D1.2 – User needs and requirements on a digital transport system

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Executive summary

1. Objectives and methods

The present deliverable is the product of WP1's T1.2 task and provides an understanding of the goals, needs, challenges and limitations of a range of vulnerable user profiles and user characteristics towards the use of digital mobility services. In order to find and define these user requirements, the task had three objectives:

- In the five pilot locations of INDIMO (Emilia-Romagna, Antwerp, Galilee, Madrid and Berlin), via literature research but mainly stakeholder interviews insights were gathered about the targeted user profile and user characteristics reactions towards the service (or a proxy) INDIMO would redesign for their benefit throughout the project's lifespan. In total 26 interviews were performed in the five pilots.
- Five additional user studies were performed (in Budapest, Brussels, Madrid and one on the level of the EU) in order to shed extra light on user characteristics, particular topics or transport modes that were not completely covered by the pilots. In total 12 interviews were performed as well as a literature study (in particular for the Brussels user study and the user study on privacy).

Based on these two research activities between June and November 2020, the table below indicates for which user characteristics of vulnerable users T1.2 could gather requirements. The identification of the requirements was based on the 15 dimensions defined in D1.1., the methodological deliverable that underpins WP1 work:

User charact e-ristic	Older person s	Mobilit y impaire d	Visual impair ed	Social ly isolat ed	Cognit i-vely impair ed	Low inco me	Care-giver s	Wom en in rural area's	Migran ts-refugee s	Vulne-rable youth
INDIMO PILOT	Emilia-Romag na Antwer p	Antwe rp Madri d	Antwerp Madrid	Madri d	Madrid	Madri d	Berli n	Galile e	Emilia – Romag-na	-
Additio nal user study	EU - Privacy	Buda-pest	Buda-pest	-	-	-	Madr id Buda pest	-	EU-Privacy	Brusse ls

We want to stress that for the INDIMO pilot studies, user requirements were gathered via the perspective of stakeholders. We understood the notion of "stakeholder" as an actor that is active in pilot site and that, due to its activity, has experienced interaction with persons with the user characteristics selected by INDIMO in the pilot. As such they can inform INDIMO about the end-user and his/her requirements towards the INDIMO pilot service although the end-user still remains someone who '*is spoken about*'. The research

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results reported in this deliverable should thus be read in combination with the output of D1.3 as the latter interviewed users and non-users in the five INDIMO pilot locations in order to identify the capabilities, limitations and constraints towards digital mobility applications and identify user requirements.
The third objective of this task was to use and combine the insights from T1.2 and T1.3 to create for each INDIMO pilot a persona via 2 webinars with the pilot leaders in December 2020 and January 2021. This persona combined several relevant end user characteristics and the gathered goals, needs, challenges, limitations, capabilities, limitations and constraints towards digital mobility services. The persona has the aim to 'humanise' the output of T1.2 and T1.3 by creating a fictional person, rooted in research results, that, instead of a blank list of requirements, can inspire the INDIMO pilot team - and the developers in particular - with the redesign by INDIMO of the digital mobility service in the pilot. Starting from the designed persona, a user journey map was created that charted along four stages the end user actions, thoughts and emotions as well as the channels with which he interacts with the service. These four stages are i) awareness of the service (how does one get to know the service?), ii) consideration (how does one find more information about the service?), iii) usage (how does one use the service?) and iv) post-usage (how can one react with the service- feedback). Based on this exercise, insights to improve the end user journey by means of the INDIMO redesign can be identified.

2. Key lessons

User goal and needs

The different INDIMO pilots were all acknowledged to have the potential to have a positive impact for the various user profiles. Vulnerable users will use the digital mobility services because a) they can increase autonomy by reducing the dependency on other persons and by reducing insecurity, b) they end isolation by connecting with relatives, c) they increase quality of life with their offering and d) they support emancipation and education.
In order to achieve these goals, there is a need for an easy and convenient system. This can on the one hand be achieved, not necessarily by using the newest technologies, but by rather looking in an intelligent way for familiar used technologies or solutions that allow hands-free operations. On the other hand, it can be achieved by easy accessing and by supporting flexibility - allowing for sudden changes in needs and adapting the requests.
Some needs are more connected to particular vulnerable characteristics and go beyond technology. Confidentiality is a particular need for refugees and migrants. Persons with impairments (mobility, visual, auditory, cognitively) are highly in need of a system that is deployed within a broader strategy or structure in order to avoid a mere symbolic implementation of the solution. For example, in case of a smart light, not only the light, but the number of lights as well as the way to the light matters. In the case of food delivery, not only the availability of healthy food options matters, but also that it is presented in a structure approach of menus. Caregivers demand a solution that pays as much importance to the person they take care off as to themselves, requesting particular demands to the service agent or the physical tool involved (car, tram, …). For woman from ethnic minorities in rural settings, the need is to reconcile two worlds: the one of tradition and the one of modernity.

User requirements

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In order to achieve the above-mentioned goals and needs, the following user requirements were deducted from the stakeholder interviews:

Usability: Interfaces (digital or physical) should be intuitive and easy to use with an interface in the local language and using easy to understand terminology. The latter becomes more important with the age of the users. Gender sensitive terminology was mentioned as a requirement for the women belonging to ethnic minorities in rural areas. Attention should also be given to features that increase accessibility (adapting fonts, using colours, incorporating voice-over text technologies, …).

The digital and physical tools should have a special approach to errors. On the one hand, the information they provide should be without mistakes (as people in particular difficult circumstances count on them to support them), while on the other hand, the functions that allow the user to provide information to the system, should be designed as much as possible to tolerate mistakes made by the user and allow easy ways out (a restart button and procedure, going back, confirmations, …).

What concerns the digital tool, vulnerable people will prefer the option of being able to set individual preferences (personalisation). This is not to increase the ranges of available choices , but to target and streamline the action they need to do with support of the application.

Finally, the physical tool should be recognisable by means of a clear branding and placed in a location that is easily accessible. In case of ridesharing and ride-pooling service, the car should meet certain requirements of safety and of size and storage space.

Workflow: The kind of workflow requested will depend on the kind of service. Two broad categories of workflow can be discerned. For delivery systems – digital lockers, healthy food delivery – as well as smart traffic lights, the vulnerable profiles demand a structured approach (e.g., step-by-step like in Instagram). In the case of the first two services, this is to reduce the information overload and allow for a learning curve through usage. In the latter case this is to be sure that too much information won't distract the user from the traffic circumstances.

In the case of transport systems, the user profiles on the other hand ask for a logical order – search, select, order, confirm – but in order to act fast, it is requested to set preferences or save history in order to skip parts of this order. For example, a caregiver of a child might need to adapt a ride while looking after a kid: she or he does not have time to move through the whole interface but rather would like to order a ride based on past searches or preferences.

Support and assistance: Besides support tools such as videos or a FAQ, there is also a need for human assistance among most of the user characteristics. In the case of younger profiles (women from ethnic minorities in rural villages or caregivers of children) the fact that a helpdesk is not operated by a bot or another technology but by a person is sufficient. In the case of older persons, persons with impairments, isolated persons or persons with low income, training is felt essential. This starts already in the early stage of detecting the system and follow-up should be organised throughout the usage stage. Working together with specific organisations that are working on the ground with vulnerable users is seen as a key element for success.

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A particular aspect is the service agent. According to stakeholders, service agents play an important role, either as a support to explain/demonstrate a service (older persons, digital locker) or as crucial element in the experience of the service. This latter aspect is important for ride-pooling and ridesharing systems where the driver should be trained to understand caregivers and their specific needs. In the case of food delivery services, the service agent should talk on a tone that is familiar for them (soft, clear).

Privacy and security: For stakeholders, privacy relates on the one hand to a need to follow data privacy legislation, although they stress that some user groups won't be interested as such in the issue apart from bank details (older persons in particular). Besides data privacy, privacy also relates to preventing eavesdropping with impaired persons or protecting the safety of refugees (preventing giving away locations to authorities or human traffickers). Women from ethnic minorities in rural areas also request a certain respect of their privacy, for instance by not having a publicly visible profile on the service.

Trust and reliability: For vulnerable persons, trust will depend on the one hand partly on the operator that is running the service. On the other hand, also opinion leaders around them are important to introduce them to a service. For the service itself, rating of service agents is considered as a means to increase trust. Finally, a reliable service is very important, especially for impaired persons. They count really on these services to organise their mobility and a non-functioning system might have an important impact. Reliability is also important for users of ride-pooling and ridesharing and is in this context understood as offering a punctual service.

Covid-19. An important part of the covered profiles by INDIMO are considered to belong to a group at high risk – older persons and impaired persons. A general requirement for vulnerable end-users will be that each service will develop a particular interaction protocol, apart from the general sanitary measures (wash hands, distance, gels). For home delivery services this means looking for safe ways to drop the food at home, with a different approach for each vulnerable segment. For transport services – be it ride-pooling or ridesharing – certain grouping of passengers will be needed in order to reduce risks of contamination. This is more urgent if caregivers are the target audience of the latter services. For digital lockers the system will have to be redesigned in order to avoid cues – for example by spreading opening hours of the place where the locker is installed or by organising a ticketing system with a certain hour when one can use the locker.

Covid-19 also had an impact on vulnerable pedestrians. Vulnerable pedestrians such as mobility and visual impaired testified that other persons initially were more hesitant to provide assistance on the road. The Belgian public train provider for example interrupted the service for impaired persons. Only after a few weeks they noticed a change in attitude. Apart from a change in attitude of other pedestrians, the fact that during lockdowns less people were on the street also impacted the mobility of visual impaired people as they had less auditory cues (cars, boots) around them to orient themselves or cross streets.

Persona and user journey

For each pilot a persona was created to turn the gathered users' goals, needs, challenges, limitations in the stakeholder interviews and the interviews with users and non-users (See D1.3) into a human portrayal of a user that can inspire developers to redesign the INDIMO services into a more inclusive and accessible tool. The persona represented the user

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characteristics for which the most information was collected in a pilot. All 5 personas turned out to be women, but apart from that touched upon different user characteristics. For each of the personas, also a user journey map was designed in order to portray the current user experience for developers and the pilot teams. Key areas of attention to improve the user experience with the INDIMO services are the following:

- Awareness stage:
  - Communication at crucial contact points with vulnerable end-user
  - Build a network of local organisations/opinion leaders
- Consideration:
  - (Structured) information on the application/digital tool
  - Set-up a support strategy
  - Highlight particular functionalities present on the tool that are relevant for the target audience
- Service usage:
  - Check presence /train service agent
  - Enable key-functionalities that support the vulnerable target audience
  - Real-time and structured information
  - Provide support to users via familiar app such as WhatsApp
- Post – usage:
  - Work on feedback channels in order to learn lessons about end-user experience
  - Assure post-usage follow-up (monitoring of usage, adapt learning strategies)

3. Relation to other tasks and work packages

The output of T1.2 will in a first step be integrated into D1.5 that provides a synthesis of the outcomes of the current deliverable D1.2 (requirements based on stakeholder interviews, persona and user journey map), the deliverable D1.3 (limitations, capabilities of users and non-users) and deliverable D1.4 (policy makers, operators) in order to identify recommendations to the Universal Digital Design Tool Box that will be developed in WP2. In that sense, the results of T1.2 will inform and support the development of guidelines of the Universal Design Manual and the Universal Interface Language Icons in WP2, while the persona and user journey map will be used in WP3 by pilot teams in the three pilot development phases.

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1. Introduction

This deliverable refers to the output of task T1.2 '*Analysis of the requirements of users towards the digital interconnected transport system*'. It is part of Work Package 1, which has the aim to analyse barriers and identify opportunities to tap the full potential of digital interconnected mobility systems from an inclusion perspective.

This task has two main objectives:

1. To collect and analyse information of users about their goals via 10 user case studies, needs and preferences towards digital mobility services, the skills and capabilities they need to possess as well as the difficulties, limitations, constraints and challenges they can experience while using these;
2. To design personas and user journey maps based on the research above and the analysis of in-depth interviews with users and non-users of digital mobility services in T1.3

INDIMO involves 5 core pilot studies, in Emilia-Romagna, Antwerp, Galilee, Madrid and Berlin. On top of that, five additional user case studies were identified that focused on user characteristics considered important by the Consortium but not completely covered by the five core pilots. These additional components were: i) caregivers and people with visual and mobility impairment in Budapest, ii) caregivers and assistance providers in Madrid, iii) micro-mobility and vulnerable youth in Brussels, iv) privacy and cybersecurity and v) the perceptions of refugees, elderly persons and impaired persons.

In order to reach these results, the methodology developed in D1.1 '*Analysis Framework of user needs, capabilities, limitations and constraints of digital mobility services*' was followed. On the level of the five core pilots, first a literature review was conducted about the foreseen end-users followed by interviews with five stakeholders that due to their activity have a good view on potential end-users. For each pilot, user goals, needs, preferences, skills, limitations and challenges were identified on the level of the different components of the pilots dispositive: the digital tool, the physical tool, a service agent, the organisation of the service, the user assistance and support, privacy and security, trust and reliability and the Covid-19 situation.

For the additional five user case studies, different data collection methods were followed (interviews or literature study), depending on the aim of the user case study. These user case studies also led to some recommendations to overcome end-user barriers or address end-user needs.

Thirdly, via two co-creation workshops with each pilot, one persona and one customer journey map for each pilot study were created (Madrid has two personas and customer journey maps), to integrate the insights that were drawn from the user case studies and the (semi-structured) interviews (SSI) in task T1.3. The user journey map for each of the additional pilots starts from the current situation and aims to identify points of negative end-user experience of vulnerable user types while currently performing an action that the

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INDIMO pilot wants to ease or resolve (e.g., book an informal ride in Galilee or a cross a street as blind person in Antwerp).

Given the Covid-19 situation, interviews had to be conducted remotely, possibly resulting in a higher response of digital skilled stakeholders over other stakeholders without internet connection, smart phones or other type of devices. This potential gap of representation, however, have been addressed during the CoPs, MetaCoPs and other INDIMO activities. We discussed about alternative options to deliver digital mobility services such as sending SMS, being able or to use the app without mobile internet connection. It is important to mention that in most of the pilots final users reported to own a smart phone and that most of the challenges were rather related to lack of digital skills and battery consumption (see D.2.5 Enhancing appropriation of digital mobility services). e.g., In Madrid users reported to regularly use WhatsApp.

These findings are supported by the statistics and literature for example by 2019, the share of EU-27 households with internet access had risen to 90 %, some 26 percentage points higher than in 2009 (64 %) (Eurostat, 2020). Digitalization has been further accelerated in many social and economic activities during covid-19 restrictions (McKinsey & Company, 2020). Finally, a recent study made in the US among older citizens shows that the smart phone ownership has been increased from 81% in 2019 to 85% in 2021 (Pew Research , 2021).

Given these positive trends, and the scope of the project, we agreed therefore to focus on mobile and web applications assuming the target population has, at least sporadically, access to Internet connection.

In WP1, the collected requirements from the ten user case studies, the personas and the user journey maps will be used in T1.5 that will synthesize the results from task T1.2, T1.3 and T1.4 and provide recommendations for the INDIMO inclusive digital design toolbox in WP2. The personas and the customer journey maps will also support the development of the five INDIMO pilots in WP3, by highlighting user needs and critical points in the current user journey of the targeted vulnerable groups.

The deliverable report for the WP task is structured as follows. Section 2 first presents the applied methodology to identify the user goal, needs, skills, capabilities, limitations, challenges and constraints of end-users and to create the persona and the customer journey map. Secondly, it discusses interesting end-user stories. Sections 3 to 7 are each dedicated to one pilot, to present the identified user requirements, the selection and the composition of the persona and the creation and insights from the user journey map of the current situation. Section 8 consists of the elaboration of the five user case studies and the identified lessons learned for the project. The deliverable report ends with a conclusion showing the importance of the performed work for the other activities of the project.

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2. Methodological approach to grasp user needs, goals and preferences

The methodology for this deliverable followed the approach for task T1.2 as laid out in D1.1 '*Analysis Framework of user needs, capabilities, limitations, and constraints of digital mobility services*' and consisted of three steps (Figure 1):

- Identification of 10 user case studies. Besides the five core pilots, five additional user case studies were identified.
- Collecting information about user needs, goals and preferences, skills and capabilities as well as challenges, difficulties, limitations and constraints of users of digital technologies for mobility by means of literature and stakeholder interviews in the five pilots and by means of interviews or literature analysis in the five additional user case studies. Provide recommendations based on this collection of information about end-users.
- Designing a persona for each pilot for the most relevant user profile or user characteristics based on the research above and the insights from the SSI with users and non-users in task T1.3. Starting from this persona, define a customer journey map based on the current situation in the pilot.

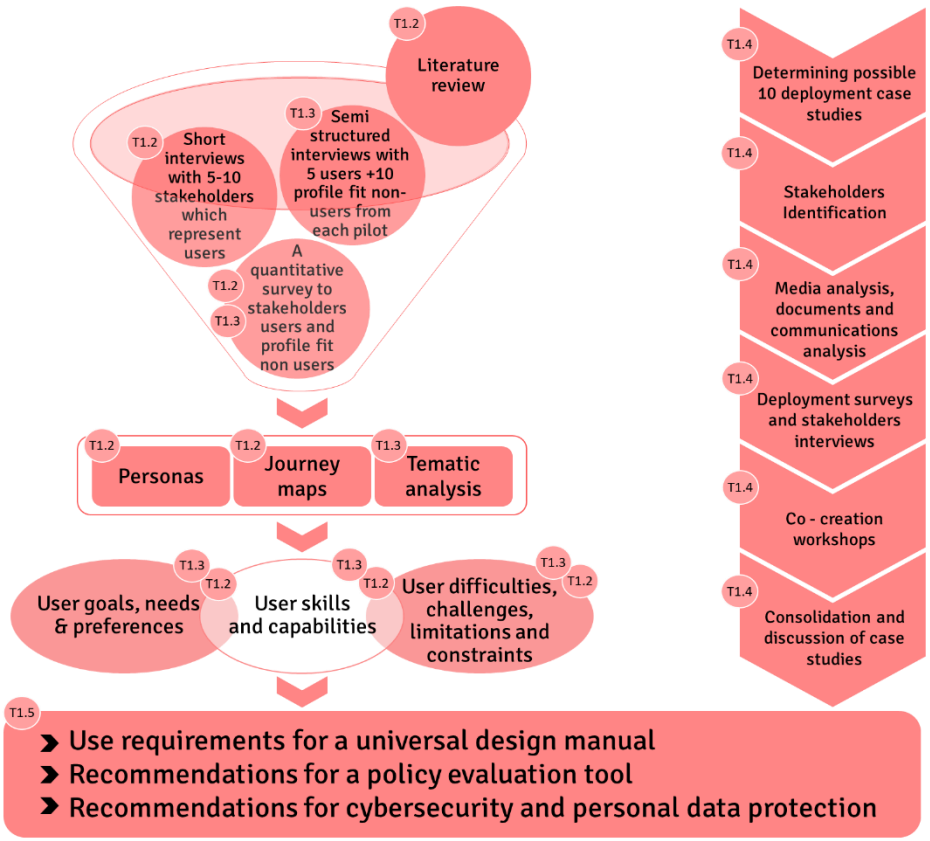

Figure 1: WP1 work plan and task T1.2 methodology

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The activities of T1.2, T1.3 and T1.4 were multiple and so all the "methodological partner" institutions (VUB, MBE, Cambiamo, imec, DeepBlue, Technion and EPF) organised regular online methodological calls between May 2020 and December 2020, according to the WP1 needs. The aim was to align the programme across the different studies (timing, avoiding content overlap, etc) and monitor the progress of the research activities of T1.2 with T1.3 and T1.4.

As one can observe from Figure 1, a quantitative survey targeted to vulnerable end-users was also planned in the pilots for T1.2. The goal was to further elicit the matter of user needs, goals and preferences for different digital technologies for mobility. But it was decided to postpone the end-user survey to February-March 2021, due to the Covid-19 situation, knowing that also the recruitment of vulnerable persons turned out to be difficult for some pilots in the context of the pandemic. This will allow us to use the survey method as an opportunity to further research certain aspects and dimensions that emerged from the analysis of T1.2 and T1.3 and needed some more insights (for example the aspect of support from social networks). The results will be reported in D4.2 "Baseline Data report for pilots" as part of WP4 "Evaluation and transferability assessment'.

The next three sessions will discuss in more detail the methodology and data collection strategy that was followed by the project for Task T1.2.

2.1. Selection of additional user case studies

The aim of the additional user case studies is to complement the core pilots by focussing on i) specific user profiles and user characteristics and ii) issues/digital mobility services that are not or could not be fully covered by the five pilots.

What concerns the user characteristics, the WP1 methodological partners made a comparison of the user characteristics covered by the pilots with the user characteristics identified in D1.1 by the project partners as important or highly important to collect data on. This comparison revealed that 12 user characteristics from that list were not covered by user profiles in the pilots. However, most of these characteristics can be considered as "hidden variables (e.g., lack of trust in digital services or lack of knowledge of transport terminology) that are to be explored via the dimensions and related questions in the questionnaire to stakeholders (T1.2) and in the SSI (T1.3). In that sense, the user characteristics that remained to be investigated were mainly caregivers and assistance providers. It was decided to research these users for Budapest and Madrid although the starting point was different. In Budapest the focus was on caregivers accompanying the person they were caring for. In Madrid new services emerging during the Covid-19 crises for the transport of caregivers to the person they need to provide care to were researched. The third use case, also in Budapest, focussed more on mobile and visual impaired people and their use of digital mobility tools in general. This case wanted to give additional information on these users because in the Antwerp case they are only targeted from the viewpoint of consumers of infrastructure (traffic light) and not of services.

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Two themes were selected by the WP1 methodological partners to address some additional issues. The first one was a more in-depth analysis of online privacy and cybersecurity from a more European angle and seen from the viewpoint of refugees (not covered by a pilot), elderly persons (covered only in Emilia-Romagna) and visual/mobile impaired persons (in Antwerp only covered from angle of infrastructure). The second issue identified was micro-mobility (steps, bike-sharing, sharing of scooters) as this mode of transport is not considered by any pilot. For the Brussels Region it was decided to research the use of micro-mobility by young vulnerable people and the issues they experience regarding accessibility and inclusion of these services.

This selection led to the following user case studies which are discussed in detail in Section 8:

- Use case study 1 - MBE: Digital mobility of caregivers in Budapest
- Use case study 2 - MBE: Digital mobility and visual and mobility impaired persons in Budapest
- Use case study 3 – DeepBlue & imec : Privacy and cyber security concerns of refugees, older persons and people with visual and mobility impairment - European perspective
- Use case study 4 – imec & VUB: Micro-mobility and vulnerable and close to exclusion social groups – Brussels
- Use case study 5 - Cambiamo: Caregivers in Madrid

The partners undertook these additional user case studies between September 2020 and January 2021.

2.2. Collection of literature and stakeholder interviews and requirements identification

The second step in T1.2 was the data collection of end-user needs, goals and preferences towards digital applications for mobility, as well as to gain insights into their skills and capacities and the challenges, limitations, difficulties and constraints they can encounter when using them. Concretely this meant that it was important to understand how the envisaged vulnerable end-users in the pilots would react on the introduction of the new or redesigned INDIMO digital mobility service in their community.

A first step was the collection of publicly available information and documents (via scientific articles, public reports, leaflets and other grey literature) already present about the usage and needs, goals, opportunities or concerns of the vulnerable people for the technology that was going to be deployed in the pilot. We were not looking primarily for general literature about users and similar or related technologies, but concretely useful insights about the pilot technology and vulnerable end-users.

The pilot had to code the gathered documents by means of a list of dimensions defined in D1.1. Each of these dimensions covered particular aspects of user experience and users in relation to digital transport technologies. If there was relevant information about the

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vulnerable end-users for one or more relevant dimensions of data collection, this could then have the positive effect that in the stakeholder interviews the researcher could focus on the other dimensions of data collection.

Each of the five pilots collected in the months of July and August 2020 the information and reported in a special template the coding process and results (Annex I). However, finding relevant literature was not an easy task and, apart from general insights of similar cases as the case of the pilots of Emilia-Romagna and Berlin, it turned out that not much information about vulnerable end-users and the INDIMO pilot technologies is already available.

Besides the literature, each pilot also interviewed five representatives of organisations that, in the context of each core pilot area, could provide insights about the user profiles with respect to their current mobility behaviour, the use or non-use of ICT within that mobility behaviour and their potential reactions, attitudes and stance towards the proposed pilot solution. A questionnaire template was designed for the pilots and covered all the dimensions of data collection as presented in D1.1. Pilots could tailor the questionnaire to their specificities (Annex II – Template stakeholder interview).

The key stakeholders that were interviewed for each pilot will be presented at the beginning of each pilot (sections 3 to 7). Important to state here is that the INDIMO pilots interviewed these stakeholders between July and November 2020. The summer holiday period as well as the Covid-19 virus forced some pilots to take more time to recruit stakeholders and to make the necessary online arrangements for the interview. Before each interview, consent was given by the stakeholder who returned a signed informed consent form before the interview started. Based upon the notes and recordings, if permissions to record the interview was acquired, the pilots completed a stakeholder debrief form in which the relevant passages and answers to the questions were reported in the local language of the pilot and in a second phase translated in English. This debrief was the basis for the analysis of user needs and goals and will be discussed in detail for each pilot in sections 3 to 7.

Imec and Cambiamo, as respectively WP1 Task Leaders of T1.2 and T1.3, organised early July 2020 a training session for the INDIMO pilots in order to train the pilot teams for doing interviews with the stakeholders and with the users and non-users (preparation, consent, recording, debriefing, …). Imec also provided support and advice to any question the pilot might have had in the interview process.

Research Activity	P1 Emilia-Romagna	P2 Antwerp	P3 Galilee	P4 Madrid	P5 Berlin
Literature collection and analysis	July – August 2020	July - August 2020	July-August 2020	July – August 2020	July – August 2020
Stakeholder interviews	July – August 2020	September-October 2020	October – November 2020	July – September 2020	July-September 2020

Table 1: T1.2 data collection on end-users - timing

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Once the data from the literature and the stakeholder interviews were collected and debriefed by the pilots, imec analysed them for each of the five pilots. The analysis was organised along the dimensions of data collection defined in D1.1, be it in a simplified form. For each of the following dimensions below, end-user requirements were formulated for each pilot:

- **Goals**: why the end-user would like to use the service
- **Needs:** what the end-user sees as a necessity to achieve that goal
- **Solution:** opportunities, challenges, limits and constraints on various key elements of a service that are important and how to address them:
    - **Digital tool:** the digital component(s) for usage by the end-users;
    - **Physical tool:** the physical object(s) end-users interact with when using the service;
    - **Service organisation:** the organisational principles of the service towards the end-user;
    - **Service agent:** a person involved by the organisation that operates the service and is performing a certain task in interaction with the end-user;
    - **Assistance and support:** mechanism of support and assistance that an operator needs to provide to support and assist users with using the service;
- **Privacy and security:** what the end-users consider to be important to protect their privacy and digital security;
- **Trust and reliability:** what the end-users considered to be the most important elements of the service in order to gain his/her trust and to consider the service as reliable.
- **Covid-19:** the impact of Covid-19 or a similar pandemic on using the service;

After a first analysis and identification of user requirements based on these criteria, imec hold two meetings with each pilot – one in December 2020 and one in January 2021 - in order to correct, mitigate and finally validate them.

As such, a rich picture of user requirements on various dimensions is present for each pilot study. Of course, the pilots will still have to make an internal exercise on how to address these requirements based on priority and importance on the one hand and budget, resources and time available on the other hand. This prioritization exercise is planned in the Community of Practices for each pilot in WP3 as in this setting within the context of INDIMO different actors from different backgrounds are present to make such a reflection and assessment.

2.3. Co-creation of persona and user journey map

Based on the analysed data from the literature and the stakeholder interviews in the previous step as well as the analysis of T1.3 of the SSI with non-users and users of digital technologies for mobility, a co-creation process of the personas and the user journey maps was organised with the five pilot teams in December 2020.

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One of the most popular methods of user-centred design is the use of personas. A persona is an imaginative, but accurate, representation of the user profile and all of its characteristics (Harlay, 2015). This representation enables designers to think of the user as a specific person with a name, face, and life frame, instead of treating users as a faceless profile with no identity.

In a first step, the personas of vulnerable transport users in the HiReach project (Hireach-project.eu), one of the first EU projects (2017-2020) to address the issue of transport poverty, were analysed in order to determine whether they could serve as a basis in INDIMO, for example by either expanding a persona to a particular INDIMO service or either by complementing a HiReach persona with INDIMO insights. It turned out however that the INDIMO project has three use cases – e-commerce, smart traffic lights and healthy food delivery – that are not covered within the HiReach persona where the focus is on transport of people by a transport service, being publicly or privately organised. Secondly, although making the same distinctions with respect to age, gender, location, income - the user characteristics of INDIMO covered by all the pilots seem to be larger than the one in the HiReach personas, which related to the dominant vulnerable to mobility exclusion groups in the project's six regions. Although INDIMO also adhered to the latter principle of focusing on the user profile and user characteristics for which most information could be collected (see below), starting from the HiReach personas would mean that we might already restrict a pilot/the pilots outlook on potential personas.

In order then to create the INDIMO pilot personas, the template presented in Figure 2 was used for creating and formulating the personas of INDIMO. Imec developed the template that is useful for the purpose of INDIMO as it is conceived to support the ideation of new digital technologies.

As can be seen in Figure 2, the left column presents the characteristics of the persona as well as its personality traits. The middle and right columns are task oriented and state (1) the goals to be achieved by the persona, (2) the current frustrations with reaching these goals, (3) the main motivation to use a technology as well as (4) other sources to achieve the goal and (5) the preferred information he/she wants. In the middle of the template, the persona's bio describes the user journey and makes the bridge for the creation of the persona's journey map.

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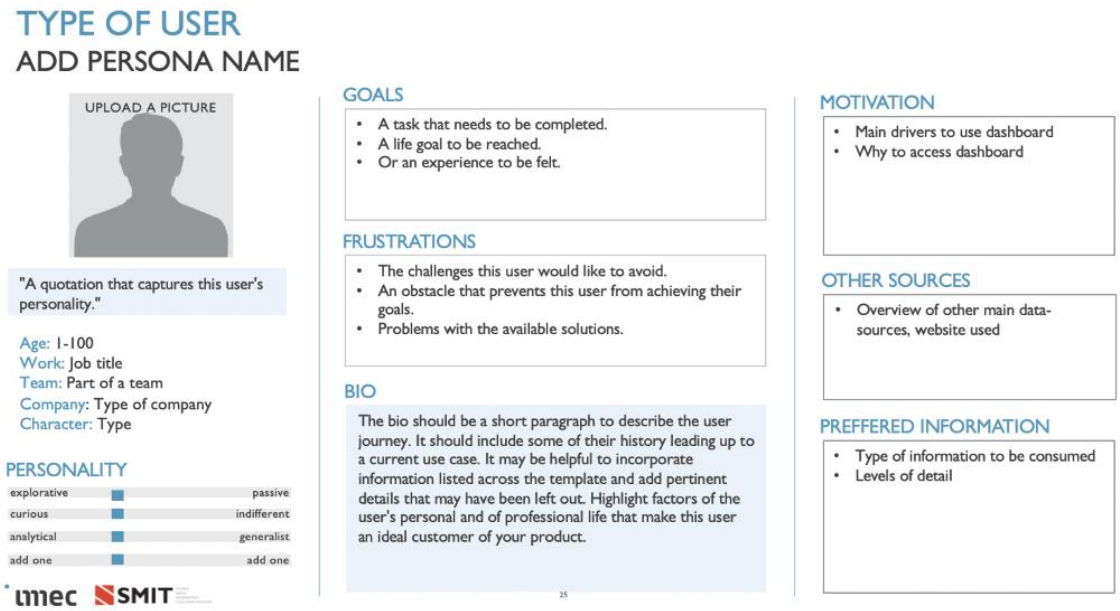

Figure 2: Persona template (source: imec-smit-vub)

One persona was created for each INDIMO pilot. As most pilots targeted more than one user profile and each of the pilot's user profile had multiple user characteristics, it was decided to create the persona for the user profile with user characteristics that the most information has been collected about during the stakeholder interviews and the interviews with users and non-users in T1.3. Only for the Madrid pilot two personas were co-created in the end, as the information gathered on all targeted user profiles was quite extensive.

The personas were co-created using Miro as support tool during two webinars set up by imec with each pilot: one in December 2020 to create the first version of the persona and a second one in January 2021 to refine and validate the first version.

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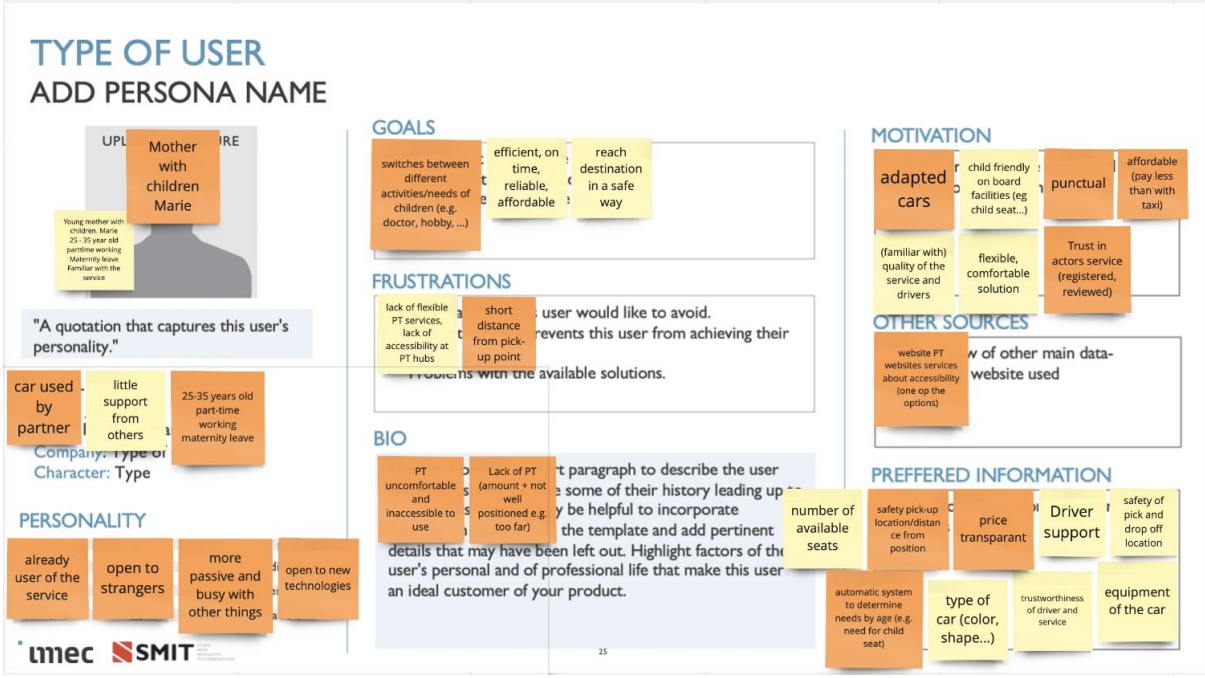

Figure 3: Co-creating the Berlin persona using Miro during webinar 1 in December 2020

Once the personas had been created the focus shifted towards creating a customer journey map with the created persona in mind as a final part of the co-creation activities with the pilot teams. In practice, this meant the customer journey maps were made in the second workshop with each pilot in January 2021.

"A customer-journey map is an infographic visualization of the process that a persona segment goes through in order to accomplish a goal" (Flahtery, 2020). Journey mapping is a user-centred design technique that describes every step a user takes when engaging with a service. It helps an organization to look outward from the viewpoint of the end-users (customers), in the process of designing inclusive services. The journey map allows to have a holistic viewpoint on the user experience and to improve the design process.

It should be stressed that the customer journey maps were focussing on the current situation without the INDIMO redesigned application. In that way, current pain points and opportunities in the experience of the vulnerable end-user category can be clearly detected and ways to address these can be devised by the pilot.

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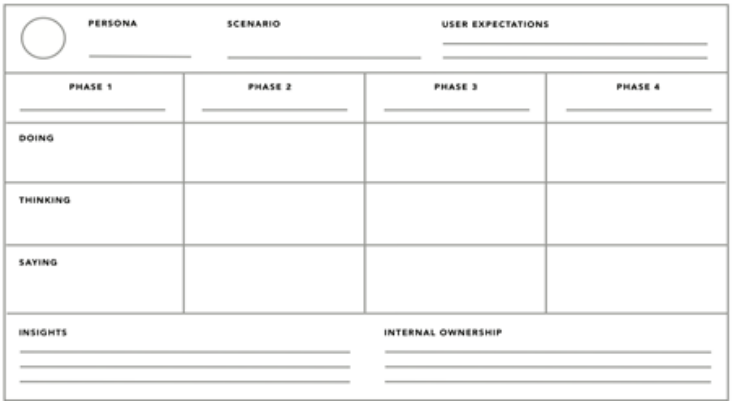

Figure 4: customer journey map template (source Gibbons - NNgroup, 2018) used as a basis for the INDIMO pilot customer journey map

In order to create the customer journey map for each pilot, the template above (Figure 3) of Nielsen Norman Group (Gibbons, 2018) was used as starting point. The INDIMO translation of the template had the following elements and underlying dimensions or research questions:

- The **persona** co-created by the pilot, allowing it to have a clear point of end-user view.
- A **scenario,** detailing the concrete experience to map, highlighting the goals and the objectives the user wants to reach. In other words, it is portraying the expectations.
- An overview of **stages and phases of the customer journey**, allowing to detail what the user is doing, thinking or saying in the stages of:
    - **Awareness:** how the vulnerable end-user becomes aware of a service today?
    - **Consideration**: how can the vulnerable end-user find more information about the service today?
    - **Usage:** how is the vulnerable end-user using the service today?
    - **Post-usage:** how is the vulnerable end-user today capable to provide feedback to the service operator?
- A list of **touchpoints and channels** in order to identify the different ways how the customer gets in touch with the service. Attention was to be paid if these channels are pilot owned or not.
- An identification of **emotions**, allowing it to chart the customer emotion for each of the four stages. We opted to explicit here and either evaluate this with an emoticon as positive 🙂, neutral 😐 or negative 😡
- A box to note **key opportunities** in order to identify unknown gaps in the user experience so that appropriate measures to address them can be identified.

The question of **internal ownership** – who or which actor should actually follow-up on the insights and lessons learned within the pilot - was dropped at this stage as the customer journey map focused on the current situation and hence the question of ownership of an identified issue should still be determined in the setting of the pilot.

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Table 2 summarises the timing of the performance of the various activities (requirement validation, persona creation and customer journey map design) discussed above for each pilot:

Co-creation activity	Activity	P1 Emilia-Romagna	P2 Antwerp	P3 Galilee	P4 Madrid	P5 Berlin
Workshop 1 : validation of end-user requirements and persona co-creation	First validation requirements	16/12/2020	14/12/2020	21/12/2020	22/12/2020	16/12/2020
	Persona creation	16/12/2020	14/12/2020	21/12/2020	22/12/2020	16/12/2020
	Customer journey map creation		14/12/2020	n/a	22/12/2020	n/a
Workshop 2: validation of persona and customer journey	2nd validation requirements	07/01/2021	n/a	n/a	n/a	n/a
	Persona validation	07/01/2021	05/01/2021	12/1/2021	2nd persona: 07/01/2021	12/1/2021
	Customer journey map creation	07/01/2021	05/01/2021	12/1/2021	2nd map: 07/01/2021	12/1/2021
Post workshop feedback (mail)	Requirements	26/1/2021	n/a	n/a	n/a	14/01/2021
	Persona	n/a	N/a	n/a	n.a	n/a
	Customer journey map	n/a	n/a	n/a	n/a	n/a
	Prioritisation	21/1/2021	21/1/2021	21/1/2021	21/1/2021	21/1/2021

Table 2: overview of co-creation activities persona and customer journey maps by pilot

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3. P1 Emilia-Romagna – user needs and requirements

Pilot 1 is developed by the Institute for Transport and Logistics and Poste Italiane. It aims to bring a digital solution in a rural area of the Metropolitan City of Bologna to improve inclusiveness and extend some services to older people and foreigners of the community. Away from urban centres, rural communities do not have access to the same services compared to the cities. The introduction of a digital locker has the potential to greatly improve the level of service of these communities.
The digital locker developed by Poste Italiane features parcel/correspondence shipping and delivery as well as payment of bills and recharging of cards. It was introduced in densely populated contexts and in private buildings. This pilot will test a totally different approach, target users and will be placed in a rural area. In the case of the pilot this will be the municipality of Monghidoro in the Metropolitan City of Bologna.
So far, the pilot dispostive as imagined at the beginning of the interviews was the following:

- A digital tool being the mobile app to handle the digital locker
- A physical tool, being the locker with a digital interface to handle it and do some operations

3.1. Interviews

D1.1 defined the two user profiles with particular user characteristics for the pilot:

- 1st: older people who receive/send parcels
    - characteristics:
        - Age: older
        - Lack of digital knowledge
        - Residing in peripheral locations
        - Lack of digital services
        - Lack of dedicated network infrastructure
        - Limited access to transport services and commercial delivery services
- 2nd: migrants who receive/send parcels:
    - characteristics:
        - Low economic conditions (assuming migrant from out of Europe)
        - Low level of education (assuming migrant from out of Europe)
        - Language barrier
        - Lack of digital knowledge
        - Residing in peripheral locations
        - Lack of digital services
        - Lack of dedicated network infrastructure
        - Limited access to transport services and commercial delivery services

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The pilot team interviewed in total five organisations, three of them being public institutions: Lepida as the public institution that is responsible for deploying the regional ICT-Plan, the municipality of Monghidoro and the department of Planning and Transportation of the Metropolitan City of Bologna. Lepida and the department of Planning and Transportation know the area of Monghidori as well as related settings of rural communities and what this setting means for digital infrastructure and the organisation of logistic. The two other stakeholders interviewed are the local section of the non-governmental association Ai.Bi (Amici di Bambini) and the local ball game and cultural centre Boccioni that each have activities with the specific user profiles of the pilot.

