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CASE STUDY

REVISED A reflection on participatory research methodologies in the light of the COVID-19 – lessons learnt from the European Research Project TRIPS [version 2; peer review: 2 approved]

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Abstract

The coronavirus disease (COVID-19) outbreak has had considerable impacts on research projects, particularly those adopting participatory approaches. This paper reflects on the methodological adaptations employed by the European research project TRIPS to facilitate co-design and open innovation practices towards the development of accessible mobility solutions. The article reports how the methods were adapted to facilitate participatory research with almost no physical meetings. In doing so, the paper presents the alternative 'distanced-based' participatory approaches employed to engage users with disabilities and institutional stakeholders in the transport ecosystem, like online workshops, social media content analysis, online surveys and peer-to-peer telephone interviews. Lessons learnt and practical guidelines for distance-based participatory research are presented and discussed with the aim of increasing resilience in the light of future changes.

Keywords

accessibility, participatory research, co-creation, COVID-19

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Any reports and responses or comments on the article can be found at the end of the article.

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REVISED **Amendments from Version 1**

After receiving two reviews, we revised our manuscript. Two major changes were made. First, the text was focussed more on the reflection of participatory research with disabled users in times of the COVID-19 pandemics. Second, initial challenges and actual challenges that occured when conducting the research were contrasted.

Any further responses from the reviewers can be found at the end of the article

Plain language summary

COVID-19 forced people worldwide to avoid direct social contact. Consequently, research projects working with members of the public, i.e., participatory research projects, had to re-think their original methods of engagement. The EU-funded H2020 research project TRIPS, was one of these projects that changed ist methods to react to the coronavirus pandemic (COVID-19). This paper reports how the methods were adapted to facilitate participatory research without physical meetings. In addition, it assesses the presented methods and makes recommendations for other researchers conducting similar studies under similar conditions.

1. Introduction

According to the motto of the International Day of Persons with Disabilities of the United Nations in 2004 "*Nothing About Us Without Us!*", people with disabilities request to be involved in decision processes that affect them (United Nations, 2004). Accordingly, research has participatory research methods in various domains such as health (Nicolaidis *et al.*, 2015), child development (Wickenden & Kembhavi-Tam, 2014) and transport (Whitzman *et al.*, 2013) to support the collection of more relevant and more valid data. Besides many advantages for the quality of research and the validity of outcomes (McDonald & Stack, 2016), participatory research and inclusive participatory research in particular are faced with a variety of challenges, among them ethical challenges (Iacono, 2006), role ambiguity (Vega-Córdova *et al.*, 2020) and costs, especially for disabled co-researchers (Vaughan *et al.*, 2020). Adding to this, participatory research is additionally challenged since the spread of the novel coronavirus (SARS-CoV-2) in early 2020, when governments around the globe implemented social distancing measures to interrupt its transmission (WHO, 2020a). The aim of the paper is to reflect the changes and challenges in the planning and implementation of participatory disability-related research due to the coronavirus pandemic. The paper thereby reflects the experiences made in the European research project TRIPS.

1.1 COVID-19 pandemic: Challenges for participatory research

COVID-19 negatively impacted participatory research relying on human interaction and presence for generating new knowledge. Participatory research relies on engaging members of the public in research and by "being reflexive, flexible and iterative" (Cornwall & Jewkes, 1995, p. 1668). Oakley (1991) defined three facets of participation: contribution, organization, and empowerment, shifting the focus from research "about people" to research "with people". Participatory research projects focus on planning and conducting research with people whose attitudes, choices, and behaviour are under study. Consequently, this means that the aim of the inquiry and the research questions develop from the convergence of two perspectives, i.e., science and practice. In this case, both sides benefit from the research process (Bergold & Thomas, 2012).

In response to COVID-19, governments restricted face-to-face meetings that were an essential precondition for participatory research and could no longer be carried out on-site. These restrictions had an enormous impact on user research, like the analysis of user needs in the context of transport systems (c.f. König & Dreßler, 2021). In response, participatory projects had to re-think their original research methods and methodology in various ways. The research project EQUIMOB (Utrecht University, 2021), for example, postponed the planned fieldwork regarding gender effects and inequalities in mobility options in Asian countries and used telephone interviews to assess the impacts of the pandemic on mobility behaviour (EQUIMOB project team, 2020). The Children Caring on the Move project used online instead of face-to-face interviews (Children Caring on the Move, 2020).

A literature review by Hall *et al.* (2021) was one of the first studies that provided an overview of over 38 documents regarding participatory methods within the context of COVID-19. The paper reflects on the challenges of distance-based participatory research methods, e.g., ethical implications, IT literacy, and equal opportunities for engagement. Based on this reflection, the authors derived implications for future projects.

Another recent publication reflects upon stakeholder engagement in participatory marine science projects in the EU (Köpsel *et al.*, 2021). The authors describe coping strategies adopted by 30 projects and recommend seven practical actions to facilitate stakeholder engagement during the pandemic: "1) know your stakeholders (better than before), 2) strengthen existing relationships, 3) do not go 100% digital, 4) re-think your offline methods, 5) stay flexible and keep it simple, 6) apply lessons in post-pandemic engagement, and 7) account for the COVID-19 circumstances in your research results" (Köpsel *et al.*, 2021).

The CLIMAFRI project sought to reduce flood risks in Togo and Benin by integrating science-based data with insights from local stakeholders and communities. The project used virtual stakeholder workshops instead of the planned physical ones (United Nations University, 2020). Community-based participatory research by Nguyen *et al.* (2020), in the context of HIV shifted the stakeholder-led steering committee meetings from in person to remote. The EU-funded project, ART-Forum, had planned interactive workshops with experts to simulate scenarios of autonomous driving (Interreg, 2021). In addition, to facilitate dialogue and turn-taking, an online Delphi study was conducted with several iterative runs. Tobin *et al.* (2020) reflected on the methodology changes of their research on marine microplastics. They used three-hour online workshops instead of five-hour

physical workshops on site. As an adaptation to remote work, they asked the participants to watch expert videos for preparation purposes (Tobin *et al.*, 2020). Reflecting on their experiences, the authors recommended further research exploring the facilitation of online workshops, such as using breakout rooms.

Many projects relating to the effects of the COVID-19 pandemic on different aspects of life, relied on crowdsourcing to collect data. Crowdsourcing is defined by a type of participative online activity implemented by individuals or groups to collect data (Estellés-Arolas & González-Ladrón-De-Guevara, 2012). For example, the open portal coronarchiv contains personal memories, e.g., diaries, photos, or social media chats reflecting life during the coronavirus pandemic (Coronarchiv, 2020). In addition, the Corona Data Donation project has collected data like temperature and heart rate from over 500.000 volunteers' wearable fitness devices Robert Koch-Institute, 2020).

Due to the novelty of the COVID-19 pandemic and the related disruptions for our lives, empirical knowledge about the changes for participatory research are still not well researched. The literature review showed that many participatory research projects already adapted their methods as an answer to the pandemic situation. However, a reflection about these changes is still lacking. The paper thus aims to answer to the research question how methods of participatory researhc can be adapted to face the challenges of the pandemic and which shortcomings and possible advantages for participatory projects are related to these changes. For this purpose, the paper reflects upon the European research project TRIPS.

1.2 Case study – The EU-funded project TRIPS

The project developed and applied a participatory research approach to increase the accessibility of public transport for persons with disabilities. TRIPS put forward a co-design approach that underpins Mandate 473: Design for All to eliminate discrimination and improve access to mobility services for all (European Commission, 2020). The project developed and applied a participatory approach that aimed to 1) co-produce knowledge on existing barriers in transport, 2) co-create solutions for making transport more accessible, and 3) co-evaluate the resulting prototypes and services in the seven cities, i.e., Bologna, Brussels, Cagliari, Lisbon, Sofia, Stockholm, and Zagreb. The Co-design-for-All methodology creates the conditions for the equal participation of all citizens in open innovation and the development of inclusive mobility designs from their inception. In doing so, the project addressed the expected impacts of the call to help regional authorities and businesses design digital transport solutions that cater to individual needs.

The mission of the TRIPS project was to develop and prove the social value and validity of a co-design-for-all methodology that enables equal access to open innovation to all citizens, including those with disability. To this end, seven pilot case studies were planned that demonstrated the value of the approach and provided reference examples by applying it in seven European cities.

Consequently, achieving genuine participation and hands-on involvement was paramount for the project. Hence, attention to achieving and maintaining this focus, despite the complications presented by COVID-19, is a top priority for the project.

The project started in February 2020 and will end in January 2023. The first two phases are finished (see Figure 1). Phase 3 ("co-create") is ongoing and will be complete in spring 2022.

