Title: Co-creating solutions to local mobility and transport challenges for the enhancement of health and wellbeing in an area of socioeconomic disadvantage

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Abstract

Introduction: The paper describes and examines a novel methodology to co-define transport and mobility challenges and co-create solutions with residents of a socioeconomically disadvantaged area within Oxford in the UK. The co-creation methodology is examined in relation to the extent of participation, inclusivity, transparency, interactivity, scale, sustainability/continuity, replicability, potential for co-benefits.

Methods: A Citizen Mobility Community was established with local residents at the core, and including representatives from the local authority, and other stakeholders. The paper describes the main elements of the co-creation process applied to identify mobility challenges, identify solutions, endorse the mobility solutions, and develop the solutions into practical action.

Setting: The setting was the Eastern Arc of Oxford, the most socioeconomically deprived area in Oxford.

Results: A sequence of co-creation activities helped identify and understand the transport challenges in Barton in the Eastern Arc of Oxford. Challenges included the high cost of public transport, traffic congestion, particularly during morning peak times, and the lack of cross-connectivity and direct public transport routes to desirable locations including affordable supermarkets, train stations, workplaces, health services such as hospitals and other neighbourhoods. The co-creation methodology led to the development of three pilot interventions to address these challenges, namely face-to-face transport app training, a transport to supermarkets shuttle service, and an information campaign about concessionary bus passes. Analysis of the co-creation methodology found that the process achieved its aims of empowering citizens in decision making about addressing locally experienced transport challenges, and building social capital.

Conclusions: The co-creation enables communities in areas of socioeconomic disadvantage to identify their transport challenges, and to co-develop and co-design practical solutions. Co-creation to address local transport needs builds community empowerment, creates social capital and may contribute, through plausible causal pathway, to improved health and wellbeing in an area of socioeconomic disadvantage.

Key words: Co-creation; planning; socioeconomic disadvantage; health and wellbeing; transport; mobility

1.Introduction

In this paper we examine a recent co-creation approach People Oriented Transport and Mobility (POTM) in a socioeconomically disadvantaged area within Oxford in the UK, which aimed to co-define challenges in transport and mobility and to co-create solutions (Cities4People, 2017). POTM is an innovative approach aimed at a local level to create more liveable towns and cities; for instance, contributing to community political empowerment and social capital, by linking low income communities with representatives of local institutions and organisations that provide transport and mobility services.

Transport and mobility services are widely considered as key determinants of health and wellbeing (Meyer and Elrahman, 2019). Transport is an enabling factor for access to health care services, recreational activities and affordable supermarkets (Cooper et al., 2019; Ver Ploeg et al., 2009), as well as access to education and economic and employment opportunities (Meyer and Elrahman, 2019). Inadequate public transport links can be a barrier for accessing services and employment opportunities, acquiring essential goods and for developing social capital (Gates et al., 2019) and can lead to social exclusion, which can consequently have adverse mental health impacts. Unequal access to transport and mobility services therefore contributes to health inequities (Boniface et al., 2015).

Given the clear link that transport and mobility have with various aspects of people's lives, including health, understanding the transport needs and values of people is important in the planning of transport and mobility services (Majumdar, 2017). However, planning processes in transport and mobility have traditionally been based on a top-down expert led approach, and typically orientated towards technical and physical adjustments of traffic flow rather than towards social inclusion (Boisjoly and Yengoh, 2017; Booth and Richardson, 2001). More recently there has been a move towards adoption of co-creation planning approaches which engage the public by incorporating local participatory methods into the transport and mobility planning processes (Boisjoly and Yengoh, 2017; Nared, 2020).

Authors have also highlighted the potential benefits of public involvement in transport planning, for example, that incorporating the practical insights of the public into the planning process can serve to improve the overall effectiveness of the transportation plan and that understanding the perspectives and values of the public can help to build on social and intellectual capital (Majumdar, 2017). In addition, planning processes which incorporate public participation have the potential to bring about more socially sustainable transportation and enhance the quality of public life (Boisjoly and Yengoh, 2017; Majumdar, 2017). Furthermore, increased social capital can also serve to balance inequities between social classes (Hom et al., 2014).

Co-creation, which can be defined as a collaborative approach to creating value by engaging multiple stakeholders in development of products or services (Hom et al., 2014), shares some characteristics with participatory processes, in that both are directed towards producing outcomes which are a result of a collaborative effort (Hom et al., 2014). However, co-creation goes beyond participation processes in that it requires practical outcomes in addition to actionable knowledge (Prager, 2016). Co-creation is therefore an example of a design process which builds on the foundations of public participation. Although public participation in urban planning traces back to 1960's, co-creation specifically in transport planning is still novel among UK public authorities and at the neighbourhood level, requiring further examination. Indeed, Müller et al., (2020) called for further research to investigate how co-creation could be used in practice and what are the outcomes and benefits of co-creation in the context of transport and mobility.

In a broader sense, while community localism has long been recognised as an integral part of democratic political systems (Evans et al., 2013), its influence on factors that affect the lives of local people are often limited within the overall local and national governance framework (Nared, 2020). This is particularly significant in communities where vulnerable social groups/individuals experiencing higher levels of socioeconomic deprivation have a sense of powerlessness over the broad social, economic and environmental conditions in which they live (Batty et al., 2011). Therefore, the overall driving-force that underpins our work is that empowering local communities in the space of decision making in transport and mobility can contribute to creating changes that improve people's living conditions and indirectly contribute to health equity (Marmot et al., 2008).

