



# A system design to support outside activities of older adults using smart urban objects

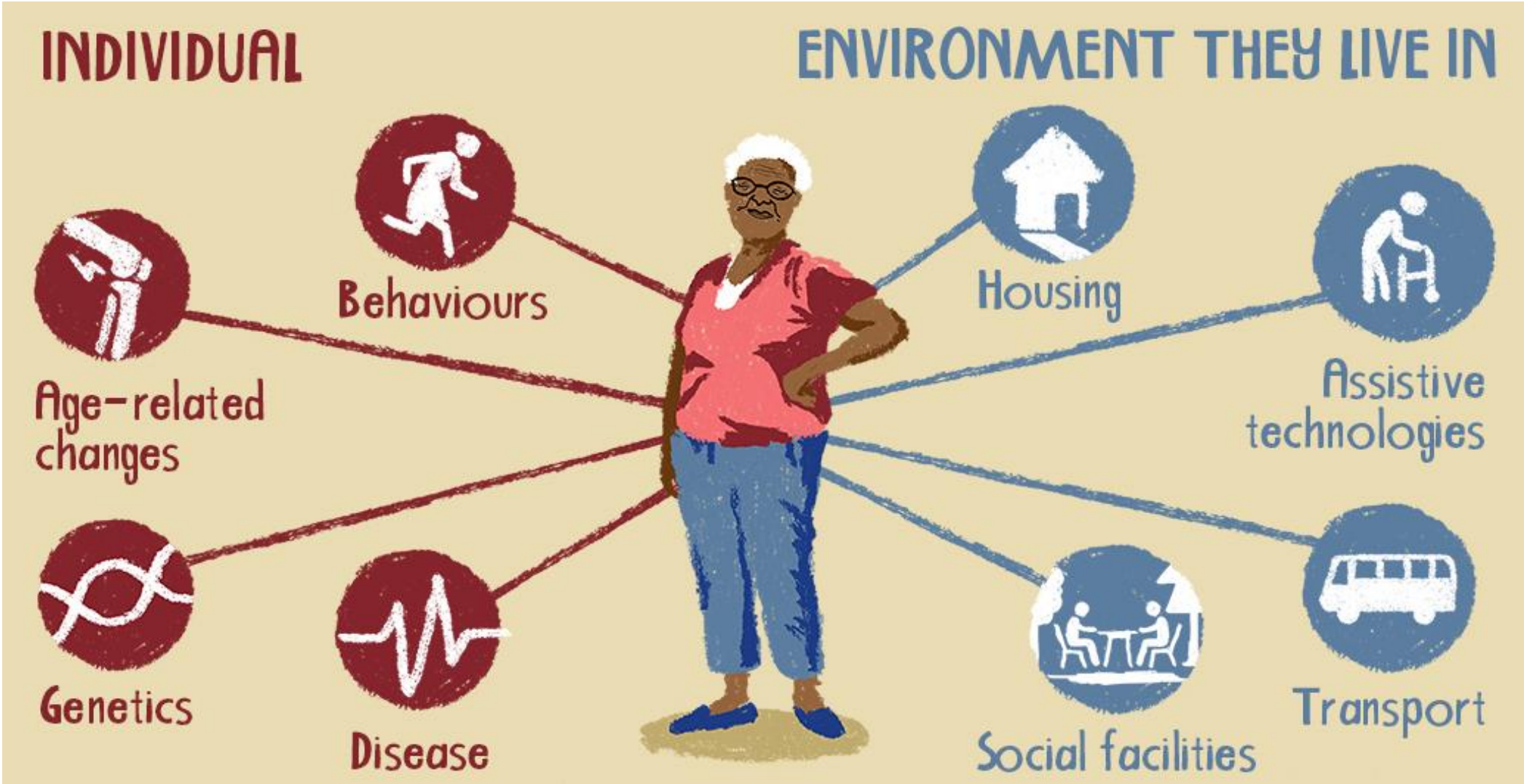
Julian Fietkau, Laura Stojko

Exploratory Paper

18th European Virtual Conference on Computer-Supported Cooperative Work

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# Seniors in urban space



Source: World Health Organization, World Report on Ageing and Health (2015)