2. Reflection on participatory TRIPS methodology

2.1 Initial TRIPS methodology based on the project description

TRIPS is based on participatory case study research (Reilly, 2010). It actively involved working groups of users and representatives of the transport community in all phases of the research and innovation process, from conceptualising the study to report writing and dissemination. It is ideologically oriented and emancipation-motivated, proposing radical changes in the social processes and innovation structures that shift the balance of power in knowledge production and use for understanding and responding to users' mobility needs. TRIPS seeks to emancipate the users to play a central role throughout the innovation process, from user research to prototyping, to business case development. Ten project partners work with disabled users and transport experts in seven European cities

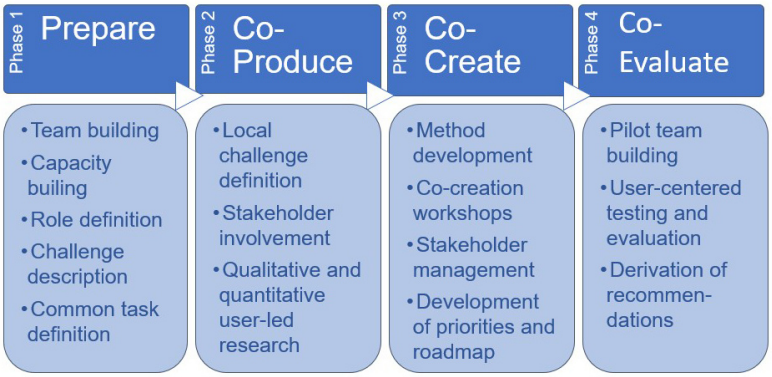

Figure 1. Original methodology of the TRIPS project.

(Bologna, Brussels, Cagliari, Lisbon, Sofia, Stockholm, and Zagreb). The project will demonstrate how people with disabilities can play a central role in designing inclusive digital mobility solutions when empowered.

As shown in Figure 1, the methodology of TRIPS consists of four phases: 1) preparation, 2) co-definition, 3) co-creation, and 4) co-evaluation. The methodological approach of TRIPS drew together diverse methods from a broad range of academic fields to support open, collaborative innovation that engages users and communities (Baldwin & von Hippel, 2011). The project extended Wright and McCarthy's (2015) notion of participatory design which stated that 'knowing the users" in their day-to-day lives involves understanding what it feels like to be that person and their situation from their perspective. First, the project identified the gaps between user needs and preferences regarding existing urban transport, future mobility trends, and institutional and cultural barriers that prevent institutional actors from meeting those needs (see Qualitative Insights report here).

2.2 Initial challenges of disabled persons participating in transport research

Although participatory research is related to various benefits for the research process and the outcomes (c.f. Jagosh *et al.*, 2012), multiple challenges also affect it (c.f. Cargo & Mercer, 2008). However, a comprehensive overview of challenges that apply specifically to participatory research projects that involve persons with disabilities is still lacking. The TRIPS consortium anticipated various challenges at proposal stage. We clustered these around five key themes:

- **Challenges of spatial accessibility**: to find accessible premises for regular meetings of working groups that are easy to reach for everyone
- **Challenges concerning digital divide**: to agree on a common communication channel, e.g., emails, among the members of the working groups, can be challenging due to the different access requirements and needs
- **Challenge of balancing individual and common interests**: to find a balance between the interest of individuals and the group as the involved groups of persons with disabilities are very heterogeneous in terms of impairments and needs
- **Challenges about role ambiguity**: to facilitate a shared understanding and agreement of roles with disabled people as the experts for their lives, yet considering that the project team does not know everything related to specific impairments
- **Challenges with scheduling**: to coordinate meting dates and times that can accommodate the daily routines of persons with disabilities and their carers and the busy working schedules and family commitments of transport experts and other institutional stakeholders.

2.3 Methodology adjustments as a reaction to the COVID-19 pandemic

One of the main aims of Participatory Design (PD) is the active involvement of all stakeholders as co-designers (Holone & Herstad, 2013). Participation can be invited but cannot be imposed as a one-size-fits-all approach (Thiollent, 2011). Participants constantly negotiate it to become relevant to their current situation in a meaningful and culturally appropriate way. The COVID-19 pandemic is a situation that demands negotiation of participatory research practices beyond physical proximity to maintain the ethos of participation.

The following section presents the aspects of the COVID situation which motivated changes of the methods employed to maintain the ethos of the initially intended study. The changes of the methods were mainly initiated by the scientists of the project team at the beginning oft he project. However, some of the adaptations of the methods were also initiated by the local working groups during the process, such as the selection of co-creation methods. Table 1 summarises the objectives of the TRIPS project and compares the original methodologies to the adapted methods that were finally used. As shown here, we drew on the personal strategies employed by people with disabilities to stay in touch remotely, be socially connected while physically distant, and pay special attention to methods where absence and delays can be considered qualities rather than problems. The table is followed by elaboration of details.

The first objective of TRIPS is to empower citizens with disabilities to participate in the research over the entire project. Initially, it was planned to establish working groups in each of the seven partner cities, consisting of 10 to 15 people with different access needs and local representatives, like transport providers. The local working groups were composed of a local user lead (LUL), who are disability activists; the core user team (CUT) comprising mostly people with disabilities themselves and institutional stakeholders, representatives of transport organisations. Typically, the LUL role and core user team members comprise people with different impairments (e.g., wheelchair users, visually impaired individuals, hearing impaired individuals, short stature persons, etc.). In partner cities, the LULsare responsible for contacting potential members of the CUT and, with the local coordinators' support, who is a scientist from the project consortium. The LUL were contacted by the project member European Network of Independent Living (ENIL) and in some cities were members of the network. The LUL and CUT were trained by the project team to conduct the methods, like for example performing an interview study. The training is described in (Vasconcelos, *et al.*, 2021).

Another project objective is to identify barriers persons with disabilities face when traveling on public transport. Initially, TRIPS intended to conduct a shadowing study in the seven partner cities to observe users taking public transport during their trips; understand their end-to-end journey challenges,

Table 1. Comparison of the original and alternative methodologies.

Objective	Originally planned methodology	Alternative or adjusted methodology
To empower disabled citizens to participate in research and development and facilitate the research amongst peers[1], their access needs, mobility requirements, and attitudes towards future mobility solutions.	Establishment of the user community and working groups, consisting of users with disabilities, transport providers, city authorities, assistive technology suppliers and other interested parties. Training of the working groups for empowering them to apply methods.	The established working groups in seven project cities held remote meetings and were trained by the project team by using virtual meetings.
To identify barriers that persons with disabilities face before, during, and after their travel with public transport	Shadowing of public transport users during their trips and subsequent questioning.	Social media content analysis performed by local user leads.
To acquire in-depth information and insights concerning the travel patterns, attitudes and opinions of people with disabilities	Face-to-face interviews by researchers	Online peer-to-peer interviews
To gauge people's attitudes towards future mobility systems	Online survey to be disseminated during conferences and workshops following a multimedia presentation of the mobility systems.	Online survey without the audio-visual presentation and support. Recruiting survey participants relied solely on word of mouth and extensive communication.
To develop a multi-dimensional metric to measure the accessibility of different public transport systems regarding travel needs, such as timing, comfort, feeling of security of people with disabilities	Focus group workshops to be held online or face to face (originally not defined) involving stakeholders' representatives	Focus group workshops implemented online and supplemented by an online survey.
To review mobility solutions together with stakeholders and co-develop design concepts for future mobility solutions that are equally accessible, intuitive, and friendly to all users.	In-situ innovation workshops in Brussels	Online interactive co-design workshops of people with disabilities delivered in their native languages, for the seven cities.
To discuss the institutional barriers to the appropriation and implementation of suggested technologies and discuss potential solutions.	In-situ workshops in seven cities with local stakeholders	Online interactive co-production workshops as flexible units with stakeholders delivered in native languages for the seven cities.
To co-create collaborative methods with the seven groups of persons with disabilities working in the project.	A string of in-person activities allowed the methodological approach to be designed in short bursts of engagement.	A long series of regular 1:1 sessions which used a combination of qualitative research methods.
To deploy the collaborative methods as peer-to-peer activities in each of the seven cities in the project.	Peer-to-peer in-person activities within the whole group or only parts of it	Peer-to-peer online activities with one to three whole-group workshops
To generate knowledge, ideas, and concepts for improving the mobility of people with disabilities through collaborations between people, technology, and society.	Research through design by different methods like workshopping and sketching	Use of predesigned kits, including artifacts, maps, or photographs, to facilitate remote co-creation and creatively share concerns and knowledge using virtual ways of sketching.

[1] With the term ‚peers' people that also face disabilities are mentioned but who are not members of the project.

and explore the criteria affecting their transport-related decisions. Unfortunately, given the partially discontinued public transport service when the shadowing study should have taken place and the high risk of infections when using public transport, the shadowing study could not be conducted. Instead, the team pursued a social media content analysis to retrospectively identify barriers to public transport use. Social media content analysis utilises user-generated social media data as a barometer for attitudes regarding specific topics (Lai & To, 2015). In the context of TRIPS, the social media content analysis provided insights into the discussion regarding public transport use in each city.

Another TRIPS objective is to acquire in-depth information and insights concerning the travel patterns, attitudes, and opinions of people with disabilities. For this purpose, a qualitative interview study is initially planned to be conducted face-to-face. Instead, the interview study was conducted online using videoconference systems due to the social distancing measures. Each LUL interviewed seven persons from their cities in their native tongue. See Alčiauskaitė *et al.* (2020) for more information.

