DESIGNING SUSTAINABLE MOBILITY FOR PEOPLE AT RISK OF SOCIAL ISOLATION – TWO CULTURAL PERSPECTIVES FROM SINGAPORE AND FRANCE

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ABSTRACT

In both Singapore and France, the proliferation of technology in mobility services induces a risk for non-tech savvy users to be left behind. This may create barriers to mobility and contribute to social isolation. This paper proposes to use a mix of design methods considering specific user problems.

In Singapore, after shadowing and interviews with people with reduced mobilities, a persona was drafted, and two key needs for travelling were highlighted: the role of time and the reliance on other people. In France, personas were defined for non-tech savvy users during a design workshop. A new mobility service was created to answer their needs.Further work will be on (i) feeding design workshops with the identification of personas, based on interviews with persons with reduced mobility and (ii) comparing personas in Singapore and France and investigating how design actions can be conducted and evaluated in two different socio-cultural contexts.
Keywords: Human-Centred Design, Sustainable Mobility, Social Isolation, Technologies in Mobility Services

1. INTRODUCTION

People with Reduced Mobility (PRM; Zajac, 2016) encounter a number of challenges when travelling out of the home into their neighbourhoods, and beyond. In this paper, this group encompasses older people and people with disabilities, as rates of disability are higher among older adults, with more than 46% of persons aged 60 years or over living with disabilities (UN, n.d.). These challenges restrict mobility and limit people's exposure to the social aspects of everyday life (Webber, Porter & Menec, 2010), which in turn contributes to a higher risk of social isolation characterised by a lack of interaction with other people. As a risk factor for depression, cognitive decline and mortality (Courtin & Knapp, 2017), tackling social isolation has been identified as a public health priority in many parts of the world, including Singapore (MOH, 2016) and France (CESE, 2017; Auxilia, 2014).

In parallel, both countries are supporting the development of technology in mobility services involving the use of smartphones for booking rides (e.g. Grab services in Singapore) and autonomous vehicles (in Singapore conducted under the Smart Nation initiative (Smart Nation, 2019), and in France, e.g. in Rouen, (Transdev, 2018)). At first glance, these technologies may have a positive impact on people at risk of social isolation. For example, door-to-door services would match the needs of seniors in reducing transfers between transport modes, therefore providing them with a more convenient and comfortable travel experience. But what would be the impact on older people who are not familiar with or unwilling to use new technologies?

Considering this specific user group (older adults or people with reduced mobilities who are 'non-tech savvy') is at risk of being 'left behind' with the rash development of technologies embedded in mobility services, the authors suggest moving towards a new approach for designing urban mobility. This new approach is i) inclusive, since the design methods used are human-centred and grounded in Universal Design principles[1]; and ii) fosters sustainability, since the developed solutions are meant to encourage public transport use and improve quality of life in cities.

2. STATE OF THE ART

2.1 Ageing populations in Singapore and in France

In 2015, 17.9% of Singapore's population was aged 60 or over, rising to 30.7% by 2030 and 40.4% by 2050, and in France, 24.1% of the population was aged 60 or over in 2015, with this figure increasing to 29.9% by 2030 and 31.8% by 2050 (UN, 2015). In Singapore, population ageing is occurring more rapidly than in France (UN, 2015). As such, Singapore will need to quickly adapt its transportation infrastructure and services to fit the needs of an increasingly aged population. In France, the majority of older people live alone or with a spouse only; 88.3% of older females and 85.7% of older males did so in 2017 (UN, 2017), whilst in Singapore, in 2011, only 9% of adults aged 65 plus live alone (Linton, Gabhaju, & Chan, 2018). 27% of people over 75 are considered isolated, especially amongst women. A risk of isolation arises when the needs for daily life are not fulfilled with available means (Auxilia, 2014).

Whilst older adults have much to gain from technologies that enable mobility, they may be less likely to adopt new technologies (WHO, 2016). For today's older generations, history-graded factors play a role as digital technologies were not in existence when they were at school or in the workforce. Thus, the pace of innovation and proliferation of technology may operate as a barrier to being mobile.