Drawing on the benefits of co-creation illustrated in different contexts, research on co-creation processes could ultimately assist in finding more sustainable solutions to complex urban mobility problems (Müller et al., 2020). This is particularly relevant at a time in which there is a growing imperative for a meaningful shift from the dominance of carbon based transport in towns and cities to more sustainable urban development planning, in support of reaching net zero greenhouse gas emissions by 2050 (Department for Transport, 2020).

To this end the aim of this paper is to demonstrate how a participatory approach with citizen centred co-creation can empower citizens, build social capital and benefit social inclusion by addressing transport and mobility issues in areas of socioeconomic disadvantage.

Setting

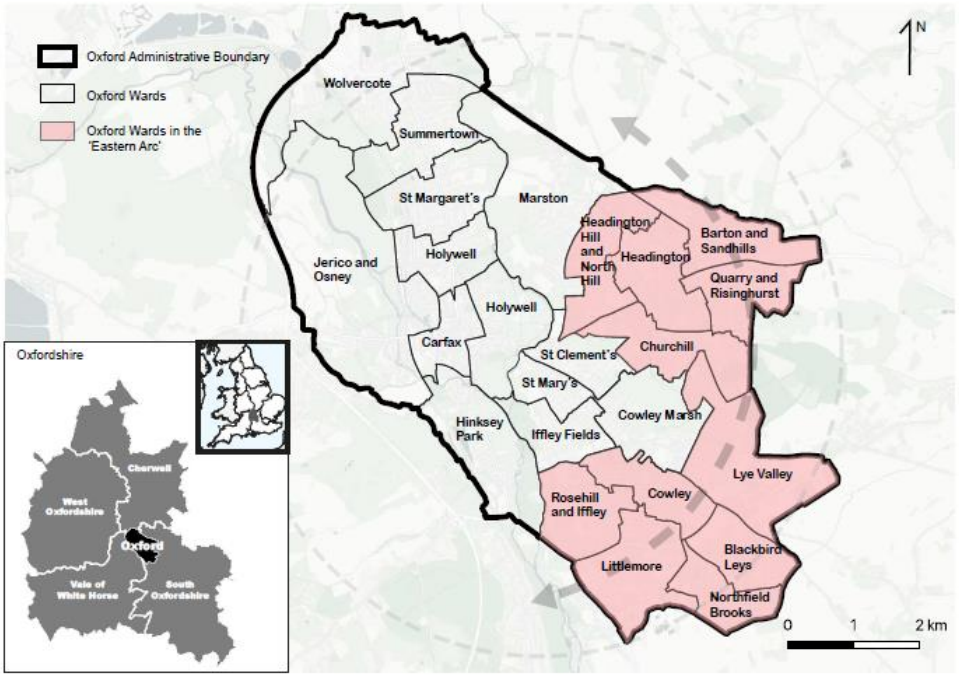
In the UK, local governments at the city or county level have responsibility for local roads and the built and natural infrastructure within overall transport and environmental policy as mandated at the national level. Removal of bus subsidies in recent years has exacerbated transport disadvantage in many rural and peripheral areas. Residents in small urban communities often experience transport disadvantage, due to a lack of accessible public transport and a low density of opportunities with regards to employment, education and recreation (Cooper et al., 2019). As such, poor transport accessibility tends to be more prevalent for those living in urban peripheral areas or rural areas, than for those living in central urban areas (Cooper et al., 2019; Lucas et al., 2019). The transport situation around the periphery of Oxford demonstrates this poor transport accessibility.

Oxford is in the rural county of Oxfordshire, with one third of the county's population being classified as living in a rural setting as of 2015, (Oxfordshire County Council, 2017). Of the 308 parishes that have a population less than 10,000, about 75% have a population lower than 1,000 (Oxfordshire County Council, 2012). Using traditional public transportation approaches, it is not commercially viable to serve such small populations with regular and frequent services. Given the cuts to all bus subsidies in Oxfordshire in July 2016, many smaller or peripheral locations therefore lost or had cut backs to their bus provision. Oxfordshire is also a particularly expensive county in which to live. For instance, In Oxfordshire, the ratio of housing cost compared to residence-based earnings in 2019 was significantly higher than the UK average, at 10.1, compared to 7.7 for the UK as a whole, based on median house prices in the region against median gross annual residence-based earnings (Office for National Statistics, 2020). Looking at the lower quartile of earnings, the situation is even worse, with a ratio of 11.2. In Oxfordshire, the average property in 2016 required an income of £60,000, with £30,000 annual income needed to rent the average property on the private market; at the same time, more than 40% of households were on an income of less than £30,000 (Oxfordshire Community Foundation, 2016). Oxford City, with the best public transport connectivity and also a large portion of the county's job opportunities is the most expensive part of the county in which to reside – in 2015, the average

house price in the city was about 16 times local annual average income – leading to significant inequalities in access to jobs and exacerbating income disparities.