A survey sought to gauge people's attitudes towards future mobility systems. The survey was conducted online as planned; however, its dissemination approach shifted to using conferences, workshops, and webinars to present the mobility systems vividly. The consortium had originally planned an online questionnaire to collect data via online voting during conferences and workshops organised around punctuated events, such as the International Disability Day on December 3, and via TRIPS working group members during their interactions with other disabled citizens during local meetings. The idea was for partners and working group members to participate in various local events, present a multimedia presentation of the mobility systems allowing users to ask questions to understand the mobility concept presented, and then answer several questions regarding their intention to use it, the value of such systems and possible ways they would adapt it to fit their lifestyle better. Unfortunately, the survey was conducted without audio-visual presentation and support due to on-site conferences and workshops being cancelled. Therefore, the recruitment of participants had to rely solely on word of mouth and extensive dissemination (Alčiauskaitė *et al.*, 2020).

One of the main objectives of TRIPS is to develop a multi-dimensional metric to measure the accessibility of different public transport systems, the so-called Mobility Divide Index (MDI, Bagnasco *et al.*, 2021). To determine the index structure, investigate and prioritize the main dimensions that could influence people with disabilities' travel experience, two workshops were planned and organized online, recruiting the TRIPS local working groups. In addition, an online survey, not initially anticipated, was conducted to assess and weight the identified dimensions of the MDI from a user perspective (N = 113).

In-situ workshops in Brussels were planned to co-create concepts of future mobility solutions that help overcome existing barriers. Instead, the consortium conducted online, interactive, co-design workshops with people with disabilities in their native languages in seven cities (Hoogerwerf *et al.*, 2021).

Five workshops with stakeholders were initially planned in Brussels over two days adjacent to a yearly accessibility conference. The aim is to discuss the institutional barriers to the suggested solutions and identify facilitators and barriers to their implementation. However, the capabilities of local teams and their facilitators varied. In some cases, users' level of impairments dictated their endurance in holding long meetings. Hence, we adapted the final research design to meet their needs. As a result, we planned the workshops in modules that facilitators could combine to adjust the length of each workshop. As a result, we held, organised, and coordinated more workshops. In particular, we conducted thirteen online workshops with 100 participants over two months (Hoogerwerf *et al.*, 2021).

TRIPS also sought to devise a co-design methodology for all, with accessibility principles of engagement and a strong stance on access, participation, and ownership. The methodological foundations TRIPS built upon were the physical presence and face-to-face modes of inquiry, yet, people with disabilities have always faced additional barriers to physical mobility that would allow for this to happen (e.g., Wilson, 2003). COVID-19 also challenged access to public transport for full participation in society and independent living to the fore as TRIPS tried to maintain its intended spirit and participatory ethos.

The co-design methodology development was conducted entirely via participatory online workshops and iterative, action research. It encompasses collaborative planning and execution of tasks, then reflection sessions for critical reflection and adjustment. This work started with defining a theoretical foundation for participatory inquiry in the context of the current limitations imposed by the pandemic. This established the stage for what constitutes the primary ongoing process of the TRIPS methodology: to co-create collaborative methods with the seven CUTs of persons with disabilities working in the project. During this process, each LUL and LC created localized versions of the methods online and deployed peer-to-peer online activities in each city. Deployment took place during March to May 2021 in each city. Workgroups engaged in a series of activities to formalize their unique identity and their vision for what they wanted to achieve within the duration of TRIPS.

To make up for the loss of in-person activities, we engaged each group in a string of conversations to anchor the methodologies into strongly-held local concerns and to guarantee that the processes remained within our understanding of co-design and co-production, despite the apparent limitations of online work. This work unfolded as a long series of regular one-on-one sessions. We used a combination of qualitative research methods: semi-structured interviews, open-ended activities, writing exercises, surveys, offline activities, etc. Our focus was to create a dynamic working rhythm and generating mechanisms to allow for heterogeneous interests and in-depth understandings to come forward. From October 2020 to May 2021, each city was involved in 10 to 16 one-to-one sessions, one to three whole group workshops, two to four offline activities. We regularly had two to four participants in the one-to-one sessions, and the workshops were open to the entirely local team (CUT) in each city. Although the number of activities varied, as in this work, we recognize that not all cities arrive at this process on the same footing. Their needs, preferences, and challenges are unique and contingent on their local contexts and therefore require ways of working that emerge from within each

of the groups involved. Specifically, some cities require more regular meetings with the project team and closer monitoring, whereas others practice a more independent working style.

This approach allowed us to tailor each interaction to local and personal preferences. Of course, not everyone had the same experience, but we worked towards shared understandings and convergence through various interactions and strategies. In practice, this work was done using the following techniques:

- **Workshopping**: We aimed to create an experience where individual narratives coexist with complex understandings of collective knowledge, leading to a great diversity in outcomes.

- **Brainstorming**: Brainstorming allows for a broad range of knowledge to manifest, be shared, and co-created. This has a dual effect on user involvement: it generates possibilities and equally improves the social dynamics of exchange as a basis for shared meaning.

- **Sketching**: Through sketching, we aimed to explore notions of collaborative visual thinking, in which non-verbal techniques like drawing are used to represent unified action (Figure 2). Live and online sketching was performed by a professional designer to visualize the work progress and record results.

- **Interviews**: Interviews elicit individual knowledge and narratives. We sought to use them as open engagements where personal stories guide participants and interviewers in the narration of lived experience.

3. Discussion

3.1 Reflection on the participatory methodology adaptation in TRIPS

The applied method's effectiveness, feasibility, and goal-reaching capacity are reflected upon below. In doing so, the pros and cons of each method are discussed.

Empowerment of citizens and building of working groups. In the TRIPS project, users with disabilities take a central role in the co-design process, not only as passive observers and reviewers, but as the individuals initiating the changes and proposals for future mobility solutions. However, building and maintaining relationships remotely has been a very challenging task. The COVID-19 pandemic-adjusted methodology required strong leadership skills from all LULs. They recruited and established the local working groups and implemented the co-design in their city. They all reported facing the following challenges: (a) not all people with disabilities are comfortable using digital technologies; (b) approaching transport providers or city authorities online was complicated; (c) virtual meetings seemed less attractive than offline ones. On the other hand, virtual meetings allowed them to be more flexible with arranging the meetings, making them easily accessible to more people and reducing logistical effort and cost. It should be emphasized that the training of disabled citizens as co-researchers was facilitated by online formats, because the recording of training sessions, e.g., how to use a digital sharepoint and teamsites, allowed them to study the material in their own pace after the training. Furthermore, content was translated and subtitled live with the help of programs, which increased accessibility for specific groups of sensory-impaired

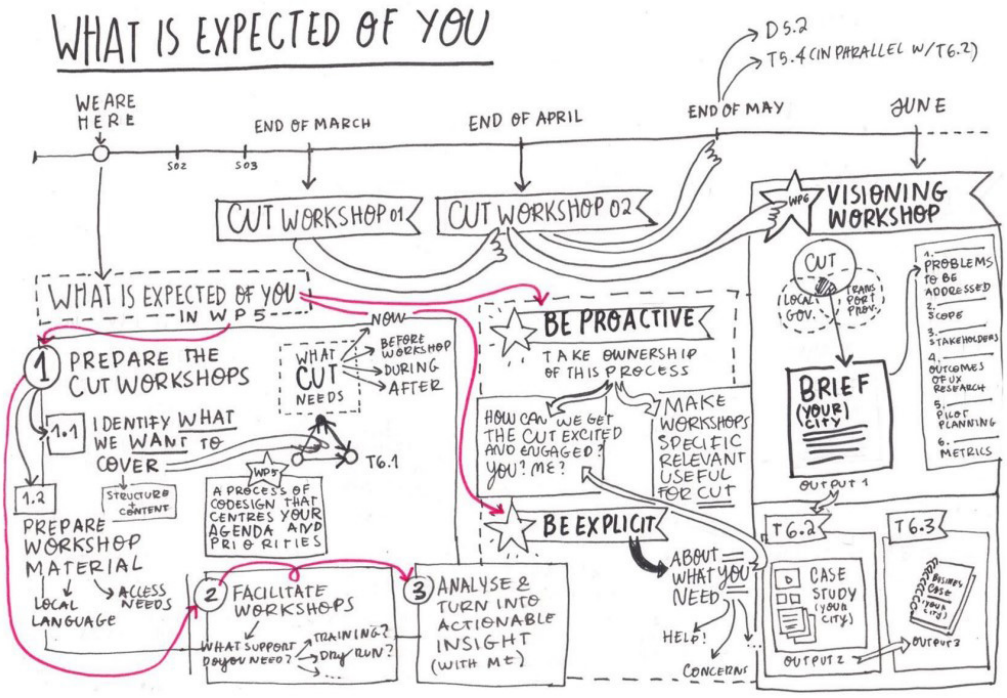

Figure 2. Exemplary sketch used in a workshop.

people. In addition, having more frequent online meetings than planned for physical meetings, helped to face the challenge to create and maintain interpersonal relationships as empasized in the literature review by Hall *et al.* (2021).

