The GOAL action plan

Growing Older, stAying mobiLe: Transport needs for an aging society

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Overall Objectives of the Project GOAL

Development of an action plan focused on the development of innovative solutions for transport needs of older people in the near future

AND thereby

- To identify different profiles of older people
- To identify technical and other approaches to overcome or mitigate the problems
- To identify research gaps in terms of both knowledge and technologies
- To deliver future mobility scenarios for older people
Identifying Profiles of Older People

- SHARE datasets
  - list of features
  - classification
  - mobility related characteristics
  - Literature
    - qualitative analysis:
      - demographics
      - health
      - transport
      - lifestyle
      - living environment
    - categorization/mapping based on cluster information

- statistical analysis (PCA, cluster analysis)

- selection of relevant features

- additional features from SHARE

- experts opinions knowledge gaps

- additional surveys:
  - mobility behavior
  - technology usage
  - transition Points

- 5 Draft Profiles

- Final Profiles:
  - Fit as a Fiddle
  - Hole in the Heart
  - Happily Connected
  - an Oldie but a Goodie
  - the Care-Full
$k$-means algorithm
The basis: Profiles of older people 2012

- Fit as a Fiddle: 37%
- Happy Together: 32%
- An Oldie but a Goodie: 13%
- Hole in the Heart: 13%
- The Care-Full: 5%
Future scenarios and gap analysis: objective

- Identification of *knowledge gaps and research needs* to support mobility of older people through a systematic approach.
The action plan

Research needs and knowledge gaps:
- Driving
- Public transport
- Walking and cycling
- Travel information
Action 1: Develop databases on walking and cycling behaviour by older people

• Despite being a healthy and sustainable mode of transport, there is little available data about walking and cycling habits and accidents.

Impact:
• Insight in types and numbers of walking and cycling accidents.
• Development of standards for the provision of safe walking and cycling.
• Identification of specific design features of cycling equipment for the older cyclist.
Action 2: Identify motivators for walking and cycling for older people

- Older people with limited physical and/or mental competence are particularly influenced by the quality of the walking environment.
- Research needs to focus on the link between urban planning and the walking behaviour of older people.

Impact:
- Increased walking by older people with all the physical and mental benefits
- Reduced healthcare costs and improved active lifestyle for the older people.
- Increased awareness amongst planners and designers of the importance of giving consideration to older people.
Action 3: Investigate the transition behaviour from car to other modalities

- Transition from using your car for most trips to using public transport can be a negative life event.
- An early and positive approach to such a change could lead to a more satisfactory outcome in terms of both personal lifestyle, reduced accident risk and more sustainable transport.
- Research is needed to understand the circumstances of change which may trigger full or partial transitions from car to public transport.

Impact:
- More sustainable mode of travel by the older people.
- Longer mobility for older people.
Action 4: Develop methodologies to assess the benefits of public transport accessibility measures

- There is a lack of a holistic view of entire trips made by older people, where a single small factor may lead to an unacceptable outcome.

Impact
- Improved accessibility to public transport will improve the quality of life of older people.
- A demonstration of improved accessibility of public transport will act as a showcase for further implementation.
Action 5: Identify the requirements for travel information and social media suitable for older people

- Older people need to have available information which enables them to plan and complete a journey safely.
- The increasing use and access to a wide variety of social media may be able to support older people in a journey.

Impact:
- An understanding of the requirements of travel information systems/services suitable for older people.
- An assessment of the extent to which such systems/services could encourage more travel.
- Increased usage of social media by older people by removing barriers e.g. fear and mistrust of technology
Action 6: Assess the impact and potential of future technology for the older driver

- In-car technology is intended to improve driver safety and comfort.
- The risks of information overload and distraction counts for all road-users, but can quickly develop into a critical situation for older drivers. Research should be focused on the capabilities of older drivers.

Impact:
- Directions for the development of in-car systems that support older drivers, without increasing workload and distraction to a critical level.
- Promoting the automotive industry to develop in-car support systems with user interfaces which are based on elderly friendly design.
- Providing support and advice for older drivers to deal with cooperative driving and (semi) automation of driving.
Action 7: Develop driving screening and assessment tools and programs

• Develop criteria that define whether someone is still capable of participating in traffic safely

• Develop insights into how older drivers adapt themselves to declining driving skills.

Impact:

• Generally accepted training programs.

• Increase in self-awareness of older drivers regarding their specific driving difficulties, leading to more effective self-regulated driving behavior.

