Summary

The use of smart mobility solutions by the young elderly
Current status, knowledge and innovation needs

Smart mobility solutions can reduce car use and car dependency. Among the young elderly (65-79 years), such solutions can contribute to an active and independent aging. Currently, their use of these appear low. However, we lack knowledge about why and what public and private actors can do to increase uptake. Together with Rogaland county and Kolumbus we have examined the status of knowledge and the need for development and innovation. Many young elderly are open to smart mobility solutions, but uptake requires that these are – and are perceived as – accessible and easy to adopt. Moreover, are perceived as relevant to a young elderly's travel needs. Among public and, in part, private actors, the topic appears relatively new and less explored. The level of knowledge about the young elderly's everyday travel habits and their use of smart solutions appears relatively low. If young elderly to adopt smart mobility solutions, this must be an active priority by relevant actors.

Background and study purpose

Norway has an aging population. The Active Ageing agenda states that the elderly should have an active and independent aging, taking part in society for a long time (Helse- og omsorgsdepartementet 2018). Today's elderly live longer, are healthier than before and, according to several studies, travel more than previous generations (Hjorthol et al., 2011; Priya Uteng and Julsrud, 2015). Many studies imply that this group has very car-based travel habits (Grue et al., 2021; Hjorthol et al., 2011; Priya Uteng and Julsrud, 2015). According to the Norwegian national travel survey, in the group 64-74 years 70 per cent travel often by car (55 per cent car driver, 15 per cent passenger), while only 2 per cent cycles, 8 per cent travel by public transport. In the group 75 years+ the repartition is as follows: 51 per cent car driver, 15 per cent passenger, 2 per cent cycling, 7 per cent public transport (Grue et al., 2021). [2] Similar trends can be found in Rogaland (Rogaland County Municipality, 2017, 2020, 2021). High car use and car dependency among the elderly, especially the young elderly (65-79 years), can be a hinder to ensure an active and independent aging, especially when a person for various reasons no longer can drive. New and smart mobility solutions such as electric bicycles, e-scooters and other micro-mobility, car sharing and other sharing solutions, carpooling, etc. has the potential to reduce car use and car dependency in general, including among the young elderly (George and Julsrud, 2018). However, there are many indications that this group uses such solutions to a small extent, but we lack knowledge of why. We also lack knowledge about how public and private actors can work to increase use among the young elderly. This pre-study sought to

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[2] For the population as a whole the repartition is as follows: 53 per cent car driver, 10 per cent car passenger, 11 per centr public transport, 5 per cent cycling and 20 per cent walking (Grue mfl., 2021).

investigate these issues, especially with regard to how Rogaland County, municipalities in the county and Kolumbus (the public transport company) can work to promote smart mobility solutions among the young elderly in Rogaland. We have gathered and compiled knowledge about the use of smart mobility solutions among the young elderly, and about how the county, municipalities and Kolumbus can work for increased use. The aim has been to identify knowledge, development and innovation needs for the improvement and innovation of smart mobility solutions and services in order to increase their use among the target group.

Research design and methods

We have combined new studies with new analysis of existing empirical data obtained by the Institute of Transport Economics (TØI), Kolumbus and Rogaland County. Additionally, we undertook literature and document studies of existing knowledge. This was done through literature searches in databases and using the so-called 'snowball method'.

New studies include:

- Survey among public and private actors in Norway
- Gathering information about what public actors in Rogaland county are doing per today
- Workshop with public actors in Rogaland
- Two group interview with young elderly in Rogaland

New analysis of existing empirical data include:

- Study on use of car sharing, focusing on the young elderly/elderly
- Study on the use of e-scooters, focusing on the young elderly/elderly
- Studies on the use of public transport in Rogaland, focusing on the young elderly/elderly

For several of the studies and the summarizing discussion, we employed a theoretical framework based on Social Practice Theory (SPT). According to SPT, activities that are characterized by particular features and that are carried out with a certain regularity are studied as *practices*, such as the use of a car or public transport. A practice is often divided into a set of interconnected elements categorized as materials, skills and meaning. *Materials* include equipment or things needed to perform the practice, *skills* include knowledge and abilities needed to perform it, while *meaning* includes what performing the practice means to the person doing it. Breaking a practice into components within these categories can contribute to a better understanding of how the practice takes place, possible barriers and challenges, what is needed to perform it, and what it means for the person performing the practice.