In Singapore, in accordance with the Enabling Masterplan (MSF, 2016), measures have been taken to promote a more inclusive public transport system, with fare concessions for senior citizens and more accessible infrastructure (e.g. wheelchair-accessible ramps). However, some challenges remain for example with accessing information about bus arrival times and routes (Ongel et al., 2018), booking taxis for travel to medical or other appointments, and navigating Mass Rapid Transit (MRT) stations.

In France, 75-85-year-old people (representing 4.5 million people) are potentially losing their autonomy (Keolis, 2016), because of health issues and functional limitations (Auxilia, 2014). Regarding technology, 40% of French adults do not own a smartphone. Similar to people with lower levels of education and lower incomes, elderly citizens may be excluded from the usage of technologies.

In France and in general in Europe, public transport becomes an attractive alternative for seniors to maintain an active and independent life, as they are faced with financial issues or difficulties driving due to ageing, health conditions or reluctance to drive in an increased traffic (Auxilia, 2014). Public transport plays an important role in older people's quality of life because it enables mobility and facilitates opportunities for social participation (WHO, 2016).

2.2 Design methodologies and a need for a new approach

It appears that the mobility of older people in the city requires specific attention because of their specific conditions and the consequences for their health in case of social isolation.

In Singapore, several agencies are already thinking of mobility for specific users and moving towards the use of

[1] As defined by the Center of Universal Design (1997)

qualitative data to understand user groups (PTC, 2018). In August 2018, the Land Transport Authority (LTA) started public engagement in the form of online surveys with the goal of ensuring a convenient, inclusive and safe land transport system (LTA, 2019). However, methods requiring potential participants to register online may inadvertently exclude subjects – in some cases, seniors – who do not have access to the Internet. New methods are needed that are more inclusive.

A possible method for greater consideration and characterisation of the needs of vulnerable groups is the use of personas. They are used to help designers focus on the major needs of a few specific user archetypes to better fulfil those needs (TandemSeven, 2019; van Boeijen, Daalhuizen, Zijlstra, & van der Schoor, 2013). Gonzalez, Justel, Iriarte & Lasa (2017) developed personas through interviews with elderly people in the French Basque country. The three types of 'elderpersonas' were described with attributes such as profile (successful, normal, pathological), age, capabilities and habits, and the products important in their lives. They stressed the importance of distinguishing ages: biological but also psychological, subjective, functional, and social. In another study, nine 'elderpersonas' were developed based on a large-scale survey of people aged 55 and over, conducted by the French cluster Silver Valley (2018). For the construction of the personas, two main dimensions were intersected: generation (consumerism 55-65; individual 65-75; collective 75-85) and lifestyle (pleasure; sharing; decline).

Additionally, once the specific needs of vulnerable groups are identified, design solutions can be created during design workshops conducted with designers, or participatory design workshops with the targeted user group. We can report several studies where elderly people are involved in co-design activities. For instance, Wallisch et al. (2018) co-designed a tricycle with ten elderly people and four students, and Wikberg-Nilsson, Normark, Björklund, & Wiklund Axelsson (2018) co-developed prototypes of digital services with seniors.

Designing for sustainable mobility which is inclusive for non-tech-savvy people requires specific methods that are grounded in the socio-cultural context of the investigations, in our case: Singapore and France.

3. METHODS

3.1 Diagnosis of mobility situations and development of a persona: Investigations in Singapore

As part of the diagnosis of the situation, we adopted a mixed methods data collection approach involving semi-structured interviews and shadowing as data collection strategies to understand the issues faced by users on public transport today. During the interviews, questions were asked about different elements of participants' mobility experiences. For example, "Why do you prefer to travel during off-peak hours?" and "How would you compare your journey on a train to a bus?". The interviews, which typically lasted 15-30 minutes, were audio-recorded and transcribed for thematic analysis (Nowell, Norris, White, & Moules, 2017). In the shadowing study, a researcher accompanied subjects from origin to destination on their usual routes to observe their experiences. Mixed methods were used to obtain conscious and unconscious insights. The latter refers to thought processes or behaviours which the user may be unaware of him/herself. The insights were gleaned from a third party's observations of repeated and/or atypical behaviours. Based on the results, key attributes, such as pain points or travel preferences, were identified and combined with contextual information such as demographics to build personas. One such persona is presented in this paper.