Peer-to-peer interviews. Conducting the interview study online using a peer-to-peer approach had various advantages and disadvantages. One of the prevailing advantages was the familiarity and intimacy created by the peer-to-peer interview setting, as reported in earlier studies in facilitating critical inquiry (Peck *et al.*, 2021; Schmidt, 2017). Presumably, the familiar and trustful atmosphere enabled a greater openness from interview partners and correspondingly more in-depth information. Conducting the interviews in the native language was another advantage of the method changes. Using online and distance formats increased accessibility of specific groups of people with disabilities with severly restricted mobility or who are particulary afraid of an infection with the coronavirus. The cons of online interview studies are sampling issues due to the level of access to and competency in using digital systems (Duffy *et al.*, 2005). These negatively impacted the TRIPS' interview study. It was difficult for LULs to identify, select and recruit disabled interviewers with access to and sufficient competency in using digital tools, like videoconference programs.

Social media content analysis. As outlined in other studies regarding participatory approaches in times of COVID-19, the use and analysis of secondary data, such as media content, may be an appropiate alternative for fieldwork (Adom *et al.*, 2020; Jowett, 2020). The social media content analysis revealed itself as a method that produced many insights into the thoughts and attitudes of persons with disabilities regarding their daily mobility challenges (see Alčiauskaitė *et al.*, 2020). However, conducting the study was somehow challenging, as the method was new to the project team and the LULs conducting the research. Detailed instructions in the form of a step-to-step manual were essential for guiding the procedure and were thus developed by the project team. Some of the LULs who conducted the social media search faced difficulties reaching the minimum number of 30 social media entries, whereas others achieved the limit more rapidly. This implies that in addition to the number of social media posts per city, the ability of people to search online, access the websites, and use appropriate search terms also differed. Furthermore, not all LULs were familiar with social media and had access to all relevant platforms. Thus, accounts were created to enter the social media platforms. Another challenge arises when reflecting the method in terms of inclusiveness for specific groups of disabled users. In detail, it must be assumed that some groups of disabled users, among them especially people with cognitive and intellectual impairments, are not fully represented in social media content analysis, because they are less likely to have access to the internet and thus social media (Chadwick *et al.*, 2013). To conclude, the social media content analysis proved to be a valuable and feasible method to identify mobility barriers discussed in a specific geographic context. However, the social media content research quality strongly depended on the people's digital skills conducting the investigation. Thus, people conducting the study should be knowledgeable in/trained to use different social media platforms and select appropriate search terms. Furthermore, limitations with regard to the representativeness of specific groups of disabled users should be considered.

Virtual co-design workshops. The adaptation of the co-design process to online activity required pilot co-design workshops to test the suitability of digital tools and the planned methodologies. Thus, a pilot workshop was conducted for each co-design session format (creating mobility solutions and identifying institutional barriers). The pilot workshops aimed to train the seven co-design workshop facilitators, who were often people with disabilities, mostly without many experiences in organizing and conducting workshops. After the training, the local facilitators conducted the workshops with participants mainly from their cities (Bologna, Brussels, Cagliari, Lisbon, Stockholm, Sofia, and Zagreb). The pilot training workshops were beneficial, as their evaluations revealed several recommendations for the workshops in the seven cities:

- The aims and purposes of the workshops should be clear from the start
- A guide for the local facilitators to explain how to deliver the workshop would be beneficial
- The material (hand-outs and worksheets) should be shared beforehand to allow the participants to familiarise themselves with the content
- Additional guidance for facilitators as footnotes would help in the delivery
- Pictures/figures should be verbally explained to increase accessibility for visually impaired users
- The content on the presentation slides should be reduced
- The time allocated should be adapted to allow more time for discussion of innovative concepts
- Relate the exercises to each other and the bigger picture and spend enough time to present the aim of the workshop
- If possible, during the exercises, display a timer counting down the available time
- During the exercises, repeat the question/task every two minutes or give an additional prompt
- Break-out rooms are essential for facilitating discussions in smaller groups
- Virtual warm-ups are necessary to replace face-to-face small talk
- After each exercise, allow time for participants to share their answers to make it more interactive

- Remind people periodically to state their name when starting to speak
- Remind speakers to speak slowly and clearly to facilitate live captioning for people with hearing impairments

As a result of the feedback in the pilot workshops, several actions were taken. For instance, all content was made accessible according to best practice guidelines, like the Accessible Online Event Toolkit of the European Disability Forum. Furthermore, the TRIPS consortium revised content to streamline running time and enhance productivity. In addition, a guide for facilitators was produced, alongside delivery notes in the slide deck to facilitate the local workshops. Furthermore, local facilitators paired up with a project team member, which helped them prepare the workshops and provided feedback and support.

Even though a pilot online training workshop was conducted in both workshop formats, the local workshops encountered several challenges. First, the importance of preparing the grounds for a shared understanding beforehand was emphasized. For example, the participants requested that mobility concepts be introduced in the briefing document to reflect upon them and facilitate creativity during the workshop. Second, facilitators asked for support to administer online tasks, such as sharing the PowerPoint presentation. Finally, participants mentioned that compared to *in-situ* workshops, the required level of interaction and focus was more intense. These were due to levels of eyestrain, discomfort, and attention to more detail. Therefore, expectations regarding concentration levels, physical endurance, and productivity should be adjusted for online settings in future research. Accordingly, enough breaks should be planned. These recommendations might help to overcome the challenge described by Woodward *et al.* (2020), that people with visual or hearing difficulties may struggle to engage fully in online discussions.

Online survey. COVID-19 deprived us of the interpersonal interaction preceding the survey as all physical events, conferences and workshops were canceled; even some online events were postponed. The survey was thus disseminated using social media channels and specific groups for people with disabilities. To ensure that the survey was clearly understood, we designed the questionnaire in consultation with the leaders of the TRIPS working teams. We pilot-tested the translated versions with the members of our working groups.

Online focus group workshops. The project LULs performed two online focus group workshops to achieve the project objective of investigating and prioritizing the main variables influencing persons with disabilities during their daily travels on public transport. These variables would constitute the core structure of our Mobility Divide Index (MDI).

Since the target audience was people with different impairments, we had to prepare the material in advance, using simple words and applying easy-read techniques to make presentations accessible for all, especially for people with reduced vision.

The size of focus groups is generally recommended to be between seven and ten participants. However, considering the topics' complexity and the heterogenity of disabilities of participants, after a preliminary introduction and discussion with all participants, we divided them into three focus groups (i.e., three concurrent breakout rooms) of three to four people. Each group was tasked with reflecting on a limited set of aspects of their daily journeys on public transport. This choice allowed us to manage the online sessions better and derive more insights. This recommendation is in line with the finding of Tobin *et al.* (2020) who recommended breakout rooms for smaller group discussions.

Since online focus group workshops can be conducted anytime and anywhere, sessions must have a limited duration to avoid participants getting bored and distracted. Therefore, we planned sessions of two hours each. We narrowed the discussion guide to a few key topics to respect the scheduled time slot. This influenced our study: while we carried out a deep investigation of the main issues that affect the mobility routines of people with disabilities, we did not thoroughly examine the prioritization of these issues. We took the opportunity to launch an online survey to collect views on the importance of different MDI variables for persons with disabilities agreed during online focus groups. We disseminated it online via ENIL channels. In addition, we contacted disability NGOs representing persons with disabilities. The latter required a significant commitment from the members of the respective organizations and resulted in a more extended data collection period to reach a substantial number of respondents.

Software adaptations. Instead of meeting physically, videoconference systems were used to meet within the project team, the project team with the CUT and the seven CUT among themselves, in what became a longer one-to-one process for specifying and establishing specific local challenges and work methods. These online tools generated advantages, e.g., it was easier to stay in touch without traveling, which is challenging especially for disabled people, and disadvantages, e.g., it became clear that creating engaging activities was much more complicated, and the potential for misalignment was higher. In addition, these online interfaces came with their accessibility issues, which influenced the outcomes in part (e.g., group work and in-depth discussions were made more difficult in those circumstances) and forced us to work in much smaller groups.

To communicate the practical software setup, the groups needed to participate in an online session, and we, therefore, created an access needs protocol. This protocol was intended to be used for all project-related work and any other activities that a group is invited to attend, e.g., a meeting with the city council. To create this protocol, we followed Sandra Lange's 'Access Rider Exercise', prompting each group to articulate what they would need, both individually and as a group, to

engage in online activities (Lange, 2020) fully. The access needs protocol was meant to be used for each group to create and occupy a shared online space while shaping their interaction conditions in that space.

Moving to a digital working space also required a greater need for establishing online collaborative working processes that catered for varying levels of digital skills of people with disabilities. Each city required different levels of support and tended to elicit unique working dynamics. This digital setup did not reflect how most groups involved in the project typically work, e.g., having a shared folder with up-to-date documents was a surprisingly challenging task. The impetus for having online documents has come not only as a means to produce deliverables (EC project reports) but also as the only way to document and share knowledge between the CUTs and the partners involved in the project. In other words, the TRIPS project worked digitally, but we need to pay continuous attention to guaranteeing that these online spaces are truly shared environments. To convice and train people with different access needs to use the same online work tools, like sharepoints, was challenging. Ultimately, creating efficient and productive online working methods in a multiple-partner project requires a significant amount of effort and ongoing attention.