Name stakeholder organisation	Date of interview	User profiles and characteristics covered in the interview
LEPIDA	06/08/2020	Elderly
Metropolitan City of Bologna, department of planning and transportation	05/08/2020	Elderly
Monghidoro Municipality	29/07/2020	Elderly
Ai.Bi (Amici di Bambini)	20/08/2020	Migrants – Elderly
Circolo Bocciofila	03/08/2020	Elderly

Table 3: Overview interviews stakeholders Pilot 1

Given that only one stakeholder focussed more on migrants than elderly, most of the user requirements will be gathered for the category of:

- Older people

However, in section 3.3, we will also highlight the end-user requirements that could be analysed for the user characteristic of:

- Migrants

The number of requirements and the dimension covered are however not as extensive as for the older people.

3.2. Digital lockers – Older people

3.2.1. Goals

From the stakeholder interviews (see Annex II – Template stakeholder interview), the following goals are defined for older persons in Monghidoro to use the digital lockers.

- Pay the post-bills
- Pension withdrawal
- Facilitate the sending and receiving of parcels

Requirement:

1. **P1- R1: Goal:** Digital locker should include the following functions: paying of post-bills, withdrawal of pensions and facilitate the sending and receiving of parcels

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3.2.2. Needs

In order to achieve these goals, the following needs were identified for older persons and that the digital lock should address.

- Improve quality of life by reducing the distance and duration of walking
- Become more independent
- Compensate for loose network
- Less relying on others (family members)
- No queuing in post-office
- COVID-19 safe operations (waiting, handling)
- Simple straightforward service without complications

Requirements:

2. **P1- R2: Physical tool:** Should be clearly identifiable and recognizable as a tool
3. **P1- R3: Physical tool:** Should be placed on the right height
4. **P1- R4: Digital tool:** Intuitive, easy to use, automatic interface where possible
5. **P1-R5: Assistance and support:** Implement means to support independence (tutorials, clear instructions on tool) in ecosystem around the tool
6. **P1- R6: Service agent:** Special attention to process of paying bills and first usage of elderly
7. **P1- R7: All dimensions:** Integrate and respect COVID-19 measures (see later)
8. **P1- R8: Service organisation:** Allow for wide usage hours and support at busy points in the lives of municipality and elderly (Sunday morning, mass, shopping Saturday).

3.2.3. Challenges and limitations

Attitudes: fear of "new technology"

Older people in Monghidoro are not used to getting involved with digital technologies and have a certain degree of fear or reluctance towards them.

Requirements:

9. **P1- R9: Digital tool:** Design from the perspective of the target group
10. **P1- R10: Physical tool:** Design from the perspective of the target group
11. **P1- R11: Assistance and support:** Design a good information and communication plan and campaign that allows to take away the fear for the new technology and shows benefits
12. **P1- R12: Assistance and support:** Volunteers as teachers to create opportunities to discover and learn about the new technology
13. **P1- R13: Service agent:** Service agent should be present during the first week of the deployment to help with first usage or discovery

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Possession of mobile phones among older people

A significant proportion of the older people in Monghidoro do not possess a smartphone, hence won't be able to use the technology.

Requirements:

14. **P1- R14: Digital tool:** Revise mandatory use of the mobile application

Digital skills: part of the older people won't possess immediately all the skills to work with the digital locker

Older people in Monghidoro will lack important ICT skills and need training to adopt and use the service.

Requirements:

15. **P1- R15: Digital tool:** Digital tool should be visually clear, interface easy to use and simply, almost automatic
16. **P1- R16: Physical tool:** Easy and intuitive interface
17. **P1- R17: Physical tool:** Toll-free number for assistance
18. **P1- R18: Service agent:** Service agent should be present during the first weeks of the deployment of the service and especially be ready to support first usage(s).
19. **P1- R19: Service agent:** After a period of time, remote assistance might be organized via phone (cfr R14)
20. **P1- R20: Assistance and support:** Teaching sessions by volunteers to instruct elderly
21. **P1- R21: Assistance and support:** Tutorials online or offline available

Digital skills: part of the older people has more digital skills than we assume

Although an important part of elderly will not have the necessary skills, there is also a proportion of older people who are digitally skilled. Therefore, we should also focus on reaching out to them.

Requirement:

22. **P1- R22: Assistance and support:** Use other communication channels like Whatsapp to inform or provide remote support

Language: older people won't understand the terminology in English

Elderly in Monghidoro don't understand English and also consider the usage of English in relation to technology as a gadget. Also, technological vocabulary is not widely understood.

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Requirements:

23. **P1- R23: Digital tool:** Use Italian language and familiar terminology (avoid gadget speak)
24. **P1- R24: Physical tool:** Use Italian language and familiar terminology (avoid gadget speak)
25. **P1- R25: Assistance and support:** Create an online list with important terminology

Age and impairments: above 75 years old and gradual impairments (auditive, visual, …)

Older people are not a homogeneous group and change over the years. The question is that also age and aging processes should be taken into account in designing the service.

Requirements:

26. **P1- R26: Digital tool:** Design for accessibility with particular attention for visual impairment
27. **P1- R27: Physical tool:** Design for accessibility with particular attention for visual impairment

Requirement: realise that elderly develop over the years and that 'aging' should be taken into account.

E-commerce interest of elderly is low

Older people are not interested in similar services and need to get motivated to adopt and use the technology.

Requirements:

28. **P1- R28: Assistance and support:** Involve children and family-members to convince for adoption and usage (opinion leaders)
29. **P1- R29 Assistance and support:** Collaborate closely with the local authorities and associations working on ICT and on elderly
30. **P1- R30: Assistance and support:** Design a good information and communication plan that shows benefits to elderly of using the technology

Isolation of older people

It is important that the service is not creating another divide between those older people that are isolated and alone and those that have a network of friends and relatives.

Requirements:

31. **P1- R31 Assistance and support:** Involve the social service of the commune and local associations to detect and follow-up

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3.2.4. Privacy and security

Correct executed money transfers are very important for older people. They probably don't mind sharing personal data for the service but bank card details will be more sensitive

Requirements:

32. **P1- R32: Service:** Have a clear and transparent privacy policy in line with regulations
33. **P1- R33: Service:** Provide notifications when money transfer is correctly executed.
34. **P1- R34: Service:** Assure that incorrect money transfer is does not lead to the loss of users' money

Given that the digital locker will be accessible day and night, there can be a concern among older people about their physical safety when it is dark or when there are not many people around.

Requirements:

35. **P1- R35: Service:** Put on a location that is frequented
36. **P1- R36: Service:** Make sure safety and security measures are in place

3.2.5. Trust and reliability

Reliability of the technology will be very important to convince older people to use it.

Requirements:

37. **P1- R37: Service agent:** Information provided by the service agent should be correct
38. **P1- R38: Service agent:** Service agent should be reliable

Older people build trust upon institutions and actors they know as well as from persons they know.

Requirements:

39. **P1- R39: Trust:** Use the image of PI as a strong weapon
40. **P1- R40: Trust:** Create an ecosystem of support and information towards the elderly with the local authority and local associations

3.2.6. Covid – 19

The solution must be made COVID-19-proof during its use.
Requirements:

41. **P1- R41: Physical tool:** Integrate security measures in design (hand gel, …)
42. **P1- R42: Service:** Assure distance with service agent at location of locker
43. **P1- R43: Service:** Avoid queuing in front of locker at location of locker and keep distance

Other from literature: physical distribution/locations of the service itself.

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3.3. Emilia-Romagna - migrants

Limited insights, only 2 stakeholders referred to the group and often migrants were not central concern. In Stakeholder interviews (see Annex II – Template stakeholder interview), the focus was mainly on the identification of issues rather than identification of requirements.

3.3.1. Goals

According to the stakeholder, migrants will be attracted to the digital locker in order to achieve the following goals:

- Exchange and delivery of goods, especially in relation to the culture of the migrant
- Payment services
- Sending money to relatives in the country of origin.

Requirement:

44. **P1- R44: Goal:** Digital locker system should have the function of exchange and delivery of goods, support payment services and enable the sending of money (to the country of origin).

3.3.2. Needs

In order to perform these goals, the digital locker should meet the following needs:

- Reduce difficulties of interacting with post office officials due to language barrier
- Guarantee confidentiality and reservation. The level of requested confidentiality depends on the culture and the community.
- Allow to support integration in local community

Requirement:

45. **P1 – R45: Service organisation:** erase language barrier via the digital and physical tool
46. **P1 - R46: Service organisation:** Make sure the tool is part of the community life, but also allow with its location also for a discrete usage

3.3.3. Challenges and limitations

Different communities and different cultures

Monghidoro has different migrant communities which also have their cultural specificities. There is a difference between migrants belonging to the first waves and more recent migrants as well. Certain cultural patterns within migrant communities might influence the usage pattern and knowledge on the meaning of that cultural practice is necessary. For example, in some migrant communities, women tend to stay at home.

Requirements:

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47. **P1- R47: Assistance and support:** It will be necessary to devise a communication and information strategy as well as a support strategy that starts from the viewpoint and understanding of different migrant communities
48. **P1- R48: Service organisation:** Know and understand local migrant cultures in order to know how the technology can integrate in their practices

Digital skills

A stakeholder states that foreign people probably don't have a problem with using a smartphone, but they don't always know for which purposes it can be used here locally. Thus, the service usage should be explained and promoted.

Requirements:

49. **P1-R49: Assistance and support:** Strong ties with local associations and municipality to provide training and support; reach out to persons in the migrant community.

Language (Italian)

Foreign people don't always speak the local language or only on a basic level or for some specific activities. There is a need to use another language than Italian to interact with the service.

Requirements:

50. **P1- R50: Digital tool:** English, French and other options (e.g. Spanish, Arabic, Urdu etc.)
51. **P1- R51: Physical tool:** English, French and other options (e.g. Spanish, Arabic, Urdu etc.)
52. **P1- R52: Service agent:** Open to conversation in other languages
53. P**1-R53: Assistance and support:** Tutorial in English, French or other language options

3.3.4. Privacy and security

In general, the stakeholder said that the migrant population had no specific problems with handling personal data. There might be sensitivity when it comes to bank transfers or specific functionalities that might give away information about revenues that they like to keep discrete. In that sense they prefer that Poste Italiane runs the service instead of a normal bank.

54. **P1-54: Privacy and security**: Make sure a good privacy policy in put in place and respected. Be particular attentive about financial information and as operator look like an operator for ways to gain trust in this matter.

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3.4. Conclusion end-user requirements – P1 Emilia-Romagna

The stakeholder interviews and the gathered end-user requirements highlight that the digital locker for older persons can serve the **goal** of doing various transactions that will contribute to being more autonomous (less relying on relatives) and improve quality of life (more hours to do certain operations). However, the lesson is that in order to realise this potential, the digital locker system will require the set-up for older persons of an end-user **support and assistance strategy** together with local partners (municipality, social organisations, …). Apart from the necessity to keep in the **digital tool** easy to use (also taking in mind the fact that older persons 'age' as well), understandable (English, terminology list, …) and intuitive in design, there is a need for clear information provision in order to take the fear of the new technology away and to show the benefits of e-commerce. The support strategy should also foresee in various online and physical training and guidance sessions in order to learn older persons how to use the digital locker (for example: creating a virtuous circle by peer-to-peer learning where skilled elderly persons can teach less skilled elderly persons). Monitoring the usage of the digital locker by older persons will equally be important, especially for those older persons living in isolation, for example in the "*frazioni*" (hamlets) around Monghidoro. This action should avoid that a digital divide will be created within the older population of Monghidoro between those that can use and take the benefit of the digital locker and those that can't. In the first weeks of the presence of the digital locker, the necessity of a presence of a **service agent** for helping older persons is felt by the stakeholders. The service agent should help and explain the tool and his physical presence will gain trust in the solution compared to a distance help-centre.

Besides the need for such a support strategy, two other dimensions are important from an end-user point of view. Although older persons are not so much concerned about **privacy and data sharing**, the digital locker should of course respect legislation. Especially sensitive for older persons will be the sharing of bank card details. From a security point of view, it is important that older persons get a confirmation message that the operation – and in particular financial transactions – performed via the digital locker was successful. Contributing to the feeling of older persons to interact with a **reliable and trustful** service will be a transparent and correct provision of information by the service operator (or the agent in case of a physical presence in Monghidoro) as well as the fact that the service is operated by a known actor (Poste Italiane).

What concerns the impact of **Covid-19,** older persons will require that the sanitary safety measures are put in place (guarding social distance, cleaning opportunities, …) around the locker and that essentially the creation of queues will be avoided.

What concerns the user profile of migrants, the stakeholder interviews did not go as detailed into the matter as for older persons. What concerns the **goal and needs,** the potential of the service lies it in its capacity for e-commerce for special products as well as the transfer of money. The **organisation of the service** should be particular attentive to three aspects when developing the service for migrants: keep in mind a certain discretion

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(either because of the financial usage, either because of cultural patterns) and allow for different sensitivities within the communities. When it comes to **assistance and support,** the Italian language can be problem so be sure to use a language the migrants know (Arabic, English). Try to also engage the migrant communities to the solution by making bridges with opinion leaders within their community.

3.5. P1 - Emilia-Romagna persona - Luisa

For the Emilia-Romagna persona, the pilot team decided to focus on the user profile of older people because most information was gathered about this profile in task T1.2 and task T1.3. Secondly, the choice was made for a person living in the centre of Monghidoro as the information from persons living in a hamlet (frazioni) around Monghidoro was less present in the collected data. In particular, the focus was placed on older woman as the gender dimension is culturally important among the target audience of older people. Building from these categories, the personality of Luisa was characterised as being curious and open but not towards technology. While she is motivated about the potential benefits of the digital locker in order to be more autonomous, send parcels to relatives and have more privacy in certain financial matters, her pain points remain a lack of technological knowledge and skills and the concrete opportunities to learn about them. Luisa can manage simple messaging technologies as Whatsapp but with the other services she is more frustrated. Her information sources will, also for the digital locker, come mainly from traditional media or informal sources such as friends or relatives so it will be important for her to also get explanations about the technology via a dedicated leaflet and training program. For Luisa it is also important that the information she got about the training sessions for the digital locker and all information about the locker is correct, clear and informative. To assure she can trust the technology, she requests clear confirmation messages from the service that the transaction was successful, especially what concerns her bills.

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Bio

Luisa is a 76 year old widowed woman living in Monghidoro, where she grew up. She's retired, lives in the centre of Monghidoro and has a daughter and a grandchild. Her husband passed away a few years ago. She went to school until she was 14 years old, but she had to leave school to go to work and support her family.

She mainly wants to stay in touch with her relatives and her grandchild. That's why she received a smartphone from her daughter, however she does not use a lot of functions as she finds it quite difficult. She is inclined to (try to) use something if it is recommended by her family, like her smartphone. However, she lacks digital skills and requires help from others to (learn how to) use it. Other than that she's active in her local community. Sometimes she received packages from family and friends.

Name

Luisa

Age: 76 y/o

Marital status: Widowed

Children: One daughter (+ one grandchild)

Occupation: Retired

Location: Centre of Monghidoro

Income: Medium

Personality

- Kind
- Wary of people that are not from Monghidoro
- Independent
- Looks after others
- Curious (but not about technology)
- Loves talking
- Enjoys being with friends

Goals / Needs

- Enjoy retirement
- Convenience
- Avoid queus
- Pay-bulletin

Pain points

- Digital world causes frustration
- Afraid of online fraud
- English language
- Concerned about 'modern times' when watching TV (e.g. "what have we come to")
- Difficulties with digital technologies due to lack of digital skills: needs help and support from others
- Has a hard time self-studying apps (prefers someone shows her first)
- Has hard time asking for help as she's quite independent: embarrassed when she's 'in need' of help
- Trying to understand complex things about personal data (e.g. don't understand need for terms and conditions): doesn't know how to handle this

Motivation

- Be more autonomous, not need the help of family
- Privacy and confidentiality
- Flexible service adapted to her way of life
- Wants to be in touch with her relatives

Information Sources

- Television programs
- Whatsapp group with friends about local information
- Relatives (daughter and grandchild)
- Sporadically reads the newspaper (buys it at the local newsstand)

Preferred information

- If bills are paid correctly without losing money
- Hour, date and location of support training
- Clear, informative document about service (how it works, why, benefits)

Table 4: Persona Luisa

3.6. P1 - Emilia-Romagna user journey map

Scenario

The customer journey map builds upon the persona of Luisa. It was decided to focus for the journey map on the scenario of Luisa wanting to pay her bills via transfers in the bank at Monghidori. She hopes it is a fluid process that does not need queuing at the bank and that she can do independently.

Experience of the persona

The four phases indicate that the current experience for Luisa is not very satisfactory and the four phases are hence labelled with a negative icon. Awareness of the option to do such transfers at the bank is raised via informal (friends) or formal channels (a flyer via post) but it means she has to organise herself again in order to find out more information. In further finding information about the service (consideration), Luisa must turn to the bank itself, hoping that the bank agent has time to provide the information. While doing the bank transfer, a relative will still be needed to accompany Luisa and she will also have to queue again. Finally, also the post-usage phase has its issues: there is currently no real strategy available to either provide feedback that the service is working well or not, neither does the bank know it.

The latter indicates that in the whole current user journey process the current touchpoints or channels with the service operator are very limited. Most initial touchpoints are either informal or via a leaflet. It is only at the bank that actually a service agent is involved, but still here there is a fear for limited availability and the need to take a relative along is felt.

Key insights for INDIMO

The key opportunities in improving the user customer journey with the INDIMO digital locker is thus working on local partnerships with organisations on the ground to increase the contact points with end-users but also to 'manage' potential older users such as Luisa. Together with these organisations, specific set up of support along the different phases can be designed: providing information, providing specific training and guidance on the app and locker but also assure the follow-up by periodically requesting how persons like Louisa are coping with the solution and remediate based on the collected feedback.

About the customer

Luisa

Age: 79 y/o

Marital status: Widowed

Children: One daughter

Occupation: Retired

Location: Centre of Monghidoro

Scenario

Luisa wants to pay her bills via transfers at the bank.

She has a smartphone (does not use a lot of functions, finds it difficult) but only partially uses it (Whatsapp) and needs support for more extensive digital application use (downloading app).

User Expectations

That it goes fluently, without queues and not having to wait too long. It's a safe and easy process as well. (others cannot see the interaction). She receives feedback (receipt) that all went accordingly.

Awareness

Doing

- By word of mouth from friend/relative about system
- Written communication about system (flyer)
- Goes to gathering place: finds out about service

Thinking

- Effort in time takes away time from other errands
- Having to walk again
- Needs to organise herself again

Means/contact person

- Flyer
- Friend/relative

Insights

- Informal point of contact => useful to organise partnership with local associations (voluntary) in order to facilitate the collection of information
- Flyer campaign organised by municipality to communicate properly (describe and explain service)

1

Consideration

Doing

- Asks service agent at bank about the service (he/she is trusted)

Thinking

- Hopes the service is more extended/detailed when she asks for information
- Should fit in her daily activity/schedule (avoid waiting, queuing, having to pick a certain moment that is not fitting with her agenda)

Means/contact person

- Service agent

Insights

- Bank gives her a tutorial and information about where to get extra lessons/help
- Offer more usage/training opportunities to anticipate needs

1

Usage

Doing

- Will watch tutorial, but is not able to do it alone
- Ask support from relatives
- Relative comes with for 1st time (2nd time alone)
- At the bank: Luisa does the operation, relative is sitting on a bench to overview and stand by for problems

Thinking

- She needs support again
- She has to queu a lot
- Opening hours don't always fit her
- Needs more efficient paying method to allow more bills to be paid at once

Means/contact person

- Relative (first time)
- Service agent (enjoys contact w/ the service agent)

Insights

- Offer more services to people who live there

1

Post-usage

Doing

- Rejection: relative is doing it for you (or a social organisation)
- Will reject the service forever
- Successful: come alone and more engaged (more usage, other time moments
- Explores more aspects and information
- Views and checks transfer

Thinking

- She wants to learn more

Means/contact person

- No real connection here

Insights

- Periodically: people to know if they are well and if the service works

1

Table 5: User Journey Luisa

4. P2 – Antwerp: user needs and requirements

Pilot 2 is developed in the city of Antwerp by imec. It aims to create an inclusive smart traffic light that will be deployed in the centre of the city. It is a planned information system to turn traffic lights more inclusive by monitoring traffic flows such as the type of pedestrians willing to cross and using this information to prioritize certain streams. With this information available, the system will adapt the length of timings and lights to the traffic situation (e.g. type of pedestrians, adequate signalization of its status), and will give the possibility to make it more fluid and inclusive. The pilot will focus on vulnerable pedestrians, in particular elderly people and persons with reduced vision and impaired mobility. Currently such smart traffic lights are not present in the city yet. Only a demonstrator was deployed in the context of the Smart Zone-Safe Crossing project which lessons will be useful for this new pilot.
In the context of the interview (October 2020), the Antwerp pilot was still focussing on what the best technology could be to use in the context of the solution from the viewpoint of the different pedestrians: a camera (allowing for detection), a badge (allowing the end-user to give a signal to the light in order to get detected), a mobile app (idem, but now automatic or via the app) or an improved ask-green button on the light (e.g. handsfree solution). Therefore the organisations interviewed (see section 4.1) were each asked to assess the technologies and from this angle the replies on the dimension of 'digital tool' and 'physical tool' should be understood.

4.1. Interviews

The user profile of the Antwerp pilot consists of:

- vulnerable pedestrians with the following characteristics:
  - Age: older (over 60)
  - Permanently impaired or with disabilities: visual disability, wheelchair mobility

Name Stakeholder Organisation	Date Interview	User profile and user characteristics
Licht & Liefde	03/09/2020 (by phone)	Vulnerable pedestrians: visually disability (blind)
Vief vzw	05/10/2020 (via MS Teams)	Vulnerable pedestrians: Elderly (over 60)
Vlaamse ouderenraad	27/10/2020 (via MS Teams)	Vulnerable pedestrians: Elderly (over 60)
VFG – Vereniging Personen met een Handicap	20/10/2020 (via MS Teams)	Vulnerable pedestrians: wheelchair mobility
KVG – Katholieke Vereniging Gehandicapten	23/10/2020 (via MS Teams	Vulnerable pedestrians: wheelchair mobility

Table 6: Overview stakeholder interview P2 Antwerp

The Pilot Team in Antwerp interviewed representatives of various interest organisations (see Annex II – Template stakeholder interview) that provide support to one of the three main user characteristics of the targeted user profile. One organisation – Licht & Liefde –

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is focussing on blind persons and was in particular relevant as it provides mobility training sessions to blind people in which the latter get all information about obstacles (what they are, where they are, how to avoid them, …) on a particular important route in their daily life. Vief vzw is a socio-cultural organisation that provides a lot of services to older persons such as excursions in group, often also involving walking. De Vlaamse Ouderenplatform is an association that assembles various organisations working with elderly and is specialised in the area of mobility for seniors. It provides advice to the Flemish Government. In order to grasp the needs, goals and challenges of people in wheelchairs with crossing current crossroads, the Antwerp pilot team interviewed two organisations – VFG & KVG – that provide administrative support as well as practical support to persons with a handicap. From this background they both wrote position statements for Flanders regarding the mobility issues of people in wheelchairs.
Due to the specific Covid-19 measures that were in vigour in the province and city of Antwerp during the summer (lockdown, evening clock, …), it was initially very difficult to reach out to organisations via mail and phone. They preferred to focus on providing assistance to their members first. Once the measures were decreased in September and October 2020, contact was re-established, and interviews were taken in the month of October. The interviews were held online via the Microsoft Teams platform.
Given the range of the interviews, end-user requirements for the following user types and characteristics will be collected via the stakeholder interviews:

- visually impaired
- mobility impaired
- older persons

4.2. Antwerp - visually impaired (blind)

4.2.1. Goals

- Safety when crossing
- Comfortable crossing experience
- Traffic independency

The target audience would use this service to increase their traffic independence and for safely crossing the street, for example to get from home to work. Persons with a visual impairment are either unable or only barely able to see their surroundings and thus the intersections they need to use. They require trustworthy auditory guidance to be able to safely cross a street. The smart traffic light provides them with more time to cross and offers them extra information on the crossing itself. This makes for a safer and more comfortable experience and improves their independence.

Requirements:

1. **P2- R1: Goal:** Make crossing safer and more comfortable
2. **P2- R2: Goal:** Improve traffic independency

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4.2.2. Needs

- Safe crossroads
- Being visible to other road users
- Able to activate traffic light
- Information about status of light: red or green
- More time to cross
- Auditory signals to help with the crossing (e.g., green/red time left)
- Information about crossing itself (e.g., roadworks or tram tracks)
- Instructions about crossing (e.g., name of street, direction to walk in)

Requirements:

1. **P2- R3: Physical tool:** Be easily detectable
2. **P2- R4: Physical tool:** Be easy to use
3. **P2- R5: Physical tool:** Have audio options
4. **P2- R6: Physical tool:** Provide more crossing time
5. **P2- R7: Physical tool:** Offer a clear auditory signal when it's green
6. **P2- R8: Physical tool:** Offer via audio how much green/red time is left
7. **P2- R9: Physical tool:** Provide instructions (e.g., direction to walk in)
8. **P2- R10: Physical tool:** Provide extra information (e.g., tram tracks)
9. **P2- R11: Physical tool:** Having to undertake no more than one single operation to activate the light
10. **P2- R12: Physical tool:** Have the volume adapted to street noise
11. **P2- R13: Physical tool:** Be reliable and leave no room for error
12. **P2- R14: Physical tool:** Be uniform with other lights (e.g., crossing time)
13. **P2- R15: Digital tool:** Be active in the background of the mobile device
14. **P2- R16: Digital tool:** Offer auditory instructions on crossing (e.g., beep for wrong direction)
15. **P2- R17: Digital tool:** Be easy to use
16. **P2- R18: Digital tool:** Need no more than one single operation to activate the smart traffic light
17. **P2- R19: Digital tool:** Have audio options
18. **P2- R20: Service:** Have an obstacle-free approach zone Service: Have an obstacle-free approach zone
19. **P2- R21: Service:** Be integrated into online route planners
20. **P2- R22: Service:** Be combined with non-digital means (e.g., remote control)
21. **P2- R23: Service:** Inform users if the solution is not working / has an issue
22. **P2- R24: Service:** Inform users when the solution is fixed
23. **P2- R25: Service:** Educate/instruct about the light (e.g., mobility trainers)

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4.2.3. Limitations and challenges

Visual disabilities of users

Visually impaired persons will not be able to use the service properly if both the digital interface and physical interface do not provide trustworthy auditory and podotactile guidance throughout the crossing experience.

Requirements:

1. **P2- R26: Physical tool:** Have the volume adapted to street noise and own preferences
2. **P2- R27: Physical tool:** Have audio options
3. **P2- R28: Physical tool:** Offer a clear auditory signal when it's green and red
4. **P2- R29: Physical tool:** Offer via audio how much time is left
5. **P2- R30: Physical tool:** Provide instructions (e.g. direction to walk in)
6. **P2- R31: Physical tool:** Provide extra information (e.g. tram tracks)
7. **P2- R32: Digital tool:** Have audio options
8. **P2- R33: Digital tool:** Offer auditory instructions on crossing (e.g. beep for wrong direction)
9. **P2- R34: Service:** Provide podotactile information about the crossing (e.g. warning strip)
10. **P2- R35: Service:** Have an obstacle-free approach zone

Digital and technological skills are required

The target group is required to have basic digital skills and own a smartphone to be able to use the service. However, some users will be technologically adept whereas others might experience more trouble with this.

Requirements:

11. **P2 - R36:** Users are required to have basic digital skills
12. **P2 - R37:** Users are required to own a smartphone
13. **P2 - R38:** Users are required to want to use new technology

Complex and inaccessible infrastructure

The target audience needs to follow fix routes. Changing routes is therefore not easy. Also there is a feeling that the road/pedestrian infrastructure in Belgian cities is not accessible. Mobility training is very important to learn routes and adapt to changes.

Requirements:

1. **P2- R39:** Users have fixed routes and avoid unknown routes (e.g., complexity of intersection). Be aware that installing smart traffic lights does not need to bring about a change in the route of the blind/visually impaired person.

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2. **P2- R40:** Users will avoid unclear, bad or inaccessible infrastructure (e.g., edges). Therefore work with mobility trainers to learn the route at a crossing to the traffic light and also involve them when introducing smart traffic lights to blind persons;

4.2.4. Privacy and security

The service needs to be safe and follow the privacy and data regulations at all times. The target group requires the service to inform them of why and for what they need certain personal data.

1. **P2- R41: Service:** Be in accordance with regulations and GDPR rules
2. **P2- R42: Service:** Be transparent and inform why certain personal data is necessary

4.2.5. Trust and reliability

The service is expected to function well and be reliable at all times, otherwise it could be hazardous for visually impaired persons. However, if a problem arises with the functionality and accessibility of the smart light, the users should be informed immediately. They should also be informed when the issue is resolved.

24. **P2- R43: Physical tool:** Be reliable and leave no room for error
25. **P2- R44: Service:** Inform users if it is not working / has an issue
26. **P2- R45: Service:** Inform users when it is fixed

4.2.6. Covid-19

Due to the COVID-19 pandemic, the service should be as safe and hygienic as possible and follow the safety guidelines set by the government. Users are unable to properly estimate the distance from other pedestrians, thus the service should provide hygienic measures.

14. **P2- R46: Covid-19:** Physical tool requires no activation button
15. **P2- R47: Covid-19:** Users rely on other pedestrians' attitude to respect the 1.5 metre guideline

4.3. Antwerp - mobility impaired

4.3.1. Goals

- Safety when crossing
- Comfortable crossing experience
- Traffic independency
- Getting more time to cross
- Lessen stress when crossing

The target audience would use this service to increase their traffic independence and for safely crossing the street, for example to get from home to work. Persons with a mobility impairment are vulnerable due to their limited movement and reduced physical abilities. They mainly require more crossing time to be able to safely cross a street, mainly due to

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the many obstacles they encounter before being able to venture onto the crossroad. The smart traffic light provides them with more time and thus a safer and more comfortable experience and improves their independence.

Requirements:

3. **P2- R48: Goal:** Make crossing safer and more comfortable
4. **P2- R49: Goal:** Improve traffic independency

4.3.2. Needs

- More time
- No physical actions to activate light (passive)
- Automatic detection (Bluetooth signal)
- Recognisable smart light

Requirements:

27. **P2- R50: Physical tool:** Provide more crossing time
28. **P2- R51: Physical tool:** Offer a clear auditory signal when it's green
29. **P2- R52: Physical tool:** Be recognisable (e.g. logo)
30. **P2- R53: Physical tool:** Be automatically detected by the mobile device
31. **P2- R54: Physical tool:** Be easy to use
32. **P2- R55: Physical tool:** Require no physical actions to be activated
33. **P2- R56: Physical tool:** Be able to monitor the crossing process
34. **P2- R57: Digital tool:** Be automatically detected by the smart light (e.g. Bluetooth)
35. **P2- R58: Digital tool:** Be easy to use
36. **P2- R59: Digital tool:** Need no physical actions to be activated/used
37. **P2- R60: Digital tool:** Be active in the background of the mobile device
38. **P2- R61: Digital tool:** Be able to receive a signal from the smart light (e.g. vibrate when it's green)
39. **P2- R62: Digital tool:** Have an in-app feedback function
40. **P2- R63: Digital tool:** Have an in-app integration of the smart lights (e.g. location)
41. **P2- R64: Service:** Be integrated into online route planners
42. **P2- R65: Service:** Educate/instruct about the light via an awareness campaign
43. **P2- R66: Service:** Educate/instruct about the light via a widespread introductory video
44. **P2- R67: Service:** Provide individual mobility walks for the target audience

4.3.3. Limitations and challenges

Digital and technological skills are required

The target group is required to have basic digital skills and own a smartphone to be able to use the service. However, some users will be technologically adept whereas others might experience more trouble with this.

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Requirements:

3. **P2- R68:** Users are required to have basic digital skills
4. **P2- R69:** Users are required to own a smartphone
5. **P2- R70:** Users are required to want to use new technology

Physical skills and basic level of mobility are required

Mobility impaired persons often lack certain physical abilities necessary to use the digital or physical interfaces, for example the ability to reach with their arm or pushing a button. They are also required to use their hand(s) to be able to steer their wheelchair and can thus not use a mobile device.

Requirements:

1. **P2- R71:** Users need to be able to get to their phone and use it while also steering their wheelchair
6. **P2- R72:** Users need certain physical abilities (e.g. ability to push a button or swipe your finger)
7. **P2- R73:** Users need to be able to get to/reach light and button

Complex and inaccessible infrastructure

The target audience tends to follow well known routes due to bad street infrastructure.

Requirements:

8. **P2- R74:** Users have fixed routes and avoid unknown routes (e.g. complexity of intersection)
9. **P2- R75:** Users will avoid bad or inaccessible infrastructure (e.g. edges)

4.3.4. Privacy and security

The service needs to be safe and follow the privacy and data regulations at all times. The service needs as little information about them as possible and that they do not need to share too much personal information to accommodate them properly.

Requirements:

1. **P2- R76: Service:** Not require too much personal data to function well

4.3.5. Trust and reliability

No stakeholder expressed for the particular user group a requirement on this dimension

4.3.6. Covid-19

No stakeholder expressed for the particular user group a requirement on this dimension

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4.4. Antwerp - older people

4.4.1. Goals

- Safety when crossing
- Comfortable crossing experience
- More time to cross
- Lessen/take away stress or fear when crossing

The target audience would use this service to increase their traffic independence and for safely crossing the street, for example to get from home to work. Older people move slower and often feel stressed when they venture into traffic. The smart traffic light could give them more time to cross and provide them with extra information on the crossing itself, which could make for a safer and more comfortable experience and improve their independence as well.

Requirements:

5. **P2- R77: Goal:** Make crossing safer and more comfortable
6. **P2- R78: Goal:** Improve traffic independency

4.4.2. Needs

- More time
- Clear signal when it's green
- Receive extra information
- Integrated into online route planners
- Better quality road infrastructure
- Lessen/take away stress or fear when crossing

Requirements:

1. **P2- R79: Physical tool:** Provide more crossing time
2. **P2- R80: Physical tool:** Offer a clear auditory and visual signal when it's green
3. **P2- R81: Physical tool:** Provide extra information (e.g. tram tracks)
4. **P2- R82: Physical tool:** Be easily detectable
5. **P2- R83: Physical tool:** Be easy to use
6. **P2- R84: Physical tool:** No more than one single operation to be activated
7. **P2- R85: Physical tool:** Give clear, short instructions on the crossing
8. **P2- R86: Digital/Physical tool:** A wireless option to send signals
9. **P2- R87: Digital tool:** Be easy to use
10. **P2- R88: Digital tool:** Need no more than one single operation to activate the smart traffic light
11. **P2- R89: Digital tool:** Require no activation method
12. **P2- R90: Digital tool:** Have audio options
13. **P2- R91: Service:** Be integrated into online route planners

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14. **P2- R92: Service:** Inform users if it is not working / has an issue
15. **P2- R93: Service:** Inform users when it is fixed
16. **P2- R94: Service:** Communicate via well-known channels of the target group about light (e.g. TV, radio, paper)
17. **P2- R95: Service:** Educate/instruct about the light (e.g. Educational sessions)
18. **P2- R96: Service:** Launch an informative campaign about the light
19. **P2- R97: Service:** Users are able to easily inform the service if the light doesn't work

4.4.3. Limitations and challenges

Digital and technological skills are required

The digital knowledge and skills of older people will vary. Some older people follow literary courses or get help from their (grand)children, others do not. Some will own a smartphone and have already used certain mobile applications and others might not.

Requirements:

1. **P2- R98:** Users are required to have basic digital skills
2. **P2- R99:** Users are required to own a smartphone

Attitude towards "new technology"

The attitude towards this new technology will differ from person to person. To be able to use the service, they will need to be open to using this new technology.

Requirement:

3. **P2- R100:** Users are required to be open to using new technology

Apprehension of certain users

Older people are a vulnerable group and thus they tend to be very careful. This sometimes results in avoiding certain places they deem unsafe and/or following more comfortable, fixed routes.

Requirements:

4. **P2- R101:** Users avoid busy and complex crossroads
5. **P2- R102:** Users have fixed routes they will not easily change
6. **P2- R103:** Users will avoid bad road infrastructure e.g. cobblestones

Visual disabilities of certain older users

Older persons suffering from visual disabilities (not able to read from far, not seeing sharp, …) will not be able to use the service properly if it does not provide auditory guidance throughout the crossing experience.

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Requirements:

7. **P2- R104:** Service: Older Users with visual disabilities are in need of auditory signals to provide information on the light and to confirm/suggest instructions to the application
8. **P2- R105:** Digital tool: Have audio options
9. **P2- R106:** Physical tool: Give auditory signals

4.4.4. Privacy and security

The service needs to be safe and follow the privacy and data regulations at all times. The target group is only required to register once and thus only consent once. The consent form and the terms and conditions are required to be comprehensible, clear and transparent. The service needs as little information about them as possible to function properly. Other than that, the service must provide their users personal data with proper protection to avoid a possible privacy breach.

Requirements:

1. **P2- R107: Service:** Provide an understandable, transparent privacy statement
2. **P2- R108: Service:** Have a one-time consent
3. **P2- R109: Service:** Implement tools to protect users' privacy (e.g. from phishing)
4. **P2- R110: Service:** Require as less as personal information as possible to be able to function properly

4.4.5. Trust and reliability

The service is expected to function well at all times, however, if a problem arises with the functionality and accessibility of the smart light, the users should be informed. They should also be informed when the service issue is resolved. The service is also required to provide proper assistance through an easily reachable service agent and certain supporting functions in the digital interface.

Requirements:

10. **P2- R111: Service:** Inform users if it is not working / has an issue
11. **P2- R112: Service:** Inform users when it is fixed
12. **P2- R113: Assistance and support:** Service agent is provided to contact when there's an issue
13. **P2- R114: Assistance and support:** Digital tool is required to have audio options

4.4.6. Covid-19

Older people mainly stay inside during Covid-19. They avoid unnecessary trips. Due to the COVID-19 pandemic, the service should be as safe as possible and follow the safety guidelines set by the government.

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Requirement:

1. **P2- R115: Covid-19:** Service is required to be as safe and hygienic as possible

4.5. Conclusion end-user requirements - P2 Antwerp

The stakeholder interviews identify for the visual impaired persons, mobility impaired persons and the older persons the same **goals** that smart traffic lights should support: contributing to their to mobility independence, increasing the feeling of safety when crossing the street and making it also more comfortable. The solution should address in particular the length of the green crossing light that is now often too short and should be adapted to their needs. Another **need,** although not connected to the traffic light as such, is to provide opportunities around the light in order to be more recognised by drivers, for example by putting a special sign on the light warning drivers that the crossing is often frequented by elderly, mobile impaired and visual impaired users. Blind or visual disabled people seem to have the most needs as they also require extra information about the actual status of the light (is it green or is it red?) and, if possible, about certain road conditions (for example road works announcement or specifying the name of the street so that it helps orientation). This signal should be auditive but can be a voice instead of a signal. Stakeholders of older persons and person with impaired mobility reported that these latter two aspects might be interesting but not so crucial as they can still see the street. In a sense it seems that visual impaired users are the most vulnerable in the situation of the traffic light or at least require the most interventions and that implementing a feature that supports them to cross the street more safely will also benefit the other two other categories (be it or not in an adapted shape).
For visual and mobility impaired end-users the stakeholders preferred what concerns the **digital tool** a handsfree solution or a digital solution that reduces to a minimum the need of having to perform an action in order to be detected by the smart traffic light. Especially for blind persons a camera seems therefore the most suited solution. The camera can also be an answer to overcoming concerns of digital skills where not all older persons, visual impaired and mobility impaired users have the same digital skills. If case the digital solution would be an artefact around the body or a mobile application that can send a signal from a distance to the light, it should also be handsfree (avoid taking the mobile application from the pocket, especially in cold or rainy weather) and be designed in such a way that it avoids a feeling of being 'stigmatized'.
All stakeholders emphasize that the service should be organised in a **reliable and trustful** way. People really count on the solution and therefore it is necessary that it is working and also maintained by the operator. Information provision about the status of the light is important. This might be done via an open data strategy that allows the status of the traffic light to be incorporated in route planner applications. In the same way getting fast information that the light has been repaired after a temporary failure is important.
What concerns **privacy and security**, the stakeholders emphasized that like with other groups in society, the level of concern diverge. Nonetheless visual and mobility impaired

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people feel that they often necessarily need to give away a lot of personal information in order to get a good service in return. Stakeholders point out that they understand this need but that it is important that operators collect data that are only needed and in line with current legislation.
For the three user categories, the stakeholders emphasized that the solution will only be really effective if it is part of a broader strategy on improving road accessibility in Flanders / Antwerp. This means that the light is not a single demonstrator in one place but is part of a for the three groups relevant route that is equipped with smart traffic lights where needed.
Finally, the stakeholder interviews point out that the three user types will need specific **assistance and support** in learning to work with the new solution. Besides a good information campaign in the media, it will be important that there is a good collaboration with organisations that work with the three target groups, such as some of the stakeholder organisations interviewed. Elderly persons for example can learn during a mobility walk about the new light. Especially in the case of visual impaired persons such training is important as blind persons follow routes for which they have been trained. A smart traffic light changes the setting and hence particular training is needed to incorporate the new solution in road detection.
Concerning the impact of **Covid-19** on the proposed INDIMO service, the stakeholders reported at this stage no particular impact, but that particularly mobility and visually impaired road users will rely on others to respect the social distance at traffic lights. We want to stress here that in the interviews in T1.3 visual and mobility impaired users identified another impact, being a reluctancy from other road users to provide physical assistance when walking (pushing the wheelchair or keeping an arm to a blind person) or crossing a street.