Existing knowledge

The reviewed literature rarely distinguishes between the young elderly and the elderly. We therefore only use the term 'elderly' in this section.

Getting around on your own and/or relatively independently is important for elderly's welfare, self-esteem, feeling of independence, etc. (Luiu et al., 2017; Nordbakke and Schwanen, 2015). Properties related to e.g., health status, finances and life situation vary and affect travel behavior for the elderly in the same way as for the rest of the population (Luiu et al., 2017; Nordbakke and Schwanen, 2015; Shrestha et al., 2016). Health appears to

be one of the most important barriers to everyday travels, especially among the oldest elderly (over 75 years) and women (Luiu et al., 2017). There is broad agreement in the literature about large knowledge gaps associated with (younger) elderly and smart mobility solutions, including the digitization of the transport system (Butler et al., 2020; Cirella et al., 2019; Loos et al., 2020 Pangbourne, 2018; Rocha et al., 2021). Most examples of elderly's use of smart mobility solutions relate to the use of ride hailing solutions such as Uber and Lyft (mainly from North America), carpooling, as well as a few on public transport use and use of travel apps. A recurring conclusion is that smart mobility solutions must be adapted to the needs of the elderly (e.g., user interface, driver training). However, there is some disagreement on whether digitization and technology constitute barriers to increased use of smart mobility solutions among the target group (Cirella et al., 2019; Pangbourne, 2018; Shirgaokar, 2018). It is often pointed out that future elderlies will probably have a higher technology competence than today's elderly, which opens up new opportunities, but also emphasizes the importance of the issue being on the agenda – for research as well as decision-makers.

Findings

Investigations among public and private actors

Among public actors and a number of private (those we were in contact with or have found something about), the issue of the young elderly's use of smart mobility solutions and how to get more of them to use these is relatively new and less explored. The level of knowledge about young elderly's everyday travels in general and their use of smart solutions in particular appears to range from fairly ok to relatively low. At the same time, our research shows that the issue is considered important when addressed. Several of the actors (survey, workshop) see the potential in getting more young elderly to change their travel habits at an early stage to ensure an active and independent aging. Hence, there seems to be a need for increased focus on young elderlies' use/non-use of smart mobility solutions. Achieving this requires collaboration across sectors (disciplines), actors and levels. Raising awareness and knowledge among public (and probably private) actors will be important to get the issue on the agenda and to initiate more efforts around this. Through our explorations we found a call for more knowledge about young elderly's travel habits in general, whether smart mobility solutions are something the target group wants to use and what travel needs this can cover, as well as barriers to use and to change their travel habits.

Investigations among the young elderly

The young elderly who participated in our explorations have quite different characteristics (in line with the literature), but the majority use the car a lot for their travels. The extent to which they have thought about their future travel behaviour varies. Among those who have thought about it, some have taken action by moving to centrally located apartments. Interestingly, we do not find as strong a connection to viewing the car as a symbol of freedom and independence as has been found in previous studies among elderly. E-bikes on the other hand, were described in this way by the group interview participants who use them. These see e-bikes as a good alternative to the car on shorter journeys. This is in line with previous findings and indicates an untapped potential to get more young elderly (and older elderly) in Norway to start using e-bikes (more). Public transport appears to be a option for those who use it, while non-users state many barriers and objections to traveling in this way.

The group interview participants used few smart mobility solutions beyond e-bikes and travel apps for public transport (among those who use public transport). In the other explorations we similarly find relatively low use of smart mobility solutions. As this is a pre-study, there is a need for more comprehensive explorations for a clearer picture, but so far, our initial assumptions of the young elderly using smart mobility solutions to a little extent are supported. The group interview participants were open to sharing solutions and other possibilities given that the systems for use (reservation, pick-up/delivery, general use, etc.) are simple and easily accessible. From the survey on car sharing, we also find a positive attitude towards smart mobility solutions among young elderly, but systems for reserving and picking up/delivering the car are among the elements that counteract their use. Digitalization can be a barrier to the use of smart mobility solutions, but even among the more sceptical of the group interview participants there was a recognition that 'keeping up' is important for continued participation in society. The group interview participants all agreed that an opportunity for testing and training (being taught) is probably one of the most important tools for them and their peers to increase their use of smart (new) mobility solutions. This is also in line with conclusions in several previous studies.