To conclude, the reflection of the adaptions of the methodology due tot he COVID-19 pandemic, revealed several challenges for participatory research with people with disabilities.

3.2 Reflection on the initial challenges and the actual challenges faced in participatory research with persons with disabilities

During the proposal writing and planning of the TRIPS project, various considerations were identified to facilitate the participation of disabled persons in our collaborative processes. As a result of the adaptation of the methodology due to the pandemic situation, the challenges faced in the project changed.

The initially identified challenges of spatial accessibility were addressed by not meeting in person, rather meeting virtually. Finding a way to adapt the methods to online meetings facilitates the participation of people that would have otherwise not been able or hard to attend physical meetings. To make up for the loss of participatory workshops in person, TRIPS used a string of 1:1 conversations to anchor the methodologies into firmly held local concerns and guarantee that the processes remain within our understanding of co-design and co-production, despite the apparent limitations of online work.

Concerning the challenges of the digital divide, we found that actual challenges were higher than anticipated for the virtual participatory work. The required digital literacy for participation was higher than anticipated before because the physical meetings would not have required digital skills. In using digital tools for collaborative work, e.g., Google docs, the CUT find it difficult to learn how to use those tools. As more documents started emerging, we were also faced with the practical difficulties of creating and maintaining collaborative processes online - keeping documents in shared folders up to date was surprisingly hard to task and required ongoing upkeep and management. Furthermore, the video conference tools used allowed for live captioning and translating of the content, thus improving the accessibility of the meetings.

Regarding balancing individual and common interests, the project faced the same challenges when adjusting the methods. Thus, no statement can be made whether the adapted methods impacted this challenge.

With respect to role ambiguity, we observed some differences compared to the anticipated challenges. For example, the training of co-trainers that implemented the methods, like co-creation workshops in their local groups, was facilitated by the more frequently virtual meetings. Furthermore, our reflection supports the hypothesis of Marzi (2020) a lack of control due to using online formats and digital tools also provides a means to equalize power-relationships between researcher and disabled participant and thus ensure equity.

Online meetings were more manageable in some respects. We did not have to consider the accessibility of venues and traveling to them and could be more spontaneous in our planning. Coordinating meeting times that fit the different daily routines of disabled people and the carers, on the one hand, and the working and family obligations of transport experts on the other were more manageable. Conducting fieldwork as a long series of regular 1:1 sessions allowed us to capture heterogeneous interests and in-depth understandings, allowing deeper rapport with CUT members. Closer collaboration between the CUT and the project team was possible because traveling was no mandatory requirement to meet.

Of course, conducting participatory activities online brought unique and unanticipated challenges and created other conducive forms of involving disabled people. Whereas in some cities, we found that the groups could adapt the imposition to work online to their advantage, we also observed the setbacks in aligning and keeping motivation up. In hindsight, using a combination of online and offline methods can create added value and facilitate participatory research. Although, we put this forward speculatively informed by the current experiences of running hybrid online-offline programmes and the unique challenges they bring with them.

3.3 Lessons learned and recommendations

Several lessons can be derived from the assessment of the applied methods. The following eight practical recommendations guide future participatory research projects that face challenges in conducting research *in-situ*.

The need for piloting new methodologies: Have a pilot of online workshops with “real” participants to facilitate the adoption of the method. We found it was worth the time. By piloting the online workshops, we identified several pitfalls, e.g., non-accessible technologies, that were then adressed before the actual workshops. By engaging disabled users in the online planning and preparation meetings is helpful for adapting the methods to the specific needs of people. Also, piloting and

training sessions should be recorded to allow disabled users, who are trained to conduct the workshops later on, to study the material in their own pace afterwards.

Absence as a feature: Try to value the other side of the impeded cooperation on-site. There are also potential advantages to distance and online formats, such as increased time for reflection, broader participation, and improved attention due to the sharing of documents and the joint and simultaneous processing of documents and tasks. Working with shared online documents facilitates disabled project partners to work at documents and tasks in their own pace.

Mixed presence: Be open to experimenting with new ways of being together at a distance. Mixed presence, which combines distributed and collocated collaboration, might create meaningful exchanges when prepared carefully. Mixed presence might also facilitate opportunities to empower people with disabilities through choosing appropiate formats for knowledge and capacity building.

Personalised and localised: These new ways of working together will allow us to tailor each interaction to local and personal preferences and specific circumstances, like local equality regulations. This also means that a shared understanding and convergence through various interactions and strategies must be facilitated. Adapted online methods allow for more frequent contact and thus a closer cooperation between researchers and disabled people as well as disabled people among each other.

Advantages and disadvantages for equity issues: On the one hand, virtual participatory methods such as online workshops expand the reach of the research and thus facilitate the participation of vulnerable-to-exclusion citizens who would otherwise have not participated in *in-situ* workshops, like people living in the suburbs or rural areas or people challenged to leave their homes without the help of others. On the other hand, virtual implementation of participatory methods excludes other groups, such as persons with low digital literacy. It should be considered that by using online formats some groups of disabled users, such as people with severe cognitive or mental impairments are mostly excluded.

Stay connected: It is important to stay connected with the participants after virtual workshops for further inquiries. Virtual communication methods, such as e-mails, can be used to ask participants to evaluate the method and additional suggestions. Thereby, follow-ups/subsequent ideas can be included in the process and continuous participation facilitated. One-to-one online meetings can help to increase motivation of honorary project partners in the research process and to adapt the methods and formats to the individuals‘ needs.

Online methods require more focus as they are highly demanding for participants' attention: Conducting creative workshops online instead of on-site requires more focus and smaller-scale formats, like meetings and workshops, as maintaining attention in online settings is challenging. Thus, people with disabilities should not be overloaded with information in online formats. It is thus recommended to plan more but shorter and less dense online workshops.

Stay flexible: Participatory approaches are inherently flexible and need continuous adaptations. Beyond that, ever-evolving situations, like a pandemic, require dynamic adaptations of research scopes and methodologies, as also recommended before fort he reflection of stakeholder engagement during COVID-19 by Köpsel *et al.* (2021) Maintaining flexibility while accepting limitations can ensure the quality of the process. In this way, the specific requirements of people with disabilities can be considered that might not be known from the start of the project.

To summarize, the assessment of the methodological changes and adaptions during the TRIPS project showed us that there are many opportunities to deal with challenging situations. Therefore, we should not only perceive disadvantages but also value opportunities.

3.4 Next steps and further work

The reflection on the methodological adaptations for the TRIPS projects as a reaction to the COVID-19 pandemic leaves several unanswered research questions that need to be further considered in research and practice. First, that participatory approaches rely on trust, continuous rapport, and exchange, an emerging research question deals with the issue of facilitating trust-building, and a collaborative working spirit and productive atmosphere in the light of social distancing. What are possible ways to foster a trustworthy working atmosphere with digital and non-digital methods? How do we replace valuable small talk and networking during workshop breaks of workshops and events when they are conducted online? How do we give local teams a sense of ownership? How can there be a structure that nurtures ownership and governance of working teams?

Further research should also address how virtual methods should be adjusted to the needs of different users. Furthermore, from the perspective of inclusivity, it seems worthwhile to find ways to implement easy-to-read material in virtual conferences and workshops.

Before the pandemic, projects were implementing participatory research methods for remote work when it was difficult or impossible to work with participants in a co-located context. Exemplary methods are cultural probes (Gaver *et al.,* 1999). These methods should be considered in light of the COVID-19 pandemic.

The TRIPS project will continue to implement methods of participatory research. The next step of the project will be the engagement of local users and institutional actors in 1) co-creating prototypes of future mobility solutions, 2) organising user testing of the prototypes and evaluation of the co-creation process, 3) developing the prototypes into local pilot demonstrators, 4) organising local user testing of local pilot demonstrators, 5) conducting business analysis of the local transport ecosystem and 6) developing the business case for the full-scale deployment of the local pilot demonstrators.The project will

also enagge people with disabilities, public transport operators, and institutional actors in developing and validating policy recommendations, research priorities, and an industry roadmap for the mobility sector. Specifically, the TRIPS project consortium will validate the described design concepts and preferences as well as the derived policy recommendations, industry roadmap and research priorities with users and institutional actors from the seven cities.

4. Conclusions

The reflections on the adaptations of the participatory research methodology for the TRIPS project will help researchers and scholars to be more prepared for conducting participatory research during the ongoing and future pandemic. Keeping in mind that the adjustments caused by COVID-19-related restrictions are going to persist and be used to some extent in the future (e.g., more people are working from home, online workshops replacing face-to-face workshops, Thombre & Agarwal, 2021), researchers need to adapt their research design to the existing situation and turn the limitations into opportunities. This paper contributes to a better understanding of the functioning of remote participation and which of its aspects could be implemented in the future. Moreover, reflecting on the methodology changes showed that opportunities to deal with the new situation are manifold, and participatory research should not consider disadvantages but value the derived options. The reflection oft he case study showed ways for online formats to help „[…] to move beyond the rhetoric of "participation" toward more meaningful, holistic inclusion of people with disabilities into research and design" (Monteleone, 2018, p. 137) To conclude, the methodology reflection for the case study of the TRIPS project provides lessons learned from implementing research during the COVID-19 pandemic but also for other possible future changes and challenges.