4.6. P2 Antwerp - Persona Johanna

Building upon the insights from stakeholders and the analysis of the interviews in T1.3, the Antwerp pilot decided to focus on the user characteristic of blind persons in order to develop its persona. As mentioned above, the analysis of the interviews in T1.3 also learnt that developing a solution for the blind persons will probably also support on the long run also people in wheelchairs and elderly as the goals and needs for the three groups were more or less the same. By thus focusing on a blind persona, we would also touch upon aspects of wheelchair users and older persons for developing the smart traffic solution in Antwerp.
Johanna was chosen as the interviewed blind persons in T1.2 and T1.3 were all women. The persona emphasized the insight that blind persons often follow the same route when walking without company, but we also designed Johanna as an active walker (she walks to her work), so somebody that really has a daily need for the solution. Johanna as the personality trait that she does not like to use complex digital solutions so to inform developers about a solution that needs to be handsfree as much as possible. This is repeated in her motivation towards using a smart traffic solution. The pain points of Johanna highlight the three main points from the analysis: getting enough time to cross

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the street, knowing the status of the light, finding the button to activate the light and getting information about the road situation. The information she likes to hear from the solution all emphasize a concrete answer on these four points.

Bio

Johanna is a visually impaired woman of 40 years old. She's single, lives in Antwerp and takes pride in her job as a public service officer. She is frustrated with the current traffic situation and is well aware of the current inconveniences in traffic. She has an active travel pattern as she has to get from home to work and back in a complex urban context. She uses a combination of public transport and travel on foot. She practiced her routes with mobility supervisors/trainers and is unlikely to travel to unknown places / use unknown routes without assistance. She is not shy to ask for help when she needs it.

Name

Johanna

Age: 40 y/o

Marital status: Single

Children: No children

Occupation: Public service officer

Location: Antwerp

Income: Medium

Personality/situation

- Explorative
- Curious
- Analytical
- Determined
- Visually impaired (blind)
- Will not use complex 'solution' (e.g. a lot of different buttons)

Goals / Needs

- Cross safely
- Needs to go to the office during the week
- Cross a busy street with traffic lights
- Wants to cross in tranquility
- Become traffic independent and less reliable on others

Pain points

- Traffic lights: difficult to know red or green
- Traffic lights: difficult to find activation button
- Length of time is too short
- Road is not accessible (e.g. edges)
- Roadworks in progress

Motivation

- Make crossing safer
- Make crossing more comfortable/less stressful
- Feedback mechanism of light
- Handsfree and requiring no specific actions

Information Sources

- Google Maps / Street view + Blindsquare
- Local facebook group of blind people with tips and tricks about local mobility
- Website municipality with information on roadworks

Preferred information

- Know that it is (still) green
- Duration green light: how long left
- Extra information: street names, roadworks, tram tracks
- Information about light in operation or not; is it repaired or not

Table 7: Persona Johanna

4.7. P2 Antwerp - User Journey Map

Scenario

The user journey map of Antwerp started from the scenario of Johanna who needs to cross a street with traffic lights on her way to work.

Experience of persona

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In order to get aware of the traffic light and the situation on the crossroad, Johanna consults local people (mouth to mouth), local news sources (Facebook groups) and she follows the advice of her mobility trainer (person that has learned to her the route she needs to follow in her neighbourhood). If she needs more information about the light (for example a friend told her the lights are not working and she needs to leave soon so she has to make a detour to another crossing in order to arrive at her work), she can eventually check online if there is some particular information about road works or contact the municipality. Both phases are not really satisfactory, especially as in the latter case the information is not always readily available at the help desk of the municipality. At the traffic lights during the usage phase, Johanna is mainly listening to the sound of other road users to assess that it is green or red or she can ask it to another pedestrian. In the post-usage phase, the analysis shows that there is not much interaction possible with the traffic light operator to share the experience or report on something wrong. Also, the usage and post-usage phases are experienced by Johanna as negative.

Key insights for INDIMO

The INDIMO smart traffic light solution can thus in the four phases support the customer user journey of Johanna by for example allowing her to select in advance a route and know if the traffic lights are working. Once on the road, the INDIMO solution can give real time information about the status of the light when approaching the traffic light. The INDIMO solution can thirdly support Johanna by enabling the detection by the light of Johanna as a blind person and the extension of the crossing time of the light (and if possible, maybe provide some road information). Finally, it should be researched how the INDIMO solution can help to let Johanna easily provide feedback about a traffic light to the operator (for example, in case it is not working).

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About the customer

Add a photo to represent a typical customer

Johanna

Age: 40 y/o

Marital status: Not married

Children: No children

Occupation: Office job; public service

Location:

Scenario

Johanna, a visually impaired woman, wants to cross the street with traffic lights on her way to work

User expectation

She is allowed/can cross at her own pace and receives clear information and instructions from the light.

Awareness

Doing

- Mouth-to-mouth recommendation from friends and relatives and from the mobility advisor

Means/contact person

- Local news
- Word of mouth
- Telephone

Insights

- Campaign about lights and where you can find them
- Show the position of the light on the map: integration

1

Consideration

Doing

- Researches the light
- Checks online for more information

Thinking

- Wonders if it works
- Wonders if she can get there / reach it

Means/contact person

- Google website municipality

1

Usage

Doing

- She goes to the crossing
- She patiently waits for a sign or the reduced noise of cars
- She shows her cane to the cars before crossing

Means/contact person

- Light

Insights

- Show whether the light is working or not via the map in order to start the route

1

Service

Doing

- **Once special sound or noise of cars that they start coursing**

Thinking

- Not enough time to cross
- Cars are coming
- Afraid there'll be bikers

Means/contact person

- Other road users
- Light

insights

- Extend the light, give clear red or green signal and extra information

1

Post-usage

Doing

- Advocacy: share experience with other visually impaired persons

Means/contact person

- Telephone
- E-mail
- Mouth to mouth

Insights

- There is not much direct interaction or feedback possible

1

Table 8: User journey Johanna

5. P3 – Galilee: user needs and requirements

Galilee pilot (P3) will test users' experience and needs related to the use of the existing ride-sharing mobile application called SAFARCON. The aim of the pilot is to Identify components that can be improved to make the application more accessible to users.
The application was developed by Technion researchers under the support of the Chief Scientist of the Israeli Ministry of Transport. The purpose of the app was to create a new platform targeting women in the Arab society for ridesharing allowing them greater accessibility, considering low motorization availability and low service level provided by existing public transport. The app was in use for a short time during the project funded by the chief scientist of the Ministry of Transport but was not maintained and hasn't been used lately. The plan is to reinstall it and apply it to a limited area/corridor for testing.
The informal ride-sharing dispositive consists of:

- Digital tool: Mobile application for ordering transport by car
- Physical tool: the car of the driver
- Service agent: the rider offering a ride-share
- Service organisation: some basic principles ordering the interaction, like the only cash payment option

5.1. Interviews

The Galilee pilot has the following user profile:

- informal ride sharing users
    - characteristics:
        - Ethnic minority man/women
        - Residing in the periphery
        - Insufficient public transport services
        - Language barrier
        - Lack of digital skills

In order to identify the goals, needs and challenges of the user profile with the pilot application, the Galilee pilot interviewed four instances that were involved in the development of the previous application that INDIMO will redesign. In that sense they could speak from the experiences gathered with Arab woman. As fifth stakeholder, an interview was organised with a representative of Kayan, the organisation that is involved in the application development. For the interview, the person was approached from her role as a Feminist Arab woman organisation that promotes emancipation and education.

Column	Date interview	User profile and user characteristic
Chief Scientist Israel Ministry of Transport	13/10/2020	ethnic minority women residing in periphery insufficient public transport services
Prime Minister Office - Smart Mobility Initiative	04/11/2020	ethnic minority women residing in periphery insufficient public transport services
Transport Planner. Involved in App development	20/10/2020	ethnic minority women residing in periphery insufficient public transport services
Ad & Marketing Company. Was involved in Launch of App	18/10/2020	ethnic minority women residing in periphery insufficient public transport services
Kayan. Feminist Arab Women	26/10/2020	ethnic minority women residing in periphery insufficient public transport services

Table 9: Overview stakeholder interviews P3 Galilee

The five different stakeholder interviews identified Arabic women in rural areas with digital know-how as the main target group for this project. The rural areas where these women live tend to have bad infrastructure and are not well-mapped and tend to lack proper public transport methods. The pilot is thus developing an informal ride-sharing tool to provide these Arabic women with an alternative to meet their mobility needs. Because the stakeholders in the interview focussed merely on the digitally skilled Arab woman, there is not much insights via this method gathered about the non-digital skilled Arab woman. The profile for which end-user requirements will be identified is thus the following:

- Arab woman in rural areas with digital skills but lack of transport services

5.2. Arab women in rural areas with digital skills but lack of transport services

5.2.1. Goals

The target audience would use this service to increase the mobility independence of women and in this way stimulate employment and higher education. Due to a lack of proper public transport in rural areas, the target audience requires an affordable and reliable ride-sharing service to be able to get places without too much hassle. The following goals were mentioned by the stakeholders:

- Promote employment among women by offering shared rides from home to work and back
- Promoting higher education among women by offering shared rides from home to school/university and back

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- Get to everyday activities (shopping, medical needs) / running errands in neighbourhood

Requirements:

The service should have the following functionalities:

1. **P3-R1: Goal:** Organise shared transport from home to work for women
2. **P3-R2: Goal:** Organise shared transport from home to high school/university for women
3. **P3-R3: Goal:** Organise rides from activities/errands and back safely and easily from home

5.1.1 Needs

According to the stakeholders, Arab women in rural communities have the following needs to achieve the goals from the previous section:

- Overcome the lack of public transport options in the region
- Have an accessible and reliable transport service of on demand planned trips
- Preference for female drivers
- A safe and secure transport service
- A trustful organisation exploiting the service
- A discrete service that does not display too much personal information publicly
- Discrete pick-up in the neighbourhood of the house
- An easy and straightforward service

Requirements:

4. **P3-R4: Digital tool:** Be easy to use and to be straightforward and intuitive
5. **P3-R5: Service organisation:** The service should be accessible 24h and 7 days in the week
6. **P3-R6: Service Agent:** The service agents are preferably women
7. **P3-R7: Service organisation/Service Agent/Digital Tool/Physical tool:** the service in all its components should be reliable, secure and trustworthy
8. **PR-R8: Service organisation/Privacy and security:** The service is designed to not display too much user information publicly and provide discrete subscription identification
9. **PR-R9: Service organisation/Privacy and security:** The service should respect the house and private sphere of the user and not 'intrude' it
10. **P3-R10: Service organisation:** The service should offer on demand planned trips

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5.2.2. Challenges and limitations

Digital and technological skills are required

The Arab women require basic technological and digital skills in order to use the application correctly. They need to possess a personal smartphone. In order to guide the initial usage, support functions should be present. Language (Arab) and simple icons can support usage and adoption too.

Requirements:

11. **P3-R11: Digital tool:** Make use of visual icons
12. **P3-R12: Digital tool:** Simple one-time registration
13. **P3-R13: Assistance and support/digital tool:** Offer help features (e.g., small explanations/FAQ) on the app for every step in the process
14. **P3-R14: Assistance and support/digital tool:** Offer audio-assistance in Arabic
15. **P3-R15: Assistance and support/digital tool:** Set up a helpdesk that is easy reachable by users via different channels (e-mail, phone, WhatsApp, chat)
16. **P3-R16: Assistance and support:** Helpdesk supports users with setting-up the application, during usage and with post-usage difficulties.
17. **P3-R17: Assistance and support:** Offer an introductory video explaining the step-by-step procedure to use the digital tool and the service

Necessity for wanting to use technology for ridesharing and showcase advantages

Stakeholders say that it is not that Arab women don't use technology that is the major barrier. The crux will be to convince the Arab women of the advantages for them to use technology for informal ridesharing.

18. **P3-R18: Service organisation:** a communication campaign is needed to convince Arab women about the benefits of the service and the advantages of using their mobile phone.

Language

The Arab woman in rural areas will have trouble with the English terminology.

19. **P3-R19: Digital tool:** Users will prefer an Arabic interface that uses feminine grammar

Geographical situation

Due to the lack of proper infrastructure in most of the rural areas, there often are no addresses to order a car ride from and the maps tend to be ambiguous or unclear. Hence, the service needs to accommodate this, by for example using points of interest like the post

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office. Also, points of interest are relevant pick-up and drop off points as some users will not like that the car drops or picks up the passenger in front of the family house.

Requirements:

20. **P3-R20: Service organisation:** Work with points of interest and location indicators to overcome lack of infrastructure
21. **P3-R21: Service organisation:** Work with point of interest and location indicators to avoid picking up/dropping off in front of the family home.
22. **P3-R22: Digital tool:** Users are able to select point of interest and location indicators in order to select pick-up and drop off places
23. **P3-R23: Service agent:** Car driver should come from the particular rural area where he/she knows his/her way

Visual disabilities of certain users

Visually impaired persons will not be able to use the service properly if it does not provide an auditive way of ordering a car ride.

Requirements:

24. **P3-R24: Digital tool:** Users can adjust the font of the digital interface
25. **P3-R25: Assistance and support:** Users should be able to be guided by audio-assistance in Arabic

Social situations that could cause issues

The target audience will be attentive towards certain social situations. These social situations might cause an obstacle for the service. Certain women will need consent from their family to ride with an unknown person that is not a family member. The target audience might also take issue if the driver is male. Other than that, the target group is a vulnerable group that will need to feel safe, otherwise they will not use the service. Finally, cash payment should be possible because most women don't own credit cards and will also not like that someone can follow them based on their payment records.

Requirements:

26. **P3-R26: Service organisation:** Informal ride sharing service should be provided by a well-known and reliable organisation in order to facilitate the consent of the family
27. **P3-R27: Service agent/digital tool:** Provide the users with different service agent and physical interface profiles to choose from
28. **P3-R28: Service agent/Digital tool:** Driver profile mentions the gender of the driver
29. **P3-R29: Digital tool:** Option for selecting a male or female driver
30. **P3-R30: Service organisation:** Emergency button on the application is required

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31. **P3-R31: Service organisation:** Users should be able to pay in cash

Economic factors

Arab women don't earn much so the rides should be within their financial capacities:

32. **PR-R32: Service organisation:** Price of the service should be affordable
33. **PR-R33: Service organisation:** Transparent about the price during the booking process

5.2.3. Privacy and security

Privacy and security are important factors for the target audience. If they do not believe the service is safe, they will not use it. The service should thus be designed and introduced by a reputable and transparent company, have the possibility to stay anonymous, for example by setting up a discrete profile. There should also be several assistance options, perchance depending on the severity of the situation (e.g. an emergency button or a chat option).

Requirements:

34. **P3-R34: Privacy and security:** Users require the service to be designed by a trustworthy and reputable organisation
35. **P3-R35: Privacy and security:** Users require that registration should not only be via their Facebook profile
36. **P3-R36: Privacy and security:** Users are only asked personal data is purposeful to use the service
37. **P3-R37: Privacy and security:** Users will like to have a discrete, anonymous user profile (nickname, serial number but no relation to personal information)
38. **P3-R38: Privacy and security:** Service is required to use points of interest and location indicators for pick-up/drop-off
39. **P3-R39: Privacy and security:** Digital tool requires an emergency button
40. **P3-R40: Privacy and security:** Users require certified safe cars in the service
41. **P3-R41: Privacy and security:** Car park involved in the service should be diverse because users will have different needs depending on the trip.

5.2.4. Trust and reliability

As mentioned, the service will not be trusted and thus not used if it is not a project set up by a trustworthy and reliable organisation. However, the target audience also requires the service itself to be trustworthy and reliable, meaning that the service agents will not cancel a ride, that it is transparent who is driving you, and so on.

Requirements:

42. **P3-R42: Service Agent/service organisation** Users want the car driver to arrive always punctual at pick-up location and drop-off location

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43. **P3-R43: Service Agents/Service organisation:** Users don't want rides to be cancelled
44. **P3-R44: Service organisation /Digital tool:** Users are able to give feedback about drivers, car, ride and provider and see feedback of other users on these four topics
45. **P3-R45: Service organisation/Digital Tool/Physical Tool/Service Agent:** Users require the service to be designed by a trustworthy and reputable organisation in all its components
46. **P3-R46: Service organisation:** Digital tool is required to always be accessible (24/7)
47. **P3-R47: Service agent/Digital tool:** Service agent is required to have a profile so users can check her/him out before making a choice.
48. **P3-R48**: **Digital tool/Service organisation:** Digital tool requires an option to give feedback (on driver, car, ride, provider)
49. **P3-R49: Service agent:** Users are able to contact the service agent directly
50. **P3-R50: Assistance and support:** Service needs to be able to be contacted via application, email and phone

5.2.5. Covid-19

Due to the COVID-19 pandemic, the service should be as safe as possible and thus follow the safety guidelines set by the government.

Requirements:

51. **P3-R51: Covid 19**: Needs to be adapted to the regulations of social distancing (e.g. availability separator, face masks and hand gel)
52. **P3-R52: Covid-19:** Safety by using separators or making sure social distance is possible

5.3. Conclusion end-user requirements - P3 Galilee

Based on stakeholder interviews (see Annex II – Template stakeholder interview), the end-user requirements highlight that in order to reach the **goals** of supporting education and working opportunities for Arab woman in rural communities.
What concerns **the service organisation**, the informal ridesharing application should keep on the one hand in mind the geographical situation. There exists no address so Point of Interests around the pick-up place in the village are important to provide on the application. On the other hand it will be important to take into account cultural aspects, especially the need for discretion – no pick up in front of the house - but also the particular social situation such as consent of the usage of the app by the family. Important is also the need for being able to pay by cash as some users won't have bank cards but also because people are quite suspicious towards paying by cards.
Especially important is the role of **trust.** We referred already to the fact that the **service agent** should be trustful, a characteristic that could be shown by means of ratings. He should also be punctual, following a clear route and keep his promises. In that sense,

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certified information and being sure that a deal will be also honoured by the mechanism of the mobile application will be an important feature for Arab woman in villages. **Privacy** of the service is also valued and public display of the user profile for example should be avoided.
Although the women are digitally skilled, it will be important to provide a minimum of **assistance and support on the digital tool**, for example by having the application in Arab language (or have it supported with audio in the local language) and to make sure that there are online support videos and a help desk is active.
Finally, what concerns the **physical tool**, it is important that the car is safe and in order. Again, as mentioned with the driver and other aspects of the service, certified information that the car is fit for the service will be an advantage

5.4. P3 Galilee - Persona Mariam

Building upon the insights from the stakeholder interviews and the interviews with non-users and users in T1.3, a persona was created. Since the focus is on Arab women, the choice of the gender of the persona was female. In order to capture the two major goals of the application for end-users – support education and work - Mariam was conceptualised as a student living in a village with a regular student job in the city. The persona also portrays Mariam as being in a dialogue between cultural tradition and modernisation. In that sense, the persona brings the dimensions to the fore in the current pain points of needing a flexible informal ridesharing service to overcome transport poverty but also the requirement of privacy and trust in the information provision dimension.

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Bio

Mariam is a 25 year old woman who was born and raised in a village in the area of Galilee. She is a parttime university student and combines this with a sales job at the grocery store outside her village. Before she stated studying and working, she spent most of her time in her village. She has digital know-how and uses multiple apps.

Goals / Needs

- Safety, reliable and trustworthy
- Go to school and work more easily
- Independence and emancipation

Motivation

- Identification and location
- Able to get destinations more easily
- Safe services

Name

Mariam

Age: 25 y/o

Marital status: Not married

Children: No children

Occupation: Parttime saleswoman at grocery store; Parttime university student

Location: Rural area/village

Income: Medium

Pain points

- Not easy to rely on family members as an alternative
- Relies on others car ownership
- Lack of PT
- Lack of functional PT (e.g. never on time)
- Location identification issue: no addresses/unclear mapping

Information Sources

- Exposed to all kind of sources, from tv to computer, to apps and web: no limitation
- Consent about the practice of ride-sharing: allowed to rideshare

Preferred information

- Driver profile
- Vehicle profile
- Direct drive or picking up more people
- Authority support of app development; reliable source
- User experience
- Know price in advance
- Route that is followed

Personality

- Open to modern life, modern technology
- In dialogue with cultural traditions and modernity: combination culture and technology/modern life
- Respectful of culture
- Strong

Table 10 : Persona Mariam Galilee

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5.5. P3 Galilee - User Journey Map

Scenario

The user journey map of the current situation for Mariam was built around the scenario to order a ride from a point of interest near her home and to be dropped off at the university.

Experience of the persona

The map highlights that each of the four phases today are experienced as negative and go along with a lot of uncertainty. In the awareness stage, Miriam will have to find on local Facebook groups and find in the advertisement messages here a driver. This can result one day in a very fast booked ride, but it can also take a while. In any case, it is very difficult to book a ride almost on the spot and bookings are often taken a few days in advance. In the consideration phase, this level of uncertainty is not gone. Most information is provided by contacting the driver himself. One can look on the Internet to find out more on the driver, but this sometimes take time since the information is dispersed. The major question Miriam has is to what extend the driver is providing correct information. There is a need for trust cues in this stage. During the stage of usage, Miriam often calls the evening before the pick-up the driver to remind him and be sure that the agreement still holds. There is thus an uncertainty until the pick-up moment since only an informal deal was no made and no mechanism of a 'contract' to perform the ride. During the ride, Miriam needs to check the route and make sure the driver will park at the agreed drop-off zone. After the ride, Miriam feels that an emergency button (for example in case of feeling unsafe) is lacking but she also misses a place where she can rate a good driver so that other women from her village know which driver is providing a trustful and reliable service.

Key insights for INDIMO

The map also highlights that in the phases of awareness raising and consideration, the application will have to find its place in the digital/physical world of the Arab women, especially in the circle of friends at university and in social media groups. The insight is that today information found in the awareness and consideration phase is not easily certified or confirmed and even when ordering and using the service, there is uncertainty about the ride and the agreement made. The application should thus be an opportunity to provide clear, agreed and trustful information from finding a driver, agreeing on the route over booking a ride as well as finally providing a 'guarantee' that the deal has been made. Also the app should allow that rides can be booked more close to the day the ride is needed than currently one week or longer before that day. At the end, in the post-usage phase, being able to provide feedback on the driver is important in order to start the rating process of the driver and his car.

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About the customer

Mariam

Age: 25 y/o

Marital status: Single

Children: No children

Occupation: Parttime university student, parttime saleswoman at grocery store

Location: Rural area of Galilee

Scenario

Mariam wants to find a driver to get to university. She wants to be picked up at a point of interest and be dropped of at the university.

User expectation

Mariam wants the service to be safe, reliable, punctual and affordable (compared to taxi, not public transport).

Awareness

Doing

- Checks social media groups for students
- Word of mouth: other university students

Thinking

- She's frustrated: Will I get there on time? Will the driver be there?

Means/contact person

- Friends and students
- Social media groups

Insights

- Provide information in app about driver (driver profile)

1

Consideration

Doing

- Checks out social media for more information
- Looks up the service
- Contacts the driver

Thinking

- She's nervous: Is the driver reliable?

Means/contact person

- Social media
- Person that told her about the service: Ask more information

Insights

- Cerfitified feeling of getting th e information; trust

1

Usage

Doing

- Call/text the driver to make the appointment
- Asks about: safety car (e.g. insurance), license driver, experience, route, time frame, cost
- Assesses safety driver: kind of response (tone and correct answers)
- If trustworthy: make appointment (text message for confirmation)
- Payment method agreed on

Thinking

- She's unsure: Is (s)he trustworthy?
- She's unsure: I have to check the route the driver is providing

Means/contact person

- Phone call or text message

Insights

- App helps her check all the information, will reduce stress and frustration
- Faster order (not 2 weeks ahead)
- Pricning agreement made in the app

1

Service

Doing

- Checks if everything is correct (e.g. same car as ordered)

Thinking

- She wants to be certain: Is everything like we agreed?

1

Post-usage

Doing

- Rates the driver and service (diffused! because not in-app just friends, rematives and social media group)

Thinking

- She finds it unhandy: No central place to complain to the organisation or to the driver or to encourage

Means/contact person

- Social media group

Insights

- Feedback is gathered in one place: the app
- Rating and comments system in the app
- Mentioned in profile of the driver

1

Table 11: User journey Mariam

6. P4 Madrid – user needs and requirements

Madrid pilot will test users' experience and needs related to the use of the existing Cycle logistics platform *Coopcycle-La Pájara* for food delivery in order to make this platform more inclusive and accessible to vulnerable-to-exclusion users. Initially, this platform for food delivery has been developed by the European Federation of Bicycle Delivery Cooperatives. The main aim of this pilot is to improve the access of vulnerable-to-exclusion groups of people to healthy food. Particular attention will be paid to the needs of low-income, people with reduced mobility/vision, socially isolated (unwanted loneliness) and COVID-19 isolated person with none or reduced number of daily trips allowed. Not-connected people (e.g., lack of digital skills and lower technology availability) will be considered specially.
The dispositive of the Madrid pilot from an end-user point of view are thus:

- A digital tool: the mobile app or the web platform to make orders
- A service agent: the biker that delivers the food or a person at the helpdesk

6.1. Interviews

The user profile identified by the Madrid pilot as the main target is the following:

- healthy food delivery users
    - user characteristics:
        - Permanently impaired or with disabilities
        - Socially isolated (unwanted loneliness)
        - Not-connected people (e.g., Low digital skills, lower technology availability)
        - Low income
        - COVID19 isolated with none or reduced number of daily trips allowed

In total the Madrid pilot performed 6 stakeholder interviews (see Annex II – Template stakeholder interview) in the months of July and August 2020. The pilot managed to interview a set of organisations that allowed to provide insights on wide range of user types having one or more user characteristics of the user profile. Andaire Coop is an association that coordinates the 'Unwanted loneliness project' in Madrid and hence can shed light on the situation of socially isolated persons, in particular woman, in certain neighbourhoods of the Spanish capital. ASINDOWN and Down Madrid are two organisations working with cognitively impaired children. Once and the Once foundation are, given their focus, useful for providing information about visual impaired people and people with other impairments. Finally, Caritas was approached in order to get insights on persons with low incomes.

Name stakeholder organisation	Date interview	User profile and characteristics
Andaira Coop.	28/07/2020	Socially isolated (unwanted loneliness)
ASINDOWN- " with Mobility disability"	29/07/2020	permanently impaired or with disabilities - cognitive
Down Madrid	30/07/2020	idem
ONCE	17/09/2020	permanently impaired or with disabilities - visual impaired
Caritas	17/09/2020	Low income
ONCE Foundation	09/10/2020	All disabilities

Table 12: Overview stakeholder interviews P4 Madrid

On the basis of the stakeholder interviews, the end-user requirements on the dimensions will be identified for the following user types and characteristics:

- Socially isolated/older woman
- Cognitive impaired person
- Mentally ill persons
- Impaired user (visually, mobility, auditory)
- Low-income user

6.2. Healthy food delivery user - Socially isolated/elderly women

6.2.1. Goals

- Being able to invite family/guest for special occasions and offer meals
- Transport medicine and grocery (heavy purchases; once-twice a month)
- Send parcels to relatives as way to break isolation

Requirement:

1. **P4- R1: Goal:** Digital service should have the functionalities to order food in order to invite guests at home, to order heavy groceries from stores and to send/receive parcels.

6.2.2. Needs

- Tailored catering with no risks or experimentation but that focus mainly on product that work within current food diaries
- Pleasure of ordering food and goods is important
- Easy to use and familiar technology for handling orders

Requirements:

1. **P4- R2: Service organisation:** Offer a good experience in all its components beyond merely the completion of an efficient and successful transactions

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2. **P4- R3: Service organisation/digital tool:** Designed as a safe experience within technologies that are currently known
3. **P4- R4: Service organisation/assistance and support:** Offer should be tailored to dietary needs of older people and focus on products they can eat

6.2.3. Challenges and limitations

Lack of technological and digital skills

The digital knowledge and skills of elderly will vary. Some will have followed some literacy courses, others not. Some will use already some mobile applications and others not. Whatsapp is mentioned as a digital tool that members of this target group use and should be used as a communication tool to overcome usage problems with the application.

Requirements:

4. **P4- R5: Digital tool:** Interface should be intuitive (e.g. with drawings) and easy to use
5. **P4- R6: Digital tool:** Design of the application should clearly make a distinction from the start between the three options: ordering a meal, ordering groceries and sending/receiving a parcel
6. **P4- R7: Digital tool:** Timetable of delivery as well as the price should be clearly visible and readable at all times for the target group
7. **P4- R8: Digital Tool:** Present the search from food labels rather than from restaurants
8. **P4- R9: Digital tool:** Work with contrasts in colours to highlight different sections or functions
9. **P4- R10: Digital tool:** Make a simple function to save preferences
10. **P4- R11: Service organisation:** If using the digital application might be too difficult, use Whatsapp as a total or partly (e.g. ordering after consulting the menus/restaurants) solution.
11. **P4- R12: Assistance and support:** Publish a tutorial video on YouTube and use older persons as characters
12. **P4- R13: Assistance and support:** Work on opportunities (e.g. training sessions) to get familiarized with the app before usage
13. **P4- R14 Assistance and support /Service organisation/service agent:** Allow for a human contact when needed help by using WhatsApp; avoid a design that leads to a talking machine or feels like talking to a machine

Language (Spanish)

Elder women living in isolation are not fluent in English and English terminology should be avoided.

Requirement:

14. **P4- R15: Digital Tool:** Use Spanish language and terminology on the digital tools

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Monetary resources

Elderly women in isolation might not always have sufficient monetary resources to buy food or have to watch their budget closely.

Requirements:

15. **P4- R16: Service organisation:** Make sure the products available via the application are within affordable price ranges
16. **P4- R17: Digital tool:** Work on price transparency throughout the whole service (By displaying this, by providing a calculator, by keeping track of the amount, ask for confirmation before placing an order and so on)

Knowledge about and image of the service

Stakeholders state that the target audience won't use the service if they don't know it and get recommended about it personally via people they know. The target audience will also not immediately perceive the service as being made for them. They rather will consider it as being for business men/women. Also they don't know the application as such.

Requirements:

17. **P4- R18: Service organisation:** Design a good social campaign - via 'opinion leaders' and 'social organisations' around the target audience - to foster knowledge about the existence of the app and stimulate recommendations
18. **P4- R19: Digital tool:** Use a design that appeals to the target audience and addresses their needs by highlighting food instead of restaurants

6.2.4. Privacy and security

Elderly women in social isolation don't bother too much about data privacy as they belong to another generation where privacy was not so much an issue. On the other hand, they have a tendency to not be disturbed too much with advertisements or tailored messages based on data-analysis of their usage.

Requirement:

19. **P4- R20: Privacy and security:** Respect basic privacy regulations

6.2.5. Trust and reliability

According to the stakeholder, establishing trust will be an important element to convince older women in social isolation to start using and keep using the service. This trust is connected to the organisation of the service as well as to the physical appearance and behaviour of the food deliverer

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Requirements:

20. **P4- R21: Service organisation:** Users require the service to be approved by a trustworthy and reputable organisation
21. **P4- R22: Service organisation:** Users require direct recommendations from trusted sources to install and use the application. The social campaign (see above) should take this into account
22. **P4- R23: Service organisation:** Being transparent in order to be increase perception of safety and reliability
23. **P4- R24: Service organisation/service agent:** Provide the opportunity to tell where to leave the food, groceries or parcels - door, hall, door men - and what time frame

6.2.6. Covid-19

Due to the COVID-19 pandemic, the service should be as safe as possible and follow the safety guidelines set by the government. The service also serves important goals in order to allow elderly socially isolated women to stay in contact and to buy medicines or other groceries

Requirements:

24. **P4- R25: service organisation:** In times of Covid-19 it is important that the target group is informed about the existence of the service in order to ease impacts of Covid-19 safety measures (e.g. lockdown)
25. **P4- R26: Service organisation/service agent:** Should be as safe as possible and follow the safety guidelines set by the government (1.5 meters distance; disinfect/wash hands before delivery and drop food, grocery or parcel in a safe spot)
26. **P4- R27: Service organisation/service agent:** Use WhatsApp or phone to warn older persons that food, groceries or parcels have arrived and can be picked-up.

6.3. Health food delivery user - cognitive impaired persons

6.3.1. Goals

- Online purchase of food can be for small vector of cognitive impaired persons
- increase their independence by providing them pleasure of ordering in by themselves healthy food

Requirement:

27. **P4- R28: Goal:** Application should support online purchase of food (for a profile of cognitive impaired persons) and give a sense of independence

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6.3.2. Needs

- A structured step-by-step approach (cfr Instagram) to the set-up of the workflow of the online service
- Structured approach in food presentation
- Friendly, empathic and easy delivery

Requirements:

28. **P4- R29: digital tool:** Application should offer an approach of workflow and presentation like Instagram: step-by-step and structured
29. **P4- R29: digital tool** Certain structured approach around food and eating (weekly menus, order of presentation) is required
30. **P4- R31: digital tool/service agent:** Service in all its components should be easy, friendly and empathically organised

6.3.3. Challenges and limitations

Cognitive disabilities of certain users: financial aspect

The users are required to have basic cognitive skills to be able to use the service properly. The service should make sure that those who are cognitively impaired or are mentally unwell, can be monitored and guided by their tutors/parents/partner, especially what concerns the payment of the service where there is a risk that they can't control their expenses as they might not have the ability to understand financial aspects.

Requirements:

31. **P4- R32: Service organisation/digital tool:** Offer couple accounts for supervision by tutor(s)
32. **P4- R33: Service organisation/digital tool:** Parental approval/confirmation of order
33. **P4- R34: Service organisation/digital tool:** Set a limit on expenses for the user/tutor

Cognitive disabilities of users: capacity on information intake

The cognitive impaired persons that can use the application won't have problems with technical and digital skills as such, but more with the design and how the information is presented and structured. Four important points are raised. As mentioned above, it is about operationalising a workflow like Instagram (structured process of step-by-step actions). Secondly, it is about offering possibilities to order food in a regular way. Thirdly, it is about being able to choose easily healthy food from a wider spectrum of food options and to understand food options. Finally, it is about restricting too many options and providing easy ways to get support in case something goes wrong in the process and complete the order alternatively.

Requirements:

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34. **P4- R35: Digital tool:** Work out an easy interface with intelligible logo's and a clear step-by-step approach for each necessary action
35. **P4- R36: Digital tool:** Enforce this approach with visuals such as a progress bar.
36. **P4- R37: Digital tool:** Provide an option to choose from a weekly menu or choose and order food for a longer
37. **P4- R38: Digital tool:** Present the options from the food types instead of the restaurants or big brands names and hence avoid ordering food they don't need
38. **P4- R39: Digital tool:** In the design restrict the options to choose to the most essential ones - the design should support decision making
39. **P4- R40: Digital tool:** Digital interface can limit the number of options based on set preferences/past interests or already auto-complete certain fields
40. **P4- R41: Digital tool/Assistance and support /service agent:** Provide a help button with direct access to helpdesk via phone and take over command from there if needed
41. **P4- R42: Assistance and support:** Provide a short tutorial video about how the service works on the website or app.

Cognitive disability: avoid surprises

The stakeholders point out that it is important that the service is structured and hence also the process of delivery is important to be recognisable.

Requirements:

42. **P4- R43: service agent:** Delivery person should wear his uniform, so he is clearly identifiable
43. **P4- R44: service agent:** Delivery person should be on time and punctual. Report any delay to the user
44. **P4- R45: service agent:** Delivery person should speak calm and with short sentences. Focus on the relevant information
45. **P4- R46: service agent:** Delivery person should avoid behaviour that might be perceived as invasive
46. **P4- R47: service agent:** Provide a review option for delivery persons so that user knows who to choose and expect

Attracting target audience: knowledge and branding

The target groups need to be informed that the service focuses on them and their particular needs. Stakeholders tell that the application of La Pareja as such is not suited for them and that it will be important to finetune it for the target audience

Requirements:

47. **P4- R48: Service organisation:** Need for a social campaign to introduce the application in the network of trusted agents (tutors/guardians) around the target audience
48. **P4- R49: Service organisation:** A way should be devised to find a use case as most of the target audience gets food at canteens

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49. **P4- R50: Service organisation:** Clearly communicate/state who their target audience is as today the reputation is that it is not for the target audience

6.3.4. Privacy and security

The target group itself is said by stakeholders not able to perceive the risk in personal data. Nonetheless, the tutors can be worried, especially because the broader risk lies with them. They have a fear for abuses - like with the monetary expenses - and like to avoid this situation.

Requirements:

50. **P4- R51: Privacy and security:** Service does not share personal information with other users or organisations
51. **P4- R52: Privacy and security:** Service offers couple accounts for supervision by tutor(s)
52. **P4- R53: Privacy and security:** Get a certification about data protection and security in order to convince tutor/guardian

6.3.5. Trust and reliability

Stakeholders don't elaborate this point, but they refer to the existence of current food platforms like Deliveroo. Although people tell a lot about it, they still use it. Another stakeholder referred here more to the role of the tutor/guardian and to the issue of privacy and data protection.

Requirement:

53. **P4- R54: Service organisation** It will be important to win the trust of the tutor/guardian

6.3.6. Covid-19

Due to the COVID-19 pandemic, the service should be as safe as possible and follow the safety guidelines set by the government. It can also be a tool to get out of the routine.

Requirements:

54. **P4- R55: Covid-19:** Service can be used as a way to escape from the daily routine
55. **P4- R56: Covid-19:** Service is required to be Covid-19-proof: food delivery keep distance at 1.5 meters at all time, wash/disinfect hands before delivering and drop off food, grocery or parcel in a safe spot (hall)
56. **P4- R57: Covid-19:** Inform the person that the food has been delivered via phone or WhatsApp

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6.4. Healthy food delivery user: mentally unwell user

With this category, we mean persons that take medication in the context of suffering from a mental disease (e.g., depression, dementia, ...) that impacts their concentration level. The stakeholders only touched upon this category briefly when discussing cognitively impaired people. Therefore, only a limited number of requirements can be identified.

6.4.1. Goals

- Order food because they can't cook or have never learned to cook
- Expand food choice beyond canteen or social organisation

Requirement:

57. **P4- R58: Goal:** Service should offer the ability to order healthy food as a replacement for cooking

6.4.2. Needs

- An easy-to-use service
- A service meant for regular (daily) healthy food delivery

Requirement:

58. **P4- R59: Service organisation/digital tool:** Service should be easy to use and serve daily food requirements

6.4.3 Challenges and limitations

Branding and finding a place of use

The stakeholder refers to the fact that the target audience is often getting its food from social organisations already or in canteens. In that sense, it is the question to what extent they will use an application. The stakeholder thinks that over time members of the target audience might start doing it, but a campaign in the first phase will be necessary

6.5. Healthy food delivery user - visually, mobility or auditory impaired user

6.5.1. Goals

- Getting food delivered at home
- Make shopping a better experience (visual impaired and mobility impaired)
- Pleasure of ordering

Requirements:

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59. **P4-R60:** Goals: make shopping a better experience by giving pleasure to ordering

6.5.2. Needs

- A universal accessible service. Universal means not only useful for the target audience, but also others (e.g: a ramp can also be used by a parent with a poussette)
- No practical difficulties when shopping in a shop
- Covid-19: turned shopping in problem for deaf people
- auditory or visual assistance (in app and via help service)
- punctual, friendly and easy delivery

Requirements:

60. **P4- R61: Digital tool/Service organisation:** Service should be designed from a universal point of view (visual and mobility impairment) and through its digital and physical components
61. **P4- R62: Digital tool/service organisation:** Service should provide a better shopping experience than in the physical setting (mobility impairment

6.5.3. Challenges and limitations

Challenges due to impairment

In general, because of their impairment, the process to order food or groceries takes longer than with other users. The choices to be made with food are different and often more complex than for example buying a train ticket so the challenge will also be to what extent screen readers can get the complexity of food choice. Third, the payment process is also one with stress because there are often steps to be performed.

Requirements:

62. **P4- R63: Digital tool:** Will be important to offer a limited but meaningful list to choose from. Use previous searches and preferences as a way to simplify the process and options
63. **P4- R64: Digital tool:** Design the tool with screen readers in mind and how the process can be well represented via these readers so that mistakes in ordering products are avoided for blind people
64. **P4- R65: Digital tool:** Provide a trustworthy but efficient payment module. If necessary, check for a cash payment option

Allowing for/anticipating mistakes

Given the challenges above, it is important to realize that mistakes will happen, mistakes that will frustrate the user but require also a strategy from the provider to handle those mistakes.

