are developed as an addition to the traditional transport system, though. As the autonomous lines are not replacing the existing lines, there is no fear of losing jobs for drivers (yet), on the contrary, drivers see it as an opportunity to engage in additional tasks.

2.2 Perceptions of other stakeholders

The transport operators are crucial stakeholders, but part of a larger social environment. In this section, we report on their perception on the other stakeholders. A subdivision is made between the end-users of the system and the other stakeholders.

2.2.1 End-users

For a successful implementation and future development potential of the autonomous shuttle system, the transport operators all highlight the critical role of (potential) users of the system. For the autonomous vehicles to evolve to a 'new urban experience' the system should fulfil the users' needs and provide an additional (not yet existing) service. Three aspects are important for autonomous shuttle systems to be successful; users should accept the technology, have trust in the system's safety and should perceive additional value (e.g. increase flexibility, reduce travel time).

Recent studies show that there is a high acceptability of the technology⁹ and that potential users are open-minded towards autonomous shuttles. While users seem to feel safe in terms of technology, the respondents also mentioned user-related safety issues. Recent pilot project have shown that other road users test the safety measures of the system, for instance by jumping in front of the shuttle (as a joke). A fear expressed by the respondents is the misuse of the safety systems of the shuttles. Once it is known by the general public that the shuttles will stop automatically for obstructions, people will be inclined to cross the road irrespective of an approaching shuttle. This could severely hinder operation and user-friendliness for those travelling with the shuttle, as unforeseen stops cause nuisance and might lead to unsafe situations within the shuttle.

From a safety perspective, our respondents stress that "technical safety" is not crucial for users, but "social safety" is. Social safety refers to "*Questions of feeling safe without driver in the bus*". Respondents mentioned the risk of feeling less safe on busses without drivers, especially at late hours.

For the users to accept the autonomous shuttle system they should perceive additional value. Here, our respondents foresee gaps in the usability of the system. Results from some existing pilot projects show that the autonomous shuttles are predominantly used by delegates and tourists. These are not the target audience, though. Reaching the target audience is still a major challenge. Our respondents proposed two strategies for reaching the target audience - targeting the emotional experience (motivator) and improving services (hygiene factor). The first strategy includes aspects such as reduction of noise and of increased comfort. Our respondents are divided in the importance of this strategy. Whereas proponents commented that shuttles have to become... "*Comparable to luxury tourist coaches - airlines (Wi-Fi, Entertainment...)*" and that the "*Comfort factor is decisive*", others claimed that "*We do not need more*", because "*After 10 seconds they use their own smartphone*" and therefore guaranteed internet connection for smartphone seems to be more

⁹ Keolis, NB. The highest customer satisfaction of all the means of transport. Power Point Slide
Keolis Downer, NB. Future-driven autonomous pilot projects at La Trobe university. Melbourne, Australia

important than additional entertainment. The second strategy relates to the frequency of transport services, on-demand services, night-time services and up-to-date information.

An important role for the transport operators is to manage the expectations of the users. Users, on their first exposure to the concept of autonomous busses “*expect a normal bus without a driver*”. In reality, the system is not as advanced as users expect. The speed of the busses is significantly lower than normal busses (max. 25 km/h) and, although not a driver, there still is an operator on board.

In conclusion, the transport operators are confident in the users’ acceptability of the technical system, but social safety is an issue to take serious. Furthermore, it is important to both offer and communicate additional value of the system to end-users.

2.2.2 Other stakeholders

In addition to the end-users our respondents reflected on other important stakeholders, including governmental actors, politicians, and manufacturers.

The perceptions on governmental stakeholders gives a very pluralistic view. In the Danish and Swiss cases, authorities, legislators, and municipalities are largely perceived as positive and supportive of the autonomous shuttle system; here the “*the window of interest is wide open*”. Other respondents sketch a more conservative and neutral environment, where administrative issues and regulation might become barriers (“*no-go’s*”) to implementation of autonomous shuttle services.

The manufactures have a crucial role as they provide the technology. Currently, the technology is determining and limiting the possible uses of the system.

Some of the obstacles and challenges related to other stakeholders are further analysed in the following section.