# Increasing safety

**Participation** in the urban space through the help of digital technology

Improvements to **perceived safety** in the face of individualized age-related barriers

**Safe movement** in public areas via appropriate technological support



**Smart urban objects** provide assistance for navigation and mobility

Developing **senior-friendly neighborhoods** to support a self-directed lifestyle for the elderly

*der Bundeswehr*  
**Universität München**

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Information Systems Institute

**Hochschule Niederrhein**  
University of Applied Sciences

 **UNIVERSITÄT HOHENHEIM**  
1818

**DREES & SOMMER**

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**SOZIAL-HOLDING**



*Mönchengladbach*

**NEW'**

  
Städtische Kliniken  
Mönchengladbach

 *Kreuz*  
**KREUDER**

 **Handelsverband  
Nordrhein-Westfalen  
Rheinland**

  
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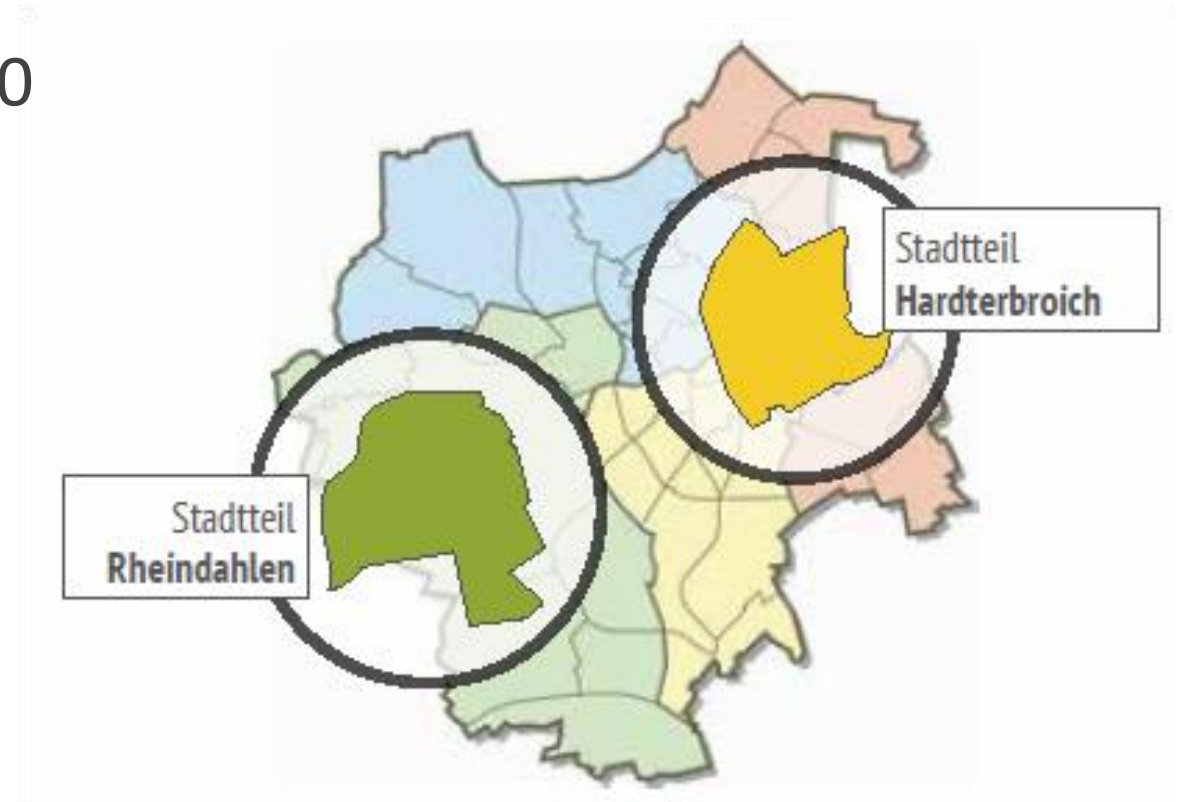
GEFÖRDERT VOM