As part of a preliminary scoping exercise, the authors conducted a situation analysis to investigate the areas of Oxford with more mobility challenges, in order to identify and target community areas for the project. The Eastern Arc of Oxford (see Fig. 1a) was selected because it was the most deprived area in Oxford according to the English Index of Multiple Deprivation (IMD). The English IMD[1] is an official measure of relative deprivation, where small areas or neighbourhoods, known as Lower-layer Super Output Areas (LSOAs), are ranked from most deprived to least deprived and divided into 10 equal groups known as deciles. This allows for the 32,844 LSOAs in England to be organized into a range from the most deprived 10% to the least deprived 10% nationally, and therefore it is used to understand not only how neighbourhoods can be compared within Oxford but also within the national context. Fig. 1b which uses the data from 2015 (when the project was initiated) shows the level of deprivation for LSOAs in Oxford within a national context. In 2015, the Eastern Arc contained all 10 of Oxford's LSOAs that were among the 20% most deprived areas in England, including LSOAs in Barton and Rose Hill. By 2019, the number of LSOAs in Oxford that were among the 20% most deprived areas in England remained 10, but one is now located in the city centre. Fig. 1c shows that Barton was also amongst the 20% most deprived areas in England for the Health Deprivation and Disability domain of the IMD. Further, whilst there has been a significant amount of business development and house building within this area, and the development of an adjacent new town, there has been a lack of public transport services to match. Lack of affordable transport service in the area will exacerbate social disadvantage.

Fig. 1a Location map of Oxford showing the area known as the 'Eastern Arc' (Source: Authors' Own)



[1] The IMD is a composite index comprising seven domains of deprivation (Income, Employment, Health Deprivation and Disability, Education, Skills and Training, Crime, Barriers to Housing and Services, and Living Environment) which are combined and appropriately weighted.

Fig. 1b Map of LSOAs in Oxford by national decile of deprivation (where 1 is most deprived 10% of LSOAs) based on data from Index of Multiple Deprivation (IMD) 2015, Department for Communities and Local Government (Source: Authors' Own)

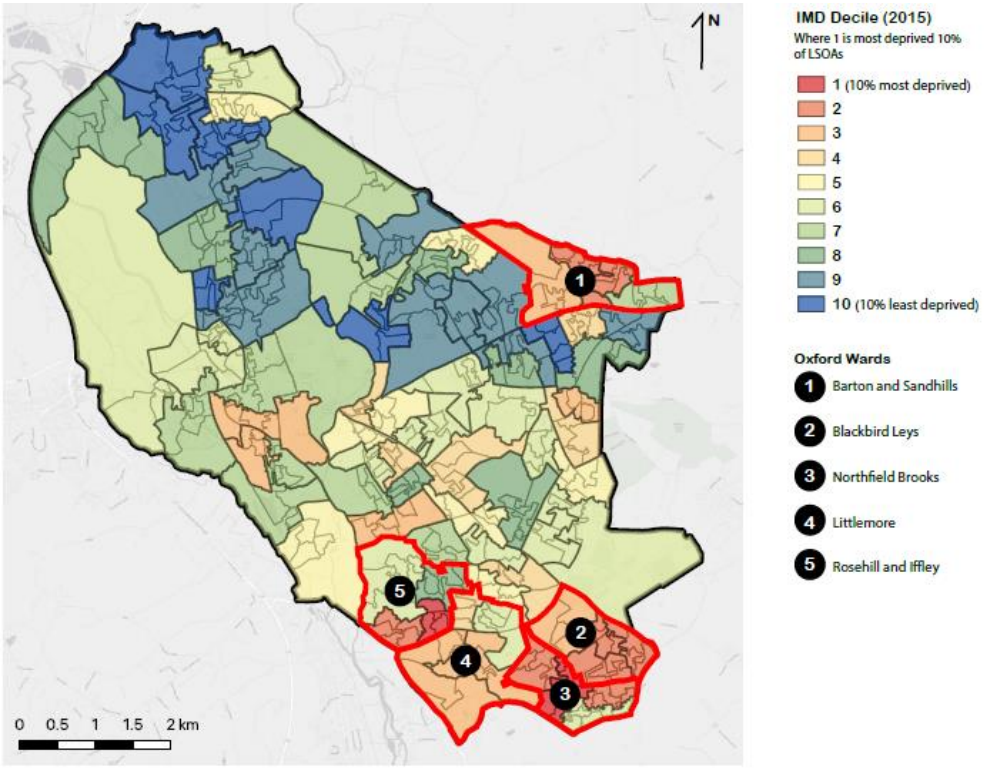
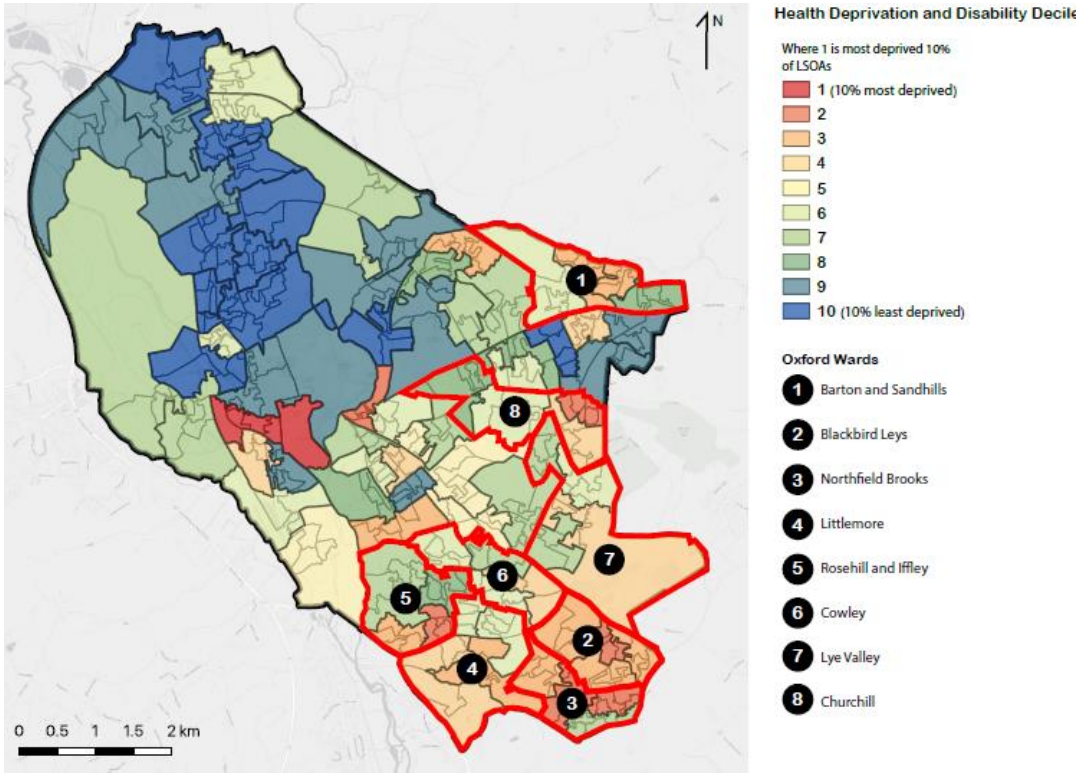