2.3 Obstacles and challenges

“We will not reach level 5 within the time-frame of the AVENUE project”

The transport operators in our sample, question the feasibility of implementing a fully autonomous (level 5) shuttle system by the end of the AVENUE project. This is not to question the capabilities of the projects’ partners, as ‘*even companies like Google or Tesla will not reach this level within this time-frame*’. In this section we discuss the challenges that need to be overcome before an autonomous vehicle system can be truly integrated in public transport system.

The transport operators perceived obstacles that we have grouped into four categories:

- Technological challenges
- Social acceptability (by users and employees)
- Regulatory framework (i.e. legal system, i.e. administrative)
- Market - business models

2.3.1 Technological challenges

The technology on autonomous driving has a long history. Currently, autonomous vehicles depend on prescribed routes and dedicated lanes that either are traced through a GPS system, or through magnets placed on-route. From a transport operator perspective, a barrier is that they depend on manufacturers for technological developments. A major challenge in the further development of an autonomous shuttle system in this respect is balancing the requirements that the current generation of vehicles set to the infrastructural environment, and the requirement that existing urban areas set to the technology of the autonomous busses. A challenge to address here is: What should be changed, the busses or the infrastructure?

As for now, the technology prescribes the requirements to the (infrastructural) environment, which include:

- An area with a speed limit of 30km/h. With a maximum speed of 25 km/h, the autonomous shuttles require either a separate driving lane, or the maximum speed should be limited to 30 km/h.
- Avoid obstacles
- Good GPS signal.
- Well maintained road - preferably asphalt
- Slope <12%

2.3.2 Social acceptability

Currently, there is a high acceptability of autonomous shuttles by users (this is discussed in more detail in section 2.2.1). Two aspects have not been discussed. A first aspect is 'prizing', in all current pilot projects, the shuttle can be used are free of charge. It is yet unknown whether users are willing to pay for using the shuttles.

In addition to the user-acceptability, the acceptability of the system by bus-drivers is a challenge for the operators. The drivers form a major part of the transport operators' workforce. Currently, as the autonomous shuttle systems are operated as 'addition' to the existing public transport network, the drivers perceive it as opportunities for new tasks. However, the activities and responsibilities as operators on autonomous shuttles is perceived as not satisfying or even boring. A current solution is to diversify the activities, alternating between driving on a normal bus, and the tasks of an operator on an autonomous shuttle. But, what happens when the shuttles will operate without drivers - will there be opposition then? On the other hand, new professions will be created with the introduction of autonomous vehicles, and the operators should train the existing drivers to the new needs and functions related to autonomous buses operations.

A third aspect of social acceptability is the demand side from the 'clients' of the transport operators. These clients are generally (local) governments and grant concessions to the transport operators. As responsible government agencies, they prescribe the modal split and preferred share of the public transport system and set requirements for the scope and quality of the public transport system within their administrative boundaries. As an example, the government of Luxembourg (ministry of Transport) aims to increase the share of public transport from 11% to 20-

25% in 2024, and aims for a transition to zero emission electric vehicles in 2030. The development of an autonomous shuttle system could support reaching these aims, however, a sole focus of electric busses with drivers could do so as well.

An additional challenge here is to move beyond the level of an 'innovation show-case'. The systems in place should really add value to the clients. Therefore, autonomous shuttle systems should only be placed at those locations where there is a demand.

2.3.3 Regulatory framework¹⁰

In general, legislation needs to be adjusted to allow for autonomous vehicles to operate on public roads. Currently, authorities and regulators are rather supportive and positive towards making autonomous transport happen. Nevertheless, the bureaucratic efforts to receive the required permissions can be rather high. One interviewee mentioned that the registration and application processes require the same amount of paperwork as building a new high speed train line. Such problems are likely to disappear once first permissions have been successfully granted. At present there is a tendency to allow only 'pilot projects', hence systems that are not yet fully integrated in the general public transport sector. Some of the interviewees mentioned that the full and frequent integration of autonomous vehicles into public transportation system might cause different regulatory challenges compared to the piloting phase.

2.3.4 Business models¹¹

A challenge for the operators is to close the business model. Currently, all vehicles in use have an operator on the vehicle. This operator makes the system too expensive, as they contribute up to 50% of the costs of the system. A second challenge is the high system cost for the busses in combination with required technology and infrastructure modifications. Competitiveness will be reached under the assumption of a rapid decrease of such costs in the future. With on-demand-services and operation of small busses, the public transport operators do furthermore face competition from taxi services and other modes of (autonomous) private shuttles and vehicle-sharing systems.