Consent

Written informed consent for publication of the participants details and/or their images was obtained from the participants// parents/guardian/relative of the participant

Data availability

Underlying data

No data are associated with this article.

Extended data

Zenodo: Research material TRIPS, https://doi.org/10.5281/zenodo.5752461 (König, 2021)

This project contains the following extended data:

- Guideline_briefing document_ media content analysis.docx (Guidelines for conducting the social media content analysis for the CUT, comprising a detailed description of the steps to perform the task)
- Interview guidelines.docx (Guidelines for conducting the peer-to-peer interview study containing semi-structured interview questions and instructions for the interviewer)
- TRIPS Workshop Design.docx (Short description of the workshop design for the co-design workshops)
- TRIPS_ Guidance document for Co-Design Workshops.docx (Guidance document for the co-design workshops, including detailed instructions for the recruiting of participants, structure, and tasks of the workshop, accessibility requirements, and technical instructions)

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).

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The authors adequately addressed our comments and recommendations, and revised the manuscript accordingly. Along with the changes according to the other reviewer's comments, the article's quality has improved and the work of the authors is presented in a more pertaining way.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Intelligent Transport Systems, electromobility, smart mobility concepts, MaaS, autonomous, connected and integrated mobility, CCAM, C-ITS, 5G applications for mobility, logistics, citizen observatories, etc.

We confirm that we have read this submission and believe that we have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

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Dear Authors,

I was delighted to see how thoroughly you responded to my review comments and would like to see the manuscript published in its updated version.

Personally, I am especially happy to learn more about the challenge of working with disabled stakeholders.

Warm regards
Vera Köpsel

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Stakeholder engagement in EU projects and transdisciplinary research; coordination of stakeholder engagement; online and offline engagement methods; challenges of stakeholder engagement during COVID-19; human geography; social scientific methods

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 20 January 2022

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Angelos J. Amditis
Institute of Communication and Computer Systems (ICCS), National Technical University of Athens, Athens, Greece
Christina Anagnostopoulou
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The article's first section provides a good summary of the challenges for participatory research in relation to the COVID-19 pandemic, and several adaptations as were decided by several projects. The presentation of TRIPS is well described in terms of overall project objectives and goals, having the aim to develop and apply a participatory approach that aimed to increase the accessibility of public transport for persons with disabilities, by 1) co-produce knowledge on existing barriers in

transport, 2) co-create solutions for making transport more accessible, and 3) co-evaluate the resulting prototypes and services in seven cities. Literature review and sources are extensive and sufficiently provided to cover the information presented.

First of all, I find the article lacking in terms of well defining the overall challenges of the endeavor that has to do with accessing, collaborating, and retrieving knowledge from people with disabilities from different countries that have different regulations and levels of penetration for smart or new mobility concepts. So all in all, a different reality for accessibility in transport. Thus, despite the extra restrictions caused by the pandemic, I could see similar issues being faced in the originally planned methodology. So in the end, these are not matters that are deriving necessarily from the conditions of the pandemic, but rather from the core of the project target that is to involve people with several disabilities and backgrounds. For example, the change from one f2f workshop in Brussels to several virtual co-design workshops worked positively to the quality of the results and facilitated the process in the end, although yes some people were not familiar with digital means or pilot workshops were needed to train the local organizers. I would imagine organizing one physical workshop instead would have neither provided a comfortable situation for disabled people nor would it have made it any easier for the work of the researchers themselves to communicate the message. So even results in a less enabling situation.

The authors do not specifically explain what were the risks or challenges that they had predicted in their original methodology. Since from the start the target group of the study is disabled people and this factor itself introduces challenges on its own. The pandemic has driven the change to the original methodology and led to shifting a lot of activities online/remotely or even changing the activity itself. Although the modified new methodology added extra challenges, it seemed in some cases that it acted positively and succeeded in solving some issues – that possibly could have been there from the beginning. Thus, in the end, it could be argued that for said target group, specific already designed approaches when shifted to online surveys or virtual workshops with given guidelines and explanatory framework, can really create added value and facilitate research. This could result in recommending such approaches and even having them adopted as effective methods for participatory research or used complementarily for the target group, regardless of cases that impose restrictions. This comparison between the challenges faced when targeting disabled people against the challenges faced when targeting disabled people with the restrictions imposed by the pandemic is not clear, and this is a shortcoming. The comparison could have shown that despite this change being imposed by the pandemic in the end, the new method can help anyway and create better terms for such work even without imposed restrictions. The argument is that it seemed in their modified approach that the remote or virtual activities created a better environment for the group, contradicting their original plan.

This would be a distinction that would make the recommendations of this work really valuable to the reader, while now the overall feeling for the lessons learned and recommendations part remain generic and not so impactful.

I would suggest to generally edit the paper in order to use less repetitive and generic language throughout the sections - be more targeted in the descriptions - retouch upon the syntax and grammar, highlight what are the initial challenges and risks in participatory research targeting disabled people and transport, how are these issues being changed by the restrictions imposed for meeting in person, and how the new approaches and the lessons learned while enforcing them enhanced the work or even provided better results and should anyhow be considered for

participatory research methods when dealing with disabled people.

Is the background of the case's history and progression described in sufficient detail?
Yes

Is the work clearly and accurately presented and does it cite the current literature?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
No source data required

Are the conclusions drawn adequately supported by the results?
Yes

Is the case presented with sufficient detail to be useful for teaching or other practitioners?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Intelligent Transport Systems, electromobility, smart mobility concepts, MaaS, autonomous, connected and integrated mobility, CCAM, C-ITS, 5G applications for mobility, logistics, citizen observatories, etc.

We confirm that we have read this submission and believe that we have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however we have significant reservations, as outlined above.

Author Response 14 Mar 2022

Alexandra König

The article's first section provides a good summary of the challenges for participatory research in relation to the COVID-19 pandemic, and several adaptations as were decided by several projects. The presentation of TRIPS is well described in terms of overall project objectives and goals, having the aim to develop and apply a participatory approach that aimed to increase the accessibility of public transport for persons with disabilities, by 1) co-produce knowledge on existing barriers in transport, 2) co-create solutions for making transport more accessible, and 3) co-evaluate the resulting prototypes and services in seven cities. Literature review and sources are extensive and sufficiently provided to cover the information presented.

First of all, I find the article lacking in terms of well defining the overall challenges of the endeavor that has to do with accessing, collaborating, and retrieving knowledge from people with disabilities from different countries that have different regulations and levels of penetration for smart or new mobility concepts. So all in all, a different reality for accessibility in transport.

Thus, despite the extra restrictions caused by the pandemic, I could see similar issues being faced in the originally planned methodology. So in the end, these are not matters that are deriving necessarily from the conditions of the pandemic, but rather from the core of the project target that is to involve people with several disabilities and backgrounds. For example, the change from one f2f workshop in Brussels to several virtual co-design workshops worked positively to the quality of the results and facilitated the process in the end, although yes some people were not familiar with digital means or pilot workshops were needed to train the local organizers. I would imagine organizing one physical workshop instead would have neither provided a comfortable situation for disabled people nor would it have made it any easier for the work of the researchers themselves to communicate the message. So even results in a less enabling situation.

We appreciate your comment on the differentiation between the general challenges of participatory research in the context of transport and the additional challenges due to the coronavirus pandemic and the related adaptations of methods. We added a section to this topic at the beginning of the manuscript. We tried to clarify that the aim of the paper is to show how the pandemic situation affected the methods and results of the participatory research. Thus, a more general reflection on participatory transport research is not in the scope of the paper.

The authors do not specifically explain what were the risks or challenges that they had predicted in their original methodology. Since from the start the target group of the study is disabled people and this factor itself introduces challenges on its own. The pandemic has driven the change to the original methodology and led to shifting a lot of activities online/remotely or even changing the activity itself. Although the modified new methodology added extra challenges, it seemed in some cases that it acted positively and succeeded in solving some issues – that possibly could have been there from the beginning. Thus, in the end, it could be argued that for said target group, specific already designed approaches when shifted to online surveys or virtual workshops with given guidelines and explanatory framework, can really create added value and facilitate research. This could result in recommending such approaches and even having them adopted as effective methods for participatory research or used complementarily for the target group, regardless of cases that impose restrictions. This comparison between the challenges faced when targeting disabled people against the challenges faced when targeting disabled people with the restrictions imposed by the pandemic is not clear, and this is a shortcoming. The comparison could have shown that despite this change being imposed by the pandemic in the end, the new method can help anyway and create better terms for such work even without imposed restrictions. The argument is that it seemed in their modified approach that the remote or virtual activities created a better environment for the group, contradicting their original plan.

This would be a distinction that would make the recommendations of this work really valuable to the reader, while now the overall feeling for the lessons learned and recommendations part remain generic and not so impactful.

According to your suggestion, we added a new section titled "2.2 Initial challenges of disabled persons participating in transport research“. This section includes the challenges that we predicted in the planning phase of the project with regard to the involvement of people with disabilities in transport research. We also added another section at the end of the paper (3.2 Reflection on the initial challenges and the actual challenges faced in

participatory research with persons with disabilities) to compare the initial challenges to the actual challenges when conducting the research, as you recommended. We think this suggestion improved the paper's focus.