Fig. 1c Map of LSOAs in Oxford by national decile of Health and Disability Deprivation (where 1 is most deprived 10% of LSOAs) based on data from 2015, Ministry of Housing, Communities & Local Government (Source: Authors' Own)

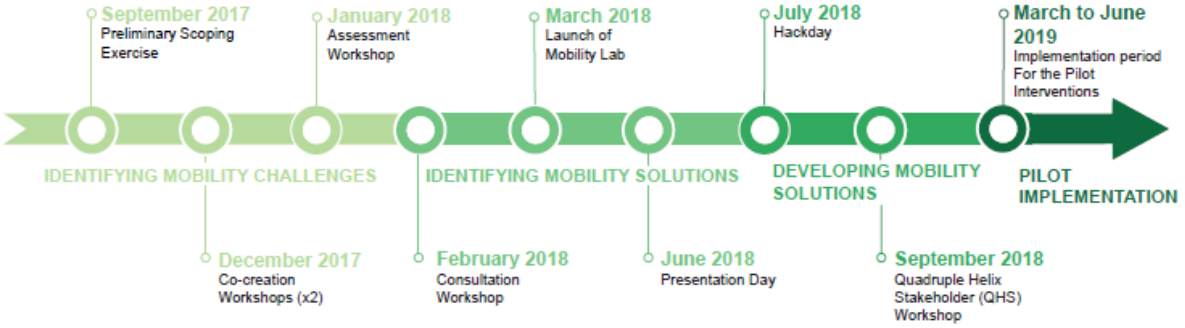


2. Methodology

As C4P was a community driven project, gathering the ideas of community members on concepts and solutions to their mobility challenges and priorities was central to the project's aims. A Citizen Mobility Community (CMC) was developed as a means of facilitating this community participation. This CMC was to be inclusive of all community voices and interests including local citizens, local authorities, researchers, designers, developers, commercial providers and students.

The CMC was the central vehicle through which mobility challenges were identified and solutions to these challenges were developed. A variety of events and other outreach methods, described in sections 2.1 – 2.4, were used to gather community inputs, in order to co-define, co-create and co-design the different stages of the project. Figure 2 show the main elements of the co-creation process.

Fig. 2: Main elements of the co-creation process



2.1. Identifying the mobility challenges

Identifying the local mobility challenges and target areas was one of the first stages of the C4P project. The preliminary scoping activities involved in identifying these challenges began in September 2017. Qualitative and quantitative data was collected through semi-structured interviews with a range of mobility stakeholders and through online surveys and an online mapping tool.

Following on from this, two co-creation workshops were conducted in December 2017 in the Rose Hill Community Centre and the Barton Neighbourhood Centre (BNC), which are both in the Eastern Arc of Oxford. The workshops were carried out in these neighbourhoods because they are two of the most deprived communities in Oxford, which have poor transport links, except into the city centre. The workshops aimed to discuss the challenges which had emerged from initial research, to gather data on the status of the mobility environment in these areas and to co-define the mobility challenges. Members of the C4P team, mobility stakeholders and community citizens were involved in these workshops. The workshops were advertised through local newspaper articles, leaflets, posters and through emails and social media posts. A guiding template including a pre-planned structure and suggested activities was used to direct the workshops and 'A World Café Method,' which is an approach for hosting collaborative group dialogues, was employed as the co-creation tool.

Following on from these workshops, an assessment workshop with transport and mobility professionals was held in early January 2018. Twenty-five individuals from varying backgrounds who could offer different insights into the mobility challenges were invited to attend - including transport and mobility experts from research organisations, transportation providers and the City and County Councils. The aims of this workshop were to gather further information about the mobility status in

both communities and to discuss which mobility challenges and area should be the focus of the project. Barton was chosen as the location for focus.

2.2. Identifying mobility solutions

The next step following the identification of the mobility challenges and the target intervention area was to formulate ideas which could later be developed into concepts aimed at addressing these challenges. The co-creation activities involved in the generation of these ideas and mobility concepts were carried out from March 2018 to June 2018.