• Validated and reliable tools to test different driving skills in older drivers, also taking into account cognitive capacities.
Future Mobility Scenarios 2030

Mobility systems
(infrastructure, driving, walking/cycling, PT, traveller info)

Macro factors
(Environment, energy, health, economy, drivers, demography, technology & innovation, Transport)

User needs
(mobility trips, personal/shared/virtual mobility, mobility management, safety)

Scenario dimensions

Energy & environment

Mobility attitude

Technology of transport

Economy

The bloom scenario
• A scenario where the EU will see greatest prosperity in all the scenario dimensions

The gloom scenario
• A scenario where the EU will see a state of depression

Energy doom scenario
• A scenario where the EU will see a severe energy crisis which is crippling the economy

Techno boom scenario
• A scenario where the EU will see fast technological advances leading to strong economy
GOAL project website: www.goal-project.eu
vruits

IMPROVING THE SAFETY AND MOBILITY
OF VULNERABLE ROAD USERS THROUGH ITS APPLICATIONS
Cooperative AEB system

The main objective of the C-AEB system is to:

identify a bicycle in the direct vicinity of the vehicle and to determine whether this bicycle is on collision course with the host vehicle.

the system will warn the driver several seconds before a collision is expected (visual, audible, seatbelt pre-tensioner)

If no manual braking is applied the system will intervene by automated braking to prevent a collision.

[video]
## HMI variants

<table>
<thead>
<tr>
<th>Phase</th>
<th>Variant 1</th>
<th>Variant 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inform</td>
<td>-</td>
<td>TTC = 3 sec</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Warning sound “watch out, bicyclist!”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Display: traffic sign</td>
</tr>
<tr>
<td>Warn</td>
<td>TTC = 1.4 sec</td>
<td>TTC = 1.8 sec</td>
</tr>
<tr>
<td></td>
<td>Deceleration = -3m/s²</td>
<td>Deceleration = -3m/s²</td>
</tr>
<tr>
<td></td>
<td>Pre-tensioning of seatbelt</td>
<td>Pre-tensioning of seatbelt</td>
</tr>
<tr>
<td></td>
<td>Warning sound “beep, beep”</td>
<td>Warning sound “ping, ping”</td>
</tr>
<tr>
<td></td>
<td>Display: [Brake]</td>
<td>Display: traffic sign</td>
</tr>
<tr>
<td>Intervene</td>
<td>TTC = 0.8 sec</td>
<td>TTC = 0.8 sec</td>
</tr>
<tr>
<td></td>
<td>Deceleration = -6 m/s²</td>
<td>Deceleration = -6 m/s²</td>
</tr>
<tr>
<td></td>
<td>Seatbelt still tensioned</td>
<td>Seatbelt still tensioned</td>
</tr>
<tr>
<td></td>
<td>No warning sound</td>
<td>No warning sound</td>
</tr>
<tr>
<td></td>
<td>Display: [Brake]</td>
<td>Display: traffic sign</td>
</tr>
</tbody>
</table>
Hypotheses: By allowing older drivers more time and by giving them a warning that does not rely on memory retrieval they would prefer variant 2 over variant 1.
Method

20 young drivers (52.6%)
18 elderly drivers (47.4%).
men 65.8% versus women 34.2%.

Acceptance scale (adapted from Van der Laan, Heino & De Waard, 1997).

1 Useful
2 Pleasant
3 Bad
4 Nice
5 Effective
6 Irritating
7 Assisting
8 Undesirable
9 Raising Alertness

Useless Unpleasant Good Annoying Superfluous Likeable Worthless Desirable Sleep-inducing
Which HMI variant is preferred?

![Bar chart showing preference for HMI variants by age group.](chart.png)

- **Favourite system**
  - **Variant 1**
  - **Variant 2**

**Count**
- Young: Variant 1 > Variant 2
- Old: Variant 2 > Variant 1
Trust and timing

Elderly drivers trust variant 1 and 2 better than young drivers,

variant 1 = 84% variant 2 = 85% (elderly)
variant 1 = 67% and variant 2 = 63% (young).

variant 1, \( t(34) = -3.68, p < 0.001 \)
variant 2, \( t(34) = -3.62, p < 0.001 \)

Elderly drivers scored the timing of both variants as “slightly too late”. Younger drivers scored variant 2 “slightly too early”. An independent t-test proved that there is indeed a significant difference for variant 2, \( t(34) = -2.14, p = 0.04 \)
Overall conclusion

- The potential of future cooperative technology for the older driver was highlighted.
- In order to assist the driver and increase road safety cooperative technology will be developed and the driving task will become more automated.
- Excellent Human Machine Interface design will ensure that older drivers will benefit from this technology whilst not increasing mental workload or decision making time.
- Furthermore, by acknowledging the different older driver profiles systems could be personalized or adapted to their needs allowing them to drive their car for longer and safer.
Thank you for your attention.

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