I would suggest to generally edit the paper in order to use less repetitive and generic language throughout the sections - be more targeted in the descriptions - retouch upon the syntax and grammar, highlight what are the initial challenges and risks in participatory research targeting disabled people and transport, how are these issues being changed by the restrictions imposed for meeting in person, and how the new approaches and the lessons learned while enforcing them enhanced the work or even provided better results and should anyhow be considered for participatory research methods when dealing with disabled people.

According to your remarks, we revised the paper and conducted English editing. We also tried to focus our paper more on the specific group of people with disabilities. In line with the suggestions from the other reviewer, we also worked on the discussion section and revised the recommendations in a way that our reflection results are linked to the state of the art and focussed more on the topic of engaging people with disabilities in participatory research in times of the COVID-19 pandemic.

Competing Interests: No competing interests were disclosed.

Reviewer Report 22 December 2021

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Vera Köpsel
Institute for Marine Ecosystem and Fishery Science (IMF), University of Hamburg, Hamburg, Germany

Paper Summary
The paper under review reflects on alternative stakeholder engagement methodologies used in the face of the COVID-19 pandemic to substitute the originally planned participatory approach of the project. The TRIPS project seeks to co-develop transportation solutions together with mobility-impaired citizens from seven European cities. Due to the social distancing measures in the context of COVID-19, TRIPS had to change its approach to co-creating and evaluating mobility solutions through in-person workshops, brainstorming exercises, and joint design sessions. The paper describes the methods originally envisioned for the project as well as the alternative or adjusted methods applied due to the pandemic. Most of the engagement formats were moved to the digital sphere with online workshops, online peer-to-peer engagement, social media content analysis instead of shadowing sessions, and virtual instead of physical co-design workshops. Each of these alternative methods is described and reflected upon in terms of its suitability and

challenges. Subsequently, lessons learned are drawn from the process of adapting the methodology and recommendations are given for fellow researchers in co-creation projects. The paper closes with a short paragraph of conclusions. All in all, the article constitutes a timely case study that will be well-placed in Open Research Europe after undergoing revisions.

Review Summary
In my view, the paper presented here does a fine job of outlining the background problem challenging the TRIPS project and its co-design approach by highlighting the impacts of the COVID-19 pandemic on participatory research projects and citing related and state-of-the-art literature. Recent studies about how the pandemic influences research projects and participatory science are outlined and quoted properly. However, both the introduction and the reflections of the methodology sections have a number of shortcomings that are detailed below. Whilst the description of the challenges for TRIPS and its methodology as well as the adjustments applied to the project outline are interesting to read, I think that a valuable opportunity was missed when the paper was written: a deeper and more meaningful reflection of the particular challenges that TRIPS faced due to the circumstance that it conducted participatory research in with disabled users of transport systems. Focusing more on this facet of the project and the specific challenges it brought to digitalising the co-creation process would have lifted the paper from being nice to being impactful and providing valuable insights to scholars and practitioners working with disabled users in transdisciplinary projects. My recommendation therefore is to spend fewer words on describing the methodologies that were used in general and focusing much more specifically on the adjustments that had to be made when moving the originally planned physical workshops and co-creation exercises to online formats. In my view this shift of focus, along with an overall more critical reflection of the adjustment process and the methods used for online engagement, will give the paper the necessary edge and make it an interesting and valuable contribution to the reflection of transdisciplinary research in times a global pandemic with social distancing restrictions.

Detailed Review

GENERAL:
- The tenses are often mixed throughout the paper. Despite this being a grammatical mistake, it makes the paper harder to read as it is often unclear if the authors are speaking about the originally planned methodology or the new, adjusted methodology. Therefore, please revise the paper with grammar and the tenses in mind and decide whether you would generally like to speak of the TRIPS project in the present or the past tense.

- Also when it comes to the English language *per se*, please revise the paper with regards to spelling and grammar mistakes.

- Please revise the manuscript with particular attention to the inverted commas when it comes to direct quotes.

- I do not know whether this is owed to the format of Open Research Europe, but I found the headings and sub-headings difficult to distinguish. A different formatting or numbering of the different sections would have helped a lot.

INTRODUCTION:
- Pp. 3/4:The introduction is generally well-written and covers current literature on the impact

of COVID-19 on participatory research projects. It does, however, not become clear what - against the background of these existing studies - are the research questions of the paper presented here. Clearly stating the goal of the paper in the introduction would help a lot in guiding the reader and clarifying the red thread of this case study.

METHODOLOGY ADJUSTMENTS

- Pp. 7 + Table 1: The methodology of the TRIPS project, both as originally planned as well as adjusted, is outlined in the paper in quite some length. Nonetheless, some points remain unclear to me. What, for example, is precisely meant by peer-to-peer activities? Who are the peers, to whom, and how were they trained for conducting interviews? How were they chosen? As this methodology stands in the centre of the paper, please clarify.

- P. 7 onwards: The paper would generally benefit a lot from a more critical reflection of the adjusted methodologies. Who could / could not be reached due to this changed approach? Did the fact that workshops were held online, for example, make it easier for certain disabled users to participate, but excluded users with other disabilities? It is this detail of reflection that, in my view, would give the paper more depth and an increased the level of information for fellow scholars as well as practitioners working with stakeholders with disabilities.

- P. 7: Considering the social media analysis I also would have expected a deeper reflection. The authors rightfully state that researchers must be trained in conducting social media analyses to successfully complete this part of the project; however, there is no mention of the groups of disabled users that might be excluded from the analysis by focusing on social media content. I am certain that only specific groups of transport users share their experiences on social media, which means that certain other groups are not represented in this analysis at all. Although this might be a fact we might have to live with due to the changed methodology, it certainly deserves some words of reflection.

- P. 10: On page 10, suddenly a method called ‘Sketching’ is mentioned without further explanation. As the focus of this paper lies on methodology, please explain in a sentence or two what this sketching method is and how it was conducted online and/or offline. Was this method originally planned to be used or is it part of the new, adjusted methodology?

- I would have liked to know: Who decided about the adjusted online methodologies? Was that a decision by the central project steering committee or a bottom-up approach?

- P. 9/10: Here it was sometimes unclear to me what was the originally planned and what was the adjustment methodology due to the mix-up of the tenses. Please re-word/edit for clarity.

- As mentioned before, I think a potential strength of this paper could be the reflection of using online methods for engaging with disabled users during (and/or after) the pandemic. This opportunity was not made use of; however, in my view the paper lacks significance if this topic is not moved into focus. Both the recommendations as well as the conclusions currently are not overly surprising or innovative. Many of the recommendations are unspecific and have already been made in other papers. I therefore think that there is a lot to gain here in terms of the usefulness and value of the recommendations - and the paper, generally - if the focus is shifted to the specific challenges posed to a participatory research

project during the COVID-19 pandemic when working with disabled users.

- P. 10: A few very general advantages and disadvantages of online engagement are mentioned in the latter part of the paper. These reflections do not go very far, though, and have already been made by other scholars as well. I would recommend to focus more specifically on cooperation with users with disabilities, as this focus would open up the possibility to reflect a lot deeper on specific advantages and disadvantages of online technologies in this context.

LESSONS LEARNED + RECOMMENDATIONS

- P. 10/11 – Recommendations: In the awareness of repeating myself, I once more highlight that the recommendation section of the paper would be a great opportunity to give recommendations specifically to fellow scholars and practitioners who engage with stakeholders with disabilities. With this focus, I believe that the recommendations the paper would be a lot less generic and a lot more surprising and helpful for others in similar situations.

- P. 10: What is meant by 'mixed presence'? Is that a term for hybrid meetings, online and in person together?

- In the general structure of the paper I am missing a discussion section that goes back to the studies introduced at the start of the paper and setting the TRIPS experiences into the context of existing studies and findings. This does not have to be a lengthy section, but I would find it important to contextualise the experiences the authors made in the TRIPS project against the experiences that others already made. What was similar in your project, what was new? What challenges did you face that were not addressed by other studies yet?

- I really like some of your recommendations which are innovative and add value to the practice of online engagement; for example, I much like the idea of piloting new methodologies in real-life settings before applying them in larger groups. Another really good recommendation is to train co-researchers in certain methods to ensure a good quality of processes and results. Except for those points, though, I suggest to generally revisit the recommendations that you give to make them more meaningful and specific to the context that you work in. Practices such as adapting workshops to local contexts and local languages are not a novel approach arising in the face of COVID-19, but should be common practice among researchers who engage with non-academic actors. The recommendation of staying connected with your stakeholders and being flexible in the methodological approach are generic and have been made in several studies already (including mine). I am aware that it is difficult at this stage to give genuinely helpful new recommendations, but I really think that focusing your recommendations on the specific circumstances of your project would add a lot of value here.

All in all I would like to thank the authors for submitting this paper and sharing their experiences. I recommend to Open Research Europe to approve the paper with reservations. A shift of the currently rather generic topic of the case study to the more specific circumstances under which the TRIPS project worked would sharpen the focus of the article and add a lot of value to its conclusions and recommendations. After undergoing revisions and language corrections, though, I am curious to read the final version of the paper and learn more about online engagement with stakeholders with disabilities.