Requirement:

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65. **P4- R66: Service organisation/Assistance and support/Digital tool:** User should be allowed to make mistakes. A function should be designed to restart the process. It should also be easy to take one step back in the process
66. **P4- R67: Digital tool/Assistance and support:** In order to avoid mistakes, special help messages can be displayed to highlight attention
67. **P4- R68: Assistance and support:** Provide a good remote assistance by phone in case of problems.

Visual disabilities of certain users

Visually impaired persons will not be able to use the service properly if it does not provide an alternative way of ordering meals/groceries.

Requirements:

68. **P4 - R69: Digital tool:** Digital interface can be adjusted (e.g., font, colours)
69. **P4- R70: Digital tool:** Offer audio-assistance / auditive guidance
70. **P4- R71: Digital tool:** Use different coloured and shaped containers to easily identify breakfast, lunch and dinner

Attracting target audience

As the healthy food ordering service is new, it will be important to reach out to the target audience. Here also it will be important to cooperate with actors on the ground to have a maximal effect.

Requirement:

71. **P4- R72: Service:** Design a good social communication campaign to reach the opinion leaders within the communities of the blind, mobility impaired and the deaf

6.5.4. Privacy and security

The main concern here was that it is not only important to follow the regulation in Spain and the EU but also to not disclose the situation of persons.

Requirement:

72. **P4-R73: Privacy and security:** collect data with respecting legislation and within these boundaries don't ask from /reveal to much information about end-user

6.5.5. Trust and reliability

N/A

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6.5.6. Covid-19

The stakeholder points out that the Covid-19 had different impacts on the type of impairment. In general, a healthy food delivery app is beneficial for the mobility impaired because Covid-19 measures making shopping less easy in stores can be circumpassed with the application. Nonetheless, although these Covid-19 safety measures should be incorporated in the service, specific barriers emerge.

Requirements:

73. **P4- R74: Covid-19:** For mobility impaired persons it is important to design a system to deliver the food at home and not in the corridor or at the doorstep
74. **P4- R75: Covid-19:** For blind and visually impaired persons, touching the products remains important and physical shopping is still preferred. Nonetheless, if they need the application, it is important that mistakes are avoided
75. **P4- R76: Covid-19:** Deaf people are restricted to read other persons because of the mask. The service should find another communication mode with the bike delivery person that is talking, e.g. via signs or whatsapp messages.
76. **P4- R77: Covid-19:** Service is required to be Covid-19proof: food delivery keep distance at 1.5 meters at all time, wash/disinfect hands before delivering and drop off food, grocery or parcel in a safe spot

6.6. Healthy food delivery user: low income

6.6.1. Goals

- Get affordable food delivered at home
- make shopping easier / less stressful (e.g. comparing prices in store)

Requirements:

77. **P4- R78: Goal:** Service should support the function to deliver food at home
78. **P4- R79: Goal:** Service should have an affordable food profile

6.6.2. Needs

- Need to be able to buy food at a cheaper price
- Need for finding other sources of food than the one offered via other support mechanisms

Requirement:

79. **P4- R80: Service organisation:** Service should be different than the current offer of cheap priced food

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6.6.3. Challenges and limitations

Lack of monetary resources

Persons need to have the monetary resources to be able to order healthy food. This refers to income/price but also to access to tools to be able to pay online (e.g. credit card, current account) or the non-capacity to pay a sufficient data connection. Conversely, the high possibility of lack of monetary resources of the target audiences must not lead to a tendency of the service to abandon its mission of providing healthy food.

Requirements:

80. **P4- R81: Service organisation:** Offer the possibility of economic autonomy with affordable prices
81. **P4- R82: Service organisation:** offer Is required to be affordable
82. **P4- R83: Service organisation:** No minimum amount for an order
83. **P4- R84: Service organisation:** Provide an option for cash payment
84. **P4- R85: Service organisation:** Foresee an option to circumvent much data-usage
85. **P4- R86: Service organisation:** Be careful to not offer unhealthy food to target group in order to keep prices low

Knowledge, reputation and branding

The mere existence of the service does not immediately mean that the target audience will use it. They need to know that the service exists but also breaking their current perception that food ordering applications are for businessmen and people without a lot of time.

Requirements:

86. **P4- R87: Service organisation:** A campaign with social associations to let the target audience know that the service exists and is dedicate for them
87. **P4- R88: Service organisation:** Affordable food profile so that it gives the image that it is within their reach

Digital knowledge and skills

The stakeholder highlighted that people with low incomes tend to have limited digital skills and sometimes also lack intellectual skills to manage requested or received information on mobile apps. The challenge is higher with age.

Requirement:

88. **P4- R89 - Assistance and support:** Provide a helpdesk with a phone to answer questions since human contact is important and phone will be most efficient ways to erase any doubts

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6.6.4. Privacy and security

When it comes to the general debate about privacy, people with low income are not as suspicious as other groups. One aspect that is important for them is that they won't probably like that others know that they are in a particular situation.

Requirements:

89. **P4- R90: Privacy and security:** Provide a privacy policy in line with EU and national legislation
90. **P4- R91: Privacy and security:** Pay attention to situations in the service that might be sensitive. Identify them and provide an alternative option

6.6.5. Trust and reliability

The service has to be provided by a reliable and trustworthy organisation.

Requirements:

91. **P4- R92: Service organisation:** Explain the required steps very clearly and transparent in order to increase the perception of reliability
92. **P4-R93: Service agent:** Bike delivery person should speak slowly and clearly, explain who he is, where he comes from and what he comes to deliver
93. **P4- R94: Service organisation:** Users require the service to be approved by a trustworthy and reputable organisation
94. **P4- R95: Service organisation:** Users require direct recommendations from trusted sources to install/use the application
95. **P4- R96: Service organisation:** Be safe and reliable by being transparent
96. **P4- R97: Service organisation:** A discrete user profile
97. **P4- R98: Service organisation/service agent:** Always be punctual
98. **P4- R99: Service organisation:** Users are able to give feedback and see feedback of other users
99. **P4- R100: Service Agent:** Bike delivery person has a WhatsApp number to call and/or text
100. **P4- R101: Assistance and support:** Service informs social organisations of service and how to use it

6.6.6. Covid-19

In times of lock-down and situations as a pandemic, there is a need for a food ordering service for those persons that can't go to stores

Requirement:

101. **P4- R102: Covid-19:** User is able to order food in times of a pandemic.

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6.7. Conclusion end-user requirements P4 – Madrid

When we look at the end-user requirements for the four user characteristics the stakeholder interviews (see Annex II – Template stakeholder interview) helped to shed light on, we can see that overall, the issues are common, but the concrete articulation is different.

What concerns **goals**, an underlying story is the recognition that the solution as envisioned by INDIMO can contribute to increase autonomy, to end social isolation and to improve quality of live. That autonomy is related to ordering food themselves instead of relying mainly on relatives or current food supply mechanisms. Regarding quality of life, the solution according to the stakeholders, can achieve the goals of ending social isolation by being able to invite others for a good healthy meal or by making shopping

What concerns the end-user requirements towards the **digital tool**, the emphasis for socially isolated persons and for persons with low income is on acquiring digital skills in order to use the mobile application. An important lesson here is to opt for designing and using a digital tool that is familiar to the technologies the target persons know. The digital environment should feel safe, recognisable and familiar. What concerns mobile, visual or auditive impaired persons as well as cognitively impaired persons, the main issue will be to adapt the design of the digital tool to make it more accessible and inclusive for these groups (using icons, colours or other means of support such as audio-translations, …). In order to overcome any problem when using the digital application, it is recommended to have a Whatsapp channel available as a user **support and assistance** strategy, apart from tutorial online or a training session. In any case, a human approach in providing support and assistance should be followed instead of opting for a solution with a voice system. The **language use** of the application should also be Spanish and for older persons avoid difficult technical terminology.

Common to all user characteristics is the need to work with a **workflow** that is like a step-by-step learning process. Instead of a crowded interface with many steps possible, a logic flow to select one function (order a meal, order groceries, send/receive a parcel) and to go from one action to the other in order to execute one of the three functions should be envisioned. This is especially requested for cognitively impaired persons this is important as information overload can challenge their mental capacity to digest information and avoids the fact of getting unexpected surprises.

Besides the learning approach it is also suggested to **improve the design of the service** to promote the ultimate goal of stimulating healthy eating habits. As an example, the service can provide a weekly menu with various healthy food options that can be selected by the user. Restaurants with healthy food options can also be shown at the top of the list, as users reported that they tend to select their meal if they are shown as first options. While the user can still select fast food restaurants, this change can promote healthy habits. Other examples include the possibility of clearly describing the food characteristics by text description or visual clues (colours, icons, ...).

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A common concern for all the user characteristics is the **monetary/financial aspect.** On the one hand, this refers for all user characteristics to the need of have access to not expensive but healthy food. It will also be a challenge for the service to meet such a demand and to avoid selling not so qualitative food in order to meet the price demand. On the other hand, for the user characteristic of cognitively impaired users it will be important that a limit is set on what they can spend in order to avoid them ordering too much food or to go over their budget. Stakeholders therefore suggest implementing a system were the warrant or guard of the person must validate an order or can check and monitor the budget status.

The interaction with the **service agent** – the bike delivery boy or girl – will have to reply to some requirements from vulnerable end-users as well. In particular it will be important to have good agreements or where the service agent will deliver the food or the parcel (at the door, in the hall, in front of the apartment building) and to speak with a slow, calm and soft voice as well as with short sentence. The service agent should wear a uniform (in order to be recognisable and generate trust) and be punctual. In case there is a problem with the delivery, a direct contact should be easily established between the service agent and the end-user by WhatsApp or phone. In other words, clear communication and keeping agreements are important to gain also rust and be perceived as reliable. These requirements are especially necessary for persons with cognitive impairment as they can easily be confused when things are not going exactly as planned.

A common line for all the four profiles discussed in section 6.6 is the need for end-users to actually **get to know the service**. Besides the challenge of really providing affordable healthy food, the current application has not the image among the INDIMO target audience of being a service that delivers services for them. Stakeholders point the need for a good social awareness and information campaign that targets relevant opinion leaders in the communities were the target audience is living and that provides the necessary information.

Finally, in situations like the one experienced with **Covid-19**, two particular requirements from the end-users are expressed. In the first place, all stakeholders point out that for the user characteristics for which they can make a statement, they see a value in the delivery system to cope with the situation: people can shop in another way, or go to other shops than usual, stay in contact with relatives or escape from the daily routine. Secondly, it is important that the sanitary safety measures are respected (social distance, gel). Here the role of the service agent is important as he will have to make particular arrangements depending on the user group. Blind people for example won't find the delivered parcel or food in the hall while for others the parcel can be left after a message in the hall without problems. Technologies such as WhatsApp or the phone play then an important role to coordinate this.

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6.8. Madrid - persona Maria Carmen

Since the stakeholder interviews managed to cover a wide range of user characteristics for the user profile identified by the Madrid pilot as its target, two personas – and hence two user journey maps – were created. The first persona, built upon the insights from T1.2 and T1.3, is Maria Carmen who covers the user characteristics of a social isolated person with a low income in Madrid. Maria Carmen thus has the personality treat of being on the one hand being in need of support for everyday expenses and on the other hand as being someone who needs familiar and safe conditions around her. Maria Carmen does not believe in the big stories anymore, without becoming sarcastic as well. She wants to be able to offer a meal to her relatives without having the cook as well as to turn down Covid-19 conditions. Maria Carmen has however pain points with respect to technology as she does not master it well and misses the functionalities to reach the goals she wants to achieve. Her motivation for using the application is guided by the promise that the app can overcome these barriers and helps her to achieve the goals. In the information sources she uses WhatsApp plays an important role. She wants clear and structured information from the application that helps her to select healthy food.

Name

Maria Carmen

Age: 60 y/o

Marital status: Widowed

Children: Two children, live on outskirts of city

Occupation: Unemployed; support from government and family

Location: Madrid

Income: Low

Personality

- Ashamed of situation: in need of support for everyday expenses
- Disillusioned and sceptical of great stories
- Not curious: fixed daily routine
- Needs security
- Trusts information from people close to her: will change routine if she trusts the 'how to'
- Socially aware (e.g. keeps in mind the environment)

Bio

Maria Carmen is a widowed woman of 60 years old. She lives in her apartment in the centre of Madrid. Her two children live on the outskirts of the city. She receives financial support from both the state and her children for everyday expenses like groceries. She's socially isolated from her family and from other people. She is very socially aware and sensitive to these kinds of topics. Because of this she's not very commercially inclined as she wants to know what the social impact of things are and she does not want to be an accessory. Maria Carmen has basic digital skills, meaning she can use whatsapp to try and stay in touch with relatives and friends.

Goals / Needs

- Being able to offer the meal themselves
- Not having to cook
- For a special occasion
- Solution to COVID-19 / general crises
- Taking pride in doing something different
- Pleasure of eating in; 'homely'

Pain points

- Lack of direct contact channel (e.g. providing details)
- Mobile applications are too complex (preference for websites)
- Digitisation of world: hard to keep up, courses on digital literacy are not sufficient
- Lack of clear interface: where to order what / which platform to use for what
- Does not own proper equipment for app (e.g. battery)
- Need to escape from routine
- Existing/typical app does not offer food they like
- services "never made for me"

Motivation

- Environmental impact
- Social project behind service: not from the big platforms
- Clear, easy platform to use
- Different from routine
- Allows for social contact
- Have a restaurant meal while complying with COVID rules (e.g. lockdown)
- Access to healthy food
- Be aware app is meant for them
- Send parcel to friend or relative (e.g. gift)

Information Sources

- Word of mouth from trusted persons (e.g. children)
- Trusted source(s): direct recommendation, not from social networks or internet
- Whatsapp number to contact for help
- Whatsapp number of delivery person (e.g. leave parcel there)

Preferred information

- Start interface clear choice between functions (e.g. parcel delivery, groceries)
- Clear search process based on what they wish to eat / type of food: not via restaurants)
- Main ingredients of food are mentioned
- Parcel delivery part of solution

Table 13: Persona Maria Carmen

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6.9. P4 Madrid - Persona Sara

The second persona built upon the insights from T1.2 and T1.3 covered the user characteristic of a cognitively impaired person. Sara is a 26-year young woman who has the Down syndrome. She lives partly independent in a community and needs a safe environment around her. She is technologically savvy, at least with general and easy technologies. Sara would like to use a service for ordering food because it meets her will to be more autonomous and do things herself like other persons. She also sees the application as a good distraction in times of Covid-19 where she is forced to stay inside for sanitary reasons. Her pain points are the fact that she has difficult to control her spending, that she can't regulate her food patterns herself and that she can't handle information overload. The motivation to use the solution lies in its promise to have the option to pay cash as well as to have an interface that follows a step-by-step approach like Instagram. She needs a structural approach to the information about healthy food without an overload in which she would get lost: visuals, suggestion of a menu, specific information on request and healthy food options first.

Sara

"I need only one decision at a time."

Age: 26 y/o

Marital status: Not married

Children: No children

Occupation: Works at sheltered workshop

Location: Madrid

Income: Low

Personality

- Fixed routine
- Very curious
- No problem with using (easy) technologies
- Lives "independently" in a community (partly w/ guardian, partly by themselves)
- Trust themselves, but not capability to react: in need of safe environment

Bio

Sara is a young woman of 26 years old. She has Down syndrome and partly lives independently in a community, partly with her guardian. She is technologically and digitally savvy, which means she has a high level of digital literacy. She knows she's different, but she trusts herself. She is in need of a safe environment as she does not have the capability to react to certain situations. Sara is in need of an easy to understand and follow interface which only requires one decision at a time, as she might get frustrated, angry or panicked. It's important that if she gets lost, someone can easily guide them. She needs to restrict her calorie intake due to heart disease and the lack of feeling satiated when eating.

Goals / Needs

- search for autonomy
- feeling of independence
- option in time of general crisis (pandemic)
- achieve everyday needs in a simple way
- have a normal life like other people

Pain points

- electronic payment systems (skills + anger guardian because of excessive spending)
- not sensitive to measures: don't have skills to regulate food patterns (people will point this out/is mad)
- get frustrated/angry when information overload e.g. metro

Motivation

- all relevant info on one place and approach
- option of cash payment
- coupled account / oversight
- easy to understand and follow interface: if they get lost, you need to be able to guide them
- instagram-like interface (one step at a time-approach)

Information Sources

- use the internet (web)
- parents want them to be digitally literate

Preferred information

- specific information on type of food
- use of visuals
- nudging -> menu -> type of food -> structure/orientation
- healthy options first

Table 14: Persona Sara

6.10. P4 Madrid - User Journey Map Maria Carmen

Scenario

The user journey of Maria Carmen starts from the scenario that she wants to organise within a few days a dinner with two other persons. She wants to order three dishes on Saturday Morning and uses the current application of La Pajara.

Experience of the persona

The experience of the persona on the four phases is mixed. The initial stage of awareness creation is emotionally evaluated as positive as she appreciates that the application has been recommended by a source she knows (a relative) and is not 'pushed' upon her by a commercial marketing campaign. She also can easily take the step to start exploring the service and the digital tool. Maria Carmen experiences the next phase of exploration

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negatively. She can explore the application and find out restaurants and food but is left with some unresolved questions. Should she better use the application or the website to get the best results? What are the closed restaurants to her? How can she get more information without having to ask a relative or friend to come over and show her how things work? Maria Carmen thus needs assistance on the spot today in order to understand the application and then move to the phase of ordering.

When she decides to order food, Maria Carmen can follow the steps to register as this was explained in the previous stage. However, the filtering of location and the information around the restaurants and food is not so clear so making a choice of food should be made clearer (e.g., Maria Carmen thinks that she can use some pictures to know what the food looks like). Maria Carmen pays and receives a confirmation of the order and now waits for the delivery by the service agent. This process and the post-usage feedback are experienced positive as with the phone she has a mean to stay in contact with the service about her order.

The customer journey of Maria Carmen indicates that currently the interaction between her and the service is mainly through the application or the website and that is not sufficient to address al answers or needs. A friend of relative therefore plays an important role currently in the early awareness and discovery stage. But this relies on his or her availability and willingness to help.

Key insights for INDIMO

The key points for the INDIMO pilot to provide Maria Carmen a better user journey experience is by developing a social awareness campaign targeting key influencers and venues around Maria Carmen in order to allow Maria Carmen (and others) to discover the service better as well as to develop a support strategy for the stages of discovery and usage in order to reduce the need for the support by a friend or relative or provide a solution if the latter can't provide support. The discovery and usage phase needs an intervention to structure the information clearly, allowing for step-by-step learning, and provide more clear information about the food and the restaurants (uniform type of descriptions, visuals, photo's…). A clear selection on location and type of foods will also support a better user experience. In the post-usage face, although for Maria Carmen this was positive, it might be good to develop a rating system or ask systematically for feedback. Finally, the use of technologies like Whatsapp that Maria Carmen can use should be integrated in this phase of delivery at the door and sending feedback.

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About the customer

Maria Carmen

Age: 60 y/o

Marital status: Widowed

Children: Two children

Occupation: Unemployed

Location: Madrid

Scenario

The family comes over on Saturday so Maria Carmen wants three plates delivered on Saturday morning.

User expectation

Easy and punctual delivery. Please someone with the meal.

Awareness

Doing

- Mouth-to-mouth recommendation from relative
- Relative helps her download the application

Thinking

- She should explore this service
- She's happy: appreciates that the application is informally recommended by a relative

Insights

Awareness

- Not present in this stage
- Possible solution: via network and social campaign (e.g. opinion leaders)
- Branding in social places (e.g. markets)

1

Consideration

Doing

- Try / check how it works by herself
- Ask for help from relative when encountering an issue
- Checks out the different restaurants and types of food they offer

Thinking

- Contact form is not clearly displayed

Means/contact person

- App or website?
- Friend or relative?

Insights

- When searching for food, the information is unclear
- Idem website for address issues
- coop cycle or la paraja
- Contact needs to be more upfront and clear to answer questions
- Application has no geolocation: need for overview of restaurants nearby
- English language

1

Usage

Doing

- Registering
- Filter the system by adding your location
- Select a type of food and restaurant
- Select number of meals and select the meals

Thinking

- She needs pictures
- Text is not uniform for all restaurants
- Unclear terminology (e.g. vegan, delicate)

Means/contact person

- App or website?

Insights

- Area of 3,5km
- Pictures of food
- User-friendly description of restaurants and food
- User-friendly language option: adapted to profile

1

Service

Doing

- Payment of order
- Receive confirmation of order

1

Post-usage

Doing

- Receive delivery at home
- Receive call when there's an issue
- Recognise service agent due to familiar relationship
- Follow-up via feedback system

Thinking

- Needs a feedback system because she can't inform them that she's content

1

Means/contact person

- Telephone?

Insights

- Interaction with a receptionist
- Add rating and feedback system

Table 15: User Journey Maria Carmen

6.11. P4 Madrid - User Journey Map Sara

Scenario

The user journey of Sara starts from the scenario that she wants to order a healthy salad for lunch with the current system of La Pareja.

Experience of the persona

The first stage of awareness raising is for Sara a positive experience. The stage of awareness raising is rather the result of luck – the app was found because somebody told her (her guardian) or she accidently came across it on the internet as persons like Sara often take the first service they find. The stage of consideration however is evaluated as negative in the end. It can lead to frustration since the app currently provides a lot of information without much structure. The current channel contacts between the application, the service operator and the customer are at these stages rather inexistant. Sara discovers without much guidance or maybe with the help of her guardian.

The next two phases in which Sara goes ordering food leads to a negative experience. While Sara will be able to register, order food and pay for it, it will turn out that she probably will end up with bad food as people with Down often order the first thing they see. Currently the application offers at first sight often fast-food restaurants. On top of that, there is a risk that the guardian gets mad at Sara because she paid for this food and ordered too much. Although at this stage the contact can be established between the service organisation and the end-user via a phone number, it is clear that this information is not easy retrievable for Sara. A real contact point is thus not present.

Finally, in the post-usage stage it becomes clear that Sara cannot tell she is mad or happy with the service. For the service it is thus impossible to collect information on how to improve the system, either from Sara or from the guardian.

Key insights for INDIMO

For the INDIMO project, the user journey map tells us that it will be key to address the guardian. This person should not be approached from a restrictive point of view but as a support in the process for autonomy. In the stages of awareness and consideration the guardian can act as a trusted source that allows Sara to easily find the application and find information. In the usage phase the guardian will help to avoid frustration by validating the command (or at least the financial aspect of it). It is also important to investigate how point of contacts between the customer and the service can be established.

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About the customer

Sara

Age: 20-30 y/o

Marital status: Not married

Children: No children

Occupation: Works at sheltered workshop

Location:

Scenario

Sara wants to order a salad for lunch.

User expectation

She can order an affordable meal by herself and can easily understand the dietary information. The process is easy and transparent for her to follow.

Awareness

Doing

- Informed by the tutor/caregive
- Discover via internet

Insights

- Impulsivity: don't explore much, first thing they see is important

1

Consideration

Doing

- Download app and look around

Insights

- Mass of information means a lot of stimuli: needs to be clear, structured (should not confuse or frustrate them)

1

Usage

Doing

- Register
- Browse offers
- Select a meal
- Review/confirm the order
- Payment

Thinking

- **Impulsebuy/buy first thing they see**
- **Wonders if it's possible to pay cash (!?)**

Means/contact person

- La pajara phone number not clear; not real possibility to reach out; formal present on the app or the web-papp; but no appropriate interaction channel

Insights

- **Impulsebuy/buy first thing they see**
- Overview/inspection by tutor/caregiver

1

Service

Doing

- Rider introduces him/herself, speaks clearly and slowly

Thinking

- Doesn't know why people are mad at her

Insights

- Tutor approval/overview finances needed
- Confirming/rejecting/descubscription

1

Post-usage

Doing

- Can't review, can't reach out

Insights

- Training needed to grasp aspects of communication (also for the riders)

1

Table 16: User journey Sara

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7. P5 Berlin: user needs and requirements

Door2door, a Berlin-based technology company, provides white-label software to public transport operators and mobility providers, enabling them to offer their very own and integrated ridepooling service. In the framework of the INDIMO project, door2door will carry out a pilot in Berlin, - to test the entire user experience of a vulnerable user group, focusing on women and care givers. They will gather data and insights regarding the usability of the technology and the interface, but also on the requirements of planning and booking a multimodal journey and on the user experience of a shared rides.
From an end-user perspective, the pilot dispositive consists of a:

- a digital tool: the mobile app to order rides
- a physical tool: the car in which the mother/care giver take the ride
- a service agent: the driver that will drive the mother/care giver

7.1. Interviews

The user profile targeted by the Berlin pilot is the following:

- on demand ride sharing users:
    - characteristics:
        - Caretakers of children/ impaired/ elders
        - Gender: women
        - Lack of services (reduced mobility)
        - Lack of digital skills
        - Residing in peripheral locations

Name Stakeholder Organisation	Date Interview	User profile and user characteristics
door2door/She drives mobility	13/07/2020	gender women care-takeers of children Residing in peripheral locations lack of digital skills
Vorn	04/09/2020	gender women care-takeers of children
Radbahn	02/09/2020	gender women care-takeers of children
Hello impact	02/09/2020	gender women care-takeers of children
Women mobility expert - TU Berlin	28/08/2020	gender women care-takeers of children

Table 17: Overview stakeholder interview P5 Berlin

The collected literature that exists about on-demand ride sharing services in Germany taught us that on-demand ride sharing services are often young people that use services for nightlife purposes and that are multi-modal transport users. Most of the relevant literature in Germany (Knie & Ruhrort, 2020; König, Bonus et al., 2018) or abroad (Morales Sarriera et al., 2017) hence provides insights about this category and not about the target audience of the pilot. Nonetheless, we see that some themes were also mentioned that

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were also highlighted by stakeholders and will be discussed here: the need to be willing to share your care with others, the need for flexible services. On the other hand, the theme of environmental concern was highlighted in the literature but not touched upon by the stakeholders.

The five stakeholder interviews (see Annex II – Template stakeholder interview) identified mothers with children located in a peripheral urban neighbourhood as the main audience for the on-demand ridesharing and discussed the dimensions mainly from the perspective of that group. The requirements will therefore relate to the user characteristic of:

- mothers with children in suburban city neighbourhoods

The interviewed stakeholders did not relate to the neighbourhood in Berlin where the pilot will be deployed and spoke more from a broader German city perspective. Insights on digital skills or areas with low public transport coverage were not explicitly mentioned by the stakeholders, apart from one stakeholder.

7.2. Mother with children in suburban city neighbourhood

7.2.1. Goals

Based on the stakeholder interviews, we are able to define four major goals. Firstly, the ability to support chained trips, meaning that mothers can connect the various daily activities of their children, like going from school to a hobby to a doctor's appointment. Secondly, mothers should be able to connect from location A to location B without too much effort. Thirdly, the service should address the issues of time poverty and money poverty by being flexible and affordable. Lastly, it can be that the service is only used by older children after parents ordering the cab (so no parental supervision during the trip).

Requirements:

According to the stakeholders, the on-demand ride sharing service should have the following main functions:

1. **P5- R1: Goal:** Connect various daily activities/errands easily in a chained trip
2. **P5- R2: Goal:** Organise the chain tripping without much effort (time, money)
3. **P5-R3: Goal:** Allow older children to be transported without parents

7.2.2. Needs

In order to achieve these goals, the following needs were identified for women with children that the service should address:

- Safe and trustful transport service
- Punctual and reliable (more than public transport) transport
- Sufficient space in cars (for strollers, bags, child seat, …)
- Child-focused and child-friendly service
- Recognisable service (clear visual identity)
- Easy and simple service
- flexible service allowing for changes on the road
- Affordable service
- Close by (at hand) pick-up and drop off zones (no distance compared to car sharing)

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Requirements:

4. **P5-R4: Service organisation:** The service should be flexible in its operations and flexibility should be built in in all its operations
5. **P5-R5: Digital tool:** The digital solution should be easy to use, intuitive and well-designed
6. **P5- R6: Digital tool/Physical Tool/Service organisation/service Agent/assistance and support:** The solution in all its components should be reliable, punctual, safe, easy recognisable in public space and trustworthy
7. **P5- R7: Physical tool:** the vehicle should be comfortable and offer enough space
8. **P5- R8: Service organisation:** The service should have an affordable price, ideally integrated into the public transport fare and support everyday life activities of mothers
9. **P5- R9: Service organisation/physical tool/service agent:** a child friendly and child-focused service

7.2.3. Challenges and limitations

Assure a child friendly and child focused service

The stakeholders point out that it will be important that the service is child friendly and child focused. This means that apart from the car characteristics (see physical tool) and the need for flexibility (see below), there are specific requirements for the driver who is more than an ordinary taxi-driver:

10. **P5- R10: Service agent:** The driver should receive training to support mothers with on/off boarding and during the ride.
11. **P5-R11: Service agent:** The driver is punctual and recognisable (specific uniform, sign, car branded)
12. **P5-R12: Service agent:** The driver should be informed by the system that children will be part of his ride and how many children it will be
13. **P5-R13: Service agent:** The driver should drive in a safe and good way (not upsetting children)
14. **P5-R14: Service agent:** As children tend to forget or lose objects/toys, the driver should be prepared to keep forgotten things and notify the user about it.
15. **P5-R15**: Service agent: The driver is advised to create a child-friendly atmosphere in the car (e.g. playing music for children)
16. **P5-R16**: **Service agent:** The driver should be instructed to park as close as possible on agreed pick-up or drop-off point close to destination

Attitude towards ridesharing with unknown others

The target group would have to be open to share the ride with other passengers. In this prospect, they would need an open mind and not be opposed to the presence of strangers.

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The literature on ride sharing points out that informal rules of conduct within passengers' groups emerge in this scheme and can contribute to gain trust in others.

Requirements:

17. **P5 - R17: Service organisation:** create some common norms around the ridesharing service that allows strangers to interact with each other ('known' stranger)
18. **P5- R18: Service organisation:** Promote the service in public accessible spaces where mothers go and where unknown people interact

Monetary cost of the service

A service that offers quality transportation services without becoming too expensive will be appreciated by the young mothers. They will need a service that is not substantially more expensive than public transportation.

Requirements:

19. **P5-R19: Service organisation:** Users require an affordable service comparable to that of public transportation
20. **P5-R20: Service organisation:** The service should have a transparent pricing mechanism to the user in order to avoid surprises

Flexible, spontaneous as well as ordered in advance

Mothers with children often have busy agendas and can sometimes be overwhelmed by the number of things to do. To make their schedule more manageable, they should be able to plan several ridesharing trips in advance and should be able to do this spontaneously or the day of the appointment. The service should be on-demand and thus always available. It will also be interesting for the mother to know connections between the service and other public transport options.

Requirement

21. **P5-R21: Service organisation:** Users need to be able to book the ride in advance or spontaneously
22. **P5-R22: Service organisation:** users need to be able to cancel or change a booking almost very instantaneously (the time window for no longer changing/cancellation is very short)
23. **P5-R23: Service agent:** The driver is not expected to cancel rides a few minutes in advance
24. **P5-R24: Service agent:** The driver should be ready for small adaptations of the ride along the way (for example stop a few hundred meters than initially requested or add an extra stop along the way)
25. **P5-R25: Service agent:** The driver should be ready for a new booking or changing of destination during the trajectory
26. **P5- R26: Service organisation:** Integrated into the existing public transport and should show the possible connections

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Physical interface: the car

When carpooling mothers with children require more space: space for their child(ren), stroller and for bags, such as for example grocery bags. Hence, they should be able to select how much room they require so they are able to take a ride comfortably. The mothers should also be able to use onboard facilities like a child seat.

Requirement

27. **P5-R27: Physical tool:** Car requires enough room to drive mothers with children and their belongings comfortably
28. **P5-R28: Physical tool:** Car requires correct size of child seats to make the trip more comfortable
29. **P5-R29: Physical tool:** Car model should fit needs of mothers and assure a safe onboarding in public space

Digital interface: the mobile application

Because they are with children, it is important to be able to take 'quick' decisions on the application. It will also be important to provide the information that is needed such as the room they need in a fast and simple way. Finally, also payment should be made easy.

Requirements:

30. **P5-R30: Digital tool:** User need a profile setting that reduces the need for providing information during the order process to the fact of having children or not for the ride and how many
31. **P5-R31: Digital tool:** Mobile application requires that the mothers are able to select how many and what kind of room they will need
32. **P5-R32: Digital tool:** Users are able to select pre-fixed destinations easily (e.g., dentist, kindergarten)
33. **P5-R333: Digital tool:** The registration to the service should be an easy one-time process
34. **P5-R34: Digital tool:** the payment should be done via an online payment option
35. **P5-R35: Digital tool/Service organisation:** a registration that is easy to change, stop or take

Image and branding

The mother will need a positive attitude towards new digital tools in order to find and use the service. A positive image that meets the demands of the target audience will be important. Moreover, on-demand ridesharing is currently not associated with the transport of young mothers with children. In that sense, there is a communication needed that tells mothers with children that the service is meant to benefit them.

Requirement:

36. **P5 -R36: Service organisation:** The service should have a family-friendly image

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37. **P5 – R37: Service organisation:** A communication campaign will be needed to overcome the mental barrier that does not associate on-demand ride sharing as a transport mode for mothers with children

Digital skills are required

The majority of women between 25 and 35 years old in Berlin have the necessary digital skills and possess the right equipment. Therefore, this will not pose as a primary issue. However, women would still require those skills to be able to make use of the service.
Requirements:

38. **P5 – R38: Digital tool:** The users will need to possess basic digital skills (ability to use smartphone, ability to do digital payments, ability to understand digital map)
39. **P5- R39: Assistance and Support:** Offer support with digital issues through contact number and/or help button
40. **P5-R40: Assistance and Support:** Provide a tutorial on YouTube or in-app

7.2.4. Privacy and security

Mothers with children need the service to be safe and follow the privacy and data regulations at all times. They require the service to need as little information about them as possible and that they do not need to share personal information about their children except if the service needs it to accommodate them properly (e.g., availability car seat).

Requirements:

41. **P5-R41: Privacy and security:** Require no personal data of the children to properly function
42. **P5-R42: Privacy: and security** Designed according to the regulations concerning privacy
43. **P5-R43: Privacy and security:** Require only essential data to run the service
44. **P5-R44: Privacy and security:** Users require an option for data-anonymization
45. **P5-R45: Privacy and security:** Service should be very careful with protecting credit card data and transactions

7.2.5. Trust & reliability

The users would more easily put trust in a reputable and trustworthy German organisation. The organisation needs to offer a reliable service that complies with their promises. Thus, the service should be safe, punctual and offer assistance when necessary. The users are able to see the profile of the vehicle and of the service agent and are able to give feedback on the driver. This way other users have a better understanding of what to expect and the organisation can adjust certain issues.

Requirements:

46. **P5-R46: Service organisation:** Users require the service to be implemented by a trustworthy and reputable organisation in the field of mobility in Germany
47. **P5-R47: Service organisation/service agent:** Service should always be punctual, and no rides should be cancelled

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48. **P5-R48: Service organisation:** Service requires a transparent price and payment method
49. **P5-R49: Service organisation/service agent/digital interface:** Users require a user profile of service agent and physical interface as well as ratings/reviews
50. **P5-R50: Service organisation:** Users are able to give feedback and see feedback of other users
51. **P5-R51: Assistance and support:** Users are able to get assistance remotely
52. **P5-R52: Service organisation**: Use a clear and simple language for service terminology

7.2.6. Covid-19

Due to the COVID-19 pandemic, the service should be as safe as possible and thus follow the safety guidelines set by the government.

Requirements:

53. **P5-R53: Covid-19**: The physical interface needs to be adapted to the regulations of social distancing (e.g. availability separator, face masks and hand gel)

7.3. Conclusion end-user requirements – P5 Berlin

The stakeholders' view on caregivers' goals, needs, challenges, limits and constraints with respect to the pilot idea of a ridesharing service indicates that the INDIMO pilot should address the goal of facilitating chain tripping by addressing in particular the need for flexibility and being children friendly in all the components of the service with which an end-user will interact.
On the level of the **service organisation**, these two needs are translated in requirements of a flexible booking system, an affordable price strategy and some restrictions to the driver about cancellations. In particular the car as physical tool and the driver as service agent are essential for guaranteeing a good experience. Indeed, compared to a 'normal' taxi service or to public transport, they will have to be tailored to the needs of the mother and children: provide enough space for strollers and bags and a driver that understands and is attentive to needs of passengers (driving style, park close to pick-up/drop off point, …) and for potential changes in customer requests along the way.
The focus in the INDIMO pilot on the context of a caregiver moving around with one or more children also requires according to the stakeholders a digital tool whose design is easy to use but also fast to complete, for example by having an easy registration process but also provide options to preselect destinations, create favourites and choose from past trajectories taken. Important on the long run will be the option to book a chain trip in one operation instead of booking multiple trips one after another.
Besides working on the pilot service as such, the stakeholders identified two particular challenges for the INDIMO pilot. In the first place there will be the need to develop a good social marketing campaign to reach important opinion leaders in the neighbourhood (for example doctors, schools, cultural centres and other venues where mothers with children go) that can inform the caregivers of children about the existence of the service. On top of

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that this campaign should turn the current image of ridesharing as not being a service for caregivers. Secondly, another specific requirement of ridesharing in the context of the INDIMO pilot is being sensitive to fostering positive attitudes among the target audience to share the ride with their kids with other unknown passengers.

What concerns **data privacy and security**, no particular end-user requirements were expressed by the stakeholders, apart from respecting current legislations and to not collect from users that are not necessary.

Reliability and trust are important aspects of the service and relate especially to the driver who needs to be punctual, especially at the pick-up point, while the system itself should propose realistic timing of rides when booking. Trust of the service will according to the stakeholders be increased among the target audience by allowing for a good feedback system such as rating the drivers and looking at comments from other users.

Finally, what concerns the **impact of Covid-19** on such a service, the stakeholders pointed out that the major impact lies in adapting the physical tool and the service agent interactions to safety measures being in place (distance, gel, reduce number of passengers in car, …).

7.4. P5 Berlin - Persona Marie

Based on the end-user requirements identified above (T1.2) and the insights from the interviews with users and non-users in T1.3, the Berlin pilot team identified as their persona Marie, a 30-year-old mother of two children who is currently on maternity leave and lives in an area of Berlin that is not well-deserved by public transport. The choice of

Since Marie can't rely much on relatives and her husband uses the household's car during the day for work purposes, she is forced to chain trip a lot. The persona of Marie therefore highlights the need for a flexible and reliable ride-sharing solution that allows to organise the chain trip in an easy manner via a mobile phone. The pain points translate the current situation while in the motivation part the aspects of the service that will convince Marie to use it are mentioned: providing crucial information (driver, seat, time) easily, paying attention to providing a child friendly service on the level of the service agent and the car (punctual, more than a taxi, space in car) and providing trust via reviews and scores by other users and correct information on various aspects (see preferred information panel in the persona).

The need for a social marketing campaign is expressed in the persona of Marie by the fact that the information sources she will use at this stage are local news site or other influencers such as doctors or friends.

The list with preferred information highlights that the INDIMO service also should work on providing a list of crucial information that can be very specific but should be correct and provided in order to allow Marie to make a good ridesharing choice.

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Bio

Marie is a 30 year old woman. She is married, has two children, one toddler and one baby. She usually works parttime, however she's now on maternity leave. She lives in the peri-urban location of Berlin with her husband, who needs the car to get to work. Her husband is very busy and her parents live an hour away, so she has little support from others to take care of her child and the household.

There are only limited public transport options in her neighbourhood, so it is more convenient to use the ridesharing option as she wants to bring her children along. She is already a user of the ride sharing service, as it helps her get her everyday tasks done more swiftly and with less frustrations, as the public transport is inadequate. She is now able to plan her trips to the grocery store, doctor, school et cetera without too much hassle.

She's an open-minded woman who does not mind ride sharing with people she does not know and she is not afraid to try out new technologies. However, she's not an explorative person and will not actively look for certain things as she is quite busy, she relies on information from others.

Name

Marie

Age: 30

Marital status: Married

Children: Two children (just gave birth)

Occupation: Maternity leave

Location: Peri-urban location of Berlin

Income: Medium

Personality

- Open-minded
- Open to strangers/others
- Open to new technologies
- More passive and busy with other things: lacks time / very busy
- Not explorative and relies on others to discover solutions (not finding new things by herself)

Goals / Needs

- Switching between different activities/needs of children (e.g. doctor, hobby)
- Efficient, on time, reliable and affordable service
- Reach destination in a safe way
- Flexible (spontaneous)

Pain points

- Lack of (flexible) public transport services
- Lack of accessibility at PT hubs
- Distance from pick-up point
- PT is uncomfortable
- Have to carry a lot of things (e.g. stroller, grocery bags)
- Difficult to organise chaintripping
- No good connection between the different transport methods (e.g. train, metro)
- Not much important information available about presence of child seat, space for car and groceries, type of car

Motivation

- Car adapted to needs
- Child-friendly on board facilities (e.g. child seat)
- Punctual
- Affordable: less than using a taxi
- Quality of the service and drivers
- Flexible and comfortable solution
- Trust in actors service: registered and reviewed
- Drivers are very friendly, helpful and child-oriented

Information Sources

- Website public transport
- Thematical website services
- Current taxi services
- Word of mouth
- Leaflet at the doctor

Preferred information

- Type of car (e.g. colour, model, space)
- Number of available seats / equipment of the car
- Enough space in the car for everything
- Distance pick up point from location
- Safety of pick up and drop off point
- Transparant pricing
- Support from driver
- Automatic system to determine needs by age (e.g. child seat)
- Trustworthiness of driver and service (e.g. reviews)
- Connection with PT

Table 18: Persona Marie

7.5. P5 Berlin - User Journey Map

Scenario

The user journey map of Marie was designed from the scenario in the current situation that Marie needs to order a ride with a ridesharing service to go from her home with her children to the doctor, then to the pharmacy and finally back home.