A Citizen Mobility Lab was set up as a collaborative tool and co-creative space to allow the CMC to come together to discuss the local mobility challenges important to them, and to co-create solutions to them. This Citizen Mobility Lab also provided the opportunity to conceptualize the mobility projects. For the co-creative space to be effective, three key elements needed to be in place – the project team, the society representatives and other Mobility Community participants, and an identified challenge upon which to focus. The consultation workshop held in February 2018 served to help define these three key elements before the establishment of the Citizen Mobility Lab.

The Mobility Lab consisted of a series of six 'Listening Lab' events which were held in different locations throughout Barton. The aims of the 'Listening Labs' were to raise awareness of the C4P project, to gather ideas and to engage with a wider range of individuals, in order to expand the citizen mobility community. A questionnaire was also deployed to gain insight into the potential usage of the PickMeUp service, the then-newly launched on-demand ride-sharing minibus service being piloted in Oxford by the Oxford Bus Company, and to identify potential barriers for uptake. An Ideas Board was included in this survey, to allow participants to provide their ideas on solutions to these barriers. A map of the local area was also displayed at these events, to allow citizens to indicate their ideas on potential destinations of the PickMeUp bus service.

A Presentation Day at the Barton Neighbourhood Centre, and a series of 'Mobility Lab' events were held as part of the process for co-creating ideas for solutions to address the previously identified mobility challenges. A variety of co-creation tools, developed by partners in the C4P project, were used as described in the C4P Citizens' Mobility Kit.[2]

During the Presentation Day in June 2018, an 'Ambition Ranking tool' was used to outline key components of the Presentation Day. These included one of the PickMeUp buses, information on the C4P project and PickMeUp Service, and a rock-painting workshop with a transport theme. The predominant aims of this Presentation Day were to display the project's work, to provide information on how PickMeUp functioned, to gain insights into the potential barriers for the PickMeUp service and to assist citizens in translating their mobility challenges into mobility solution ideas. The event was advertised through social media posts, posters displayed around the neighbourhood and through an article in a local newsletter.

Following on from the Presentation Day and 'Listening Lab' activities, a Hackday was held in July 2018, as the final event in the development of the mobility concepts. The ideas were discussed during the Hackday and co-creation tools were used to eliminate and prioritize these ideas and develop them into mobility concepts. The co-creation tools employed as part of this included a feasibility vs impact prioritisation matrix, an 'I like, I wish, what if' activity and an Ambition Ranking. The concepts developed during these activities were to be taken to the Quadruple Helix Stakeholder Workshops

[2] Co-creation Navigator at: https://waag.org/en/project/co-creation-navigator

(section 2.3) where they would be further short-listed and three then fully developed into pilot interventions.

2.3. *Endorsing mobility solutions*

A Quadruple Helix Stakeholder (QHS) workshop was held with a selection of participants based on their expertise in one or more of the concepts, in September 2018 following on from the Hackday. 'QHS' refers to stakeholders from four broad groups, in this case, local citizens, urban mobility authorities, academia and business (mobility providers). The QHS at this event comprised a member of the general public, two local community association members, two university representatives, an individual from Age UK Oxfordshire, one representative from Oxford City Council and six from Oxfordshire County Council, representing different departments, and two representatives from mobility providers. The main purpose of this event was to refine the list of twelve concepts, into a list of five. An online voting tool, promoted outside of the QHS group, 'Your priorities', held before, during and after the QHS workshop was also used to assist with this.

The C4P project team then undertook further research in order to identify any potential barriers to each of the concepts. Oxford Councillors were consulted on their opinions on which concepts should be progressed. These opinions, along with consideration of feasibility including barriers such as cost, risk and ease of application, likely impact including breadth of applicability, and the potential scalability of each possible pilot, were taken into account in making a decision on which to implement.

2.4. Developing mobility solutions:

Once the final three mobility solutions had been selected for piloting (Face to Face App Training, Transport to Supermarkets and Information about the Concessionary Bus Pass) separate working groups were established comprised of quadruple helix stakeholders relevant to each mobility solution.

To co-create pilots to test the three mobility solutions, a series of workshops where held with each working group. Group discussion and co-creation tools such as Iteration Dice and Ambition Ranking were used in these workshops to develop and iterate pilot design. Between workshops, the core C4P group worked with individual quadruple helix stakeholders to research aspects of pilots and action decisions made in working groups. Prototypes of pilots were tested with members of the mobility community, the results of which were fed back to working groups.

The outcome of the series of working group workshops was a Pilot Action Plan for each of the mobility solutions pilots. These highly detailed plans covered all aspects of the pilot implementation, including methods, schedule, roles and responsibilities, monitoring methods, assessment criteria, and risk mitigation.

3. Results

3.1 Findings from the co-creation activities:

3.1.1 Scoping exercises and preliminary co-creation workshops

The results of the preliminary scoping exercises, including the semi-structured interviews and online surveys, pointed to five key areas relating to the mobility challenges in Oxford. These included the frequency of bus services, the connectivity of the bus system, traffic congestion, service prices and service information.

From the co-creation workshops, which followed on from the scoping exercises, Barton was selected as the target intervention area, because it had clearly defined transport challenges and observable

community interest in engaging with the project. The co-creation workshops also led to the identification and prioritisation of the top three mobility challenges in Barton. These challenges included the high cost of public transport, traffic congestion, particularly during morning peak times, and the lack of cross-connectivity and direct public transport routes to desirable locations such as affordable supermarkets, train stations, workplaces, health services such as hospitals and other neighbourhoods.