Is the background of the case's history and progression described in sufficient detail?
Yes

Is the work clearly and accurately presented and does it cite the current literature?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Is the case presented with sufficient detail to be useful for teaching or other practitioners?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Stakeholder engagement in EU projects and transdisciplinary research; coordination of stakeholder engagement; online and offline engagement methods; challenges of stakeholder engagement during COVID-19; human geography; social scientific methods

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 14 Mar 2022

Alexandra König

- *I think that a valuable opportunity was missed when the paper was written: a deeper and more meaningful reflection of the particular challenges that TRIPS faced due to the circumstance that it conducted participatory research in with disabled users of transport systems. Focusing more on this facet of the project and the specific challenges it brought to digitalising the co-creation process would have lifted the paper from being nice to being impactful and providing valuable insights to scholars and practitioners working with disabled users in transdisciplinary projects. My recommendation therefore is to spend fewer words on describing the methodologies that were used in general and focusing much more specifically on the adjustments that had to be made when moving the originally planned physical workshops and co-creation exercises to online formats. In my view this shift of focus, along with an overall more critical reflection of the adjustment process and the methods used for online engagement, will give the paper the necessary edge and make it an interesting and valuable contribution to the reflection of transdisciplinary research in times a global pandemic with social distancing restrictions.*

We agree with your suggestion that the paper will improve by providing more information

on the challenges that the project faced due to the fact that it focuses on people with disabilities. We thus added a new section to the introduction that stands under the title: "Initial challenges of disabled persons participating in transport research". We listed here five key challenges that we planned to face during the participatory process of engaging people with disabilities. We also added a new section to the discussion called "Reflection on the initial challenges and the actual challenges faced in participatory research with persons with disabilities" to discuss and contrast the initial and the actual challenges faced.

- *The tenses are often mixed throughout the paper. Despite this being a grammatical mistake, it makes the paper harder to read as it is often unclear if the authors are speaking about the originally planned methodology or the new, adjusted methodology. Therefore, please revise the paper with grammar and the tenses in mind and decide whether you would generally like to speak of the TRIPS project in the present or the past tense.*

- *Also when it comes to the English language per se, please revise the paper with regards to spelling and grammar mistakes.*

- *Please revise the manuscript with particular attention to the inverted commas when it comes to direct quotes.*

As suggested, we revised the manuscript with regard to English language. This was done by a native speaker.

- *I do not know whether this is owed to the format of Open Research Europe, but I found the headings and sub-headings difficult to distinguish. A different formatting or numbering of the different sections would have helped a lot.*

We agree that the clarity of the paper would improve by using a numbering of the sections. We did so and added numbers.

INTRODUCTION:

- *Pp. 3/4:The introduction is generally well-written and covers current literature on the impact of COVID-19 on participatory research projects. It does, however, not become clear what - against the background of these existing studies - are the research questions of the paper presented here. Clearly stating the goal of the paper in the introduction would help a lot in guiding the reader and clarifying the red thread of this case study.*

We absolutely agree and added some paragraphs regarding the research gap and the addressed research question to the end of the introduction.

METHODOLOGY ADJUSTMENTS

- *Pp. 7 + Table 1: The methodology of the TRIPS project, both as originally planned as well as adjusted, is outlined in the paper in quite some length. Nonetheless, some points remain unclear to me. What, for example, is precisely meant by peer-to-peer activities? Who are the peers, to whom, and how were they trained for conducting interviews? How were they chosen? As this methodology stands in the centre of the paper, please clarify.*

Thank you for this remark. We added some more information concerning the team building and the training of the working group members. Please see section 2.3. We also clarified the term 'peer'.

- *P. 7 onwards: The paper would generally benefit a lot from a more critical reflection of the adjusted methodologies. Who could / could not be reached due to this changed approach?*

Did the fact that workshops were held online, for example, make it easier for certain disabled users to participate, but excluded users with other disabilities? It is this detail of reflection that, in my view, would give the paper more depth and an increased the level of information for fellow scholars as well as practitioners working with stakeholders with disabilities.

We appreciate your comment and think it is valuable. However, the critical reflection of the adjusted methodologies is not part of the method description in section 2 but part of section 3 ('Discussion'). We added some more thoughts regarding this topic in the section '3.2 Reflection on the initial challenges and the actual challenges faced in participatory research with persons with disabilities**.'** We hope, you find the reflection of the adjusted methodologies in a good shape now.

- *P. 7: Considering the social media analysis I also would have expected a deeper reflection. The authors rightfully state that researchers must be trained in conducting social media analyses to successfully complete this part of the project; however, there is no mention of the groups of disabled users that might be excluded from the analysis by focusing on social media content. I am certain that only specific groups of transport users share their experiences on social media, which means that certain other groups are not represented in this analysis at all. Although this might be a fact we might have to live with due to the changed methodology, it certainly deserves some words of reflection.*

We are thankful for this comment. We followed your suggestion and added some more information regarding the limitations according to the exclusion of specific groups of disabled users to the section. We also added a literature reference for this.

- *P. 10: On page 10, suddenly a method called 'Sketching' is mentioned without further explanation. As the focus of this paper lies on methodology, please explain in a sentence or two what this sketching method is and how it was conducted online and/or offline. Was this method originally planned to be used or is it part of the new, adjusted methodology?*

Thank you for this remark. We restructured the text and added more information and an exemplary sketch to visualize the method. Please see section 2.3.

- *I would have liked to know: Who decided about the adjusted online methodologies? Was that a decision by the central project steering committee or a bottom-up approach?*

We think this is a very interesting remark. We decided to add some information on the decision process to the paper. Please see section 2.3.

- *P. 9/10: Here it was sometimes unclear to me what was the originally planned and what was the adjustment methodology due to the mix-up of the tenses. Please re-word/edit for clarity.*

We checked the tenses according to your suggestion.

- *As mentioned before, I think a potential strength of this paper could be the reflection of using online methods for engaging with disabled users during (and/or after) the pandemic. This opportunity was not made use of; however, in my view the paper lacks significance if this topic is not moved into focus. Both the recommendations as well as the conclusions currently are not overly surprising or innovative. Many of the recommendations are unspecific and have already been made in other papers. I therefore think that there is a lot to gain here in terms of the usefulness and value of the recommendations - and the paper, generally - if the focus is shifted to the specific challenges posed to a participatory research project during the COVID-19 pandemic when working with disabled users.*

We agree and adapted the methodology reflection according to your suggestion to highlight the changes due to using online methods for people with disabilities. We added more information regarding this topic in section 3.1. We also followed your recommendation and tried to shorten the text where possible.

- *P. 10: A few very general advantages and disadvantages of online engagement are mentioned in the latter part of the paper. These reflections do not go very far, though, and have already been made by other scholars as well. I would recommend to focus more specifically on cooperation with users with disabilities, as this focus would open up the possibility to reflect a lot deeper on specific advantages and disadvantages of online technologies in this context.*

The previous point also addresses this suggestion. Please see the revised section 3.1.

LESSONS LEARNED + RECOMMENDATIONS

- *P. 10/11 – Recommendations: In the awareness of repeating myself, I once more highlight that the recommendation section of the paper would be a great opportunity to give recommendations specifically to fellow scholars and practitioners who engage with stakeholders with disabilities. With this focus, I believe that the recommendations the paper would be a lot less generic and a lot more surprising and helpful for others in similar situations.*

We appreciate your comment regarding the specificity of the recommendations. We followed your suggestion and described the recommendations in more detail and with a stronger fit to disabled users.

- *P. 10: What is meant by 'mixed presence'? Is that a term for hybrid meetings, online and in person together?*

We clarified this and provided more information on the topic.

- *In the general structure of the paper I am missing a discussion section that goes back to the studies introduced at the start of the paper and setting the TRIPS experiences into the context of existing studies and findings. This does not have to be a lengthy section, but I would find it important to contextualise the experiences the authors made in the TRIPS project against the experiences that others already made. What was similar in your project, what was new? What challenges did you face that were not addressed by other studies yet?*

We are thankful for this comment. We revised the discussion section and refered to the references presented in the state of the art. We further worked out additional recommendations that came out of our reflection more clearly.

- *I really like some of your recommendations which are innovative and add value to the practice of online engagement; for example, I much like the idea of piloting new methodologies in real-life settings before applying them in larger groups. Another really good recommendation is to train co-researchers in certain methods to ensure a good quality of processes and results. Except for those points, though, I suggest to generally revisit the recommendations that you give to make them more meaningful and specific to the context that you work in. Practices such as adapting workshops to local contexts and local languages are not a novel approach arising in the face of COVID-19, but should be common practice among researchers who engage with non-academic actors. The recommendation of staying connected with your stakeholders and being flexible in the methodological approach are generic and have been made in several studies already (including mine). I am aware that it is difficult at this stage to give genuinely helpful new*

recommendations, but I really think that focusing your recommendations on the specific circumstances of your project would add a lot of value here.

We see your point and revised the recommendations accordingly to your suggestion. We deleted one of the recommendations and enriched the others by giving more detailed information and references.

Competing Interests: No competing interests were disclosed.