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Experience of the persona

The customer journey map highlights that at least from the perspective of Marie the first two phases of allowing her to get aware of the service in her neighbourhood and to find more information are not experienced positively. Marie will only get aware because of mouth-to-mouth information provided by relatives or because she noticed it on a website for public transport. However, the latter information is not sufficient to convince her that the service is also organised for her user profile. In order to find out more information, she will find this on websites of transport providers or download the application of a ridesharing service but will lack essential information (e.g., on pricing options for mother and children, on correspondences between a ridesharing service and public transport options, …). It is also possible she tries out the app but does not confirm the ride at the end. The experience is getting a better in the current usage and post-usage stages, with a neutral evaluation since actions can be performed to book rides one after another (different bookings) although a lot of questions will remain and won't be currently answered or met by the ridesharing service. A distinction should be made between the ordering phase and the driving phase (pick-up and drop-off) in order to better understand the customer journey. Finally, from a current perspective, the post-usage phase is considered as well as a neutral experience since features as rating the driver exists already as well as an in-app build hotline in case of emergency. However, this can be expanded towards e-mail or a phone service.

The customer journey map learns that especially from the stages of consideration (finding more information) the mobile application (supported by a website) will be the preferred touchpoint between the end-user and the service operator within the INDIMO pilot. From the stage of service usage, the driver (and his car) is a key player as well as touchpoint between the end-user and the service, hence the importance of the requirements uttered in section 7.2 about the service agent. In the awareness raising phases it is clear that other channels will have to be mobilised in order to reach the potential target audience.

Key insights for INDIMO

The key insights for the INDIMO service to support Marie with her customer journey are twofold. In the phases of awareness raising and consideration a good branding of the INDIMO service as well as dissemination plan can help Marie to find the necessary information about the service in a fast way as well as in relevant online and offline spaces (e.g., places where she goes with kids or on the relevant internet sites about transport in Berlin/her neighbourhood). In order to support Marie in the consideration phases and the two subdimensions of the usage phase (ordering and driving) crucial functionalities or information should be incorporated in the mobile application within the horizon set by the requirements identified above (section 7.2) and in T1.3.

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About the customer

Marie

Age: 30 y/o

Marital status: Married

Children: Two children

Occupation: Parttime; maternity leave

Location: Peri-urban location of Berlin

Scenario

Marie needs to order a ride with ridesharing from her home to the doctor and then to the pharmacy and then back home with her children (don't walk yet).

User expectation

Safe ride, without much waiting time for the car, enough space in the car for the stroller and the maxi-cosy.

Awareness

Doing

- Mouth-to-mouth recommendation (e.g. friend or relative)
- Visits thematic website
- Seen on the street
- Uses route planner (service integrated)

Thinking

- Who are the current users?

Means/contact person

- No fit channel for the ridesharing for young mothers functionality

Insights

- Is this already in place?
- Work on a branding and image campaign to counter current opinions of young mothers about the ride sharing service
- Team up with local stakeholder representatives
- Team up with third parties that are relevant for target group (eg doctors, hospitals...) for promotion of the system

1

Consideration

Doing

- Check the website of public transport or ridesharing website for more infromation
- Download the app/reads information the app
- Try to book a ride as a test but does not confirm it at the end of the process

Thinking

- Checks out potential benefits: Is there a combined price for mother and child(ren)?
- Cost of the ride combined with travline with children
- Is there quick correspondence between different public transport modes possible?
- How can I pay? Is it flexible (so with PT ticket)? Is it via credit card?

Means/contact person:

- Team up with local stakeholder representatives
- Team up with third parties that are relevant for the target group (e.g. hospitals) for promoting the system
- Adjust the pricing
- Integration of the system in route planners

Insights

- There is a need for a tutorial and FAQ addressing there questions towards mothers
- Add mother and child option
- Develop feature for price-combination mother-child

1

Usage

Doing

- Option 1: order ride in the mobile app: register + destination & 3 passengers
- Get time frame (pick up - drop off) and get info about type of car
- Receive info about the option: book or not
- Online payment after booking (rate pr km) and get receipt
- (Pre-) book 2nd ride after completing booking of ride 1
- Input of needs: children, seat, destination, pick up location
- Confirm 2nd ride

Thinking

- Booking multiple rides: no chaintrip function
- Still considering alternatives (e.g. friend)
- Possible to see connections (public transport)?

Means/contact person:

- Application

Insights

- Implement a via/step over functionality or process
- Add mother and child option
- Make clearer from the beginin if car is suitable for children

1

Service

Doing

- Receive notification of arrival car
- Go to the pick up point
- Information: name driver, number car, location car and logo car
- Onboard first children, then the strollers and then yourself
- Once in car do cash payment (if not paid online)
- Drive
- go out and checks confirm pre-booking for 2nd ride
- she goes to doctor and returns
- Waits for the confirmed 2nd ride

Thinking

- Is the driver going to help or not?
- Will pick-up and drop-off take place in safe spaces?
- How would other ride-sharers in the car react to the young children?

Means/contact person

- Driver
- Car

Insights

- Info about type of car to better the service

1

Post-usage

Doing

- Star rating and comment at end of ride and get notfiied in the app
- Hotline in app

Thinking

- E-mail or call if unhappy / bad experience?

Means/contact person

- App
- Phone

1

Table 19: user journey Marie

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8. User Case Studies

8.1. Introduction

Besides the focus on researching user requirements in the context of the INDIMO pilot sites, the INDIMO consortium also identified 5 other case studies to gather insight on user goals, needs, limitations, challenges and restraints in using digital mobility service by particular groups of vulnerable end-users.
The five INDIMO use cases are the following:

- Use case study 1 - Digital mobility of caregivers in Budapest (lead INDIMO project partner: MBE)
- Use case study 2 - Digital mobility of visual and mobility impaired persons in Budapest (lead INDIMO project partner: MBE)
- Use case study 3 – Privacy and cyber security concerns of refugees, older persons and people with visual and mobility impairment - European perspective (lead INDIMO project partners: DeepBlue & imec)
- Use case study 4 – Micro-mobility and vulnerable and close to exclusion social groups in Brussels (lead INDIMO project partners: imec &VUB)
- Use case study 5 – Caregivers and assistance in Madrid during Covid-19

The five INDIMO use case studies are meant to shed extra light on certain user characteristics considered in D1.1 by the consortium as important or very important to research (caregivers in use case 1 in Budapest, covid19 in use case 5 in Madrid) or on themes that could not fully be grasped by the pilots (use case 4 on micro-mobility, use case 3 on privacy and cyber security) or to shed more light on a user characteristic from another angle than the one in taken in one of the pilots (use case 2 and visual and mobility impaired persons in Budapest). We should stress that the aim of the use case reports is not to have an extensive research report where all kinds of literature, data and viewpoints are gathered and triangulated in a detailed analysis, but to get, via a dedicated research focus and a specific data-selection process, fast access to useful insights that INDIMO can mobilise in the other work packages during the remaining time of the project (support pilots in WP3, support development of the Universal Design Manual in WP2, …).
Each of the five use cases had its own dynamic and therefore research path was different: Budapest (use case 1 and 2) and Madrid (use case 5) followed the dimensions of data collection identified in D1.1, while the use cases on micro-mobility or security were more specific and developed their own data collection methodology. Nonetheless, they all had to follow the same pattern of reporting: introduce the subject and its relevance for the INDIMO pilots, provide the research data and end with recommendations based on the gathered data.

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8.2. User case study 1 & 2 - mobility and visual impaired / assistance and care givers in Budapest

8.2.1 Introduction

Use case – main outline	
Theme	Digital Mobility solutions
User Group	Visually and mobility impaired Caregivers of disabled people
Location	Budapest
Useful links to INDIMO Pilots	Antwerp, Madrid

Table 20: Main outline use case 1 & 2 Budapest

The interviews taken in Budapest by MBE serve multiple purposes. Generally, it broadens our knowledge about user needs and requirements of various user groups towards digital mobility applications in terms of geographical area covered and services assessed. The analysis of the interviews makes use of two different approaches. For the current deliverable (Task 1.2), the general usability and knowledge gap of digital mobility solutions used in Budapest are assessed through the mobility patterns of the selected user groups. Whereas in Task 1.3 (Deliverable D1.3), the interviews are used to evaluate further characteristics, limitations, and requirements of those user groups, aiding the thematic and user-centric analysis of the five pilot sites. For this intent, three user groups were selected, namely people with reduced mobility, people with reduced vision and caregivers of disabled people. In Task 1.4 additional interviews were taken with operators and policy makers from Budapest, in order to assess in detail, the BKK Futár application (the official public transport application of Budapest Transport Centre).

In Budapest, a high number of studies have been conducted on the topic of transportation as more than two million people travel throughout the city every day. Most of these people also use digital applications on their smartphones to be updated about current traffic situations or to aid them in navigating the city. However, the applications they use were usually developed with a general usability approach, considering only the average user's needs, and only a few special features were determined and developed. As the customer base increased, user groups with an impairment became vulnerable to exclusion from using the advantages of these digital mobility solutions. To give equal opportunity to these user groups, their specific needs and requirements should be assessed and included in the prospective application development processes, increasing the accessibility and inclusivity of transport applications in Hungary.

The Budapest use case study 1 brings extra light on a user characteristic mainly covered by the Antwerp pilot - visual and mobility impaired - but now expands the insights of that group to the general mobility behaviour with digital applications. Another contribution of the Budapest chapter as user case study 2 is the focus on another group of caregivers (caretakers of disabled persons) and their needs for digital mobility solutions compared to the Berlin pilot (mothers, caretakers of children).

User and non-user (stakeholder) interviews were taken between September 2020 and January 2021. Three of the interviews were with people with reduced mobility, five with people with reduced vision and four were conducted with caregivers. From each group one

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interviewee was considered a non-user, as they had some understanding of the digital mobility services and maybe even used them on the PC, but they did not use these solutions on their smartphones for everyday purposes. However, their ideas, needs, and requirements should also be assessed, to broaden the inclusiveness of applications developed in the future. All of the interviews except one were conducted in person, complying with the COVID-19 pandemic measures. In the interviews, different letters were designated to different terms: N and U refer to non-users and users and V, M, and C to visual impairment, mobility impairment and caregivers respectively.

Code	User Group	Total	Non User	User
V	People with reduced vision	3	1	2
M	People with reduced mobility	5	1	4
C	Caregivers of disabled persons	4	1	3

Table 21: Number of interviews taken with different groups in Budapest

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When digital mobility service-related questions were asked (workflow, usefulness, opinion about functions), public transport users referred to the BKK Futár application, while car users referred to Waze. Non-users were also asked about general smartphone applications and usage to assess their capabilities and skills, this information was analysed in the related sections.

8.2.2 Goals and needs

As the interviewees have different backgrounds and different mobility limitations, their mobility patterns vary. Usually, they use public transport for going to work, the store or leisure activities. In most cases, this is the only option for them, as their disability prevents them from driving a car, riding a bicycle, etc. However, one of the interviewees with the ability to drive uses his car almost exclusively, as it provides more freedom and has a higher availability. During the pandemic, there were several interviewees who decided to switch from public transport to cars, as it provides more social distancing.

> "She travels mostly for work, shopping, attending her children and leisure." (MBE_U_V_i06)
> "He doesn't have car, he uses all means of public transport." (MBE_U_V_i07)
> "But since COVID-19 she hasn't used public transport, only car (for work-based travels and caregiving, as well)." (MBE_U_C_i11)
> "By car, always." (MBE_U_M_i04)

During the interviewees' travels, especially when going to new places, they use digital mobility solutions. Generally, they are satisfied with the functions provided. It is worth noting though, that visually impaired people seldom go to new places alone, as they are more confident using well known routes. However, DMS applications can raise their confidence level by providing specific and usable information about their environment. Interviewees use the route planner option (even on known routes) for multiple purposes: Fastest routes, minimizing transfers, accessible vehicles and stops and guiding are the main needs.

> "She checks timetables and plans routes on public transport. (She has also registered for notifications for service updates, and she is generally satisfied with them but only gets them via email.)" (MBE_U_V_i08)
> "She supposes that these apps help to find routes with shorter travel time and ease orientation during her daily travels." (MBE_U_C_i10)
> "Main advantage of navigation is the assistance all along the route until the destination." (MBE_U_V_i06)
> "She uses app when riding public transport; app addresses all her needs that she has about it." (MBE_U_M_i03)

8.2.1. Workflow

All users prefer the route planning function of the applications. They will open the application, open the tab for route planning and will then select and accept the best available route. Especially for people with limited sight, it is also helpful to have saving options for favourite routes, which is quite frequently used among the interviewees.

> "He finds it complicated to search for particular stops or routes, therefore he has to define his favourite ones (but this solves the difficulty)." (MBE_U_V_i09)

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The applications have several options for customization, which allows the user to pre-set preferences (e.g. accessible vehicles, only trams) for every planned trip.

> "She cannot mention any difficulties. (Customization of the app need some effort, but it worth, use is more convenient later.)" (MBE_U_C_i11)

8.2.2. Usability of the digital interface

In general, most of the interviewees were satisfied with the digital mobility applications they use. They emphasized its easy usability and praised functions such as audio navigation, although one of them also added that the most popular apps are not always well suited to her needs.

> "She agrees that it is easy to use, without difficulties." (MBE_U_C_i02)
> "For the first try, using the app seemed to be difficult to her but she could learn it." (MBE_U_V_i08)
> "She supposes functions of audio navigation is the most important, because these are essential to give help in routing during driving. The most important among these functions are the notice for changing direction in time and the indication of directions (e.g. left/right, instead of points of the compass)." (MBE_U_C_i10)
> "She can use it without difficulties. She thinks that Budapest Menetrend app *(unofficial timetable application which uses the open source database of BKK)* is better optimized for her way of use than Futár." (MBE_U_C_i11)

The users also highlighted some issues about application services they used. Most importantly, apps with text-to-speech software need careful design in order to avoid malfunction, which can lead to hazardous situations and cause discomfort

> "He has found some imperfection regarding accessibility: sometimes element descriptions/labels – which could be read by screen reader software – are missing, especially after updates." (MBE_U_V_i07)
> "Map view is not useful for her and a bit embarrassing (as it is not handled by screen reading software)." (MBE_U_V_i08)

Two of the interviewees use the application services only for certain settings or functions, like checking timetables instead of route planning. As the default setting can be other than their favourite choice this can cause confusion or annoyance.

> *About least useful functions:* "In Budapest Menetrend app, no; but in Futár she doesn't need the map view." (MBE_U_C_i11)
> "Has a public transport app (Budapest BKK Futár), but uses rarely (only on unknown routes) and only to check the timetables." (MBE_N_M_i05)

8.2.3. Usability of the physical interface

Interviewees use their smartphones for digital mobility solutions; therefore, usability of the physical interface depends on their device, which factor is not assessed in this survey. However, for visually impaired people, BKK Futár environment has a special remote control, which has several useful functions. For example, the interface can announce information auditively from the Futár displays at public transport stops (1) and when the button is pressed, traffic lights offer voice information about their direction and signal (2).

> "She uses BKK Futár's remote control device, which turns on audio signals on traffic lights (and public transport vehicles)" (MBE_U_V_i06)

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8.2.4. Skills and capabilities

Interviewees agreed on the different skills and capabilities needed to be able to use the service. Four of them mentioned digital and also four of them cognitive skills, which are essential when using digital mobility applications. They agreed that no specific knowledge (e.g., terminology, higher education) is needed. Interestingly, some users also mentioned visual abilities, although visually impaired people did not report any restrictions or issues.

> "He supposes cognitive skills (and intelligence in general) are needed, but nothing special skills." (MBE_U_V_i06)
>
> "Other important skills are digital skills (for smart devices, by routine), but it is also in connection with the capabilities of the device (e.g., he needs a headset to use audio navigation from the device)." (MBE_U_V_i09)
>
> "She finds visual abilities are the most important – without them using the app would be quite hard to use (but this is true for the travel itself, as well)." (MBE_U_C_i02)

Interviewees who currently do not use digital mobility applications for everyday purposes admitted that, with a little effort, they could also use them without encountering problems.

> "Digital skills are important; therefore it is hard to learn for elderly people. She thinks that she is able to learn to use such applications." (MBE_N_C_i01)
>
> "For foreign language apps, some language skills are also needed of course, but the needed terms can be learned." (MBE_N_V_i12)

8.2.5. Perception of service demands by users

There were only four issues reported by the interviewees and those were connected to two main topics. Firstly, visually impaired people experienced issues regarding using the application with a text-to-speech software – some of these problems may be caused by the possible inattention of developers (e.g., missing labels), some may be caused by accessibility needs, which are difficult to implement (e.g. maps for visually impaired people).

> "Disadvantage: after update, some errors may occur (e.g., labels, element descriptions – which could be read by screen reader software – are missing)." (MBE_U_V_i07)
>
> "Her difficulties are mostly in connection with accessibility. As she uses the app with a screen reading software, it would be important that all parts of the interface could be handled and read by it; while some parts (e.g., maps) do not work with it." (MBE_U_V_i08)

Secondly, the other topic concerns the notifications about public transport service changes and unusual conditions (e.g., rebuilding of infrastructure), as this function is not included in the BKK Futár application. For people with an impairment, this information can be the deciding matter when pondering different routes, or it can even make their travel plan impossible.

> "She misses the notifications for service updates/unusual conditions by the app itself (not by email)." (MBE_U_V_i08)
>
> *Public transport app (BKK Futár):* "She misses the notices of service changes/limitations." (MBE_N_M_i05)

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8.2.6. Self-use, assistance and group use

All interviewees have smartphones which they can generally use independently. The handling of typical applications (e.g., Facebook Messenger) poses no challenges for any of the users. Most of them learned to use the different applications by themselves, and many of them have helped others use and customize the digital mobility solutions. The interviewees are also happy to help anyone in their community, even if they are less skilled. Caregivers also aid those in need of their assistance; however these people are usually in need of escorting as they are unable to use transport services (and so related digital mobility applications) unaccompanied.

> "Generally, she uses it alone, but sometimes gets some help with her family." (MBE_U_C_i02)
> "Usually he uses it alone, sometimes his friend helps him, but he also helped others." (MBE_U_M_i04)
> "The disabled people she usually aids do not use such services (many of them doesn't have smartphone), but she thinks some of them could learn how to handle it with some assistance." (MBE_U_C_i11)

8.2.7. Perception of personal privacy

Awareness of sharing personal data and handling privacy varies widely among the interviewees. Many of them are aware that giving personal data is not mandatory and interrupted the installation process because the application asked for access permission to unrelated functions (e.g., camera for DMS is not used). Five of the interviewees identified payment data as the most sensitive. Some were less conscious about the possible risks of sharing personal data, but all of them stated that they only provide the number of permissions and datasets that they feel are comfortable and acceptable.

> "While using a route planner, don't worry it doesn't need registration or asks for personal data." (MBE_U_C_i02)
> "He finds bank and health data the most sensitive; for address, this depends on use." (MBE_N_V_i12)
> "In general, she hopes that providers won't misuse her data." (MBE_U_V_i08)
> "She feels annoying to share personal data, tries to share the minimum. (However, she usually doesn't read required app permissions when installing a new app.)" (MBE_N_M_i05)

There were four interviewees who found location data one of the most sensitive but agreed that this information highly increases the functionality of digital mobility applications.

> "She finds location data the most sensitive, especially the recording of that, but she often agrees to provide such data." (MBE_U_C_i11)
> "However, he accepts that if he uses location-based apps, his position is known by the provider." (MBE_U_V_i07)

Two of them also reported that personalized advertisements might be based on unwillingly shared personal data. They feel annoyed when seeing advertisements based on their personal data.

> "She feels annoyed to share personal data. She has noticed that sometimes web advertisers know what she had searched for before." (MBE_N_C_i01)

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General applications: "she can use them; but personalized advertisements bother her (as they prove that service providers know her shopping habits)." (MBE_N_M_i05)

8.2.8. Difficulties, challenges and constraints

Many of the interviewees in each assessed group that have jobs at non-profit organizations do not have high salaries, which may result in them being unable to afford the suitable solution. Visually impaired people prefer to use iPhones due to the built-in VoiceOver function, which tends to work smoothly in combination with any application. However, these smartphones are usually more expensive than other smartphones in the same category. Most digital mobility solutions also require a continuous internet connection, but some users only have a limited amount of internet available in their subscriptions.

"Has a public transport app (Budapest BKK Futár), but uses rarely as her mobile internet connection is limited." (MBE_N_C_i01)

"He finds such services useful in general; the obstacle is accessibility, and the price of suitable devices." (MBE_N_V_i12)

If only third-party aiding applications exist for the hardware or the hardware is not compatible with an effective aiding software, the users may be obligated to use insufficient solutions, which can result in compatibility issues.

"He tried to install Messenger on his phone, but he had compatibility issues with reading software." (MBE_N_V_i12)

People with reduced sight would also welcome contrast and zoom options, as these are the minimum requirements for usability for them.

"But in general, many apps lack a zooming function which would help a lot for people with reduced sight in searching." (MBE_U_V_i06)

8.2.9. Attitudes and feelings

Generally, the interviewees welcomed the digital mobility and delivery services. Their attitude is very positive towards them. They praised the easy usage and its help in their everyday mobility. They also addressed some concerns, but those were connected to changes these applications brought to everyone's life rather than the applications itself.

"Her travels are more calculable (especially dep. times and transfers) thanks to the service. On the other hand, this information can make her more disposed to start her travels too late and hurry." (MBE_U_C_i11)

"Main advantages of the app are: fast, available, free of charge and easy to use." (MBE_U_V_i07)

"Main advantages are the option to plan routes with estimated time and allows the user (with limited sight) to travel alone." (MBE_U_V_i09)

"She feels that they are useful in general. Many food shopping delivery services are very unavailable during pandemic (because of high demand)." (MBE_N_M_i05)

8.2.10. Reliability and trust

Most interviewees were satisfied with the reliability of the data provided in the digital mobility applications they use. Most of the time they get the information they expected

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right on time. However, two users reported occasional unreliable data or distrust caused by the lack of response (not necessarily regarding the two assessed applications).

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Usage of driving navigation (as a passenger in car) "She is satisfied in general (information is accurate), and specifically with notifications referring to actual traffic conditions." (MBE_U_C_i02)

"She uses the Futár app less often, but she is less satisfied with actual departure time information (she experienced missing times)." (MBE_U_C_i11)

"He has ordered a taxi with an app. He had to verify his order via phone because he didn't get any feedback from his order (and he wanted to be sure about it)." (MBE_U_V_i09)

8.2.11. COVID-19

Interviewees agreed that they did not change their habit of using digital mobility solutions during the pandemic, although, their mobility demands, and their mode-choice might have changed.

"Previously, she used mainly public transport (bus and train) and only sometimes car. (…) But since COVID-19 she hasn't used public transport, only car (for work-based travels and caregiving, as well)." (MBE_U_C_i11)

"She mostly uses public transport and for nearby destinations, walking. Because of the Covid-19, nowadays she uses cars (as passenger) more often." (MBE_N_M_i05)

They also tended to try new applications or services, most importantly food delivery applications.

"She uses such apps, especially during the pandemic. This kind of food delivery makes it possible to receive food without personal contact which is safe nowadays." (MBE_U_V_i06)

There were more conscientious interviewees who tried to minimize the chance of getting infected by touch, therefore they always used smartphones with the same hand and held the handrail with the other.

"Yes, he tries to separate his mobile device usage from travelling on public transport (for hygienic reasons)." (MBE_U_V_i09)

8.2.12. Conclusion

According to the previous sections, several recommendations can be formulated to address the needs of the assessed user groups. Some of these requirements are partly included in several digital mobility solutions but need some improvement for creating a more inclusive application. Most of the development ideas listed, will refer to public transport applications as it is used most frequently among the interviewees. Three clusters of recommendations can be discerned:

The first cluster of recommendations focus on improvement ideas where the added function or service may require additional development in the basic processes of the organization. These additions can advance the application more towards the users' needs and goals.

- **Service organisation:** The main purpose of using public transport applications during travelling is route planning and route guidance. Therefore, a route planner that can manage different accessibility needs is indispensable: e.g., Knowing the type of vehicles (low-floor or high-floor) in real-time or planning routes where the transfers can be made without level-changing (or using elevators).

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- **Service organisation:** Route planners should also focus on walking to and from stops, as there can be obstacles for specific groups (e.g., visually impaired people with guide dogs tend to avoid escalators). It would also be a nice feature to give information to the public transport vehicle drivers about the passengers who need assistance on boarding and disembarking. That way they are prepared.
- **Service organisation:** The set of real-time data provided can be also extended, using notifications on service changes (especially on actually/frequently used routes), indicating any rebuilding and refurbishment actions where temporary accessibility solutions can appear. Useful data that can be added, can be the crowdedness of each public transport vehicle – not only because social distancing is a crucial measure against the pandemic –, as this makes the vehicle selection easier for caregivers of bigger groups, wheelchair users or people who cannot travel standing up.

Another set of requirements can be towards the information technology developers, concerning the creation of more inclusive applications, increasing the accessibility of the digital interface by the consideration of specific skills, capabilities, and constraints of user groups, while also adapting to their unique workflow.

- **Digital tool:** Using universal icons, language and design elements can result in a quicker learning process for users with an impairment.
- **Assistance and support:** A short introduction tutorial for the main functions, focusing on various needs and user groups would be also welcome. When major updates happen, these tutorials should be introduced again, highlighting the changes from previous versions, including changing functions, and 'button' placements.
- **Digital tool**: A zoom option for texts can be added for people with somewhat reduced vision (or elderly people). However, most visually impaired persons' biggest need is to create an application able to be used with text-to-speech software.

Therefore, testing the application with the most popular text-to-speech readers can be useful. In case of misunderstanding services or functions, offering a live voice-based information contact can be reassuring for customers.

The third cluster consists of recommendations from a financial and privacy and security standpoint:

- **Service organisation/privacy:** Public transport applications should be affordable (free, if possible) and should require only a minimum of personal information. This can improve reliability and trust, and customers will feel safer (concerning both themselves and their personal data).
- **Service organisation:** However, real-time data requires an adequate internet connection, which is not necessarily affordable for many vulnerable groups, thus excluding them. For many mobile service providers an exception list exists for applications where the internet used does not count against the customer's subscription. Usually these lists contain chat applications, but digital mobility solutions could also be added (e.g., maybe on account of the public transport operator or contracting authority or state contribution).

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- **Digital tool/service organisation**: E-ticketing, which is connected to the routing function can also be added, as finding, reaching, and using a ticket vending machine can create additional obstacles of accessing public transport for people with reduced vision or mobility.

8.3. User case study 3: Privacy and security from the viewpoint of the elderly, visually impaired and refugees

8.3.1. Introduction

Use case – main outline	
Theme	Privacy and cybersecurity
User Group	Older persons, refugees, visually impaired
Location	European Union
Useful links to INDIMO pilots	All pilots, in particular Antwerp and Emilia-Romagna

Table 22: Main outline user case story Privacy and Cybersecurity

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This user study focusses on the perception of privacy and cybersecurity aspects by vulnerable and close to social exclusion groups in the European Union living in urban areas. It wants to know how members of these groups stand towards both issues and how it affects their usage of digital applications. This user study is based on a literature review of the main recent studies (2016-2020) with respect to privacy and cybersecurity and vulnerable and close to social exclusion groups as well as a review of cybersecurity and privacy issues in the context of smart cities.

The user study aims to complement the work performed in the stakeholder interviews (T1.2) and the user and non-user in-depth interviews (T1.3) where privacy and cybersecurity aspects are investigated from the angle of members of target groups in the pilots. In this user study we try to shed light on three user groups that are not covered by one of the 5 INDIMO pilots or for which we believe an extra view on privacy can shed necessary extra light - refugees, people with reduced mobility and elderly. Indeed, while conducting our literature research, we found out that current research on privacy and cybersecurity is focusing on groups or segments of the population that INDIMO is not so much focussing on or only looking at from

Together with the interviews for T1.2 and T1.3 mentioned before, this user case study is part of the preparatory work for the Privacy and Security Guidelines that will be developed in WP2.

The user study consists of three sections. First, a brief introduction in the relationship between smart cities and cybersecurity and privacy is presented. We focused on Smart Cities considering the importance that this label has as a growing trend in all parts of Europe; and more important considering the importance that cybersecurity and privacy has now in this context due to the spread of digital services. Secondly, the state of the art about privacy and cybersecurity with respect to three specific groups is performed, namely: refugees, older people, and visual impaired people. Finally, the document concludes with recommendations towards the building of the guidelines in WP2.

8.3.2. Smart City, cybersecurity and privacy

Smart Cities label is nowadays popular, and it is applied to a wide range of application. For the European Commission, a smart city is *"a place where traditional networks and services are made more efficient with the use of digital and telecommunication technologies for the benefit of its inhabitants and business" (EU, 2020, see here)* While information and communication technologies (ICTs) are the backbone toward which the idea of a smart city can be implemented, it also means that current networks and services will undergo through a series of changes that will concern the way in which people will experience those services and networks. Several sectors have now developed and deployed smart city services, among which, for example, transport, traffic management, e-government, energy, etc.

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The increasing application of such technologies put cybersecurity and privacy at the centre for an effective and secure implementation of new digital services. The risk is that cyber threats can undermine citizens' trust in digital services. Those services are more and more interlaced with daily activities of people, and any successful strategy for cybersecurity must consider the human and societal aspects as well the technical ones (Nai et al., 2020). It has been noted that while many new systems and devices are deployed, there is a risk that they did not pass adequate security testing (Alibasic et al, 2017). Several studies identified cybersecurity challenges for smart cities, such as the risk posed to autonomous vehicles by possible data confidentiality breach, and data integrity breach, posed by the integration of IoT and cloud technologies within smart cities (Baig, 2017). Cerrudo et al. (2015) proposed guidelines to provide practical recommendations in relation also to such challenges (e.g., having proper process to evaluate the security posture of the different solutions). Organisation such as ENISA periodically report emerging trends in security threats, recognizing how in the next decade the acceleration of technology makes cybersecurity risks more difficult to assess, since risks are systemic and complex (ENISA 2020). This complexity is fully embedded within smart cities, because of the deep connection among different socio-technical system. To enhance the level of cybersecurity, ECSO identified the need to raise public awareness and to carry out extensive training and testing (2018), and Lévy-Bencheton et al. (2015) recommended supporting the development of a harmonised cybersecurity framework to municipalities, together with a more structured knowledge shared among all the actors involved.
From the analysis of several studies, Habibzadeh et al. (2019) discussed the idea that to have a secure smart city there is the need to use a holistic approach, that tackle together technological, organizational and social challenges. Looking at the user perspective, there can be not familiarity with security issues, and thus becoming easy targets for attackers while interacting with smart-cities services. This risk is even higher if we take into account some groups of users such as older adults and young people (Khatoun and Zeadally, 2017). Also, as noted by Habibzadeh et al. (2019), there is a security disparity among various stakeholders: data is shared and circulate through different organizations both public, and private, with possible different security guidelines. Increasing the transparency of data and security features is an important factor to get a "real" informed consent from the users. Indeed, the attention toward privacy and cybersecurity becomes even more important for vulnerable categories of people, such the ones that are take into account by the INDIMO project.

Recommendations

- **Privacy and security:** Increasing the transparency of data and security features is an important factor to get a "real" informed consent from the users;
- **Privacy and security:** Sharing knowledge among different stakeholders and users is important to create a common understanding of the issue;
- **Privacy and security:** Top-down communication to users and stakeholders is not an appropriate strategy; rather an active engagement of users and stakeholders will be necessary to raise awareness and improve security;

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8.3.3. State of the art on vulnerable and close to social exclusion groups

Refugees

The usage of smart phones among refugees to find and share relevant information about resources in the place of arrival as well as the mean to stay in contact with friends, family and other refugees has been well visible since the refugee crisis of 2015 in Europe. This visibility of smart phone usage by refugees led initially to the view that the smartphone was a new indispensable asset, more valuable than physical resources. The smartphone became a tool of 'empowerment', and humanitarian organisations also developed applications that should support the refugee on his way to Europe and within Europe. The smartphone became an 'enabler' to turn the refugee into a resilient person or even digital refugee. As a lifesaver, mobile phones were considered to allow the refugee to cross borders on their own, reducing the dependency on smugglers or allowing to call for help to authorities in case of problems. However, what remained initially unclear was the fact that these digital tools were collecting personal data and leaving digital traces, turning the refugee into a more vulnerable person. What happened is that refugees entered in this way into potential structures of surveillance and control, not only from smugglers but also by governments (Piro, 2018). Although research has been undertaken into the usage of migrants of mobile (smart) phones and some of these studies also research privacy and information security, the literature is still emerging and therefore it is not possible to give definite conclusions (Manzini, 2019).

Although text-and video messages services such as WhatsApp or Viber are used by a huge group and used on a rather daily basis by 40 to 50% (Manzini, 2019), research into experiences of refugees about privacy states that an important part of refugees is requested information that they would rather have not shared and do not trust platforms such as WhatsApp or Facebook for sharing personal information. (Check for example the numbers for the Syrian Refugee Camp Retsona by Latonera et al., 2018). On the other hand, the SIM card seems to be less a matter of concern. Refugees tend to own multiple SIM cards but also share them among each other.

However, the use of mobile phones can also be a source of surveillance, fraud and extortion. The (personal) information on the smart phone or the digital traces left allow governments or malicious groups that track refugees. On the other hand, given that for purchasing some goods online certain personal information is needed, fraud is emerging. Thirdly, the personal information on the mobile (smart)phone of oneself or others (e.g., their phone numbers) is useful information for other persons or organisations that have not the best intentions.

Research shows that refugees have developed strategies to mitigate these risks. In order to avoid online surveillance from governments or smugglers, migrants often develop codes or their own language (Manzini 2019) or use avatars. We should mention that most studies on mobile phones usage and privacy/cybersecurity concerns among refugees are dealing

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with Syrian Refugees who have a high degree of digital skills and literacy (Mancini et al. 2019). The ability to protect oneself from negative consequences of smart phone use depends also on the level of digital literacy and skills.

Recommendation:

- **Privacy and security:** Develop an improved information provision about privacy, security and related risks to refugees;
- **Privacy and security:** In order to guarantee human dignity and human rights, ensuring privacy rights and data protection should be envisioned from the initial stages of design.

Older people

A recent report from Eurostat (2020) about the ageing in Europe highlighted a divide among generations in digital skills: in 2017 44% of people in the range from 65 to 74 years of age had never used a computer. Even more striking is the data of 43% of European people aged 65 to 74 years old that did not used the internet in the three months before the survey in 2019 (Eurostat, 2020). At the same time ICTs can ease living condition for older people, give them access to new services, help them communicate with family members and maintain a good quality of life. However, the presence of a digital divide gap makes it more difficult for older adults to access those services and, at the same time, lack in digital skills make them more vulnerable to cybersecurity vulnerabilities. Thus, access to reliable information and training for cybersecurity become two important factors that are also discussed in recent literature.

Nicholson et al. (2019) argue that older adults look for cybersecurity information only in case of need, while friends and family are important sources for knowledge about cybersecurity risks. Also, the access to reliable information sources, such as courses, official support, and professionals makes older adults less vulnerable, giving them the right information to prevent and address threats (Nicholson et a. 2019). The need to increase older adult's cybersecurity awareness and skills is confirmed by Blackwood-Brown et al. (2019), that contributed to a better understanding on how addressing older adults training in cybersecurity skills. Training content for older adult should be administered in small groups, and delivered over a period of time, avoiding information overload and favouring social interactions with hands-on activities.

Among the different sources of reliable information that users can access, the use of commercial support from vendors and providers about cybersecurity is recognized as an important source for people. Especially for whom own new devices which need to be configured and setup from scratch by themselves, instead of relying on families and friends to setup for them or using second-hands devices already configured by others (Nicholson et al. 2019). This is suggested also by Morrison et al. (2020) that connected cybersecurity to previous working experience, and socio-economic conditions: they made the example of retired doctors living alone and using new smartphone, downloading best-selling apps, in contrast to retired salesclerks living in proximity with children, and using their second-hand devices that have a higher risk profile.

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So, while older adults could have benefit from accessing digital services, they remain a vulnerable target for attackers. Several cybersecurity threats could be addressed by a better training, as noted also by Morgan et al. (2019) for the case of malevolent pop-up alerts. From the design point of view, Morgan et al. (2019) recognized the importance of interface design features to support users in checking the integrity of messages, while not reducing the performance of a primary task. They also suggest relevant design principles from literature that can be used, such as avoiding complex or long messages; clearly label items; and use simple, minimal steps to help older people performing tasks.

Recommendations:

- **Privacy and security:** Improving access to reliable information for older adults, being carefully for possible information overload;
- **Privacy and security:** Training older people in cybersecurity issues, fostering social interaction (e.g., having small groups of people, and divide content in small amount at a time, leaving time for social interactions);
- **Privacy and security:** Using design principles and design features that support user's effort in checking the integrity of messages (e.g., clearly label items, allow to reverse actions…)

Visual impairment

When we speak about online privacy and visual impaired and blind people, we have to distinguish between three aspects of privacy concerns. First, there is the sharing of personal information with online providers. While sharing some personal information has become a kind of entry point to the digital world, digital service operators ask visually impaired people - and people with disabilities in general – on average to share more personal information than other users. On this aspect similar concerns are found with the larger population: understanding the terms and agreement of the privacy declaration, making sure that the privacy settings are alright, that the provider respects the privacy regulation and so on…In particular concerns are present with the way their choices can be implemented and managed. On social media for example, privacy settings button are not always clear because providers of social media tend to change the interface quite regularly as well as the privacy policy. This can lead sometimes to disclose and share pictures with other social media users that are from embarrassing private situations. Another issue is for example managing add trackers.
Secondly, five types of privacy concerns emanate from the usage of the device in public space and the way these tools are designed. There's first the fear of visual or aural eavesdropping (or shoulder surfing) where other people might read or hear what a person with visual impairment is consulting on his/her screen. Using a blackened screen options or headphones are not always good solutions. In the latter case, it denies blind and visual impaired people from necessary auditive cues to orient themselves and move around. Secondly there are issues with the passport management of devices due to the visual disability. Typing in a password is not easy or requires special sounds in screen reading software that does not reveal the content of the password. Password management

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software is not always designed accessible or deemed complicated to use. On top of that, extra protection mechanisms such as CAPTCHA's are by some considered as very annoying as it is visually difficult to decipher. Third, there are complaints about a greater vulnerability to hacking. Phishing email or malicious URL's are not easily to be detected based on screen reading software, while security measures to protect the user are not easily confirmed by visually impaired people. A fourth kind of privacy issues appear with technical problems of the devices and the screen reader software. If assistance is needed in those cases, they can feel vulnerable because they need to give away access to passwords or allow someone to look at other personal data. One issue is that, although the device has been designed accessible, the manual to fix the bug or problem isn't. The fifth source of privacy concerns emanate from badly designed and inaccessible websites, forcing in the end a visual impaired or blind person to give his personal data to somebody else in order to have it inserted digitally to a website.

Finally, the issue of online privacy has a strong offline component as well. While using an online app for mobility purposes in the public domain, the organisation of the physical infrastructure might lead to privacy concerns. Poor matches between the information provided by the mobile device and the physical infrastructure can lead to different situations in which a visual impaired person might have to ask for help from an unknown person and hence privacy can be invaded as directions and goals need to be shared. The inaccessibility of the physical infrastructure often leads to similar experiences. Thirdly, the obvious usage of the device can lead to physical safety perceptions, fearing for example the theft of a device.

Recommendations:

Privacy and security: Involve visually impaired persons in the design of the app and the data-gathering. Follow privacy by design and provide concrete privacy enhancing solutions so that persons can manage their privacy in an easy and transparent way

Privacy and security: involve visually impaired persons to understand what security measures work and which aspects of design of the tool can be privacy sensitive in a public setting

Privacy and security: Work with designated trusted people when one needs to disclose personal data to others.

Privacy and security: If possible, change passwords regularly

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8.3.4. Conclusions and Recommendations

In this case study we addressed the issue related to perception of cybersecurity and privacy aspects by vulnerable groups of people, in a broader scenario of smart cities. We analysed how the three considered vulnerable groups (refugees, older people, and visual impaired people) stand about cybersecurity and privacy and how this affects their usage of digital services and applications.
The project has a strong focus on cybersecurity and privacy, with the objective of developing guidelines for cybersecurity and data protection in relation with inclusive digital mobility solutions. Working with vulnerable groups of people require even more attention to the issues of cybersecurity and privacy, in order to provide inclusive and safe services. Therefore, we consider relevant to conclude this case study with some general recommendations for the whole project tasks, also in view of future activities related to design of the Universal Design Manual:

- While engaging with vulnerable groups, consider developing clear and transparent documentation toward personal data usage, go further than the GDPR-rules;
- When considering cybersecurity requirements, take into account to approach the issue with a holistic approach; involving not only technical requirements, but also human factors and communication issues;
- During the meetings and the interactions with users in the Communities of Practice context, consider in giving also specific training on cybersecurity and privacy;
- Usability is important also for cybersecurity, for the designing of a usable and inclusive service and product take into account literature best practices for cybersecurity such as the ones presented in this case study

8.4. User case study 4 - Brussels: micro-mobility and vulnerable young adults (18-25 years)

This use case was developed in order to have a view on a mobility service that is new in European cities and is not covered by any of the INDIMO pilots. By situating the use case in Brussels, the use case study allowed us to also shed light on the user characteristic of vulnerable young adults living in the area of Molenbeek. This user study complements the user characteristics of the Galilee pilot.
The use case study will first start with an overview of micro-mobility services in Brussels and their (geographical) expansion. In the second section, we will first focus in more details on steps and bikes and provide, based on existing studies, insights in some usage pattern in Brussels. In the second part of this section, insights of more international studies regarding the usage of shared steps and bikes and vulnerable persons are provided. In a third section we report on the interview we had with Foyer, a youth house in Molenbeek, in order to gain more insights into the usage dynamics of vulnerable youth with micro-mobility.