3.1.2 Mobility Lab events

The Mobility Lab events allowed participants to ideate solutions to the mobility challenges previously identified. The Mobility Lab events also helped to establish and expand on the CMC. This CMC provided a link between the community residents and local mobility providers i.e. the Oxford Bus Company/PickMeUp (demand response transport accessed digitally via an app). This led to adaptations of the PickMeUp service, most notably evident in the expansion of the PickMeUp service to include the Barton Crematorium. Engagement between the Oxford Bus Company/PickMeUp and local residents through Mobility Lab events and the co-creation of aspects of the service led to an increased uptake of the service in Barton. In July 2018, the month following the launch of PickMeUp, there were more than triple the number of trips originating in Barton as compared to Rose Hill, a neighbourhood similar in size and characteristics to Barton.

3.1.3. Presentation Day

A total of 58 individuals, including transport experts and local citizens, were involved in the Presentation Day. One key observation of this event was that it helped to build positive relationships between the C4P CMC and the wider Barton community. Information gathered, as described in section 2.3, further confirmed the mobility challenges in Barton which had previously been identified in the Mobility Labs. Additionally, the opinions collected in the Mobility Lab provided insights into the types of passengers who could have difficulty in using the bus service and the barriers they could face in accessing this service. In particular, the use of an app to access the service was identified as a barrier for those who might benefit most from using the service. Challenges relating to the delivery of a large amount of information in a comprehensive manner as part of this Presentation Day were also noted. In order to make the event attractive to the public, based on the CMC's understanding of the community, it was necessary to both include additional fun features, and to make it a drop-in event, rather than a traditional 'presentation' event; as such, bringing people with no prior knowledge of the project up to speed on it, as well as then gathering their input, was challenging in the small amount of time available.

3.1.4 Hackday

The Hackday served to develop the ideas gathered during the Mobility Lab into twelve mobility concepts, described in Table 1. This event also helped to further build on the CMC. Challenges with regards to balancing the length of the workshop with gaining sufficiently detailed input were observed.

Table 1: concepts co-created during the Hackday

	Concept	Description	Endorsed by QHS	Piloted
1	**Face to face app training**	Train community members, specifically vulnerable people, in how the app works.	x	x
2	**Pick Us Up**	Work with existing organisations to offer a buddy service in which first-time users could go on a trip with a knowledgeable person.		
3	**PickMeUp partnerships**	Scheduled sponsored group trips on PickMeUp taken from the Barton Neighbourhood Centre to desirable destinations that are difficult to get to by traditional bus, such as affordable supermarkets and GP practices	x	x
4	**PickMeUp champions**	Recruit, train, and reward champions from a variety of communities to promote the PickMeUp service and mentor people.		
5	**Introduce PickMeUp to new Concessionary Pass Holders**	Create and distribute travel information packs to concessionary pass recipients in Barton. This would include information specific to concessionary pass holders on buses, PickMeUp, and active travel options.	x	x
6	**Multi-modal link-up**	Connect PickMeUp to other transport and mobility options as one part of a journey that could also use bus, train, cycle, walking, etc.		
7	**PickMeUp school bus ++**	Partner with a local school or 6th form college to use PickMeUp as an alternative transport for students in a specific year.		
8	**Information about PickMeUp to new residents**	Provide information about PickMeUp to new residents as they move into Barton Park, as part of the wider Travel Information Pack distributed to residents.		
9	**Increase accessibility of app**	Provide a more user-friendly interface for people to learn and use the app. For example, a lending library of more accessible devices such as tablets.	x	Aspects incorporated into face-to-face app training
10	**Make app accessible to people not fluent in English**	Increase access to PickMeUp for people who speak languages other than English.		
11	**Partner with existing charities to provide information and technology for digital literacy**	Work with existing charities to distribute information and technology. Support people who could benefit from PickMeUp service develop digital literacy by working with trusted organisations, e.g.host a tech fair with charities demonstrating resources for digital literacy skills	x	Adapted into pilot launch event
12	**Promotion through digital reviews**	Promote PickMeUp service through encouraging reviews on multiple online platforms such as Facebook, TripAdvisor, Google		

3.1.5 Quadruple Helix Stakeholder (QHS) workshop

The QHS workshop ultimately resulted in refining the list of twelve concepts formulated from the Hackday to a list of five concepts, as shown in Table 1 (concepts endorsed by QHS).

The QHS working groups (as outlined in 2.4) co-created three pilots (section 3.2) from these concepts in a series of three workshops. In addition, the QHS working groups co-created the launch event for the pilots (section 3.2)

3.2 Practical outcomes of the co-creation activities

The series of co-creation events helped to identify and understand the transport challenges and needs in Barton. This ultimately led to the development of three pilot interventions which were directed towards addressing these challenges. These interventions were face-to-face transport app training, a transport to supermarkets shuttle service, and an information campaign about concessionary bus passes. These interventions are described in Box 1.

Box 1 Description of the three piloted interventions and launch event

Face to Face App Training

A module of four workshops, held in Barton, providing training and basic knowledge on transport apps. Transport apps covered were Google Maps, Stagecoach Bus App, and PickMeUp. Entry level smartphones and tablets were offered to those who did not currently own one. These 1.5 hour session were followed by an outing that put some of the new skills participants had learnt to work.

Information about Concessionary Bus Pass

Provision of transport information to people who are both eligible for, and in receipt of concessionary passes within Barton. The information covered how and where the concessionary pass can be used and how to apply for one.

Partner with Supermarkets to provide Transport

Several types of weekly shuttle services to affordable supermarkets utilizing both PickMeUp and a community minibus. The services were adapted to meet the differing needs of target audiences.