¹⁰ Please note: A detailed analysis of the regulatory environment is conducted within tasks 2.4 of AVENUE. This section highlights some general perceptions of the transport operators in this domain.

¹¹ Please note: Business models including societal economic consequences due to autonomous public transportation (reduction of time losses due to congestion decrease, lower levels of noise and emissions, etc.) will be assessed in work package 8 of AVENUE. This section highlights some very general perceptions of the transport operators in this domain only.

3 Stakeholder map

The findings from previous sections allow for a better understanding of stakeholder roles and engagement within autonomous public transportation. The following figure provides a stakeholder map based on the outcome of the transport operator interviews. The stakeholder map will be refined and adapted throughout next phases of AVENUE task 2.3.

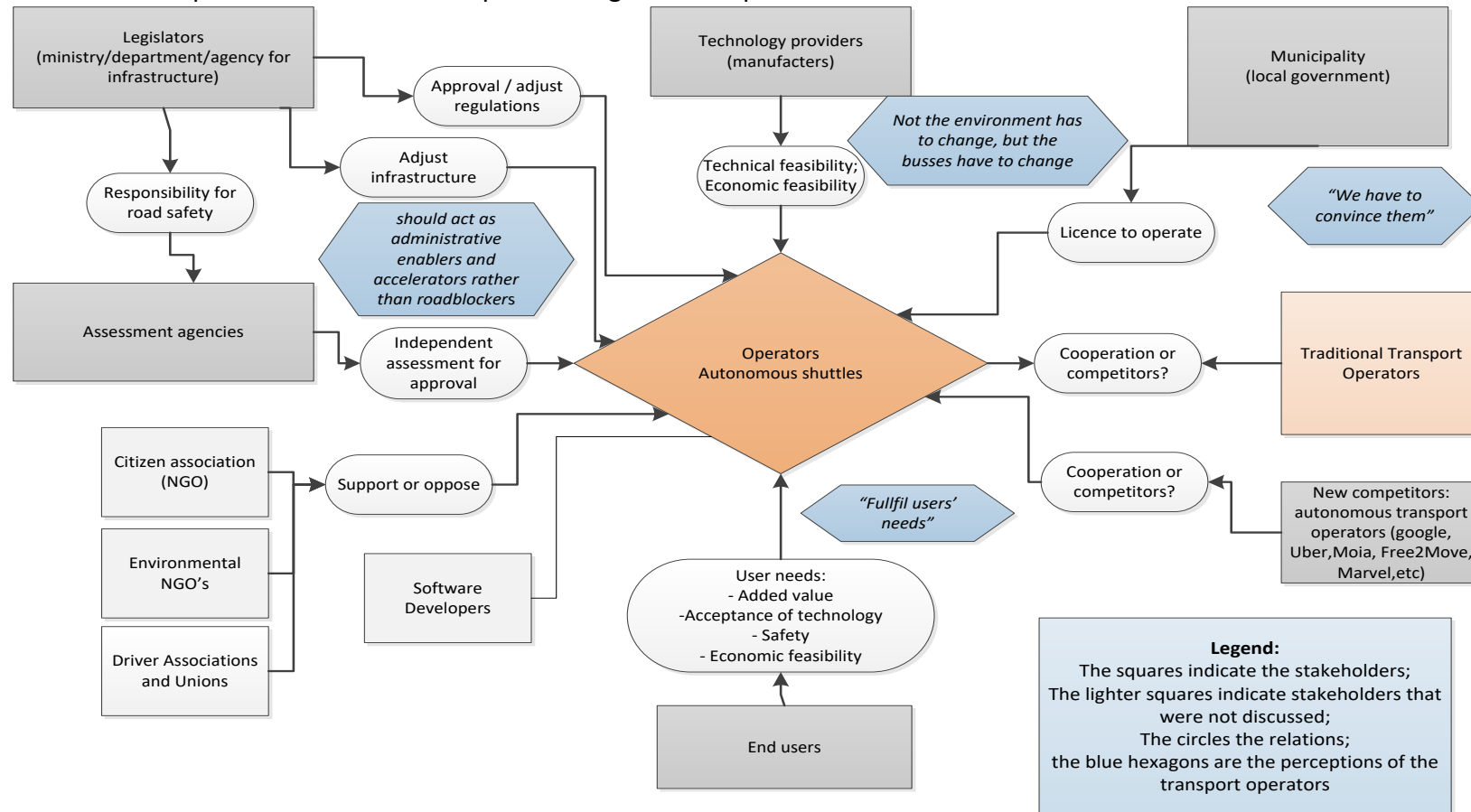


Figure 1 Stakeholder map from transport operators' perspective

4 Conclusion and research agenda

The transport operators have a crucial position in developing autonomous shuttle systems. However, they strongly depend on stakeholders at both the demand as well as the supply side.

As for the supply side, they are dependent on the manufacturers for technical developments. These technical requirements set enabling and constraining conditions for the application sites.

For the demand side, the transport operators are dependent on the local governments, as their clients, that set aims and goals for the future shape of the public transportation system in their geographic jurisdictions. They also have the power to grant or withdraw concessions to operate as a transport operator in their jurisdiction.

A second group of stakeholders on the demand side, the transport operators depend on the end-users. Only systems that fulfil the end-users needs and provide real added value are future proof.

At current, societal stakeholders such as driver unions or environmental activists are not playing crucial roles. This might change once autonomous public transportation system get scaled up.

In next phases of AVENUE's work package 2 task 2.3 the stakeholder analysis will take wider perspectives. This includes further interviews with stakeholders and experts in order to validate or scrutinize the first phase findings and other research modes, e.g. comparative cognitive mapping.

The four demonstrator cities Copenhagen, Geneva, Luxembourg, and Lyon will be focal point of immediate next research activities before at later stages further dissemination cities and regions are included as well. The overall outcome will be aggregated into general conclusions and strategic recommendation for stakeholder engagement for the further dissemination of autonomous public transportation within Europe.



Appendix