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Theme	Micro-mobility
User group	Vulnerable young adults (18-25 years' old)
Location	Brussels – Molenbeek
Useful links to INDIMO pilots	Berlin, Galilee, Madrid

Table 23: Outline user case story 4 - Brussels

8.4.1. Introduction of micro-mobility schemes in Brussels

Micro-mobility refers to personal or rented lightweight transportation technology in the form of vehicles. In this case, we are talking about (electric) bicycles, (electric) steps and (electrical scooters. These vehicles can also be shared.

Bike-sharing in Brussels

Bike-sharing was established in Brussels in 2009, when Villo! introduced their bicycle rental program. After Villo!, both the Jump bicycle sharing service and the Billy Bike sharing service made their way to Brussels in the last years. (KLD, 2009). Uber introduced Jump to the city in April 2019 and Billy Bike launched their sharing service at the end of 2018 (de Terwangne, 2019; Schram, 2019).

At first, Billy Bike was only available in Brussels City, Elsene, Etterbeek and Sint-Gillis, which belong to the central, but also wealthier municipalities of the Brussels-Capital Region. However, in July 2019 Billy Bike broadened its scope to ten new municipalities, which are Koekelberg, Oudergem, Schaarbeek, Sint-Jans-Molenbeek, Saint-Joost-Ten-Node, Sint-Pieters-Woluwe, Sint-Lambrechts-Woluwe, Ukkel, Vorst and Watermaal-Bosvoorde. But not all municipalities are served fully. Billy Bikes are only partly available in Molenbeek-Saint-Jean and Schaarbeek. Anderlecht, Evere, Ganshoren, Sint-Agatha-Berchem and Jette are not included. (de Terwangne, 2019; TRO, 2019).

Jump also launched its micro-mobility service in Brussels City, Sint-Gillis, Elsene, Etterbeek, Sint-Joost-ten-Node and Schaarbeek, with these last two not being the first places Billy Bike launched their bicycles. By July 2019 Jumps service included Anderlecht, Molenbeek, Koekelberg and Laken, but they were (partially) removed from these municipalities after a rise in vandalism by September 2019. Both Billy Bike and Jump first focussed on the more central, richer parts of Brussels. Only later they expanded their service, thus they were and are still inaccessible in certain parts of the city. By May 2020, however, Jump announced they would pull their service, following a deal with Lime, a service providing sharing steps. (ADM, 2019; SG, 2020).

Steps in Brussels

In Brussels, three big electrical step-services are present, namely Lime, Dott and Bird.

In November of 2018 Lime established itself in Brussels by placing 500 electrical sharing steps in the city. These steps can only be used in certain parts of the city, which are digitally decided by the company. It can be seen as a 'virtual zone' in which one can rent a step and drop one off. As mentioned by Brussels newspaper Bruzz, the Lime steps were only available in the centre of Brussels and richer parts of Brussels. By September of 2019 however, the electrical steps were available in all Brussels municipalities. Bird was also introduced in 2018, two months before the arrival of Lime. Due to Lime's success, Bird disappeared from Brussels for nearly two years. Since October of last year their electrical steps are back in use. (Hendrickx, 2018; Hendrickx, 2018; De Tijd, 2020).

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Another big player is Dott, which introduced their electrical steps in January 2019, after both Lime and Bird were already present. By November 2020, Dott owned 50 percent of the electrical steps in Brussels, being the most successful. At first, Dott was only present in the European Quarter and then in Brussels City. After a rise in demand, the company also placed their sharing service in Ukkel, Vorst and Sint-Gillis in September 2019, with 2017 figures claiming that Ukkel is the richest municipality in Brussels and Sint-Gillis is becoming more prosperous (Gatzios, 2019). In March 2020 Dott broadened its scope to include Anderlecht, Sint-Jans-Molenbeek and Evere. (Hendrickx, 2019; De Tijd, 2020; TRO, 2021).

Scooters in Brussels

In June 2019, Dutch company Felyx introduced their electric scooters to Brussels City, Elsene, Etterbeek Sint-Gillis and Ukkel. These are the same areas other sharing services focussed on, with only broadening their scope to less wealthy and/or less central municipalities after establishing success in these districts (Nijs, 2019). By June 2019, Felyx broadened their scope to Watermaal-Bosvoorde and Sint-Lambrechts-Woluwe, but had pulled their service from Laken, due to vandalism. Vandalism was also claimed to be the reason that Jump (partly) left several municipalities (see above). (KVDP, 2019; ADM 2019).

8.4.2. Current knowledge of micro-mobility in Brussels

Brussel Mobiliteit (2019) did research on micro-mobility in Brussels. The first article focussed on the electric steps, but the other article had a broader scope, dedicating one of their chapters to the step service. The Brussels Fietsobservatorium (2018) of ProVélo focussed on the amount and kind of cyclists in Brussels.
Brussel Mobiliteit (2019) found that there are more or less 5000 electrical sharing steps in the Brussels-Capital Region. Users of these steps are mainly young, well-educated men. 66% of the users are men, with frequent users of the step service 70% men and 30% women. ProVélo's Brussels Fietsobservatorium (2018) mentioned the same observation, noting that 63% of the cyclists in Brussels were male, 35% female and 2% children. Brussel Mobiliteit (2019) pointed to the more complex routes women take as the reason for this difference, like having multiple stops on their way to work or home, e.g., dropping off their children, but also the fact that steps cannot be used to transport more than one person and is not outfitted to carry luggage. As mentioned, the article also cited that the users were well educated. 3/4th has a higher degree. 21% is self-employed or are senior managers and 58% of the users are employees. 44% of the users are estimated to be between 25 and 34 years old, only 15% of the users are students (Brussel Mobiliteit, 2019). Of these users, Brussel Mobiliteit (2019) says 53% are occasional users and 55% are one-time users. Users were drawn to the steps due to the possibility of time saving (53%) or just because they were curious (55%). Those that kept using the service, did it because it saved time and often in combination with other (public) transport modes. 46% combines the step with other transport modes, of which 90% is public transport. (Brussel Mobiliteit, 2019).

Brussel Mobiliteit (2019) launched a survey about electrical step use in Brussels and had results comparable to that of the other Brussel Mobiliteit (2019) article. They found users to be mainly men, averaging around 33.4 years old, working as employees and having achieved a degree of higher education. Most of the respondents making use of the sharing

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service, are occasional users, using steps about three times a month. Users that own a step make use of it more frequently, averaging around once a week.

As there is not yet much written about the accessibility of micro-mobility focussing on exclusion in Brussels, three international articles were engaged, namely "Macro managing Micro mobility" (POLIS, 2019), "Dockless bike-sharing systems: what are the implications?" (Chen, van Lierop & Ettema, 2020) and "Is micro-mobility sustainable? An overview of implications for accessibility, air pollution, safety, physical activity and subjective wellbeing" (Milakis, Gebhardt, Ehebrecht & Lenz, 2020). All studies contain chapters on the accessibility and possible social exclusion of micro-mobility.
POLIS (2019) dedicated a chapter to 'equity', in which the study looked at several aspects of micro-mobility that could cause exclusion due to the companies' focus on profit: "[P]rivately-owned companies are oriented towards profit, not necessarily the public interest; and those who want to use their services are supposed to accept the way their services are provided" (16). POLIS (2019) mentions that a person's financial capital, geographical position, (lack of) digital skills, need for anonymity and possible mental or physical limitations could cause someone not to be able to use the micro-mobile service. If one does not possess enough or has only limited funds, the service might not be accessible due to its pricing.
Geographically speaking, these services can often be found in a city's centre and/or a densely populated area. They are less likely to introduce their service in the periphery or areas with less accessible public transportation. It could also be said that the services are less likely to be found in less wealthy parts of a city. Thus, the geofencing will not include that geographical area. POLIS (2019) mentions that this could be because companies fear or have experienced vandalism, however "it can be worked out, through dialogue and cooperation between the operators and the local communities. Looking at enforcement, at affordable prices, but also at local jobs, and maybe also at new service solutions, which in turn will open up new opportunities elsewhere. Cities can encourage and support this dialogue" (17).
Other aspects that might cause a person to be unable to use an electrical step or bicycle, could be because of the digital gap. For example, a person might not have or be able to use a banking app, but it could also be the case that a person does not possess a smartphone. Thus, he or she is excluded from using the service. The same goes for persons who wish to stay anonymous or do not want to share their personal data with companies. (POLIS, 2019).
Lastly, micro-mobile services exclude people with disabilities. Firstly, micro-mobility affects people with visual and/or motoric disabilities "by the deployment of these vehicles on sidewalks and in the vicinity of crosswalks and bus stops. This is seriously degrading public space accessibility and safety, including in cities that in the past few years have been making significant investments in the elimination of physical barriers" (17). Secondly, people with visual and/or motoric are not able to use micro-mobile services properly.
However, POLIS (2019) mentions that it might be of benefit to companies to meet these people's needs as well, like being more affordable, to satisfy more than one customer profile, as there will be more users and they might be more reliable. They would expand their customer base and thus be more profitable. The study also refers to Universal Design as an answer to these issues. Universal Design for these micro-mobile services could

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ensure that people who are excluded now, can use the service in the future and therefore they could become more active and autonomous

Recent scientific articles Dockless bike-sharing systems: what are the implications? (2020) and Is micro-mobility sustainable? An overview of implications for accessibility, air pollution, safety, physical activity and subjective wellbeing (2020) address these issues as well. Chen, van Lierop and Ettema (2020) point out three major social groups affected by the accessibility of micro-mobility, namely elderly and people with an impairment, people who do not own a smartphone or who lack digital skills and people living in less densely populated and/or less wealthy areas, where the service might not be (fully) available. They state that this geofencing could lead to unequal access and discuss the danger of this uneven distribution pattern: "[T]his approach of allocating bikes could raise the unintentional social consequence of limiting the accessibility of shared bikes for groups who are already experiencing social disadvantages or limitations of other transport modes" (14). Milakis, Gebhardt, Ehebrecht and Lenz (2020) only shortly focus on the social exclusion issue by drawing on other studies but note that the service's availability is better in wealthier and/or more densely populated parts of a city, although this is sometimes only an issue when a company first introduces the service. Other than that, they note that users often are well educated and have higher incomes and the service might prevent persons with a lower income to use the service as well as exclude those who lack digital skills and those who have a physical disability.

Future research should focus on micro-mobility in Brussels. Different aspects should be taken into account, like the (un)accessibility of different micro-mobile services, the (lack of) saturation of the different micro-mobile services and the reason why certain groups are not able to use or do not wish to use the micro-mobile services.

8.4.3. Interview with Foyer on micro-mobility usages by urban youngster in Brussels (18-25 year olds)

In order to get some insights into the dynamic of the use of micro-mobility of vulnerable people, 2 youth workers of Foyer (one man and one woman), a social-cultural organisation that strives for an inclusive society (www.foyer.be), were interviewed concerning micro-mobility in Brussels and the possible obstacles it poses for vulnerable young people. They raised the following points during the interview:

The shared steps are used by the youth because they offer an easy alternative to public transport and other transport options for short distances, especially to avoid waiting times, avoid busy busses or to go to areas around them where there is no public transport. The usage of steps supports trips for recreational purposes, but also helps to support mobility to students' jobs. In general, the usage of steps is for the majority for trips in their neighbourhood or around Molenbeek and the centre of Brussels, although it can sometimes happen that longer trips are made (other side of the city), but at the current stage this is quite expensive.

Shared steps are more popular than bikes, mainly, according to the two interviewees, because biking as a cultural practice is not part yet of the cultural frame of the youth in Molenbeek. Shared biking solutions also have the problem that in the case of a solution with a fixed docking station, one has to still walk from the station to the destination and

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the stations or free-floating bikes are not that present as steps. The step is in other words the easiest and most convenient alternative for public transport.
The usage of shared steps is currently strongly connected to the young generation – teenagers and young adults (18-25 years' old). Parents – 'the older generation' - are concerned about the usage of their kids because they don't know the technology and they fear for the traffic safety of their son(s) or daughter(s). Regarding gender, it seems that more boys than girls are using the steps while girls are using more bikes. A reason for this gender constatation was not given.
Although the use of steps is a visible mobility practice and the issue of geofencing is not recognized by the interviewees, they nonetheless point out that there are two major obstacles that can block the widespread usage by young adults of steps: financial considerations and issues of privacy and security
What concerns financial considerations, it is important to note that the tariffs of renting a step are considered to be quite expensive. If someone wants to use the steps often, a student job is often required to finance the trips. Besides the price, the requirement to have a banking app and to possess a credit card is also a limitation to access the steps. Not everybody has a credit card yet. A third concern is the perception of a lack of financial transparency, although the unlock fee and the fee pro minute is communicated in the application before confirming the start of the journey. Since the application is connected to a bank card that charges you immediately after the ride, it is not easy to know the whole time how much you already spent while you are driving, which sometimes leads to surprises.
Concerns of privacy and security relate on the one hand to the feeling that end-users need to share quite a lot of personal data in order to be able to use the system. On the other hand, young people are not trained to read and check the terms and conditions in detail.

8.4.4. Recommendations

From this study on micro-mobility in Brussels and the usage of vulnerable youth, we can conclude that more detailed end-user studies are needed regarding the way vulnerable groups are perceiving the opportunities and barriers of these new transport means. Currently, its usage and its meaning by social groups is deduced from the location of the offer or on the basis of number of trips or indicators that provide general patterns (gender, age, profession). While opportunities are mentioned (increase access to local employment for example), concerns are uttered in the literature by mobility experts and also in the interview with Foyer important barriers were mentioned.
In that sense this user case study will end with two general recommendations towards policy makers and mobility providers that can help to meet a general demand from persons with certain vulnerable characteristics (such as living in area's with not much public transport connections, low income or having impairments):

- Accessibility: Support the research in the development of micro-mobility transport means and schemes that investigate how:
    - people with disabilities can take advantage of them
    - older people can feel secure to use them
    - people with financial problems can pay the service

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- Geography: Develop policies that block the development of geofencing in micro-mobility deployment.

In particular towards youth living in vulnerable neighbourhoods it is important to take following aspects into consideration to support the uptake of the new mobility in order to realise some of the predicted benefits for them regarding (access to education, work, …):

- **R1: Service organisation:** work out a tariff scheme that is more transparent of the expenses made during a trip or to follow it up more closely or allows for better monitoring (select a thresh hold of a maximum spending)
- **R2: Service organisation:** look for payment options other than a credit card.
- **R3: Privacy and security:** develop ways to inform end-users about their practices of data sharing and the connected implications.

8.5. User case study 5 – Caregivers and assistance during Covid19 in Madrid

8.5.1. Introduction

Theme	Caregivers and assistance providers using DDS in times of Corona
User group	Caregivers (stakeholders) Vulnerable users (social isolation, older people, impaired). Bike riders
Location	Madrid
Useful links to INDIMO pilots	Madrid, Galilee, Berlin

Table 24: Outline user case study 5 - Madrid

For this use-case, five semi-structured interviews (see Annex II – Template stakeholder interview) were conducted with caregivers and representatives of social isolated groups, older and impaired people. The composition of the group consisted of 4 females and 2 males with 2 people in the range 36-45 years old, 1 person in the range of 46-55 years old, and 3 people in the range 56-65 years old (more information can be found in Annex 3 D1.3. Characterization of pilot interview persons).

The interviews focused on vulnerable end-users and their expectations towards digital delivery services during the Covid-19 crisis and on new mobility services to transport care givers that emerged during the Covid-19 crisis in Spain.

In this section, we first provide an overview of these new mobility services for caregivers. Second, we provide the synthesis of interviews with caregivers and bike riders as well as vulnerable end-users taken in between August and October 2020. Finally, concrete recommendations are identified that can be used to support WP2 and its creation of the different guidelines and manuals.

The Madrid has two main angles situated in the same context of time and space. The use case focuses first on vulnerable end-users and their expectations towards digital delivery services during the Covid-19 crisis. While some profiles are also part of the pilot study, the difference is here on the context since preparing for a post-Covid 19 world implies also

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preparing for a next pandemic that hopefully will not happen but can't be excluded. In that sense, the Madrid use case will also inform other pilots with similar vulnerable end-user characteristics (Emilia-Romagna and Antwerp). On top of the focus on vulnerable users, the range of actors is expanded because the use case study also takes experiences and expectations of caregivers of vulnerable persons (as users) and bike riders of digital delivery services into account. A greater picture on the dynamics of such services in a context of Covid-19 is hence provided which can also support the use study of Berlin and Galilee (ride pooling and informal ride sharing).
The second angle of the use case focusses on new mobility service to transport care givers that emerged during the Covid-19 crisis in Spain, especially in Madrid (Hoop app). As such interesting insights are obtained for this new transport mode while the use cases of Galilee and Berlin that also provide transport can take inspiration from the Madrid insights.

8.5.2. New mobility services for caregivers during Covid-19

During the COVID19 outbreak, Spanish capital city, Madrid, showed more than 73% of the deaths among elderly residents of nursery homes. Like in many European countries, nursery homes were high-risk contexts for severe cases. This phenomenon is due to the advanced age and frequent comorbidities of the residents as well as some other contextual factors such as the mobility and risk-related behaviours of caregivers. Last September 18th, the Comunidad de Madrid government made the decision of restricting mobility in 37 Basic Health Zones which coincided with low income neighbourhoods. Additionally, these are the areas that concentrate the higher number of caregivers and other frontline workers. While the areas that concentrate economic activities lay on the centre and northwest part of the metropolitan area, workers who produce there tend to live in southern areas and have to cross a large geographical extension to reach their workplaces.
There was limited action from the authorities in Madrid to tackle the above presented situation. On June 2020 the government of the Ayuntamiento de Madrid launched an on-demand bus for caregivers which connected different hospitals in Madrid city. A seat in the bus could be reserved through an app with a minimum of 90 minutes in advance and a maximum of seven days. It had 73 possible stops between the heads and it was aimed especially at the southern part of the city (Puente de Valllecas and Villaverde. But there were not many other policies oriented at this segment of population and geographical area, for which the outbreak and increase in cases in that part of the city shouldn't be surprising. There are nevertheless many civil society projects and enterprises that can be very illustrative of this new mindset and exhibit hints for a new direction in the course of actions in the country.
One of these initiatives was taken by HOOP Carpool, an app that contacts drivers and passengers to share their daily trips. HOOP Carpool is currently running a pilot experience related to the transport of health care workers from the El Escorial Hospital in Madrid. The platform has observed and increase in the sharing of cars as a consequence of the avoidance of public transit. They decided to establish incentives to improve safety condition in the use of vehicles. HOOP Carpool rewards users who travel everyday with the same colleagues and tracks and informs every registered user who could have been

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exposed to the virus during the trips. Car sharing can be a safe mode of transport as long as protocols are followed and the vehicle is reasonable sanitized.
Another example in this orientation is Childfy, a start-up from Malaga whose purpose is to bring new opportunities for families to share the transport of their children to school. The firm has established an agreement with the social innovation centre La Noria to set a pilot study that will cover in the first phase the area of Marbella. This pilot test aims at offering a solution to a social problem, which is mobility in the "new normality" caused by COVID-19. Similar to HOOP Carpool, it is a way of maximizing the present resources for mobility and offering alternatives to families that minimize the exposure in the transport of children to educative centres and allow the monitoring of information.
Finally, we can remark another case which involves active mobility. In Valencia, the bike store Todobici decided in April 2020 to lend bikes to health care workers who use them to commute in a safe way to their institutions. The idea came out of webinar and conversation with nurses in which the shop manager took part. The action involved their whole fleet of hiring bikes and the awareness of bikes as individual and safe vehicles to keep the promoted social distancing. The same initiative was promoted by Biciclot, a bike Hub from Poblenou, Barcelona, which have facilitated bikes for the health care workers of Hospital Clínico, CAP Cerdeña and Hospital del Mar during the confinement of the first wave of infections.
These are some of the examples of private initiatives taken by store managers, entrepreneurs or start-ups that are incline to address many gaps in the mobility that are not well covered by public actions, but hinge on the cooperation and coordination of responsible citizens and, many times, in the centralization and efficient employment through technology of user's data for their success.
In the next sections, we will provide a synthesis along the dimensions of D1.1 of interviews with caregivers and bike riders as well as vulnerable end-users taken between August and October 2020 in order to understand the role of digital delivery and transport systems during the Covid-19 crisis.

8.5.3. Goals and needs

Goals *According to you, for which purpose(s) are [vulnerable category] using the service?*	Vulnerable **users** have common usage drivers with general **users**, and also specific drivers of their segment. Convenience and restricted activity associated with disabilities are common drivers of digital delivery services (DDS). They are also important barriers to the use of DDS by vulnerable population, mainly see it as a luxury, too expensive or for special occasions Regarding the COVID crisis, the circumstances were in favour of the use of DDS for some users, but for some others it went against it. Let's differentiate this: DDS was an opportunity for those who were isolated because of their age and feeling of vulnerability in the face of the disease. Many respondents said that courier services (and not only food delivery) were important for this case.

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	Geographical isolation is another subject that comes about. But many other respondents said that the lockdown went against their use of DDS because: i) they had more time to cook and less other recreational activities to spend time with; ii) they had healthy concerns about being in touch with a rider or their food; iii) they cared about the rider's health and prefer to avoid a trip; iv) they felt they had to save money in times of uncertainty. With regards to **frontline** staff, the Delivery service workers (many of them known as riders) took a protagonist role during the pandemics guaranteeing the provision of food, medicine and other goods to people who were isolated by the restrictions imposed by the context. Although the adherence to the established protocols would have limited the contact between the delivery workers and their clients, the mere fact that they have greater mobility across neighborhoods, that they spent more time in public and shared spaces and that they became very frequently in contact with physical interfaces of the many buildings they served, make them a group of high risk in the face of the infection. With regards to **caregivers** (health staff, nurses, assistant nurses etc), there is evidence of greater risk exposure than other workers. McMichael, Currie et al (2020) processed information from surveys of nursery homes and identified several factors that contributed to the vulnerability of these working locations, including symptomatic workers that continued their services; the multiple jobs of the nursing staff, lack of familiarity and experience with the protocols to be followed, lack of sufficient supplies for the adherence to the protocols, delayed recognition of cases because of low suspicion alarm and the inclination to identify cases purely on the basis of signs and symptoms.
Needs *How should the service addressing the needs of (vulnerable category) using the service?*	Some needs of the vulnerable **users** can be very well satisfied by the DDS in times of restrictions to movement in the scenario of pandemics. First, in time of pandemics elderly people and those who feel at health risk avoided going shopping or doing it with high frequency. This goes in hand with the difficulty at some age or physical condition to carry one's shops and the need to have this done with assistance. In the second place, geographical isolation, aggravated by the COVID scenario, that can be summarized in users being away from different products and having

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	the DDS shortening this distance. Another need typical of vulnerable users, especially elderly people, is that they have special diets and they cannot improvise, because it means taking risks. So, if the DDS can guarantee regularity, fixed menus etc, this offers a great help to users. From a negative side, all these opportunities may imply further problems: not all urban areas are covered by delivery, the app may have little alternatives, not the food that users know is safe for them; not as regular service as they would like it to be, etc With regards to **frontline** workers, their need is being cared of to minimize exposure to risk. This means that, for instance, every trip to the supermarket that a professional nurse avoids doing, means a benefit for the whole society. We know that because frontline workers had a permit to circulate and work from the beginning of confinements and were out working, they: i) had more regularity of exposure (for example, ate more times out, went more often to supermarkets etc), ii) may have had less perception of risk in comparison to other groups.

8.5.4. Workflow

Workflow *What procedure/sequence/workflow will (vulnerabl e to exclusion category) have to follow? Please describe it step-by-step /the important steps*	This is a topic that comes about very often in the course of interviews and of high concern for vulnerable **users**: no matter which specific impairment they have, the workflow of the DDS should be thought of as a learning process. It has to be organized in a step-by-step way, in such a manner that users don't have to provide multiple information nor make multiple decisions on the same screen. In interviews with **frontline** workers, it came about the relevance of having available channels of direct contact with the firm. The human presence behind is important for all services.

8.5.5. Usability of the digital interface

Usability digital interface *Which mean features are important for (vulnerable category) and which are particular relevant from an inclusive point of view?*	At this point there are concerns about the adaptability of the digital interface to the different needs of impairment, for instance, assisted voice menu, external text reader, enough visual aids etc. There are also concerns about the type of

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	payments allowed by the platform. Here, many users find it important that the service allows also to pay in cash, for data security and privacy concerns, focusing on the sensitivity to handling credit card info. Even in times of COVID and the risk on the money notes, many users would rather pay in cash. With regards to **caregivers**, they need to: a) minimize their exposure in public transit (by means of i) personal isolated vehicles, such as bike, ii) sharing personal vehicles with others, as long as the car is properly sanitised, iii) reduced the time spent on vehicles and iv) avoid those trips that are avoidable); b) minimize the exposure in shops, by means of doing more delivery, with a DDS service that is adjusted to the workday characteristics of the worker (different locations, multiple work spaces, tight times)

8.5.6. Usability of the physical interface

Usability of physical interface Which features for the physical interface are recommended for the (vulnerable category), especially from an inclusion point of view?	Vulnerable **users** tolerate less the uncertainty than general users. It is important to minimize uncertainty with anticipation and visibilization. Regularity, as in other dimensions, is important. It is also important for **caregivers**: they tend to work in different institutions and places on the same day; they tend to go across many neighbourhoods in a day and this contributes to the dissemination of the virus. So, it is a good measure (as long as it is possible) if it is always the same rider that brings the food to a singular caregiver. Or the same car pooling group or car sharing group that accompanies him/her. This reduces the multiplication of contacts, and makes it easier to trace cases.

8.5.7. Skills and capabilities

Skills and capabilities What skills and knowledge is needed for (vulnerable category)? Which of them are the most hard to achieve?	Some of the skills have been mentioned in the workflow aspect. There must be adaptation to especial cognitive skills (speed of the flow, info step-by-step, visual aids), especial visual aids (fonts, contrast, position of icons, type of icons etc) and age (possibility of having whatsapp or telephone numbers as alternative and human presence behind).

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8.5.8. Perception of service demands by users

Perception of service demands by users What are the most important service demands that users (vulnerable category) will have problems with?	Problems will appear with regards to adaptation to their skills, as mentioned in the section before, and the sensitivity of sharing certain information. The type of food available and economics might be additional problems.

8.5.9. Self use, assistance or group use

Self use, assist, group use Can the (vulnerable group) use the service on its own or is a assistance needed? Which kind of assistance? How to implementi t?	There are some vulnerable **users** that access food by the institution. There are others that don't know how to handle money, or don't know how to estimate measures, or need parents approval of each purchase. With regards to **caregivers**, there is a part of the literature that suggests that a special care should be given to children of caregivers because they are more exposed than other children.

8.5.10. Perception of personal privacy

Personal data and privacy Are there aspect of sharing data privacy that should be taken particularly in account for the (vulnerable category)? How?	Sensitivity to information about credit card and bank account, name, address, gender and disability information, fear of companies bombing with ad etc.

8.5.11. Difficulties, challenges and constraints

Difficulties, limitations, challenges and constraints What are the major challenges and difficulties for (vulnerable category) when using the service?	For **users,** the challenge is to go through all the skills adaptabilities and beyond their fears. For **caregivers,** the challenge is to redesign mobility thinking in social responsibility in terms of public health, along with concerns about social and environmental impact that previously existed.

8.5.12. Attitudes and feelings

Attitudes and feelings Are (vulnerable category) standing positive towards the service (in general, partly). Which aspects in particular?	There persists a feeling of "not for me" among the vulnerable segment with regards to the category DDS. In elderly, there's also an ambiguity in relation to the attitude towards spending: either an attitude of "I have to save and leave some money to my kids" or an attitude of "life remaining is short for me, let's enjoy and spend without worries".

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8.5.13. Reliability and trust

Reliability and trust How are (vulnerable category) perceiving the reliability of the information of the service and the trustworthiness of the provider?	There's trust by contiguity: those who have social and environmental awareness as values, and believe that the cooperative satisfies these demands, tend to also trust other dimensions of the app such as data privacy and security.

8.5.14. Covid-19

How did COVID-19 influence the service for the (vulnerable category)?	It implies a potential against geographical isolation and involuntary isolation. It goes beyond delivery of food and generates possibilities for courier. The dynamics of the pandemics for many users goes against the use of DDS. As we mentioned before, there are users that said that the lockdown went against their use of DDS because: i) they had more time to cook and less other recreational activities to spend time with; ii) they had healthy concerns about being in touch with a rider or their food; iii) they care about the rider's health and prefer to avoid a trip; iv) they felt they had to save money because of the uncertainty of the crisis.

8.5.15. Recommendations

The present user case study covered the perception of caregivers, vulnerable users and bike riders towards digital delivery services in the context of a pandemic, in particular a service of food delivery and the transport of nurses and caregivers. Based upon the research about the new mobility initiatives that emerged during the Covid-19 crisis and the interviews with vulnerable end-users, bike riders and caregivers a about mobility and food delivery during Covid-19, in total 36 requirements for these three end-user groups could be assembled. For the three groups, the capacity of technology to connect places and people at distance (stores and consumers) and to organise them in a different manner (group them to avoid public exposure or allow pooling of resources) was acknowledge, although there were concerns and attention point as well. Some of these gathered requirements for vulnerable end-users are very close to the ones gathered for non-pandemic situations in cities. Nonetheless, they highlight their importance in order to anticipate disasters such as pandemics in cities. On the other hand, the user case study enables to shed another light on the role of caregivers and service agents – in this case bike riders – compared to the Berlin pilot (Mothers and caretakers of children).

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Vulnerable users:

Goals:

Since vulnerable users are often recommended to stay at home due to the sanitary safety measures, a DDS should:

1. **R1 Goal:** Assure accessibility to food in time of Covid-19;
2. **R2 Goal:** Focus on special food requirements (diets) and support healthy food concerns;
3. **R3 Goal:** Develop services that overcome geographical isolation and enable connecting with relatives and friends such as a courier service.

Needs:

For vulnerable users, in order to support these goals, they have the following needs:

4. **R4 Service organisation:** Provide convenience and usage advantages in order to circumvent the inabilities;
5. **R5 Reliability and trust/digital and physical tool:** Provide a safe, trustworthy and easy to use solution that bridge challenges of distance and isolation.

Challenge and limitation

Food offer

6. **R6 Service organisation:** The DDS should pay special attention to the type of food it is delivering (diets, healthy food choices upfront, structured menus to guide the choice);

Overcome image of luxury

7. **R7 Service organisation:** DDS are confronted among a part of vulnerable users with the image of being a 'luxury' commodity.
8. **R8 Service organisation:** Develop a campaign to show benefit of service and that is there for all.

Develop a protocol for bike rider

In times of Covid-19, end-users might perceive the bike rider as a source of health concerns

9. **R9 Service agent:** develop a clear protocol for the interaction with the bike – rider, adapted to the type of audience.

Avoid a surprise with the bike rider

As in their online interactions, vulnerable people don't like surprises in the offline world, especially older persons and impaired persons. It is important that the bike rider is identifiable (a badge) and recognisable (certain clothes in line with image of company) as well as follows some clear actions at the doorstep/doorbell.

10. **R10 Service agent:** Develop a clear branding and outfit strategy for the bike rider.
11. **R11 Service agent:** Train the bike riders way to speak and to present themselves to vulnerable users.

Spending and saving during the period of a pandemic

A feeling to not spent money on DDS as a security measure – either to create a financial back-up in times of long periods of crisis or in the case of older persons as a means to

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secure the future of relatives that will inherit by not wasting it on unnecessary goods – can grow during the time of a pandemic.

12. **R12 Service organisation:** develop a pricing strategy for the DDS service in order to offer cheap priced food as well as to turn the attitude of not using DDS in order to save for relatives.

Highlight good diversity of offer -> courier

As there can be a tendency in some of the vulnerable user segments to use a DDS less during a time of a pandemic, other needs may emerge, such as a courier service to transport goods between relatives and friends. For the DDS, a new 'market' can emerge here.

13. **R13 Service organisation:** diversify the offer and display it clearly in the application in order to support the vulnerable user in other needs than food delivery.

Improve autonomy while guaranteeing crucial assistance points

Although the DDS want to provide more autonomy, for some vulnerable categories at crucial points the assistance of a third party or third person will be relevant. Also children of caregivers need to a close attention.

14. **R14 Assistance and support/digital tool:** Identify the key points of assistance and develop room for an intervention of third person or party (e.g. confirming order; confirming payment or check on account; delivery at an institution access instead of a private flat/room);
15. **R15 Assistance and support***:* Develop a protocol to take care of children of caregivers.

Skills and abilities – guaranteeing accessibility and a good workflow

16. **R16 Digital tool:** An adaptation of the end-user interface (both digital and physical tools) is needed to cover visual/auditive impairments (fonts, colours, shapes, icons, voice-over, speech, …) or cognitive challenges (avoid information overload, work with a structured step-by-step learning approach);
17. **R17 Assistance and support:** Besides an accessible interface, provide a good assistance and support system as well in order to allow vulnerable users to overcome their disabilities and fears;
18. **R18 Assistance and support:** In the communication strategy to end-users, communicate clearly about these accessibility features;
19. **R19 Digital tool/physical tool:** build the application (on a mobile phone or website) in a structured step-by-step approach so that it shows a learning curve (or progress) with easily going back, forward and confirm step functions.

Privacy and security

Vulnerable persons have a fear that bank account details are not stored safely and that theft can occur

20. **R20 Privacy and security:** develop a safe and secure payment system and communicate about it in a transparent way
21. **R21 Service organisation:** allow for cash-payment

Reliability and trust:

For all three user groups, trust depends on their belief in the value system that is connected with the concept of a cooperative.

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22. **R22 Service organisation:** Don't break the image and reputation of the ideal of a cooperative

Caregivers and DDS in context of Covid-19

Goals

It is important to reduce risks at the home(s) of person(s) to who(m) care is provided and hence to avoid shopping at many shops

23. **R23 Goals:** Service should enable avoiding unnecessary visits to supermarkets or other stores and remove all barriers for achieving this goal

Caregivers have to reduce the context in public transit as well in order to reach the patient:
R24 Goals: should assure that caregivers can reach the persons they need to give care to

Needs:

In order to provide the goals, the Digital mobility solutions should in a context of Covid-19 bridge current gaps of isolation, distance and availability and provide a safe

24. **R25 service organisation**: A DDS solution that allows to make orders and manage/assure food requirements of the person to who care is provided by the caregiver
25. **R25 physical tool**: a clean and sanitized vehicle
26. **R26 service organisation**: other carpoolers should be informed if another passenger had an exposure to a person with a Covid-19 risk

Challenge and limitations:

Regularity

In order to avoid multiple contacts and reduce exposure in public transit, the DDS should provide regularity in connecting drivers with caregivers

27. **R27 Service organisation:** develop a system that allows for connecting drivers and caregivers in a meaningful way that allow for sustaining a regular pattern of rides

Current ways of thinking about mobility and its practices

In order to Caregivers will have to rethink their mobility in terms of social responsibility, taking into account not only environmental but also social aspects.

28. **R28 Service organisation:** the service has to develop a good communication to caregivers in order to explain its service and to show the benefits from a mobility and public health perspective
29. **R29 Service organisation:** the service should develop a strategy in order to reward returning caregivers

Reliability and trust:

For all three user groups, trust depends on their belief in the value system that is connected with the concept of a cooperative.

30. **R30 Service organisation:** The DDS must not break the image and reputation of the ideal of a cooperative

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Front workers of DDS in context of Covid-19

Goal:

Bike drivers don't want to put the vulnerable end-users at risk when delivery food.

31. **R31 Goal:** Provide food deliveries or parcel deliveries to different type of vulnerable end-users in a safe way

Needs:

Deliver food to many types of vulnerable users in a safe way and in different contexts (hall, doorstep)

32. **R32 Service agent:** Develop a protocol for different end-user types for the bike deliveries
33. **R33 Service agent:** Provide training to bike delivery rider in order to put protocol in practice

Challenges and limitations

Connection with firm

It is important to have an easy connection with the firm in order to manage the deliveries

34. **R34 Service organisation/service agent:** Identify and develop channels for easy contact with the firm in order to easily support the delivery of parcels/food to vulnerable persons

Regularity

It will be important to provide regularity in order to avoid multiple contacts:

35. **R35 Service organisation/service agent:** Build in the system or attribution of rides a system so that one rider connects with the same vulnerable end-users and multiple contacts are avoided

Reliability and trust:

For all three user groups, trust depends on their belief in the value system that is connected with the concept of a cooperative.

36. **R36 Service organisation:** Don't break the image and reputation of the ideal of a cooperative

9. Conclusion

In this concluding section, an overall pilot and use case overview will be developed in order to provide some underlying insights about the goals, needs, opportunities, challenges and limitations of vulnerable users of digital applications in the field of mobility. The conclusions will have three parts: a cross pilot view on the dimensions for each of the user characteristics that could be covered by each of the pilot, secondly a cross pilot view on the level of user profiles and user characteristics combining insights from different pilots and thirdly a cross persona and user journey map view. After these three parts, we provide still a short discussion on lessons learned during the execution of Task 1.2 and detail how the insights of this deliverable will support other tasks and activities in the INDIMO project.

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9.1. End-user Requirements: cross pilot view on user characteristics

The five pilots interviewed in total 26 stakeholder between July and November 2020. Getting a positive response of stakeholders for an interview was not always easy due to Covid-19 situation, the summer period or the nature of the identified stakeholder organisation. In the case of Antwerp for example, the targeted stakeholder organisations have limited staff. In a particular context such as Covid-19 (curfew in Antwerp in August as well as extra lockdown measures) where there was an increasing request for support from their members, these organisations decided to focus first on answering these challenges. After the end of the curfew and a loosening of sanitary safety measures, contact was established, and interviews were rather quickly organised.

Although all pilots reached out to a diverse range of stakeholder organisations so that a broad picture could be collected regarding the needs, goals, opportunities, limitations and challenges that vulnerable end-users experience when using digital applications in the field of mobility, not all identified end-user characteristics could be covered in every pilot by merely relying on stakeholder interviews alone. This was the case in Emilia-Romagna (only partial view on migrants), Berlin (view on lack of digital skills and no focus on peripheral location) and Galilee (no view on lack of woman who are lacking digital skills). We should stress that in each of these pilots, these characteristics are only a minor part of the total characteristics that was aimed for. In the context of WP3 T3.3, an end-user questionnaire will be designed that will be targeted in the pilot context to vulnerable end-users in order to fill these research gaps. Besides a focus on these user characteristics, dimensions such as social network, motivation, empowerment and specific context factors will be specially investigated as further insights can be useful to support the pilot work in WP3 and other work packages of INDIMO.

Tables 25 and 26 provide an overview of the number of end-user requirements the user characteristics covered in the pilot. The analysis of the stakeholder interviews resulted in a total of 399 end-user requirements for all pilots. What is important in these two tables is not the absolute number of requirements for each dimension for a certain user profile but rather the presence or absence of a recommendation in a certain dimension. A detailed listing of all the requirements is provided for each pilot in sections 3-7.

What we can discern from this table is that stakeholders define clearly for each pilot one or more positive goals for the target audience(s). As such, each of the services provides an opportunity to contribute to improve an aspect of the current situation of the vulnerable persons: increasing autonomy (Antwerp, Madrid, Emilia-Romagna), quality of life (Antwerp, Emilia-Romagna, Madrid) and contributing to emancipation and education (Galilee), improving mobility organisation (Berlin).

In order however to achieve the pilot goals, stakeholders identified demands and expectations from the end-users towards the INDIMO services. The dimensions show that an improved digital tool that takes into account usability and accessibility requirements is not the only action that should lead to a more inclusive solution. All pilots across all user characteristics demand specific assistance and support strategies that go beyond the mere publishing of an instructional video on a website of a mobility provider or on YouTube.

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Collaboration with local associations or opinion leaders that are trusted by vulnerable persons is seen as a key action to get people to know the service followed by providing opportunities for training and learning. This is especially the case for groups such as older people in Emilia-Romagna but also for the user characteristics in Madrid. In Antwerp the demand is less intense but nonetheless significant: training and assistance is seen as important, especially with blind persons, before one goes on the street using smart traffic lights. Another dimension that refers to a 'human' factor in the pilots is the importance that stakeholders assign to the service agent who has to perform either an information function (Emilia-Romagna) or perform an essential role in the service (Madrid, Berlin, Galilee). In the latter case, specific requirements towards the service agent are expressed in order to assist, understand or support the vulnerable users.

Another common line throughout the stakeholder feedback on expectations of vulnerable end-users is the need for adapted physical tools of the service. Antwerp and Madrid are exceptions as the solution will only have a digital component. In Berlin and Galilee much emphasis is put on the type of the car (space, age, safety). In Emilia-Romagna it is especially the ergonomics and the place of the locker (his height, way to operate, …) that requires close attention of the service provider.