Pilot Launch Event

To launch and raise awareness of the three pilot mobility interventions, a promotional event was held at the BNC in partnership with charities and council teams with a similar target audience. At this event, participants were able to reserve space at app training sessions, book a seat on shuttle services to supermarkets, learn about new Demand Response Transport services, apply for and have questions answered about the concessionary bus pass, and learn about new at-home consultation services through the NHS.

4. Discussion

The POTM methodology described in this paper effectively enabled residents living in a relatively disadvantaged area in Oxford city to co-identify local transport challenges and corresponding solutions, and to co-create interventions to address these challenges with local development and transport stakeholders.

In discussing the POTM methodology as it played out in Oxford, we examine the process with regard to the following aspects of relevance to researchers, policy-makers and practitioners. These build on and extend the four principles of public participation in the process of local transport planning: inclusivity, transparency, interactivity and continuity (Bickerstaff et al., 2002).

- Extent of participation (with reference to Arnstein's ladder of participation (Arnstein, 1969)
- Inclusivity
- Transparency
- Interactivity
- Scale
- Sustainability/continuity

- Replicability
- Co-benefits

Extent of participation: Arnstein (1969) described a typology of eight levels of public participation, described as the 'Ladder of Citizen Participation' in which each rung corresponds to the extent of the public's power in producing an outcome (Arnstein, 1969). This ranges from levels of non-participation i.e. manipulation and therapy, to levels of citizen power i.e. partnership, delegated power and citizen control (Arnstein, 1969). In the POTM methodology, the extent of participation of residents relates to the power relationships between residents, Oxfordshire County Council (OCC) officers, researchers, and transport providers. The challenge is to overcome any barriers between the residents and other stakeholders and enable residents to realise that the locus of power in the process is being deliberately shifted towards them (Arnstein, 1969; Gaber, 2019). This was enabled by locating the meetings in the BNC, the local community hub, which is trusted and widely used by neighbourhood residents, and seen as a safe and welcoming place. In this way community representatives and residents took the role of hosts, even though the meetings were facilitated by OCC. Furthermore, the emphasis throughout meetings was that community residents are experts based on their lived experience, which in the flow of the project is the most highly valued area of expertise. This meant that other stakeholders tended to provide relevant information or take a facilitating role, to ensure that residents felt free to offer their opinions. In addition, for those less confident in speaking at meetings, the use of co-creation tools facilitated their contributions, in addition to making the meetings more interactive and enjoyable. An essential part of the process was building trust among stakeholders, which has been identified as the fundamental basis for successful collaboration (Stegeman et al., 2020). To achieve this requires stakeholders to demonstrate openness, integrity, and genuine interest in all interactions with residents.

Inclusivity: The project was deliberately planned to support social inclusion. To do so, research and pre-planning were undertaken to identify a locality with unfilled transport and mobility needs in an area of relative social disadvantage. The project was able to tap into the local community via the community organisers based at the BNC. Further, practical steps taken to include diversity of local representation included attending a variety of locations to promote involvement and gather input (e.g. leisure centre, local shopping area, bus stops, local primary school) and events (e.g. bingo, Age UK Oxfordshire gadget group), frequented by different types of user. Promotional approaches were also wide-ranging, including using a variety of media, both online and printed. The neighbourhood newspaper was used as a regular vehicle to promote the project and inform the community, as it is circulated to every household in Barton. However, despite the steps taken to include the community, there was still some lack of diversity within the core Mobility Community group, particularly around representation of ethnic minorities, which make up a considerable proportion of the Barton community. Whilst individuals from ethnic minorities were engaged in the wider events and activities, this unfortunately did not follow through to detailed input to the process from members of these groups.

Transparency: Transparency was integral to the process, achieved through regular events, online newsletter, meetings and communications which included explanations of the process and actions being taken. As the local community were so central to decision making, transparency was not only fundamental to build and maintain community participation and manage expectations, but also enable informed decision making. Being transparent throughout in presenting the process used to identify challenges and solutions, and shape the concepts enabled genuine co-creation.

Interactivity: Interactivity was a core element of the co-creation process. A more traditional approach usually brings in the community at a later stage in the process, normally after the challenge and possible interventions have already been identified; at this stage the community sometimes has the opportunity to comment on a range of possible interventions, but sometimes only to comment on the details of a particular pre-selected scheme or intervention. Whilst the community may have been informed of the intention to undertake a scheme in a given area at an earlier phase, their input to it does not usually occur until this late stage in the process. In addition, for smaller-scale interventions, community engagement is sometimes not undertaken until actual deployment. In the POTM approach, interaction with the community was central to the process, from the earliest stage of identifying what the most important mobility challenges to address were. A variety of approaches were taken to collaboration and making decisions with the community, as mentioned in the Methodology, from simple and more complex voting (both on and off-line) to iteration techniques to refine the interventions with the community.

Scale: the co-creation process involved a disadvantaged community in a particular locality, therefore it operated at the micro level in terms of number of people involved. Working at the micro level has advantages, particularly when working with disadvantaged communities. For example, we cannot assume that smart interventions and digital technology, such as on demand pubic transport, are available, accessible, acceptable or affordable to everyone, since a sizable number of people are digitally excluded, possibly because they cannot afford a smart phone or mobile connectivity, or are unable to use the technology (Age UK, 2016).