**Bundesministerium  
für Bildung  
und Forschung**

# Location context

- Mönchengladbach, Germany
  - approx. 260,000 residents
  - 21.6 % people aged 65+ in 2020
  - projected: 28.8 % by 2040 \*
- Two observed areas:
  - Hardterbroich (more urban)
  - Rheindahlen (more rural)



\* Prognose IT NRW, 2018

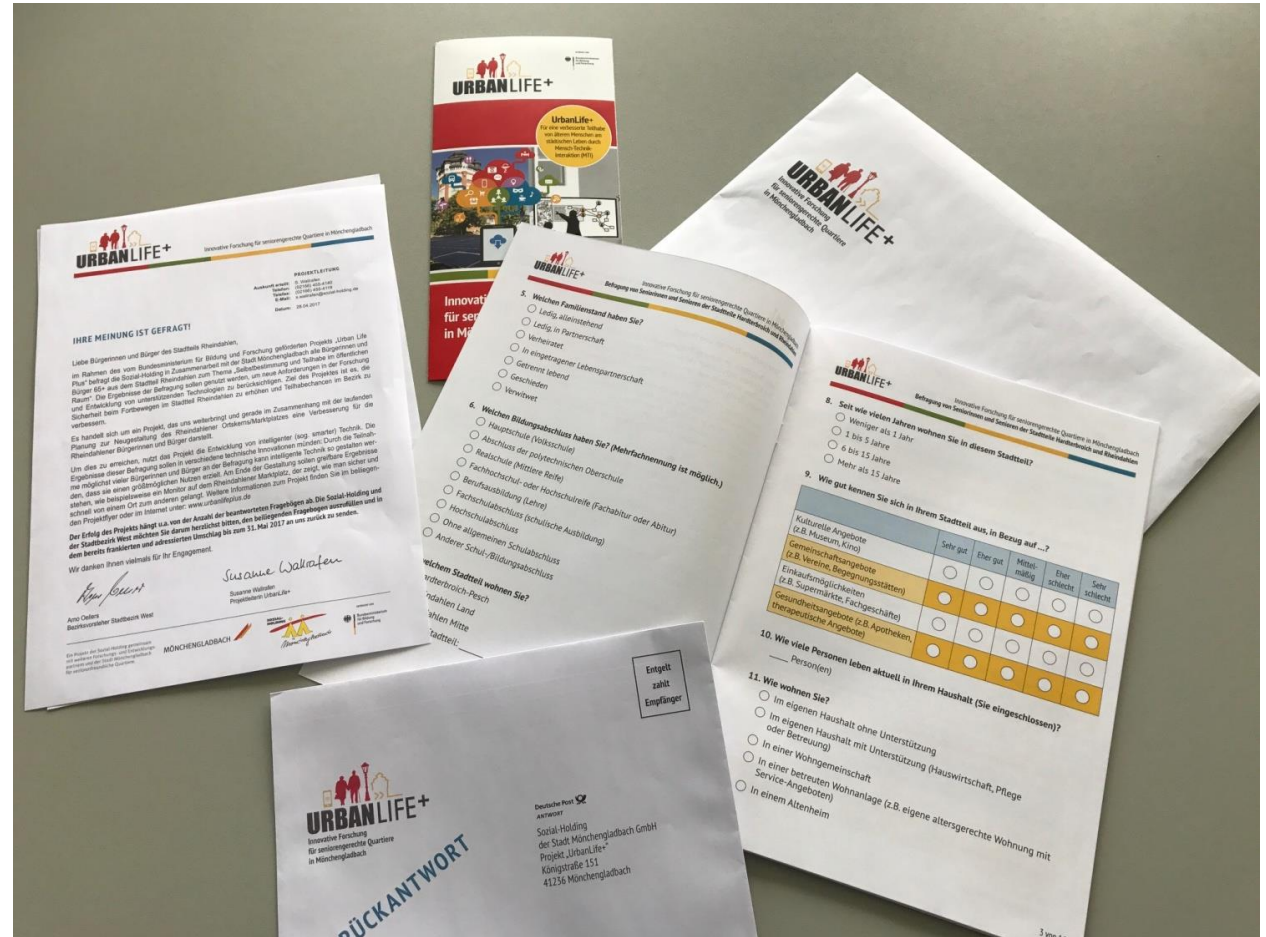


# Panel study

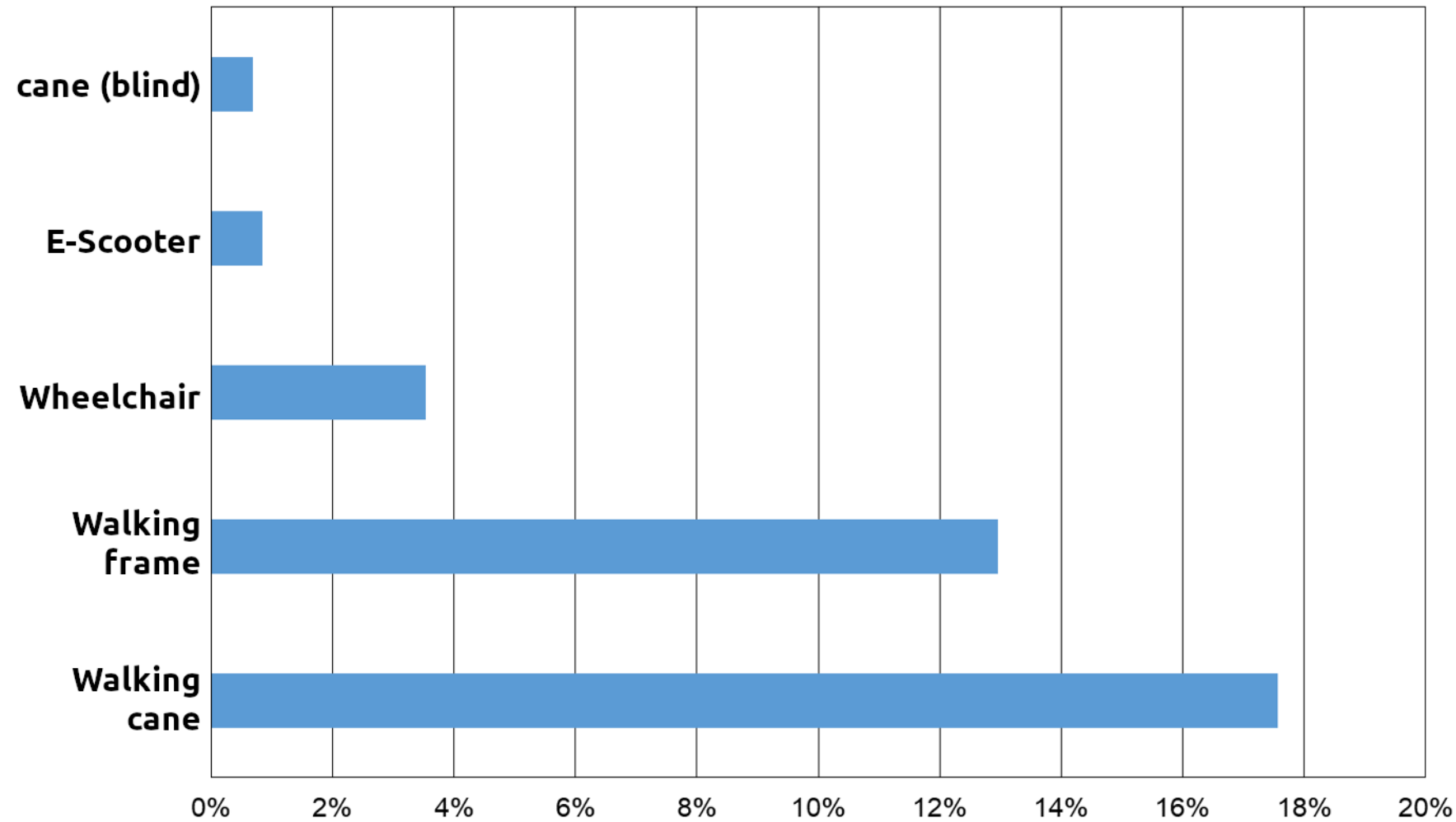
- Questionnaire sent to all residents aged 65+, **6.078** in total
- Return rate: **21.5%** (1.307 questionnaires)