The Covid-19 situation finally led to the identification of a need for adaptation in each pilot. Implementing the sanitary safety measures (social distance, mouth masks, …) by a service agent or around a physical tool (e.g. hand gel) is considered the basis. In Madrid, Emilia-Romagna and Antwerp however the protocol needed to take into account more consequences, either turning down fear of other pedestrians to provide assistance (Antwerp) or either developing particular ways to pick-up delivered food at home (Madrid) or develop a system to avoid cues (Emilia-Romagna).

Dimension / pilot/ user characteristic	P1 Emilia-Romagna Older people	P1 Emilia-Romagna migrants	P2 Antwerp Vulnerable pedestrians : Older persons	P2 Antwerp Vulnerable pedestrians : Visually impaired	P2 Antwerp Vulnerable pedestrians: Mobility impaired	P3 Galilee Informal ridesharing Ethnic minority Woman
Goal	4	2	2	2	2	3
Digital tool	7	1	14	15	15	16
Physical tool	8	1	0	0	0	2
Service agent	7	0	1	1	1	10
Service organisation	7	3	9	6	6	
Assistance and support	14	4	4	2	2	7
Privacy and security	3	2	4	2	3	10
Covid-19	4	0	2	2	0	2
Total	**54**	**13**	**36**	**30**	**29**	**64**

Table 25: Overview of number of requirements along dimensions, pilot and user characteristic part 1

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Dimension/ Pilot/ User characteristic	P4 Madrid Socially isolated	P4 Madrid Cognitively impaired	P4 Madrid visually, mobile and auditively impaired	P4 Madrid Low income	P5 Berlin Caretaker Woman
Goal	3	1	1	2	3
Digital tool	3	12	10	1	7
Physical tool	0	0	0	0	7
Service agent	4	7	0	4	15
Service organisation	12	8	4	16	19
Assistance and support	4	1	3	2	4
Privacy and security	1	3	1	2	5
Covid-19	3	3	4	1	1
Total	**30**	**35**	**23**	**28**	**61**

Table 26: Overview of number of requirements along dimensions, pilot and user characteristic part 2

9.2. End-user requirements: cross overview along user profiles and characteristics

In the INDIMO setting, pilots are not isolated islands but share some user characteristics with other pilots. As a second part of the conclusion, the following tables present the main insights, based on stakeholder interviews and literature analysis, for end-user characteristics across the 5 pilots and the 5 user case studies:

9.2.1. Goals and needs

What concerns goals, the stakeholder interviews across the different pilots and use cases emphasize the need of the INDIMO pilots to support or realise the autonomy of the target audience by reducing dependency on a relative, friend or service and to increase comfort and quality of life by removing barriers or providing opportunities that did not exist before. On top of these common goals, more specific goals can be discerned related to the particularity of the proposed service such as increasing safety (Antwerp – older persons, mobility impaired, visual impaired), ending social isolation (Emilia-Romagna – older persons; Madrid – socially isolated), improving emancipation and employment (Galilee – woman in rural areas) and enabling new practices of transport (Berlin – women caregivers).

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Dimension	Older persons	Mobility impaired	Visually im-paired	Socially isolated	Cogni-tively im-paired	Low income	Care-givers	Women in rural area's	Migrants (refugees)	Vulne-rable youth
INDIMO PILOT	**Emilia-Romagna ; Antwerp; Use case 3 Privacy**	**Antwerp; Madrid; Use case 1 Budapest Use case 3 Privacy**	**Antwerp; Madrid Use case 1 Budapest Use case 3 Privacy**	**Madrid**	**Madrid**	**Madrid**	**Berlin Use case 2 Budapest Use case 5 Madrid**	**Galilee**	**Emilia-Romagna; User case 3 Privacy**	**Use case 4 Brussels**
Goals	Become more autonomous and independent Increase comfort and quality of life Increase Safety End isolation	Become more autonomous and independent Increase comfort and quality of life Increase Increase safety	Become More independent Increase comfort Increase Safety	Become more auto-nomous End isolation Increase quality of life	Become more auto-nomous Increase quality of life	Increase Quality of life Expand range of food to eat	Increase quality of life Allow for organising chain trips Be informed about specific mobility/transport aspects that influence their care-giving (e.g.: know if a tram is accessible)	Emanci-pation Education	Enable e-commerce to find specific goods not easy to find in the local community	Increase transport comfort Increase mobility, employment, recreational and educational oppor-tunities

Table 27: overview of goals according to user characteristics

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What concerns the needs to achieve these goals, there is a need for an easy and convenient system. This is of course not a surprising need, but what is important is that – as will be clear in the next section on tools and workflow – that this convenience and ease of use should strongly answer their particular vulnerable characteristic and context. In that sense, the accent for one part of the user characteristics is not on integrating the newest technologies that needs a special learning, but rather on working with familiar technologies (e.g. WhatsApp), creating similarities with existing technologies they use and avoiding anything new to learn or having to train a new action. The latter is especially relevant for visually, mobile and auditive impaired persons (Madrid, Antwerp, Budapest use case 1) as they need their other senses to fill up the void. When they walk, a lot of concentration and effort is needed in focussing on these other senses and decode the information coming from that source. In other words, the action (taking a smartphone, pressing a button, …), if needed, should needlessly fit in the context and practice and has to bring an added value in order to be accepted. Otherwise, hands-free solutions are preferred.

In the case of transport services for a younger target audience (Galilee, use case 4 Brussels, Berlin), also at this stage less dependent on other persons or senses to perform an action (Berlin, Galilee, Madrid use case 4, Budapest use case 2 and Brussels use case 4), ease of use is mainly understood as supporting easy registration and quick access to the service and as providing flexibility in all aspects of the service in order to be able to anticipate sudden changes in demands (e.g.: in Berlin a sudden cancellation of appointment at the doctor can force a mother to cancel the trip close to the agreed pick-up time).

Specific needs can be identified to the user characteristic as well. For migrants (Emilia-Romagna and use case study 3) and refugees (use case study 3) confidentiality of the system is an important need. Out of this concern for confidentiality there is a sensitivity for the privacy of refugees as well (both among refugees as organisations that supports them). In the case of migrants, the need for confidentiality with the digital locker can depend from community to community, but it is also related to the fact of not having to tell or reveal important personal preferences when having to interact with a service agent.

In the case of vulnerable pedestrians (mobility and visually impaired - Antwerp) the specific requirement is that the deployment of smart traffic light solutions should not restrict be restricted to one particular place but should be part of a larger out roll strategy. Similarly, for the use case of food delivery (Madrid), a same plea can be found not to restrict the offer to a symbolic intervention: although one can focus on an offer in one or two blocks with a nearby restaurant in the initial phases to test the solution and gain experience, the real added value and ambition should be a food offer that is rather generic and available for a whole neighbourhood. The need for a structured approach to the food offering (cognitively impaired, social isolated), expand the available food offer or take into consideration dietary requirements underpins as well this need to go beyond a mere symbolic incorporation of restaurants in the offer of the application.

User characteristics connected to ridesharing/ridepooling services involving care givers (Berlin, Budapest use case 2, Madrid use case 5) also have to address a need towards the person about which caregiver is giving care. As we shall see below, this relates as well to the driver (service agent) and to the car (physical tool). In the case of women being part of ethnic minorities, there is also a need that the service accepts the balance between modernity and cultural tradition by possibly integrating it as part of the functional requirements. A fast, efficient, and safe, on-demand service should, for example, possibly

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include: (i) the possibility of having pick-up points not in front of the home address, but in a nearby location; (ii) the possibility of paying with cash; (iii) a preliminary approval of the driver by a member of the family.

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Dimension	Older persons	Mobility impaired	Visual impai-red	Socially isolated	Cogni-tively impaired	Low income	Care-givers	Women in rural area's	Migrants /refugees	Vulne-rable youth
INDIMO PILOT	**Emilia-Romagna ; Antwerp; Use case 3 Privacy**	**Antwerp; Madrid; Use case 1 Budapest Use case 3 Privacy**	**Antwerp; Madrid Use case 1 Budapest Use case 3 Privacy**	**Madrid**	**Madrid**	**Madrid**	**Berlin Use case 2 Budapest Use case 5 Madrid**	**Galilee**	**Emilia-Romagna; User case 3 Privacy**	**Use case 4 Brussels**
Need	Easy to use service Convenience: Avoid queuing/simple/broader opening hours than post-office Familiar technologies	Solution that does not require to learn any new action Beyond a mere symbolic installation	Solution that does not require to learn any new action Beyond a mere symbolic installation	Good experience Familiar digital environment with technologies that are known Food that is in line with dietary needs	Familiar technological context Structured approach around food Easy organised service	Affordable service Expand food choice beyond the current support mechanism	Flexible service Target group friendly service (child, person in wheelchair)	Easy and straightforward service 24h and 7/7 active Safe, secure and reliable transport Discrete service Trustworthy operator	Easy convenient system to send and receive parcels, reducing barriers with service agent System that allows confidentiality Connects with local community	Convenient, affordable and flexible system (at hand)

Table 28: overview of needs across user characteristic

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9.2.2 Usability of the digital and physical tool

What concerns the expectations around usability of the digital and physical tool, the common baseline along all profiles and services is to have an easy-to-use and intuitive interface, preferably in the local language and with a terminology that is easy to understand. The latter is especially important to older persons as they are not always so accustomed to modern technology terminology. This can be supported via a specific online list with explanations of difficult terminology or a printed leaflet distributed to older persons. The only user characteristics for which stakeholders identified to be explicitly attentive to gender in the use of terminology and language is in the case of the Galilee pilot where the target audience are women living in rural communities and belonging to an ethnic community.

Regarding the physical tools, for each user characteristic the requirement is to have it clearly displayed as well as to be branded in such a way that it is recognisable as being part of the service.

In order to access the digital and physical tool as well as being able to use it, each user characteristic requires specific adaptations: either reducing or simplifying the amount of information to process by using specific icons, by being able to adapt the font and size of text, by using audio-support such as voice-over-text technologies and specificly for physical tools to be at a good height and placed in an accessible place.

We notice two particular interesting expectations for mobility and visually impaired persons: the usability of both the digital (application) and physical component (the traffic light) in the case of smart lighting was extended to the perception of the public space around the light and the place the light occupied in the walking practices. The public space around the light needs to be appropriate for walking with a cane or with a wheelchair, while the place of the light should be along a strategic point along the routes they take.

The degree to which errors are supported on the tools is especially related to the digital tool in the answer of the stakeholders. Nonetheless we see a difference depending on the user characteristics and the situation. What concerns the returned information and the working of the tool, there is no tolerance of error as the functioning of the digital tool and correct information are important elements they trust on. On the other hand, what concerns the information they return to the application, the system should allow for coping with usage errors from their side by not directly blocking functions, allow for easy 'start over' buttons and requests for confirmations of actions.

In the case of transport services, the vulnerable user characteristics– caregivers, women rural areas – will have, according to stakeholders, a need for a safe car and for certain car types (size, space for strollers, number of seats, …). Not all cars can thus be part of the service.

Finally, a recurring request is a need for ways to personalise the service beyond its outlook and intuitiveness. Mobility and visually impaired persons in the case of smart traffic lights ask for setting route preferences so that they can use the digital solution handsfree. Although they don't personalise the content themselves in this regard, people in social isolation, cognitively impaired and people with low income asked for some kind of structuring of the offer towards their needs. Caregivers and women in rural areas are best

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served with an app that allows to select Point of Interest and saves past routes so ordering can be done much faster based on repeating needs.

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Dimension	Older persons	Mobility impaired	Visual impai-red	Socially isolated	Cogni-tively impaired	Low income	Care-givers	Women in rural area's	Migrants /refugees	Vulne-rable youth
INDIMO PILOT	**Emilia-Romagna ; Antwerp; Use case 3 Privacy**	**Antwerp; Madrid; Use case 1 Budapest Use case 3 Privacy**	**Antwerp; Madrid Use case 1 Budapest Use case 3 Privacy**	**Madrid**	**Madrid**	**Madrid**	**Berlin Use case 2 Budapest Use case 5 Madrid**	**Galilee**	**Emilia-Romagna; User case 3 Privacy**	**Use case 4 Brussels**
Digital Tool	Local language and familiar terminology Easy to use Intuitive Visually clear	Local language Easy to use Intuitive No effort: automatic detection - Handsfree No tolerance for error in instructions/information Preferences: Routes/lists	Local language No effort : automatic detection - Handsfree Audio-support Provide extra information about tracks No tolerance for error in instructions/information	Local language and easy terminilogy Clearly separate the functions of the app Search for food labels than restaurants Visuals/images/ic	Easy to use interface Empathically organised Structured approach around food (weekly menu's/food types instead of brands/show essentials/setting of preference)	Local language	Easy to use Intuitive Set preferences based on history/profile Select Points of Interest No tolerance for error	Intuitive and easy to use Audio-assistance in Arabic Visual icons Arabic language, feminine grammar Point of Interest for selecting pick-up/drop off point	Easy to use	n/a

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			Preferences: Routes/lists	ons/colours Set preferences Price transparance	Allow for mistakes Coupled accounts for tutors/parents and parental approval Limit on expenses					
Physical tool	Recognisable in public space Easy to use Convenient	Recognisable n public space Should be part of a meaningful route	Recognisable in public space Should be part of a meaningful route	n/a	n/a	n/a	Recognisable and identifiable Only car types that have enough space for strollers and bags	Recognisable and identifiable Decent car type ; safe car	Discrete place	n/a

Table 29: overview usability digital and physical tool and user characteristic

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9.2.2. Workflow

Regarding the workflow, one can identify a common need along two types of user characteristics. On the one hand, older persons (Emilia-Romagna), visually, mobility and cognitively impaired persons (Antwerp and Madrid) as well as socially isolated persons and persons with low income (Madrid) are expecting a workflow that is structured as a learning process where one step logically follows the other (cfr Instagram) and one screen is limited to one kind of action. This demand is generated out of a concern to get lost when confronted with too much information, to get annoyed with too much information or to fear to lose concentration on other aspects that are required for the action the application is facilitating.

On the other hand, the user characteristics connected to ridesharing and ride pooling also require a logical order but there is an emphasis on taking the history of past searches and routes into consideration as well as selecting Point of Interests in order to skip steps in the ordering process or move faster through it. In this way, screens for selecting preferences are preferred and can contain many options in order to allow rather flexible and fast booking/cancelling of rides.

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Dimension	Older persons	Mobility impaired	Visual im-paired	Socially isolated	Cogni-tively impaired	Low income	Care-givers	Women in rural area's	Migrants /refugees	Vulne-rable youth
INDIMO PILOT	**Emilia-Romagna ; Antwerp; Use case 3 Privacy**	**Antwerp; Madrid; Use case 1 Budapest Use case 3 Privacy**	**Antwerp; Madrid Use case 1 Budapest Use case 3 Privacy**	**Madrid**	**Madrid**	**Madrid**	**Berlin Use case 2 Budapest Use case 5 Madrid**	**Galilee**	**Emilia-Romagna; User case 3 Privacy**	**Use case 4 Brussels**
Workflow	Step-by-step approach in order to learn and get confidence	Step-by-step approach in order to learn and get confidence	Step-by-step approach in order to learn and confidence	Step-by-step approach in order to learn and confidence	Step-by-step approach in order to learn and get confidence	Step-by-Step approach in order to learn and get confidence	Easy regis-tration process	Easy regis tration process	Not mentioned by stake-holder	Easy registra-ion process

Table 30: overview of workflow across user characteristics

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9.2.3. Service agent and assistance and support

The stakeholder interviews point out that for most user characteristics the service agent in a service has to play more than the initial role as executing a service or provide general assistance and support (see next section). Pilots that offer direct face-to-face contact with a service agent have a need for that person to be reliable, friendly and empathic. For example, Berlin offers child-friendly ridesharing, so the service agent too should be child-friendly. Service operators should thus provide special training to the service agents in order to cope with the vulnerable customers. For example, the bike rider in the Madrid pilot needs to be able to speak slow and on a certain tone in order to not disturb the customer. In the case of Galilee and Berlin where people that need a transport service – caregivers and woman in rural communities - are the target audience, we notice an emphasis on the service agent to be punctual, to respect agreements and, especially for caregivers, to adapt his driving and parking depending of the unexpected needs that can emerge from the person that is taken care off. Especially in the case of Galilee a certain discretion from the driver is also required. In Berlin, the service agent should be able to pause a few minutes if a kid is upset and drop-off and pick-up a caregiver as close as possible to the agreed pick-up or drop-off point.

Assistance and self-use should be promoted via channels as online videos, a FAQ on the website or printed material. However, specific support mechanisms are requested for some of the user characteristics: Older persons, vulnerable pedestrians and profiles for healthy food delivery (pilots of Emilia-Romagna, Antwerp and Madrid in particular) will need specific training and teaching sessions in order to get acquainted with the new technology. However, Emilia-Romagna, Galilee, Madrid and Berlin agree that there should be some sort of remote support function provided by the service, preferably as a helpdesk for which the contact information is provided by the digital interface. This should be available 24/7.
The stakeholders point out that older people, visually and mobile impaired persons, cognitively impaired persons and people with low income and/or living in social isolation will need dedicated training and introduction sessions, preferable organised by associations with ties to the target audience. These associations will also be good channels for providing support and assistance, especially in the first month of deployment of the service. Nonetheless, a difference can be noted: for blind persons and people in wheelchairs, the learning is not a such ICT-related but related to integrating the technology in the context of use in a smooth way. After a first try-out, they probably will need less follow-up, compared to older persons. In the case of Emilia-Romagna for example, the stakeholders point out that a monitoring of the usage by this segment needs to be performed in order to find out how to improve the service and learn, in case of low adoptions, what the barriers are and how to overcome them.

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Dimension	Older persons	Mobility impaired	Visual impai-red	Socially isolated	Cogni-tively impaired	Low income	Care-givers	Women in rural area's	Migrants /refugees	Vulne-rable youth
INDIMO PILOT	**Emilia-Romagna ; Antwerp; Use case 3 Privacy**	**Antwerp; Madrid; Use case 1 Budapest Use case 3 Privacy**	**Antwerp; Madrid Use case 1 Budapest Use case 3 Privacy**	**Madrid**	**Madrid**	**Madrid**	**Berlin Use case 2 Budapest Use case 5 Madrid**	**Galilee**	**Emilia-Romagna; User case 3 Privacy**	**Use case 4 Brussels**
Service agent	Present during first weeks of deployment Empathic	Recognisable Identifiable Empathic: certain style and tone of voice	Recognisable Identifiable Empathic: certain style and tone of voice	Recognisable Identifiable Empathic: certain style and tone of voice	Recognisable Identifiable Empathic: certain style and tone of voice	Recognisable Identifiable Empathic: certain style and tone of voice	Recognisable and identifiable Empathic: Children friendly Supportive to mother Understand situations Reliable, punctual	Recognisable and identifiable Reliable and punctual Reachable Same area	No need expressed, but Italian service agent is problematic due to language barrier and need for discretion (depend on community)	n/am

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Assistance & self use	Specific training needed Specific support Work with associations	Specific training needed in the beginning of the deployment of the light Work with associations	Part of the training given by mobility trainer Work with associations	Work with trusted associations	Parental control on expenses	Work with trusted associations	Online tutorial/video's	Helpdesk Video's Specific communication campaign to convince woman to use the service	Arabic/English language Bridge with opinion leaders within community	n/a

Table 31: Overview Service agent and assistance/self-use across user characteristics

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9.2.4. Privacy and security, reliability and trust

When it comes to privacy and security, it will be important for all user characteristics to respect legislation on privacy and security in place. Collection of personal data should be restricted to what is absolutely necessary. Visually and mobility impaired persons can understand that for their particular situation a lot of information needs to be collected in order to provide a good personal service, but also here purposefulness of the collection is important. A particular concern with older persons is guaranteeing security about digital financial transactions. In the case of women in rural areas belonging to ethnic minorities as well as refugees, we notice a requirement to be able to be discrete as an end-user and not to be tracked by other instances. While in the case of refugees this relates to pay attention not to be tracked by the authorities, in the case of the Galilee pilot this requirement relates to avoiding having a public visible profile or to find easy information about the fact that one is a customer of the service. The Galilee case relates as well to the situation of mobile and visual impaired persons in the sense that privacy concerns are not to be understood only in terms of data collection, but also in the consequences of usage of a service in public space with particular consequences. For example, for visually impaired people, the usage of a voice-over-text technology in public might lead to eavesdropping and to particular sensitive information being disclosed. In the case of Madrid, particular sensitive situations of people can be disclosed to the bike rider that delivers food. Finally, digital mobility technologies to be used by impaired people in public can lead to particular situations in which they feel unsafe as they fear that people might steal their digital device. Some design work is needed in order to reduce this overtly exposure, which also can contribute to lessen a feeling of 'stigma'.

Regarding trust, the stakeholders mention that for the user characteristics connected to the pilots (Emilia-Romagna, Galilee, Madrid, Antwerp and Berlin) a kind of endorsement of the service by a trusted and reliable organisation active in the broader network of the target audience will be required. These organisations will also be an important gateway for the service to get to be known by the target audiences. In the case of older persons, impaired persons (visually and mobility) socially isolated people and people with low income, the recommendation organisation is, as we saw in the previous section, also the important gateway for providing training and support during the initial usage stages (and for providing eventually support in a more continuous way). In the case of cognitively impaired persons, it will be important to generate trust with the guardian.

For user characteristics using informal ride sharing and ride pooling, trust is generated by the reputation of the operator, by the rating mechanisms of the driver and the service and by financial transparency. Older persons in particular are considered to be sensitive to the reputation of well-known brands/companies that are active in a sector for many years in order to trust a service. Although older persons in the case of Emilia-Romagna might have issues with Poste Italiane, they know the organisation and hence a threshold to adoption might be taken more easily. A rating system is meanwhile a common feature but here the rating can be targeted directly to specific needs of a caregiver (so asking a score on specific

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dimensions such as sufficient space in the car in the case of Berlin). As to financial transparency, the need of vulnerable persons is that there are no unexpected or hidden costs and the price that is displayed when you book is the one you will pay at the end of the ride. For vulnerable youth (user case study Brussels), this financial transparency relates to incorporating features that enable a better monitoring of their expenses, also while driving the step or shared bike.

Being reliable and put the practices in place to achieve this aim is an important demand for all user characteristics, but in particular for the vulnerable pedestrians (impaired), the users of the informal ridesharing service (woman in rural communities) and ride pooling services (caregivers). In the latter two cases reliability is connected to being punctual, while in the case of vulnerable pedestrians, it means that the technology can not have any technical error while being in use. Receiving information about non-functioning traffic lights (and their repair) is therefore as important as knowing at a crossroad whether the person has a red or green light, and the light has been extended in time.

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Dimension	Older persons	Mobility impaired	Visual impai-red	Socially isolated	Cogni-tively impaired	Low income	Care-givers	Women in rural area's	Migrants /refugees	Vulne-rable youth
INDIMO PILOT	**Emilia-Romagna ; Antwerp; Use case 3 Privacy**	**Antwerp; Madrid; Use case 1 Budapest Use case 3 Privacy**	**Antwerp; Madrid Use case 1 Budapest Use case 3 Privacy**	**Madrid**	**Madrid**	**Madrid**	**Berlin Use case 2 Budapest Use case 5 Madrid**	**Galilee**	**Emilia-Romagna; User case 3 Privacy**	**Use case 4 Brussels**
Privacy & Security	Respect legislation Fear of theft of banking details	Respect legislation Avoid risk of eave-doving Avoid exposure of ICT in public	Respect legislation Avoid risk of eave-doving Avoid exposure of ICT in public	Respect legislatio n	Certificate about data protection in order to convince the guardian	Respect legislation Be attentive to sensitive situations	Respect legislation Only purposeful data	Respect legislation Anonymou s profile	Refugee: Fear of tracking Migrant: Especially financial data are sensitive	Overload of data
Reliability & Trust	Technology should work Inform about non-functioning / repair Operator should be a	Technolog y should work Inform about non-functionin g/repair Operator should be	Technolog y should work Inform about non-functionin g/repair Operator should be	Approval /recomm endation by institutio ns/person s they trust Service agent	Trust of guardian in service is key	Recommen dation Service agent follows protocols Easy channels to connect to service	Being punctual (driver) is	Punctual Reliable Rating system of driver Trans-parent price system		Trans-parent pricing

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	known partner	a known partner	a known partner	follows protocols Easy channels to connect to service			very important Rating system of driver Trans-parant price system			

Table 32: Overview Privacy & security / reliability and trust accros user characteristic

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9.2.5. Covid-19 implications

During the Covid-19 pandemic, according to the stakeholders, one of the first impacts of the service towards vulnerable end-users was the need to follow the basic sanitary measures (hand gel, social distance, …) and develop particular protocols around this. For pilots targeting persons with impairments and pilots offering transport services (Galilee and Berlin) particular challenges were identified due to Covid-19. Although belonging to the groups at risk that are advised to stay at home, visually and mobility impaired persons were confronted with a lower willingness of other pedestrians to provide assistance while on the other hand for blind people the need to keep distance and the general advise to stay at home meant that less people were present on the street to provide auditive cues. The smart light solution in case of a pandemic can therefore be an important tool to support mobility of blind and visually impaired persons. Impaired people also require a particular attention during Covid-19 for food delivery services. During the Covid-19 pandemic, one needs to make special arrangements for handling food. While socially isolated persons and people with low income can benefit from the use of technologies as WhatsApp or the phone to be in contact with the bike rider and can go down to the hall to pick up the food, in the case of impaired persons some extra protocols should be developed in order to have the food picked up in the hall or delivered at the entrance of the flat. In the case of the smart locker positioned on a public place a mechanism should be devised to avoid queues by for example, apart from physical infrastructure to assure social distance, providing certain hours to persons when they can come in order to 'spread' the usage throughout the day.
For transport services, care givers (Berlin, Budapest, Madrid) and women from ethnic minorities in rural areas (Galilee) a reduction of the number of passengers in the car is required while ways to group people according to some criteria (geographical location) will have to be devised in order to reduce the risks of social contacts.

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Dimension	Older persons	Mobility impaired	Visual impai-red	Socially isolated	Cogni-tively impaired	Low income	Care-givers	Women in rural area's	Migrants /refugees	Vulne-rable youth
INDIMO PILOT	**Emilia-Romagna ; Antwerp; Use case 3 Privacy**	**Antwerp; Madrid; Use case 1 Budapest Use case 3 Privacy**	**Antwerp; Madrid Use case 1 Budapest Use case 3 Privacy**	**Madrid**	**Madrid**	**Madrid**	**Berlin Use case 2 Budapest Use case 5 Madrid**	**Galilee**	**Emilia-Romagna; User case 3 Privacy**	**Use case 4 Brussels**
Covid-19	Service should follow general sanitary measures Avoid queues	Service should follow general sanitary measures Make sure that intention to providing assistance by other pedestrians is not impacted Interaction with service agent to	Service should follow general sanitary measures Make sure that intention to providing assistance by other pedestrians is not impacted Interaction with service agent to	Service should follow general sanity measures Interaction with service agent to organise pick-up of food at home/flat; communication via WhatsApp/ phone	Service should follow general sanity measures Interaction with service agent to organise pick-up of food at home/flat; communi-cation via WhatsApp/ phone	Service should follow general sanity measures Interaction with service agent to organise pick-up of food at home/flat; communi-cation via WhatsApp/ phone	Service should follow general sanitary measures Reduce number of passengers in one trip Pool persons together in groups	Service should follow general sanitary measures Reduce number of passengers in one trip	n/a	n/a

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		organise pick-up of food at home/flat ; communi-cation via Whatsapp/ phone	organise pick-up of food at home/flat; communi-cation via Whatsapp/phone							

Table 33: Overview Covid 19 implications across user characteristics

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9.3. Persona and user journey map: cross pilot view

The deliverable presented a persona, after the listing of requirements for each pilot, co-created on the insights from the literature review and stakeholder interviews and the interviews with users and non-users in T1.3. Each pilot chose to focus on the user characteristics for which most of the information was collected. Therefore, a persona does not necessarily cover all the listed user characteristics for each user profile of the pilot as described in D1.1. Nonetheless, a diversity of profiles could be covered, as Table 34 indicates. One common characteristic of all the personas is that they are women. This was not planned in advance but was an outcome of the co-creation workshops, meaning that gender is also an important factor to take into consideration when designing and developing inclusive and accessible digital mobility solutions.

Stage	P1 Emilia-Romagna Luisa	P2 Antwerp Johanna	P3 Galilee Mariam	P4 Madrid Maria Carmen	P4 Madrid Sara	P5 Berlin Marie
User characteristic covered	Older woman	Blind	Woman rural community ethnic minority	Older woman socially isolated	Young woman Cognitively impaired	Young Mother Suburban neighbourhood

Table 34: Overview of personas

The customer journey maps of the personas all focused on a scenario that was composed of a chain of actions (ordering three dishes by Saturday and receiving it at home) than one specific action (take mobile phone to place one order). The exercise showed that in the current situation the persona in each pilot would rate her current experience as negative. Table 35 provides the key-insight for each persona and pilot where INDIMO can make a genuine difference to improve the current user experience of vulnerable users.

Stage	P1 Emilia-Romagna Luisa	P2 Antwerp Johanna	P3 Galilee Mariam	P4 Madrid Maria Carmen	P4 Madrid Sara	P5 Berlin Marie
Awareness	Establish local points of contact by working out a partnership with local organisations Communication strategy by municipality	Put all information on traffic lights in one place (online) so that it is easy to find	Provide information about the driver	Social awareness campaign to influence key opinion leaders and to be present at strategic place in community	Application must try to be within the first thing that is seen when looked for on various platforms	Create a campaign to raise knowledge about the service via strategic actors and venues Branding and image of service to target audience (is

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						ride sharing for me?
Consideration	Set up a support strategy (introduction, training, leaflet)	Provide a way to tell easily if lights are working on a particular trajectory	Provide certified information in order to generate trust	Support strategy that reduces need for a relative to operate app Structure information on the application	Structure information and make it clear in order to avoid confusion	Convince by providing information that service of ridesharing is useful for them Add mother-child options in pricing
Service usage	Set up a support strategy (training) Involve a service agent at initial stage of deployment of locker	Real – time information about status light Detection and extension of light	Application allows to easily verify and check information Ordering goes faster (not 2 weeks in advance) Pricing agreement	Structure information on the application Provide support via WhatsApp	Overview and supervision by tutor/guard/ caregiver Clear confirmation/rejection of order process or button	Provide information upfront that car is child friendly Implement a feature that allows to book a chain trip in one step (so via/step-over at) Service agent is attentive to needs of target audience and has received training
Post-usage	Local partnerships to assure a post-usage research (feedback, adjust)	Easy mechanism to provide feedback	Rating of drivers	Integrate/work with Whatsapp Rating system/develop better feedback mechanism	Improve communication flow with service operator How to communicate with bike riders	Improve current functionalities of rating driver/services Add phone

Table 35: main user experience points where INDIMO support will be important

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9.4. Lessons learned & next steps

During the process of data collection and data analysis, three main lessons were learned:

- **Understand the background and operation of a stakeholder organisation very well in planning its engagement**

Given the Covid-19 situation, it was not always easy to consult stakeholders in the pilots. This was not so much the case for governmental actors or well-developed organisations as they often have specialised staff that work on a specific topic and could make time for an online interview. However, smaller organisations were confronted with more requests of support from their audience, shifting their priorities to answer this need for support. In the case of Antwerp for example, the combination of a local increase in Covid-19 infections end of July and August 2020 meant that interviews had to be postponed till September.
Secondly, the planning of the stakeholder interviews was also at the initial stages of the project, meaning that relationships with actors on the ground still had to be established and hence the project objectives still had to be communicated and 'reputation' still had to build up.
Assuring the engagement of stakeholder organisations that work with vulnerable users in later stages of the INDIMO project thus means that INDIMO partners will have to understand the background and the operations of the organisation very well. In that sense, specific requests for collaboration – for example support the recruitment of testers – can be timed at moments that are suitable for the stakeholder organisation.

- **Avoid broad range of data collection at once**

Since the literature review did not provide many insights about already existing insights of the targeted vulnerable audience for the service, the stakeholder interviews became an important source of knowledge. Due to Covid-19 we also planned one interview covering all 15 dimensions identified in D1.1 as necessary dimensions of data collection. As can be seen in the individual discussion of the pilot interviews, it turned out that this strategy generated a lot of insights for particular user characteristics in the pilot, but not all of them were always covered or covered with the same level of detail. In order to counter this, one can increase the number of stakeholders – but there is no guarantee that this adds content wise an added value - or look for other methods like focus-groups, but the latter were not easy to organise in a Covid-19 situation. What we advise is to rather work with smaller interviews (2x 45' min instead of 60 min now) with the same person in order to work better on particular themes/dimensions or to identify other ways of data-collection, for example surveys in a well-targeted community of stakeholders or users. This activity was originally planned in D1.1 as a back-up strategy but could not be executed due to the workload Covid-19 put on the pilots for organising the interviews with stakeholders in T1.2 and with users and non-users in T1.3. The proposed end-user survey will be organised in February – April 2021 in each pilot. For each pilot the focus will be on a dimension or user characteristic that was not well covered by the inputs generated in T1.2 and T1.3. Results will be reported in deliverable D3.2.

- **Process of aligning T1.2 and T1.3 in efforts and insights was complex due to context**

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WP1 was composed of three tasks that complement each other in finding requirements (T1.2: stakeholders, T1.3: users and non-users and T1.4: organisations, developers, policy makers) with a final task (T1.5) providing a synthesis. Within T1.2 however there was, building upon the insights of the in-depth interviews with non-users and users in T1.3 and the stakeholder interviews of T1.2, a second objective to design personas and user journey maps for the pilots. While via the online workshops in December 2020 and January 2021 the insights of T1.3 could be integrated and communicated in a spoken way, a formal documentation process of preliminary/on-going insights from both tasks would have helped to align both tasks better towards using a common vocabulary and reporting that would support the integration and identification of requirements in T1.5 and hence support the development in WP2 of the Universal Design Manual and Universal Interface Language icons repository. The situation of Covid-19 influenced this situation to a great extent – for example in Antwerp recruitment of users and non-users could only start from October onwards because of the legitimately low response of contacted organisations that focussed on providing support to their members first. Nonetheless, future outlines of the project devising a more formal and operational mechanism to exchange temporary insights and results will benefit the project and the integration of results.
As next steps, the presented results in this deliverable will flow back to T1.5 where, as mentioned above, a synthesis of the results of task T1.2, T1.3 and T1.4 will be made for the various user profiles and user characteristics. This will then support the creation of the first version of the Universal Design Manual and Universal Interface Language icon repository that will be validated by the pilots. The generated personas will be used in WP3 by the pilots to further refine and design their service, in particular by having an eye on issues raised by the persona. Finally, the user journey map, looking at the end-user experience of each persona with the current situation of the pilot technology or pilot context, will support developers and pilot teams in WP3 with highlighting key areas in the journey of the vulnerable user where they can intervene and hence create an impact for INDIMO.

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11. Annexes

Annex I – Template literature review

By compiling this list, each pilot identifies the relevant stakeholder to contact and to interview in order to get insights from current users about their needs and expectations towards the digital mobility system or from one or more specific user characteristics in your pilot.

Stakeholder: Please add the name of the organization
Contact person: Please add the name within the organisation of the person you will contact and if available her/his contact data
Representing user characteristic/type/information about users in general: *Please indicate if you believe the stakeholder can tell something interesting about the users in general or in specific on the user characteristic/profile in your pilot. Specify the characteristics*
Gateway to recruit end-users of the service (yes/no): *Please indicate here if the stakeholder can give you access to end-users of the service to which user needs and expectations are being investigated*

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PILOT NAME:			
Stakeholder	**Contact person**	**Representing user characteristic/type/information about users in general**	**Stakeholder gateway to recruit end-users of the service**

Table 1 Stakeholder mapping pilot XX

Literature list

The list below aims to collect useful literature that exists about current users of the service and to identify on a more high level if there are gaps (without going in concrete detail) already. In that sense, in an interview with stakeholders the emphasis can be on certain aspects rather than those already coverd by means of literature.

Reference: Author, title, source, year
Type of publication:

- Scientific article/book chapter
- Internal document for public use
- Deliverable project
- Online link of publication (if available)

Type of data/information provided:

- Usage patterns ("hard" data): number of users,duration of use of a service, patterns of use...
- Vulnerable users (broader than pilot user characteristics)
- Specific User characteristics of pilot

Information about dimensions of needs and preferences:

1. Value of system
2. Need
3. Usage
4. Frequency
5. Experience with digital interface
6. Experience with physical interface
7. Self, assist or group use
8. Perception information and security/privacy
9. Difficulties
10. Attitudes, preferences and opportunities
11. Trust and reliability

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PILOT NAME:

Reference	Type of publication	Type of data/information provided	Information about dimensions of needs and preferences

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Annex II – Template stakeholder interview

Template for pilot adaptation

Who to interview? Stakeholders representing end-users, in particular vulnerable to exclusion users (they can speak on behalf of the vulnerable to exclusion users). These end-users are:

- Vulnerable to exclusion people in Madrid using the current app.
- Vulnerable to exclusion people in Berlin, Antwerp, Galilee using digital apps for mobility, preferentially in line with the service develop in INDIMO (proxy)
- Vulnerable to exclusion people in Emilia-Romagna in the area where the lockers will be placed;

Number of interviews: 3 to 5 stakeholders for each user case study
Duration: 30-60 min
The template distinguishes between Madrid on the one hand and Antwerp, Berlin, Emilia-Romagna, and Galilee on the other hand. In Madrid there is a first out roll of a service that will be redesigned by INDIMO while in Antwerp, Berlin, Emilia-Romagna and Galilee only a beta-version is present (no actual use yet) and will be designed further via INDIMO.
Please find below:

A. Interview introduction for all pilots
B. Stakeholder questionnaire for Madrid
C. Stakeholder questionnaire for Antwerp, Berlin, Emilia-Romagna and Galilee

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A) Interview introduction for all pilots

Hello and thank you for your time. In the field on digital mobility, one major challenge today is to develop services which everyone can benefit from. INDIMO is a EU-funded research project that wants to make the digital interconnected transport system more inclusive. It consists of several European partners and we (*the name of your organization*) are part of it. Our role is to develop a specific service *(specify the name of service*) in your area that addresses the needs of vulnerable to exclusion people (*specify the target user in your pilot)*. We need to understand what are the specific NEEDS of the aforementioned categories towards digital mobility services, in particular the INDIMO services. We focus on those people who have issues using digital mobility services today. As a *(mention expertise of the stakeholder) …* we therefore believe that you can provide us with useful insights to understand the real needs of vulnerable to exclusion people and develop solutions that will be important for the INDIMO pilot and for European research on inclusive transport.
In this interview we will explore the eleven dimensions that we consider important to understand users' needs and expectations.

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Before starting with the questions, please read briefly the aim of the [location] pilot.
Name of INDIMO Pilot - Aim of INDIMO pilot – Objectives of INDIMO pilot – target users of INDIMO pilot.
Do you have any questions with respect to the outline of the pilot?
[your answer…]

B. Stakeholder questions for Madrid

1. **Dimension: goal and purposes**

Q1 *According to you, for which purpose(s) are [vulnerable to exclusion category] using the service? (Please complete the category for your pilot)*

2. **Dimension: needs**

Q2: Which needs of the (specific category) is the service addressing?
Q3: Are [vulnerable to exclusion category] using alternative services (apps, tools, services) to satisfy some specific needs the service is supposed to address?

3. **Dimension: workflow**

Q4: What is the procedure [vulnerable to exclusion category] usually follow while using your service to have food or goods delivered?

4. **Dimension: usability digital interface**

Q5: Which aspects of the digital interface of the service are vulnerable to exclusion people considering easier to use? Which aspects of the digital interface of the service are they having trouble with? (Use an example to illustrate this question)

Q6: Are vulnerable to exclusion people satisfied with the support provided by the app? What further support would they need before, during and after contacting the customer service? Which are the best aspects? What should be improved?

Q7: What specific adjustments of the service do [vulnerable to exclusion category] require for improved accessibility and inclusivity?

5. **Dimension: usability physical interface**

Sometimes digital mobility services have a physical dimension, for example in case of ordering a taxi via an app, the interaction with the driver is part of the physical experience of the service as there is a person-to-person interaction. We understand it thus a physical object that is used as part of the digital service or the involvement of humans in the service.

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Q8: Which aspects of the physical interface (physical setting or) do vulnerable to exclusion people find easy to use? Which aspects of the physical interface do vulnerable to exclusion people find difficult to use? Do they get enough support while they are using it? Is there a way they can provide feedback or ask for assistance?

6. **Dimension: Skills and capabilities**

Q9: Which skills and knowledge should a vulnerable to exclusion person have in order to use the service? Which are the features causing more challenges/difficulties to users while using your service?

7. **Dimension: Perception of service demands**

Q10: With which service interaction activity do you think vulnerable to exclusion people are having most problems?

Q11: If the app can learn from previous searches or interactions or preferences, can (vulnerable to exclusion category) make use of this functionality? Do they understand the mechanism behind it?

8. **Dimension: Self use, assist or group use**

Q12: What kinds of vulnerable to exclusion users are requiring support or assistance? Is it easy to provide assistance to vulnerable to exclusion users? Make some examples derived from direct or indirect experienced

9. **Dimension: Trust, personal data privacy and information security**

Q13: Do vulnerable to exclusion people have specific concerns with sharing personal data with the service?

Q14: What can be done to improve vulnerable to exclusion people's trust in the service/ the service provider?

10. **Dimension: Challenges, limitations, opportunities and changes**

Q15: What are the main difficulties and challenges for vulnerable to exclusion people while using the service?