In addition, working at the micro level enabled a deep dive into issues and concerns of local people that might not otherwise be brought to the council's attention, or would otherwise be slower to penetrate transport planning processes. The operation of POTM in the way it did in Oxford enabled members of the community to have direct access to mobility providers, the local authority, and to elected local authority members. Having direct access to the mobility providers, for example, allowed the community to shape the PickMeUP smart Demand Responsive Transport service both in its area of operation (extending the service out to the Barton crematorium) and in app accessibility (through removing the need for a credit card to be entered on registration). This micro-level scale, however, does bring some disadvantages, notably in the area of people and time resources. To work to this level of detail, particularly if wanting to apply in multiple areas (geographically and topically), would be prohibitive in terms of the level of resourcing which would be required. In addition, working in detail with the community can potentially easily lead to raised expectations, which need to be well managed in order to avoid loss of community support.

Sustainability/continuity: through working at the micro-level of detail with the community, the POTM process has allowed up-skilling of members of the community, giving them insights into Local Authority and Mobility Provider approaches and ways of working. This will provide the potential for this community to continue to advocate for themselves, not only within the sphere of mobility, but also more widely. In addition, having built the project within the community and used the BNC as an anchor-point within that community will allow the group to continue to meet and use the mobility community as a vehicle to continue work in this area should they wish to do so, beyond the end of the C4P project.

Replicability: there is potential for the POTM approach to be replicated as well as adapted and developed further. Whilst it will be important to consider scale in replication, given the resource-intensiveness of working at the micro-level undertaken in Barton, and adapt the approach to the needs of the community, the C4P project has built a tool-kit which will allow for easier replication elsewhere. This toolkit, the Citizen Mobility Kit, is being disseminated through local Oxfordshire

websites, to allow for the POTM approach to be applied to other projects. However, there is an inherent dissonance in co-creating at the micro-level in order to scale up to a wider geography, since some of the benefits of the approach are in developing a tailored solution for the given community and gaining buy-in from that community; these benefits can easily be lost in the scale-up process. Therefore, as in the case of Hamburg, a partner city on the C4P project, for a wider geographical area to be addressed, a different application of the POTM methodology may be beneficial (Tatum et al., 2020).

Co-benefits: POTM can contribute to improving aspects of transport and mobility for those facing disadvantages, and thereby contribute, through plausible causal pathways to health equity, and environmental sustainability. In addition, the process built local social capital, enabling citizens via the Citizen Mobility Community to link with the local authority, transport providers and academia, and to strengthen bonds within the local community.

Strengths and Limitations of the POTM methodology: As already alluded to, there are both strengths and limitations of the POTM approach, particularly around the issues of resource and scale. It is worth noting that some of the strengths of the process can help to alleviate its limitations, for example, a strength of the approach taken was to build social capital, allowing the project to make use of community assets within a number of areas, from communications and engagement even through to the deployment of the interventions. Whilst, therefore, the initial phases of the project involved in building the Mobility Community were time and resource intensive, once buy-in had been achieved, it was possible to deploy and promote the interventions quickly and inexpensively by making use of the community resources available.

In addition, strengths of the approach can be seen in aspects such as ideas generation, with a wide variety of concepts being generated; and the ability to better understand and address the details of the community's needs, which alongside aspects such as a greater level of community ownership, in turn leads to good uptake. In the context of ideas generation, it is worth noting that walking routes were identified among other challenges in the context of difficulties experienced by people with mobility difficulties and people with pushchairs, and in the context of safety at night. However, the community ranked these aspects as less pressing than connectivity to affordable supermarkets and across the Eastern Arc. In addition, during the co-creation process, in response to questions regarding who had barriers to accessing transport services, the community most often cited older people.

As mentioned earlier, one of the gaps in inclusivity was gaining detailed input from ethnic minority groups; three possible remedies for this could be in providing translations of materials into the most commonly spoken languages within the community; in using more than one 'anchor' point within the community, with a different demographic representation, perhaps using different faith groups; and in approaching members of under-represented groups to become community champions. These latter two approaches could potentially be applied to gain broader representation from other types of group as well, such as different age groups, and people with disability.

5. Conclusion

There is potential for the POTM approach to be adapted and applied in different ways. One notable possible future application is around its use within planning more widely than just mobility. In the context of the UK Government's White Paper on planning reform (2020), it would be of potential benefit to consider the application of the POTM approach within the planning system in order to achieve the goal of greater public participation in setting out a framework for development within different communities (UK Government 2020). As the White Paper states, "the importance of local

participation in planning is now the focus of a campaign by the Local Government Association but this involvement must be accessible to all people" – the POTM approach could contribute to gaining better local participation in planning at a neighbourhood level (UK Government 2020).

It is evident that the specific deployment of POTM processes, the demographics, and transport and mobility challenges are highly context specific. For example, a study on the C4P POTM in Hamburg, in a context with differing demographics and mobility challenges compared to those investigated in Oxford, identified interactivity and continuity of participation as challenges to the POTM methodology, but concluded that despite these limitations the methodology contributed to citizen empowerment in local mobility (Tatum et al., 2020).

Local, UK national, European and global aspirations are aligned with regard to three imperatives: the need for socially inclusive processes to support reducing inequalities, to promote health, and to address the urgency of moving towards net zero carbon and environmental sustainability. While our study in Oxford is at a micro local level, it remains relevant to the bigger picture, since it is well argued that action to address global challenges needs to happen across the whole of society, at every level of governance, across all sectors, and with no-one left behind (Marmot and Bell, 2019; Morton et al., 2017; Stegeman et al., 2020).

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