3.2 Design workshops based on personas: Investigations in France

As part of the design of sustainable solutions, we report an excerpt of a 3-hour "Design of Mobility Experience" workshop organized by five post-graduate students training in innovation in CentraleSupélec in Paris in 2017. The workshop was attended by 15 people of various backgrounds and expertise (students, professionals and researchers in the mobility domain, industrial designers). It was hypothesised that shared mobility could counter social isolation, as well as solve mobility issues. The brief was written as follows: "How to design desirable solutions for shared mobility while restoring social links in everyday life?" The objective was to uncover ideas for situations where people would be eager to share their mobile life with others to further inspire new solutions. Based on the persona approach, four phases were developed in groups of two to three persons:

- Choice of one persona among predefined categories namely 'Shares'; 'Does not share'; 'Shares without awareness'
- Creation of the persona profile, and description of his/her "Journey Map" from morning to evening, while detailing what he/she does, feels or thinks, and if he/she feels like sharing throughout the day.
- Detail the moments of sharing mobility and activities depending on the family and social situation of the persona (single, with children, couple, with friends, with his/her grandmother).
- Focus on the sharing moments as creative prompts to design new mobility solutions to alleviate social isolation.

4. RESULTS

4.2 Investigations in Singapore

The sample (n=16) comprised public transport users from vulnerable populations – older people and people with physical or sensory (i.e. visual or hearing) impairments. The interviews provided practical insights into the details important

to these users. The problems that hinder PRM from travelling are not confined to the mobility system (e.g. lifts leading to the train station). For instance, when the lifts at MRT stations break down, a physically-impaired subject could not travel as they were unable to even access the train platform. One visually-impaired participant (male, guide dog owner) agreed to the shadowing procedure. The subject was able to find an available seat easily with the aid of his guide dog. However, the researcher noticed that he needed more time than the average person to sit down as he had to rely on haptic feedback, i.e. feeling around the seat, to orient his body. In another instance, the guide dog successfully led the participant to the escalators upon receiving an instruction. However, the dog had guided the participant to an escalator going in the wrong direction, so the participant had to rely on a fellow passenger to show him the way.

These investigations enable us to define the main attributes of a persona that could be considered later for design actions (i.e. design conception and evaluation). The persona is Peter Tan, a 72-year-old who moves with support aids, such as a walking stick or handrails, within the home. He stays at home most of the week, and when he does go out, his travels are restricted to his immediate neighbourhood because he relies on a wheelchair to travel longer distances, which can be a hassle. The travel experience with public transport is unpredictable for several reasons: crowds can greatly impede movement, particularly when boarding or alighting vehicles; facilities enabling access to the mobility service are sometimes unavailable (e.g. lift breakdowns), and there is a reliance on other passengers to give way or provide information about the route when going to an unfamiliar destination. This unpredictability makes Peter anxious, as he can never be sure whether the journey will be smooth and comfortable. Although his family gave him a smartphone, he rarely uses it, except to make and receive phone calls, as he does not really know how to use it.

4.3 Investigations in France

During the "Design of Mobility Experience" workshop, the groups created intertwined life and mobility experiences for five personas who mainly belong to non-sharing profiles (Table 4.1).

[Table 4.1] Personas created for the Design of Mobility Experience workshop

Name	Age	Category
Pierrette	64	Does not share; Impaired mobility and arthrosis of inferior limbs
Clara	68	Does not share; Non-tech savvy
Romane	Non-defined	Unconsciously share; Single young women
Gérard	Non-defined	Does not share; Independent; Single father
Jean-Pierre	50	Does not share; Reluctant

In the sample of non-sharers, we were interested in Pierrette, who represents a person with reduced mobility, and Clara, who is non-tech savvy. For Pierrette, the group imagined all sorts of moments where she may feel pain and isolation while leading her daily mobile life with family and friends. For instance, an experience imagined for Pierrette is at 8 pm, when she goes to the theatre with some friends: "I enjoy theatre plays very much. But moving to the theatre is such a nightmare that it makes me nervous and I do it only from time to time".