Carpooling – an extra low hanging fruit?

Carpooling appears to be a particularly interesting and already quite well-implemented solution for the young elderly. This is in line with findings from previous research. In the group interviews, the participants did not consider this a new and 'smart' mobility solution as the principle has existed since they were young workers. Carpooling mostly takes place informally among family, friends and acquaintances. A disadvantage of this practice is dependency on having a family (nearby or at all) and/or a social network. Not all elderly has that. Forms for formalizing carpooling can therefore be interesting and help make the solution available to more. Moreover, it can contribute positively to public health, climate, environment, etc. One approach could be to develop digital solutions that simplify the connection between driver and passenger and expand the networks of carpooling. There are some digital solutions in Norway and several international (apps) for carpooling. Based on what we find in the literature (Meurer et al., 2014; Shirgaokar, 2018), and previous and existing solutions in Norway, there is reason to assume that the use of formalized solutions among the young elderly is low. It is important to follow the recommendations from the literature to develop solutions in close collaboration with the users (here young elderly) to ensure that the output corresponds to the target group's needs.

Measures to promote smart mobility solutions among the young elderly

Based on findings from our explorations, we have identified several measures and instruments that Rogaland County, Kolumbus and municipalities in the county (and other actors in Norway) can implement to promote smart mobility solutions among the young elderly. These are summarized in the table below.

Table S1: Measures that Rogaland county, Kolumbus and municipalities in Rogaland can implement to promote the use of smart mobility solutions among young elderlies, sorted according to materiality, skills and meaning (non-exhaustive list).

Measures that Rogaland county, Kolumbus and municipalities in Rogaland can implement to promote the use of smart mobility solutions among young elderlies	
Materiality	- requirements to the design of vehicles that are bought (or rented/leased), and potentially requirements to companies offering smart mobility solutions
	- requirements to the solutions/systems for reservation, pick up/delivery if an external service provider. If the public authorities are the service provider this must be ensured.
	- requirements to the design of stations/pick up places/public transport stops, etc.
Skills	- educational offers for digital solutions and technology in general
	- educational offers for smart mobility solutions
	- information campaigns about smart mobility solutions
	- ensure that information is easily accessible and useable (depending on the needs of young elderly and elderly)
Meaning	- campaigns to promote different solutions
	- incentives to test smart mobility solutions for young elderly to familiarize themselves with these

Conclusion and further research

To increase the use of smart mobility solutions among young elderlies, there is a need for more knowledge about them as users and as travellers, a need for more focus and targeted efforts on the topic from public and private actors, as well as more development and innovation related to solutions and services aimed at the target group. Based on our findings, it seems that the topic is currently relatively new and less explored among various actors, at the national level as well as in Rogaland. For the young elderly as users, findings point in a similar direction, but we assume there is variation within the group. Some of the knowledge needs we see are summarized as follows:

Young elderly's travel behaviour in general

- better knowledge about their everyday travels and travel needs, their difficulties for traveling, and how this varies within the group
- challenges and opportunities to change travel behaviour among the target group, e.g., if there are large differences compared to other groups of the population
- how findings related to this group differ from findings related to those who are 10 years younger (with a view to preparing the transport systems and society for the latter's aging),
- young elderlies' use of sharing economy, and how this differs from other groups

Young elderly's use of smart mobility solutions

- more knowledge related to specific solutions and young elderly's use of these, including what travel needs they can cover
- go more in depth on barriers related to e.g., insecurity, digital and technical competence, attitudes, willingness to pay
- the extent to which increased use of such solutions can contribute to tackling challenges with loneliness among young elderlies,
- how technology can facilitate transport and mobility for the elderly, and how it can coincide with transformative-based innovation (e.g., desire to live completely differently)

- coordinated testing of various smart mobility solutions and observe and evaluate these
- health effect and thus financial savings through increased use of smart mobility solutions among young elderly

Young elderly and digitalization and technology
- better understanding of (young) elderly's perception and use of technology and digital solutions related to mobility and transport
- what experiences can be gained from working on welfare technology to make smart mobility solutions available to young elderlies