11. **Dimension: Attitude**

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Q16: Are (vulnerable to exclusion category) standing positive towards the service?

12. Dimension: Reliability of service

Q17 Do (vulnerable to exclusion category) find that the service reliable?three points of attention for reliability: the information provided on the digital mobility service, the service agents involved and by the service in general (in meeting its promises)?

12. COVID 19

Q18: Do you think the COVID-19 crisis has influenced the use of the service by (vulnerable to exclusion category)? How? How can the service mitigate this impact on (vulnerable to exclusion category) in the future?

C. Stakeholder questions for Antwerp, Galilee, Berlin, Emilia-Romagna

1. **Dimension: Goals**

Q1: *According to you, for which purpose(s)(vulnerable to exclusion category) could use the service (to cross the street, deliver/receive parcels, order a ride – delete the activity that is not appropriate for your pilot here and in questions below)?*

2. **Dimension: Needs**

Q2: How should the service address the needs of (vulnerable to exclusion category) in order to cross the street, deliver/receive parcels or order a ride?

3. **Dimension: Workflow**

Q3: What procedure/sequence/workflow will (vulnerable to exclusion category) have to follow in order to cross the street, deliver/receive parcels or order a ride? Please describe it step-by-step

4. **Dimension: Usability digital interface**

Q4: Which aspect/part of the digital interface of the proposed service will have to be particularly easy for (vulnerable to exclusion category) to use? Which aspects of the digital interface of the service are they having trouble with? (Use an example to illustrate this question)

Q5: What kind of user support mechanisms should be provided by the app to (vulnerable to exclusion category)?

Q6: What are the main accessibility and inclusivity tools or improvements for specific (vulnerable to exclusion category) that the service should provide?

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5. **Dimension: Usability physical interface**

Sometimes digital mobility services have a physical dimension, for example in case of ordering a taxi via an app, the interaction with the driver is part of the physical experience of the service as there is a person-to-person interaction. We understand it thus a physical object that is used as a part of the digital service or the involvement of humans in the service.

Q7: Which aspects of the physical interface must be easy to use for vulnerable to exclusion people?
Which aspects of the physical interface of the service are they having trouble with? (Use an example to illustrate this question)

Q8: Will there be a need for interaction with service agents? If so, when do you think they'll need it? (Before, during, after) Should they be able to send feedback/ask questions? How to organize that interaction?

6. **Dimension: Skills and capabilities**

Q9: What are the skills and knowledge that are needed by (vulnerable to exclusion category) to use this service?

Q10: In your opinion, which of the skills and knowledge are harder to achieve for (vulnerable to exclusion category)?

7. **Dimension: Perception of use demands of the service**

Q11: With which service demands (from the users) do you think (vulnerable to exclusion category) will have most problems? Give examples.
Q12: What are the activities/interactions required by the service causing more issues to vulnerable to exclusion users?

8. **Dimension: Self use, assist, group use**

Q13: Is a specific support needed for a specific segment of (vulnerable to exclusion category)? How can the assistance be best organized?

This phrasing is better I think (took it from above) What kinds of vulnerable to exclusion users are requiring support or assistance? Is it easy to provide assistance to vulnerable to exclusion users? Make some examples derived from direct or indirect experienced

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9. Dimension: Trust, personal data privacy and information security

Q14: Do (vulnerable to exclusion category) have specific concerns with sharing personal data in the app?

Q16: What would be the major concerns of (vulnerable to exclusion category) with sharing personal data?

Q15: What trust mechanisms should be in used for ensuring (vulnerable to exclusion category) trust and willingness to share personal data?

12: Dimension: Reliability and trust:

Q19: Do you believe that the reliability of the information that vulnerable to exclusion users obtain and the trustworthiness of the provider (keep promises, keep consumers' interests in mind) is important for (vulnerable to exclusion category) ? Why (not?)

10. Dimension: Difficulties, limitations, challenges and constraints

Q17: What will be the major challenges of (vulnerable to exclusion category) when using the service?

11. Dimension: Attitude

Q18: Do you think that (vulnerable to exclusion category) will stand positive towards the proposed service? If this is the case, on which aspects in particular are they having a positive stance? If this is not the case, why is this so?

12. COVID-19

Q20: If there would be an outbreak of COVID in the future, how can the service be best prepared for guaranteeing a proper functioning and delivering services to (vulnerable to exclusion category)?

This phrasing is better (took it from above):
Q18: Do you think the COVID-19 crisis has influenced the use of the service by (vulnerable to exclusion category)? How? How can the service mitigate this impact on (vulnerable to exclusion category) in the future?

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Annex III – Prioritisation pilot

This prioritization was made by the pilots lead to support the pilots into prioritizing design and development of features. These outcomes also inform the development of the first UDM version.

P1 Emilia Romagna

REQUIREMENTS PRIORITISATION EMILIA ROMAGNA	Very important (3)	Important (2)	Nice to have (1)
OLDER PEOPLE			
Goals			
P1- R1: Goal: Digital locker should include the following functions: paying of post-bills, withdrawal of pensions and facilitate the sending and receiving of parcels	3		
Needs			
P1- R2: Physical tool: Should be clearly identifiable and recognizable as a tool		2	
P1- R3: Physical tool: Should be placed on the right height	3		
P1- R4: Digital tool: Intuitive, easy to use, automatic interface where possible	3		
P1-R5: Assistance and support: Implement means to support independence (tutorials, clear instructions on tool) in ecosystem around the tool	3		
P1- R6: Service agent: Special attention to process of paying bills and first usage of elderly	3		
P1- R7: All features: Integrate and respect COVID-19 measures (see later)		2	
P1- R8: Service: Allow for wide usage hours and support at busy points in the lives of municipality and elderly (Sunday morning, mass, shopping Saturday).	3		
Challenges and limitations			
- Attitude new technology			
P1- R9: Digital tool: Design from the perspective of the target group	3		
P1- R10: Physical tool: Design from the perspective of the target group	3		
P1- R11: Assistance and support: Design a good information and communication plan and campaign that allows to take away the fear for the new technology and shows benefits	3		
P1- R12: Assistance and support: Volunteers as teachers to create opportunities to discover and learn about the new technology	3		

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P1- R13: Service agent: Service agent should be present during the first week of the deployment to help with first usage or discovery	3		
- Mobile phone			
P1- R14: Digital tool: Revise mandatory use of the mobile application	3		
- Digital skills			
P1- R15: Digital tool: Digital tool should be visually clear, interface easy to use and simply, almost automatic	3		
P1- R16: Physical tool: Easy and intuitive interface	3		
P1- R17: Physical tool: Toll-free number for assistance	3		
P1- R18: Service agent: Service agent should be present during the first weeks of the deployment of the service and especially be ready to support first usage(s).	3		
P1- R19: Service agent: After a period of time, remote assistance might be organized via phone (cfr R14)	3		
P1- R20: Assistance and support: Teaching sessions by volunteers to instruct elderly	3		
P1- R21: Assistance and support: Use other communication channels like whatsapp to inform or provide remote support		2	
- Cognitive skill			
P1- R22: Assistance and support: Teaching sessions by volunteers (covering before, during and after use)	3		
P1- R23: Assistance and support: Tutorials online or offline available		2	
P1- R24: Service: Service agent present during deployment phase	3		
P1- R25: Service: remote support (free toll number/direct from physical tool) operational	3		
- Language			
P1- R26: Digital tool: Use Italian language and familiar terminology (avoid gadget speak)	3		
P1- R27: Physical tool: Use Italian language and familiar terminology (avoid gadget speak)	3		
P1- R28: Assistance and support: Create an online list with important terminology		2	
- Age and impairments			
P1- R29: Digital tool: Design for accessibility with particular attention for visual impairment	3		
P1- R30: Physical tool: Design for accessibility with particular attention for visual impairment	3		
- E-commerce			

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P1- R31: Assistance and support: Involve children and family-members to convince for adoption and usage (opinion leaders)	3		
P1- R32: Assistance and support: Collaborate closely with the local authorities and associations working on ICT and on elderly	3		
P1- R33: Assistance and support: Design a good information and communication plan that shows benefits to elderly of using the technology	3		
- Isolation			
P1- R34: Assistance and support: Involve the social service of the commune and local associations to detect and follow-up	3		
Privacy and security			
P1- R35: Service: Have a clear and transparent privacy policy in line with regulations	3		
P1- R36: Service: Provide notifications when money transfer is correctly executed.	3		
P1- R37: Service: Assure that incorrect money transfer is not leading to money taken away	3		
P1- R38: Service: Put on a location that is frequented	3		
P1- R39: Service: Make sure safety and security measures are in place	3		
Trust and reliability			
P1- R40: Service agent: Information provided by the service agent should be correct	3		
P1- R41: Service agent: Service agent should be reliable	3		
P1- R42: Trust: Use the image of PI as a strong weapon		2	
P1- R43: Trust: Create an ecosystem of support and information towards the elderly with the local authority and local associations	3		
Covid-19			
P1- R44: Physical tool: Integrate security measures in design (hand gel, …)		2	
P1- R45: Service: Assure distance with service agent at location of locker		2	
P1- R46: Service: Avoid queuing in front of locker at location of locker and keep distance	3		
MIGRANTS			
Goals			
P1- R47: Goal: Digital locker system should have the function of exchange and delivery of goods and payment services	3		

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Needs			
Challenges and limitations			
- Migrant communities			
P1- R48: Service: It will be necessary to devise a communication and information strategy that starts from the viewpoint of different migrant communities		2	
- Cultures (restricted usage patterns)			
P1- R49: Service: Know and understand local migrant cultures in order to know how the technology can integrate in their practices	3		
P1- R50: Assistance and support: Tailor assist and support towards the different communities	3		
- Digital skills			
P1- R51: Assistance and support: Training sessions needed		2	
P1-R52: Assistance and support: Strong ties with local associations and municipality to provide training and support	3		
- Language (Italian)			
P1- R53 : Digital tool: English, French and other language options (e.g. Spanish, Arabic, Urdu, Romanian, ect.)			
P1- R54: Physical tool: English, French and other languages option (e.g. Spanish, Arabic, Urdu, Romanian, ect.)			
P1- R55: Service agent: Open to conversation in other languages			
P1-R56: Assistance and support: Tutorial in English, French and other language options			

P2 Antwerp

REQUIREMENTS PRIORITISATION ANTWERP	Very important (3)	Important (2)	Nice to have (1)
VISUALLY IMPAIRED (BLIND)			
Goals			
P2- R1: Goal: Make crossing safer and more comfortable	X		
P2- R2: Goal: Improve traffic independency	X		
Needs			
P2- R3: Physical tool: Be easily detectable	x		
P2- R4: Physical tool: Be easy to use	x		
P2- R5: Physical tool: Have audio options	x		
P2- R6: Physical tool: Provide more crossing time		x	
P2- R7: Physical tool: Offer a clear auditory signal when it's green	x		

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P2- R8: Physical tool: Offer via audio how much green/red time is left		x	
P2- R9: Physical tool: Provide instructions (e.g., direction to walk in)	x		
P2- R10: Physical tool: Provide extra information (e.g., tram tracks)		x	
P2- R11: Physical tool: Having to undertake no more than one single operation to activate the light		x	
P2- R12: Physical tool: Have the volume adapted to street noise	x		
P2- R13: Physical tool: Be reliable and leave no room for error	x		
P2- R14: Physical tool: Be uniform with other lights (e.g., crossing time)		x	
P2- R15: Digital tool: Be active in the background of the mobile device			x
P2- R16: Digital tool: Offer auditory instructions on crossing (e.g., beep for wrong direction)	x		
P2- R17: Digital tool: Be easy to use	x		
P2- R18: Digital tool: Need no more than one single operation to activate the smart traffic light		x	
P2- R19: Digital tool: Have audio options	x		
P2- R20: Service: Have an obstacle-free approach zone Service: Have an obstacle-free approach zone		x	
P2- R21: Service: Be integrated into online route planners	x		
P2- R22: Service: Be combined with non-digital means (e.g., remote control)			x
P2- R23: Service: Inform users if the solution is not working / has an issue	x		
P2- R24: Service: Inform users when the solution is fixed			x
P2- R25: Service: Educate/instruct about the light (e.g., mobility trainers)		x	
Challenges and limitations			
Visual disabilities of users			
P2- R26: Physical tool: Have the volume adapted to street noise and own preferences	x		
P2- R27: Physical tool: Have audio options	x		
P2- R28: Physical tool: Offer a clear auditory signal when it's green and red	x		
P2- R29: Physical tool: Offer via audio how much time is left		x	
P2- R30: Physical tool: Provide instructions (e.g. direction to walk in)	x		
P2- R31: Physical tool: Provide extra information (e.g. tram tracks)		x	
P2- R32: Digital tool: Have audio options	x		
P2- R33: Digital tool: Offer auditory instructions on crossing (e.g. beep for wrong direction)	x		
P2- R34: Service: Provide podotactile information about the crossing (e.g. warning strip)			x
P2- R35: Service: Have an obstacle-free approach zone			x

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Digital and technological skills are required			
P2 - R36: Users are required to have basic digital skills	x		
P2 - R37: Users are required to own a smartphone	x		
P2 - R38: Users are required to want to use new technology	x		
Complex and inaccessible infrastructure			
P2- R39: Users have fixed routes and avoid unknown routes (e.g., complexity of intersection). Be aware that installing smart traffic lights does not need to bring about a change in the route of the blind/visually impaired person.	x		
P2- R40: Users will avoid unclear, bad or inaccessible infrastructure (e.g., edges). Therefore work with mobility trainers to learn the route at a crossing to the traffic light and also involve them when introducing smart traffic lights to blind persons;	x		
Privacy and security			
P2- R41: Service: Be in accordance with regulations and GDPR rules	x		
P2- R42: Service: Be transparent and inform why certain personal data is necessary	x		
Trust and reliability			
P2- R43: Physical tool: Be reliable and leave no room for error	x		
P2- R44: Service: Inform users if it is not working / has an issue	x		
P2- R45: Service: Inform users when it is fixed		x	
Covid-19			
P2- R46: Covid-19: Physical tool requires no activation button	x		
P2- R47: Covid-19: Users rely on other pedestrians' attitude to respect the 1.5 metre guideline		x	
MOBILITY IMPAIRED			
Goals			
P2- R48: Goal: Make crossing safer and more comfortable	x		
P2- R49: Goal: Improve traffic independency	x		
Needs			
P2- R50: Physical tool: Provide more crossing time		x	
P2- R51: Physical tool: Offer a clear auditory signal when it's green	x		
P2- R52: Physical tool: Be recognisable (e.g. logo)		x	

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P2- R53: Physical tool: Be automatically detected by the mobile device		x	
P2- R54: Physical tool: Be easy to use	x		
P2- R55: Physical tool: Require no physical actions to be activated		x	
P2- R56: Physical tool: Be able to monitor the crossing process	x		
P2- R57: Digital tool: Be automatically detected by the smart light (e.g. Bluetooth)		x	
P2- R58: Digital tool: Be easy to use	x		
P2- R59: Digital tool: Need no physical actions to be activated/used		x	
P2- R60: Digital tool: Be active in the background of the mobile device		x	
P2- R61: Digital tool: Be able to receive a signal from the smart light (e.g. vibrate when it's green)	x		
P2- R62: Digital tool: Have an in-app feedback function	x		
P2- R63: Digital tool: Have an in-app integration of the smart lights (e.g. location)		x	
P2- R64: Service: Be integrated into online route planners		x	
P2- R65: Service: Educate/instruct about the light via an awareness campaign	x		
P2- R66: Service: Educate/instruct about the light via a widespread introductory video	x		
P2- R67: Service: Provide individual mobility walks for the target audience		x	
Digital and technological skills are required			
P2- R68: Users are required to have basic digital skills	x		
P2- R69: Users are required to own a smartphone	x		
P2- R70: Users are required to want to use new technology	x		
Physical skills and basic level of mobility are required			
P2- R71: Users need to be able to get to their phone and use it while also steering their wheelchair	x		
P2- R72: Users need certain physical abilities (e.g. ability to push a button or swipe your finger)		x	
P2- R73: Users need to be able to get to/reach light and button		x	
Complex and inaccessible infrastructure			
P2- R74: Users have fixed routes and avoid unknown routes (e.g. complexity of intersection)		x	
P2- R75: Users will avoid bad or inaccessible infrastructure (e.g. edges)		x	
Privacy and security			
P2- R76: Service: Not require too much personal data to function well	x		

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OLDER PEOPLE			
Goals			
P2- R77: Goal: Make crossing safer and more comfortable	x		
P2- R78: Goal: Improve traffic independency	x		
Needs			
P2- R79: Physical tool: Provide more crossing time		x	
P2- R80: Physical tool: Offer a clear auditory and visual signal when it's green	x		
P2- R81: Physical tool: Provide extra information (e.g. tram tracks)		x	
P2- R82: Physical tool: Be easily detectable		x	
P2- R83: Physical tool: Be easy to use	x		
P2- R84: Physical tool: No more than one single operation to be activated	x		
P2- R85: Physical tool: Give clear, short instructions on the crossing	x		
P2- R86: Digital/Physical tool: A wireless option to send signals			x
P2- R87: Digital tool: Be easy to use	x		
P2- R88: Digital tool: Need no more than one single operation to activate the smart traffic light		x	
P2- R89: Digital tool: Require no activation method		x	
P2- R90: Digital tool: Have audio options		x	
P2- R91: Service: Be integrated into online route planners		x	
P2- R92: Service: Inform users if it is not working / has an issue	x		
P2- R93: Service: Inform users when it is fixed		x	
P2- R94: Service: Communicate via well-known channels of the target group about light (e.g. TV, radio, paper)		x	
P2- R95: Service: Educate/instruct about the light (e.g. Educational sessions)	x		
P2- R96: Service: Launch an informative campaign about the light	x		
P2- R97: Service: Users are able to easily inform the service if the light doesn't work	x		
Challenges and limitations			
Digital and technological skills are required			
P2- R98: Users are required to have basic digital skills	x		
P2- R99: Users are required to own a smartphone	x		
Attitude towards "new technology"			
P2- R100: Users are required to be open to using new technology	x		

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Apprehension of certain users			
P2- R101: Users avoid busy and complex crossroads		x	
P2- R102: Users have fixed routes they will not easily change		x	
P2- R103: Users will avoid bad road infrastructure e.g. cobblestones		x	
Visual disabilities of certain older users			
P2- R104: Service: Older Users with visual disabilities are in need of auditory signals to provide information on the light and to confirm/suggest instructions to the application		x	
P2- R105: Digital tool: Have audio options		x	
P2- R106: Physical tool: Give auditory signals		x	
Privacy and security			
P2- R107: Service: Provide an understandable, transparent privacy statement	x		
P2- R108: Service: Have a one-time consent	x		
P2- R109: Service: Implement tools to protect users' privacy (e.g. from phishing)	x		
Trust and reliability			
P2- R111: Service: Inform users if it is not working / has an issue	x		
P2- R112: Service: Inform users when it is fixed		x	
P2- R113: Assistance and support: Service agent is provided to contact when there's an issue	x		
P2- R114: Assistance and support: Digital tool is required to have audio options	x		
Covid-19			
P2- R115: Covid-19: Service is required to be as safe and hygienic as possible	x		

P3 Galilee

REQUIREMENTS GALILEE PILOT	Very important (3)	Important (2)	Nice to have (1)
YOUNG ARAB WOMAN IN RURAL AREA			
Goals			
P3-R1: Goal: organise shared transport from home to work for women	x		
P3-R2: Goal: organise shared transport from home to high school/university for women	x		

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P3-R3: Goal: organise rides from activities/errands and back safely and easily from home	x		
Needs			
P3-R4: Digital tool: Be easy to use and to be straightforward and intuitive	x		
P3-R5: Service : The service should be accessible 24h and 7 days in the week and reliable	x		
P3-R6: Service Agent: The service agents are preferably women		x	
P3-R7: Service/Service Agent/Digital Tool/Physical tool: the service in all its components should be reliable, secure and trustworthy	x		
PR-R8: Service/Privacy: The service is designed to not display to much user information publicly and provide discrete subscription identification	x		
PR-R9: Service/Privacy: The service should respect the house and private sphere of the user and not 'intrude' it		x	
P3-R10: Service: The service should offer on demand planned trips	x		
CHALLENGES AND LIMITATIONS			
Digital and technological skills are required			
P3-R11: Digital tool: Make use of visual icons		x	
P3-R12: Digital tool: Simple one-time registration	x		
P3-R13: Assistance: Offer help features (e.g. small explanations/Faq) on the app for every step in the process	x		
P3-R14: Assistance: Offer audio-assistance in Arabic	x		
P3-R15: Assistance: Set up a helpdesk that is easy reachable by users via different channels (mail, phone, whatsapp, chat)	x		
P3-R16: Assistance: Helpdesk supports users with setting-up the application, during usage and with post-usage difficulties.	x		
P3-R17: Assistance: Offer an introductory video explaining the step-by-step procedure to use the digital tool and the service	x		
NECESSITY FOR WANTING TO USE TECHNOLOGY FOR RIDESHARING			
P3-R18: Service/digital tool: a communication campaign is needed to convince Arab women about the benefits of the service and the advantages of using their mobile phone.		x	
LANGUAGE			
19. P3-R19: Digital tool: Users will prefer an Arabic interface that uses feminine grammar	x		
GEOGRAPHICAL SITUATION			

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P3-R20: Service: work with points of interest and location indicators to overcome lack of infrastructure	x		
P3-R21: Service: work with point of interest and location indicators to avoid picking up/dropping off in front of the family home.		x	
P3-R22: Digital tool: users are able to select point of interest and location indicators in order to select pick-up and drop off places	x		
P3-R23: Service agent: The car driver should come from the particular rural area where he/she knows his/her way		x	
Visual disabilities of certain users			
P3-R24: Digital tool: users can adjust the font of the digital interface			
P3-R25: Assistance: users should be able to be guided by audio-assistance in Arabic	x		
Social situations that could cause issues			
P3-R26: Service: The informal ride sharing service should be provided by a well-known and reliable organisation in order to facilitate the consent of the family	x		
P3-R27: Service: Provide the users with different service agent and physical interface profiles to choose from	x		
P3-R28: Service/digital tool: Driver profile mentions the gender of the driver	x		
P3-R29: Digital tool: Option for selecting a male or female driver	x		
P3-R30: Service: An emergency button on the application is required	x		
P3-R31: Service: users should be able to pay in cash	x		
Economic factors			
PR-R32: Service: the price of the service should be affordable	x		
PR-R33: Service/digital tool: be transparent about the price during the booking process	x		
Privacy and security			
P3-R34: Privacy and security: Users require the service to be designed by a trustworthy and reputable organisation	x		
P3-R35: Privacy and security: Users require that registration should not only be via their Facebook profile	x		
P3-R36: Privacy and security: users are only asked personal data is purposeful to use the service	x		
P3-R37: Privacy and security: users will like to have a discrete, anonymous user profile (nickname, serial number but no relation to personal information)	x		
P3-R38: Privacy and security: Service is required to use points of interest and location indicators for pick-up/drop-off	x		

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P3-R39: Privacy and security: Assistance and support: Digital tool requires an emergency button	x		
P3-R40: Privacy and security: Users require certified safe cars in the service	x		
P3-R41: Privacy and security: The car park involved in the service should be diverse because users will have different needs depending on the trip.		x	
Trust and reliability			
P3-R42: Service Agent/Service: Users want the car driver to arrive always punctual at pick-up location and drop-off location	x		
P3-R43: Service Agents/Service: Users don't want rides to be cancelled	x		
P3-R44: Service/Digital tool: Users are able to give feedback about drivers, car, ride and provider and see feedback of other users on these four topics	x		
P3-R45: Service/Digital Tool/Physical Tool/Service Agent: Users require the service to be designed by a trustworthy and reputable organisation in all its components	x		
P3-R46: Service: Digital tool is required to always be accessible (24/7)	x		
P3-R47: Service agent/Digital Tool : Service agent is required to have a profile so users can check her/him out before making a choice.	x		
P3-R48:Digital Tool/Service: Digital tool requires an option to give feedback (on driver, car, ride, provider)	x		
P3-R49: Service Agent: Users are able to contact the service agent directly	x		
P3-R50: Assistance: Service needs to be able to be contacted via application, email and phone	x		
Covid-19			
P3-R51: Covid 19: Needs to be adapted to the regulations of social distancing (e.g. availability separator, face masks and hand gel)	x		
P3-R52: COVID-19 proof: safety by using separators or making sure social distance is possible	x		

P4 Madrid

Prioritisation Requirements Madrid	Very important (3)	Important (2)	Nice to have (1)
SOCIALLY ISOLATED ELDERLY WOMEN			
Goals			
P4- R1: Goal: Digital service should have the functionalities to order food in order to invite guests at		x	

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home, to order heavy groceries from stores and to send/receive parcels.			
Needs			
P4- R2: Service: Offer a good experience in all its components beyond merely the completion of an efficient and successful transactions	x		
P4- R3: Service: Designed as a safe experience within technologies that are currently known	x		
P4- R4: Service: Offer should be tailored to dietary needs of older people and focus on products they can eat			x
Challenges and limitations			
- Digital skills			
P4- R5: Digital tool: Interface should be intuitive (e.g. with drawings) and easy to use	x		
P4- R6: Digital tool: Design of the application should clearly make a distinction from the start between the three options: ordering a meal, ordering groceries and sending/receiving a parcel	x		
P4- R7: Digital tool: Timetable of delivery as well as the Price should be clearly visible and readable at all times for the target group		x	
P4- R8: Digital Tool: Present the search from food labels rather than from restaurants		x	
P4- R9: Digital tool: Work with contrasts in colours to highlight different sections or functions			x
P4- R10: Digital tool: Make a simple function to save preferences	x		
P4- R11: Service: If using the digital application might be too difficult, use What's app as a total or partly (e.g. ordering after consulting the menus/restaurants) solution.		x	
P4- R12: Assistance and support: Publish a tutorial video on Youtube and use older persons as characters	x		
P4- R13: Assistance and support: Work on opportunities (e.g. training sessions) to get familiarized with the app before usage		x	
P4- R14 Assistance/Service: Allow for a human contact when needed help by using What's app; avoid a design that leads to a talking machine or feels like talking to a machine	x		
- Language (Spanish)			
P4- R15: Digital Tool: Use Spanish language and terminology on the digital tools	x		
- Monetary resources			
P4- R16: Service: Make sure the products available via the application are within affordable price ranges		x	

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P4- R17: Digital tool: Work on price transparency throughout the whole service. By displaying this, by providing a calculator, by keeping track of the amount, ask for confirmation before placing an order and so on		x	
- Knowledge about and image of the service			
P4- R18: Service: Design a good social campaign - via 'opinion leaders' and 'social organisations' around the target audience - to foster knowledge about the existence of the app and stimulate recommendations	x		
P4- R19: Digital tool: Use a design that appeals to the target audience and addresses their needs by highlighting food instead of restaurants and allow		x	
- Privacy and security			
P4- R20: Privacy and security: Respect basic privacy regulation		x	
- Trust and reliability			
P4- R21: Service: Users require the service to be designed by a trustworthy and reputable organisation		x	
P4- R22: Service: Users require direct recommendations from trusted sources to install and use the application. The social campaign (cfr RXX) should take this into account	x		
P4- R23: Service: Being transparent in order to be increase perception of safety and reliable		x	
P4- R24: Service: Provide the opportunity to tell where to leave the food, groceries or parcels - door, hall, door men - and what time frame	x		
- Covid-19			
P4- R25: Goal: In times of Covid-19 it is important that the target group is informed about the existence of the service in order to ease impacts of Covid -19 safety measures (e.g. lockdown)	x		
P4- R26: Service: Should be as safe as possible and follow the safety guidelines set by the government (1.5 meters distance; disinfect/wash hands before delivery and drop food, grocery or parcel in a safe spot)		x	
P4- R27: Service: Use Whatsapp or phone to warn older persons that food, groceries or parcels have arrived and can be picked-up.		x	
COGNITIVE IMPAIRED PERSONS			
Goals			
P4- R28: Goal: Application should support online purchase of food (for a profile of cognitive impaired persons) and give a sense of independence		x	

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Needs			
P4- R29: Need: Application should offer an approach of workflow and presentation like instagram : step-by-step and structured	x		
P4- R29: Need: Certain structured approach around food and eating (weekly menus, order of presentation) is required	x		
P4- R31: Need: Service in all its components should be easy, friendly and empathically organised	x		
Challenges and limitations			
- Financial aspect			
P4- R32: Service: Offer couple accounts for supervision by tutor(s)	x		
P4- R33: Service: Parental approval/confirmation of order		x	
P4- R34: Service: Set a limit on expenses for the user/tutor	x		
- Capacity on information intake			
P4- R35: Digital tool: Work out an easy interface with intelligible logo's and a clear step-by-step approach for each necessary action	x		
P4- R36: Digital tool: Enforce this approach with visuals such as a progress bar.		x	
P4- R37: Digital tool: Provide an option to choose from a weekly menu or choose and order food for a longer		x	
P4- R38: Digital tool: Present the options from the food types instead of the restaurants or big brands names and hence avoid ordering food they don't need	x		
P4- R39: Digital tool: In the design restrict the options to choose to the most essential ones - the design should support decision making		x	
P4- R40: Digital tool: Digital interface can limit amount of options based on set preferences/past interests or already auto-complete certain fields	x		
P4- R41: Digital tool/Service: Provide a help button with direct access to helpdesk via phone and take over command from there if needed	x		
P4- R42: Service: Provide a short tutorial video about how the service works on the website or app.	x		
- Avoid surprises			
P4- R43: Delivery: Delivery person should wear his uniform so he is clearly identifiable	x		
P4- R44: Delivery: Delivery person should be on time and punctual. Report any delay to the user		x	
P4- R45: Delivery: Delivery person should speak calm and with short sentences. Focus on the relevant information	x		
P4- R46: Delivery: Delivery person should avoid behaviour that might be perceived as invasive		x	

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P4- R47: Delivery/Service agent: Provide a review option for delivery persons so that user knows who to choose and expect		x	
- Knowledge and branding			
P4- R48: Service: Need for a social campaign to introduce the application in the network of trusted agents (tutors/guardians) around the target audience		x	
P4- R49: Service: A way should be devised to find a use case as most of the target audience gets food at canteens			x
P4- R50: Service: Clearly communicate/state who their target audience is as today the reputation is that it is not for the target audience			
Privacy and security			
P4- R51: Privacy and security: Service does not share personal information with other users or organisations		x	
P4- R52: Privacy and security: Service offers couple accounts for supervision by tutor(s)		x	
P4- R53: Privacy and security: Get a certification about data protection and security in order to convince tutor/guardian			x
Trust and reliability			
P4- R54: Trust and reliability: It will be important to win the trust of the tutor/guardian		x	
Covid-19			
P4- R55: Covid-19: Service can be used as a way to escape from the daily routine		x	
P4- R56: Covid-19: Service is required to be Covid-19proof : food delivery keep distance at 1.5 meters at all time, wash/disinfect hands before delivering and drop off food, grocery or parcel in a safe spot (hall)		x	
P4- R57: Covid-19: Inform the person that the food has been delivered via phone or whatsapp		?	
MENTALLY UNWELL USER			
Goals			
P4- R58: Goal: Service should offer the ability to order healthy food as a replacement for cooking		?	
Needs			
P4- R59: Needs: Service should be easy to use and serve daily food requirements			
Challenges and limitations			
VISUALLY, MOBILITY OR AUDITORY IMPAIRED USER			
Needs			
P4- R60: Need: Service should be designed from a universal point of view (visual and mobility impairment) and through its digital and physical components		x	

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P4- R61: Need: Service should provide a better shopping experience than in the physical setting (mobility impairment	x		
P4- R62: Need: Service in all its component should be easy to use (visual and mobility impairment)	x		
Challenges and limitations			
- Challenges due to impairment			
P4- R63: Digital tool: Will be important to offer a limited but meaningful list to choose from. Use previous searches and preferences as a way to simplify the process and options.		x	
P4- R64: Digital tool: Design the tool with screen readers in mind and how the process can be well represented via these readers so that mistakes in ordering products are avoided for blind people.	x		
P4- R65: Digital tool: Provide a trustworthy but efficient payment module. If necessary, check for a cash payment option.		x	
- Anticipating mistakes			
P4- R66: Service/Digital tool: User should be allowed to make mistakes. A function should be designed to restart the process. It should also be easy to take one step back in the process		x	
P4- R67: Digital tool: In order to avoid mistakes, special help messages can be displayed to highlight attention	x		
P4- R68: Service: Provide a good remote assistance by phone in case of problems.	x		
- Visual disabilities			
P4 - R69: Digital tool: Digital interface can be adjusted (e.g. font, colours)	x		
P4- R70: Service: Offer audio-assistance / auditive guidance	x		
P4- R71: Service: Use different coloured and shaped containers to easily identify breakfast, lunch and dinner			x
- Attracting target audience			
P4- R72: Service: Design a good social communication campaign to reach the opinion leaders within the communities of the blind, mobility impaired and the deaf.		x	
Covid-19			
P4- R73: Covid-19: For mobility impaired persons it is important to design a system to deliver the food at home and not in the corridor or at the doorstep.	x		
P4- R74: Covid-19: For blind and visually impaired persons, touching the products remains important and physical shopping is still preferred. Nonetheless, if they need the application, it is important that mistakes are avoided.	x		

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P4- R75: Covid-19: Deaf people are restricted to read other persons because of the mask. The service should find another communication mode with the bike delivery person that is talking, e.g. via signs or whatsapp messages.		x	
P4- R76: Covid-19: Service is required to be Covid-19 proof: food delivery keep distance at 1.5 meters at all time, wash/disinfect hands before delivering and drop off food, grocery or parcel in a safe spot			x
PEOPLE WITH LOW INCOME			
Goals			
P4- R77: Goal: Service should support the function to deliver food at home		x	
P4- R78: Goal: Service should have an affordable food profile		x	
Needs			
P4- R79: Need: Service should be different than the current offer of cheap priced food	x		
Challenges and limitations			
- Monetary resources			
P4- R80: Service: Offer the possibility of economic autonomy with affordable prices		x	
P4- R81: Service: Is required to be affordable		x	
P4- R82: Service: No minimum amount for an order		x	
P4- R83: Service: Provide an option for cash payment		x	
P4- R84: Service: Foresee an option to circumvent much data-usage			x
P4- R85: Service: Be careful to not offer unhealthy food to target group in order to keep prices low	x		
- Knowledge, reputation and branding			
P4- R86: Service: A campaign with social associations to let the target audience know that the service exists and is dedicate for them	x		
P4- R87: Service: Affordable food profile so that it gives the image that it is within their reach		x	
- Digital skills			
P4- R88: Assistance and support: Provide a helpdesk with a phone to answer questions since human contact is important and phone will be most efficient ways to erase any doubts	x		
Privacy and security			
P4- R89: Service: Provide a privacy policy in line with EU and national legislation		x	
P4- R90: Service: Pay attention to situations in the service that might be sensitive. Identify them and provide an alternative option			x

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Trust and reliability			
P4- R91: Service: Explain the required steps very clearly and transparent in order to increase the perception of reliability	x		
P4-R92: Service agent: Bike delivery person should speak slowly and clearly, explain who he is, where he comes from and what he comes to deliver		x	
P4- R93: Service: Users require the service to be designed by a trustworthy and reputable organisation		x	
P4- R94: Trust: Users require direct recommendations from trusted sources to install/use the application		x	
P4- R95: Service: Be safe and reliable by being transparent	x		
P4- R96: Service: A discrete user profile		x	
P4- R97: Service: Always be punctual		x	
P4- R98: Service: Users are able to give feedback and see feedback of other users	x		
P4- R99: Service Agent: Bike delivery person has a whatsapp number to call and/or text		x	
P4- R100: Assistance and support: Service informs social organisations of service and how to use it		x	
Covid-19			
P4- R101: Covid-19: User is able to order food in times of pandemia		x	

P5 Berlin

REQUIREMENTS PRIORITISATION - BERLIN PILOT	Very important (3)	Important (2)	Nice to have (1)
Young mother in suburban neighbourhood			
Goals			
P5- R1: Goal: connect various daily activities/errands easily in a chaintrip	x		
P5- R2: Goal: Organise the chaintripping without much effort (money, time)	x		
P5-R3: Goal: allow older children to be transported without parents		x	
Needs			
P5-R4: Service organisation: The service should be flexible in its operations and flexibility should be build in in all its operations	x		
P5-R4: Digital tool: The digital solution should be easy to use, intuitive and well-designed	x		

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P5- R5: Digital tool/Physical Tool/Service/service Agent/assistance and support: The solution in all its components should be reliable, punctual, safe, easy recognisable in public space and trustworthy	x		
P5- R6: Physical tool: the service should be comfortable what concerns the space dimensions	x		
P5- R8: Service: The service should have an affordable in price, ideally integrated inot the public transport fare	x		
P5- R9: Service/physical tool/service agent: a child friendly and child-focused service	x		
CHALLENGES AND LIMITATIONS			
Assure a child friendly and child focussed approach			
P5-R10: Driver: The driver should receive training to support mothers with on/off boarding and during the ride			
P5-R12: Driver : The driver is punctual and recognisable (specific uniform, sign, car branded)			
P5-R13: Driver: The driver should be informed by the system that children will be part of his ride and how many children it will be			
P5-R14: Driver: The driver should drive in a safe and good way (not upsetting children)			
P5-R15: Driver: As children tend to forget or lose objects/toys, the driver should be prepared to keep forgotten stuff and notify the user about it.			
P5-R16: Driver: The driver is advised to create a childfriendly atmosphere in the car (e.g. playing music for children, ...)			
P5-R17: Driver: The driver should be instructed to park at close as possible on agreed pick-up or drop-off point close to destination			
Attitude towards ridesharing			
P5 - R19: Service: create some common norms around the ridesharing service that allows strangers to interact with each other ('known' stranger)			
P5- R20: Service: Target only mothers that are willing to rideshare with persons they do not know			
Monetory cost of the service			
P5-R21: Service: Users require an affordable service that compares to that of public transportation			
P5- R22: Service: prices of the service should be affordable			
P5-R23: Service: The service should have a transparent pricing mechanism to the suer in order to avoid surprises			
Flexible, spontaneous ordering as well as order in advance			

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P5 -R24: Service: Users require an on-demand service for everyday use			
P5-R25: Service: Users need to be able to book the ride in advance or spontaneously			
P5-R26: Service: users need to be able to cancel or change a booking almost very instantaneously (the time window for no longer changing/cancellation is very short)			
P5-R27: Driver: The driver is not expected to cancel rides a few minutes in advance			
P5-R28: Driver: The driver should be ready for small adaptations of the ride along the way (for example stop a few hundred meters than initially requested or add an extra stop along the way)			
P5-R29: Driver: The driver should be ready for a new booking or changing of destination during the trajectory			
P5- R30: Service: Integrated into the existing public transport and should show the possible connections			
Physical interface: car			
P5-R32: Physical tool: Car requires onboard facilities for both mother and child to make the trip more comfortable: correct size of child seats and room for stroller			
P5-R33: Physical tool: Car size and type should be fit for variety of places in public space to assure a safe onboarding			
Digital interface: the mobile application			
P5-R34: Digital tool: User need a profile setting that reduces the need for providing information during the order process to the fact of having children or not for the ride and how many			
P5-R35: Digital tool: Mobile application requires that the mothers are able to select how many and what kind of room they will need			
P5-R36: Digital tool: Users are able to select pre-fixed destinations easily (e.g. dentist, kindergarten)			
P5-R37: Digital tool: The registration to the service should be an easy one-time process			
P5-38: Digital tool: the payment should be done via a fast online payment module			
P5-R39: Digital tool/Service: a subscription that is easy to change, stop or take			
Image and branding			
P5 -R40: Service: The service should have a young and dynamic image			
P5 - R41: Service: A communication campaign will be needed to overcome the mental barrier that does not associate on-demand ride sharing as a transport mode for mothers with children			

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Digital skills are required			
P5 - R42: Digital tool: The users will need to possess basic digital skills (ability to use smartphone, ability to do digital payments, ability to understand digital map)			
P5- R43: Assistance and Support: Offer support with digital issues through contact number and/or help button			
P5-R44: Assistance and Support: Provide a tutorial on youtube			
Privacy and Security			
P5-R45: Privacy: Require no personal data of the children to properly function			
P5-R46: Privacy: Designed according to the regulations concerning privacy			
P5-R47: Privacy: Require barely any data to offer you a good service and works by selecting different options			
P5-R48: Privacy: Users require an option for data-anonymization			
P5-R49: Privacy: Service should be very carefully with protecting credit card data and transactions			
Trust and reliability			
P5-R50: Service: Users require the service to be implemented by a trustworthy and reputable organisation in the field of mobility in Germany			
P5-R51: Service: A policy to pick up close to home and drop off close to destination is requested			
P5-R52: Service: Service requires to be safe and reliable by being transparent and the ability to select what data the users share			
P5-R53: Service/driver: Service should always be punctual and no rides should be cancelled			
P5-R54: Service: Service requires a transparent price and payment method			
P5-R55: Service/Driver: Users require a user profile of service agent and physical interface as well as ratings/reviews			
P5-R56: Service : Users are able to give feedback and see feedback of other users			
P5-R57: Assistance and support: Users are able to get assistance remotely			
P5-R58: Service: Use a clear and simple language for service terminology			
Covid-19			
P5-R59: Covid-19 The physical interface needs to be adapted to the regulations of social distancing (e.g. availability separator, face masks and hand gel)			

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