Guideline for stakeholder interviews within task 2.3

Methodology n=4 to 30 in-depths

**duration determined by interviewee
(at least 60 minutes, max. 2 hours)**

Sample structure:

Stakeholder
• 4 operators (Geneva, Copenhagen, Lyon, and Luxembourg)
• additional stakeholders as opinion leaders, city councils, political influencer, citizens' initiatives etc. (at later AVENUE stages)
• Final sample will be defined data-driven, means that additional interview partners will be selected driven by the results of previous interviews

Key questions:

- Personal involvement, personal interests of stakeholders
- How are autonomous vehicles reflected in general?
associations, thoughts, opinions, knowledge
- Specific reflection of the situation in the pilot (autonomous e-busses in local areas)
- Expectations towards advantages, disadvantages, risks, opportunities in general and for each local area
- Who are, in the view of the respondents, important influencers, stakeholders?
- Typical stakeholder interactions
- Common and/or conflicting interests
- Desired automation, control and monitoring levels
- Level of acceptance of different service and business models, etc.
- Elaboration of strategies to overcome potential conflicts of interests and take advantage of mutual expectations and objectives between stakeholders

(scale-up from local to European level)

To provide respondents a maximum level of openness the guidelines determines the topics in detail but does not determine accurate direct questions.

General Remarks

about 5 min.

- Data protection declarations
- Request for audio recording
- Use of citations for reporting
- Introduction of the interviewer

I. Warm-Up

about 5 min.

Introduction of the respondent

- Professional background, professional career as technical, economic, political, social, psychological background
- Current areas of responsibilities

II. Involvement, Attitudes, Expected Trends

about 10 min.

Aim: Identifying personal and professional involvement, personal and professional interests of stakeholders, self-conception

With regard to your own person but as well with regard to your professional tasks, what do you think about mobility in general, public transport and finally autonomous vehicles in special?

- Personal and professional attitude, guidelines, goals
- Personal and professional involvement concerning e-mobility, autonomous vehicles as is it an affair of their heart, are they open-minded, neutral, enthusiastic or sceptical?
- Which future trends, developments are expected concerning mobility in general?
- Which role will automobility play in future? Will automobility stay but change or will automobility completely be substituted?
- How far will these developments change our personal and social life?
- Which opportunities but also risks are expected for one's own professional area, one's own company?

III. Information behaviour

about 5 to 10 min.