The outcomes of the workshop were translated into design actions as follows. The story of Pierrette was taken as a new innovation design brief by a group of students, who implemented a need-seeker method called Radical Innovation Design (Yannou, 2015; Lamé, Yannou, & Cluzel, 2017). Crossed with insights on the difficulty for seniors to live a satisfactory life, especially in suburban areas, and with the benchmark of existing solutions on the French territory, they designed and service-blueprinted a ride-sharing concept dedicated to elderly people called Mooment – a single word for Moment, Move and Mood. It aims at connecting two types of user profiles: elderly people, like Pierrette, who are supposed to be non-sharers; and sharers in their neighbourhood, who are ready to help. This service works with an easy-to-use device to counter the reluctance towards technology. It consists of a simple support in the form of a connected button allowing the elderly person A to send: (1) a request of ridesharing to all the people owning a matching phone application in a defined area, (2) a request for a particular service, shopping groceries for instance. If the person B acknowledges the request, a phone call is established without having to share one's phone number. If no one answers the request, Mooment suggests an alternative transportation service and deals with the booking procedure for the elderly person.

5. DISCUSSION AND CONCLUSION

These investigations in France and Singapore confirmed the necessity of using mixed methods in designing towards sustainable mobility. Both sets of methods – in Singapore and in France – complemented each other, revealing different aspects of designing for older people, including those with disabilities. In Singapore, empirically-based qualitative research enabled a detailed diagnosis of the public transport experiences of people with restricted mobility, who may be at risk of social isolation. One insight was about their need for time. Although participants did not always formulate this explicitly, observations and interviews showed that this user group requires more time, e.g. to board and settle into their seats. Mobility design guidelines can include considerations for time that the passenger needs to complete each segment of the trip; further work will be done on how this affects other operational functions, e.g. vehicle dwell times and on a larger scale, the service schedule. Additionally, the investigations in Singapore identified a new key need: 'reliance on other persons while travelling', which has so far not been identified by

transport authorities, such as in the standard EN 13816 defining service quality for public transport (CEN, 2002). This key need should be considered in designing future mobility systems, for example autonomous buses (i.e. driverless): The issue of not having a driver on board – whom people with reduced mobility currently rely on heavily for information and vehicle access – could be tackled thanks to a Virtual Companion that answers their questions and requests. In France, the involvement of experts and the use of hypothetical scenarios during the "Design of Mobility Experience" workshop enabled the creation of a new mobility service adapted to the needs of non-tech savvy older persons. This should be consolidated with observations and interviews with older people. A design workshop could be conducted with a panel of seniors in a participatory approach, as in Wallisch et al. (2018) and Wikberg-Nilsson et al. (2018). Moreover, the diagnosis of mobility situations and the design workshops could be chained thanks to the construction of personas.

The investigations focussed on specific user groups who are non-tech savvy and less mobile. Beyond that, in a mindset aligned with the Universal Design principles, any actions benefiting people with reduced mobility would likely benefit other user groups, e.g. both a wheelchair-bound user and a parent pushing a baby stroller will need barrier-free access to transportation. Sze & Christensen (2017) conducted a review of Universal Design guidelines for the US, UK and Hong Kong, noting the target group for each specification. The proposed groups can be enhanced for design action. Firstly, by identifying distinct sub-groups, e.g. different abilities and needs between young-old and old-old users. And secondly, by prioritising design tasks through the clustering and identification of similar needs across personas. In this way, design considerations for one group, e.g. PRM, can also ease travel for other vulnerable groups, such as pregnant women or people with injuries. For future mobility, e.g. driverless buses, how can people with disabilities signal to the vehicle that they simply need a little more time, especially in the case of a visually-impaired passenger who may be unaware that the vehicle is departing?

With the use of design methods grounded in the local socio-cultural context, social isolation can be countered by enabling better access to and acceptability of mobility services. This extends to the creation of greater comfort and a more predictable experience on public transport. Such action would foster increased usage of public transport, including shared mobility services, which in turn would better facilitate people with opportunities for social interaction. The enhancement of these interactions combined with a reduction of private motorized mobility is aligned with sustainability goals for a better quality of life through improved mental and physical health in less polluted environments.

Further work will be on strengthening research collaborations between Singapore and France by (i) feeding design workshops with the identification of personas, based on interviews of persons with reduced mobility, (ii) comparing personas in both countries and investigating how design actions can be conducted in two different socio-cultural contexts, and (iii) conducting usability tests with users from Singapore and France with the developed solutions (e.g. the ride sharing service Mooment or a Virtual Companion for autonomous buses) and comparing the results.

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