Aim: Identifying relevant sources for information, formal information but especially as well informal information, social networking, formal and informal interaction with other stakeholders / Who are, in the view of the respondents, important influencers, stakeholder?

E-Mobility and autonomous vehicles are huge and very complex topics. It may be difficult to

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build up once own mind. What are you doing to obtain the information you need to build up your own mind.

- Touch points with e-mobility and autonomous vehicles - so far as in the private area, political area, professional area, economic, social...
- Formative experiences
- Using public media, which?
- Using scientific studies, professional publications
- Working groups, personal network
- Preferred sources for information, why these? Seriousness, credibility, competence...
- Most important partners for discourse, interaction, why these?

IV. Focus on autonomous e-busses

about 10 to 20 min.

Aim: How are autonomous vehicles reflected in general? associations, thoughts, opinions, knowledge
Specific reflection of the situation in the pilot (autonomous e-busses in local areas)

Now I'd like to go into more details concerning autonomous vehicles especially autonomous e-busses. You may know there will be a pilot in your city. What do you know about this pilot so far?

(If respondents are not yet involved, some prepared background information is given).

Which thoughts come into your mind when you think about this pilot?

CHECKLIST

Thoughts about...

- main Trends (Individuals, Society, Markets, Technologies, Ecology, Politics/Legislation) driving an AVENUE Concept
- expected advantages, disadvantages (towards the already above mentioned checklist)
- expected risks, opportunities (towards the already above mentioned checklist)
- challenges, obstacles
- public vs. private mobility
- security
- sustainability, ecological aspects
- legal issues
- administrative aspects
- political aspects
- technological aspects
- economic aspects
- social, psychological aspects
- target groups
- competitors, competing interests
-

V. Role of the interviewee's organization

about 10 to 20 min.

Aim: Identifying the interviewee's role within his/her organization with regard to autonomous vehicles. Understanding the importance and interests of the organization's stakeholders.

We have talked about your work at [organization name] already. How would you describe the role, the specific interests, strategic goals or even responsibilities of your organization with regard to introducing and establishing autonomous public vehicles (mini busses in the first place) in your community/city?

CHECKLIST

- Role of own organization
- Specific interests, strategic goals, general Vision
- Regarded success factors
- Strengths & weaknesses, advantages/disadvantages
- Risks & Opportunities for the own organization
- Expectations towards different target groups, attractive market segments, application fields
- Who will accept, who will refuse using the autonomous e-busses? Why? Who will be the End Users (e.g. general people, scholars/commuters, tourists, shoppers, weekenders/'night owls')
- Challenges, obstacles, threats (e.g. competition, politics/regulation/technical/technological, individuals/society, business, politics/legal, ecology)

VI. Identification and Perception of other Stakeholders

about 20 to 30 min.

Aim: Identifying important stakeholders for the data-driven "theoretical sampling"

Projective question:

How is the topic discussed in the public media, in the scientific context, in a more private context?

CHECKLIST

- Who is strongly involved in the public, scientific or political discussion? Might be politicians, municipalities, "proper" organizations, other companies, competitors as taxi drivers, bus driver organization, other groups of people etc.
- Which are their main interests and concerns?
- Whom does one expect to be strongly critical and why?
- Which of these stakeholders could be most risky for the realization of the avenue project? Int.: Ask for ranking!
- Whom does one expect to be strongly supporting autonomous e-busses and why?
- Which of these stakeholders are most crucial for enabling autonomous public transportation and why? Int.: Ask for ranking!

VII. Wrap Up - Final Self-Reflection

about 5 to 10 min.

Aim: Common and/or conflicting interests / Desired automation, control and monitoring levels / Level of acceptance of different service and business models, etc.

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Elaboration of strategies to overcome potential conflicts of interests and take advantage of mutual expectations and objectives between stakeholders (scale-up from local to European level)

Expectations towards advantages, disadvantages, risks, opportunities in general and for each local area

Please imagine there is civil/public forum. You are invited for a public speech. What would be the main content of your speech?

And now imagine there is an important meeting in your professional context. You are asked to present your own position towards the pilot with the autonomous e-busses in your city. What would be the main contents of your statement in this context?

- Expected advantages, disadvantages (towards the already above mentioned checklist)
- Expected risks, opportunities (towards the already above mentioned checklist)
- Challenges, obstacles

MANY THANKS FOR THIS INTERVIEW !