Schehl, B. (2020): 'Outdoor activity among older adults: exploring the role of informational internet use'. *Educational Gerontology*, vol. 46, no. 1, pp. 36–45.

Schehl, B. and Leukel, J. (2020): 'Associations between individual factors, environmental factors, and outdoor independence in older adults'. *European Journal of Ageing*.

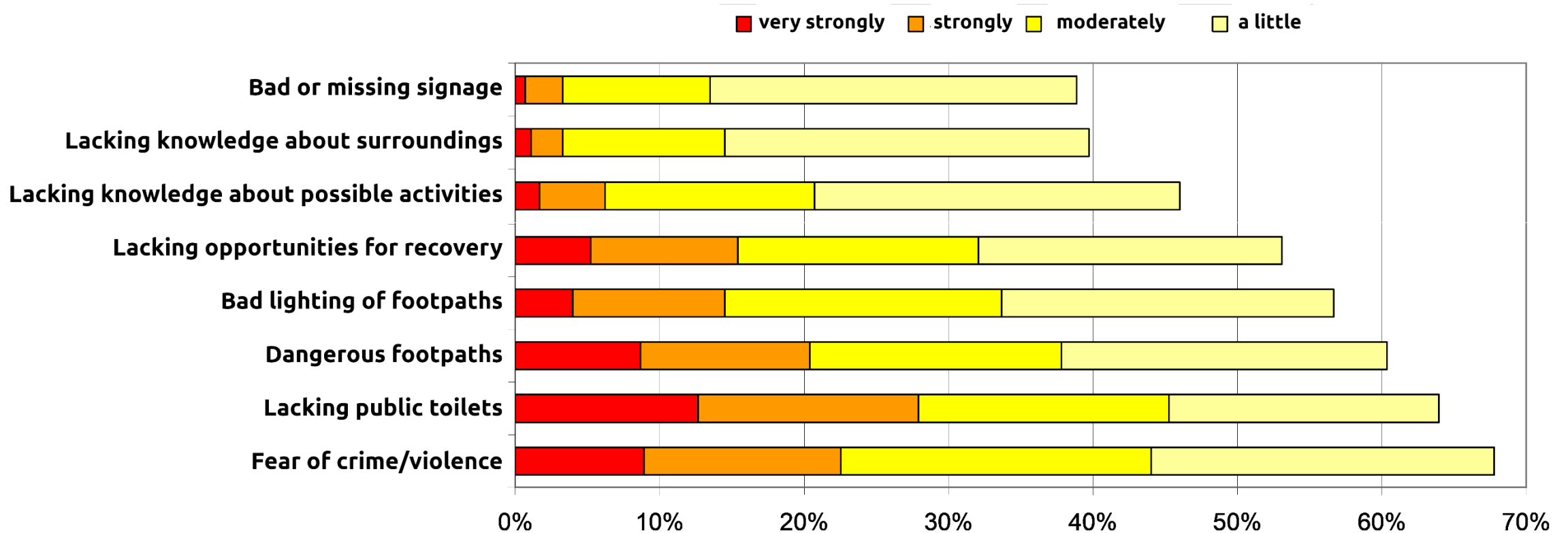


# Selected results: use of mobility aids



<https://www.urbanlifeplus.de/2017/09/ergebnisse-der-buergerbefragung-jetzt-online/>

# Selected results: Factors preventing seniors from undertaking more outside activities (partial list)

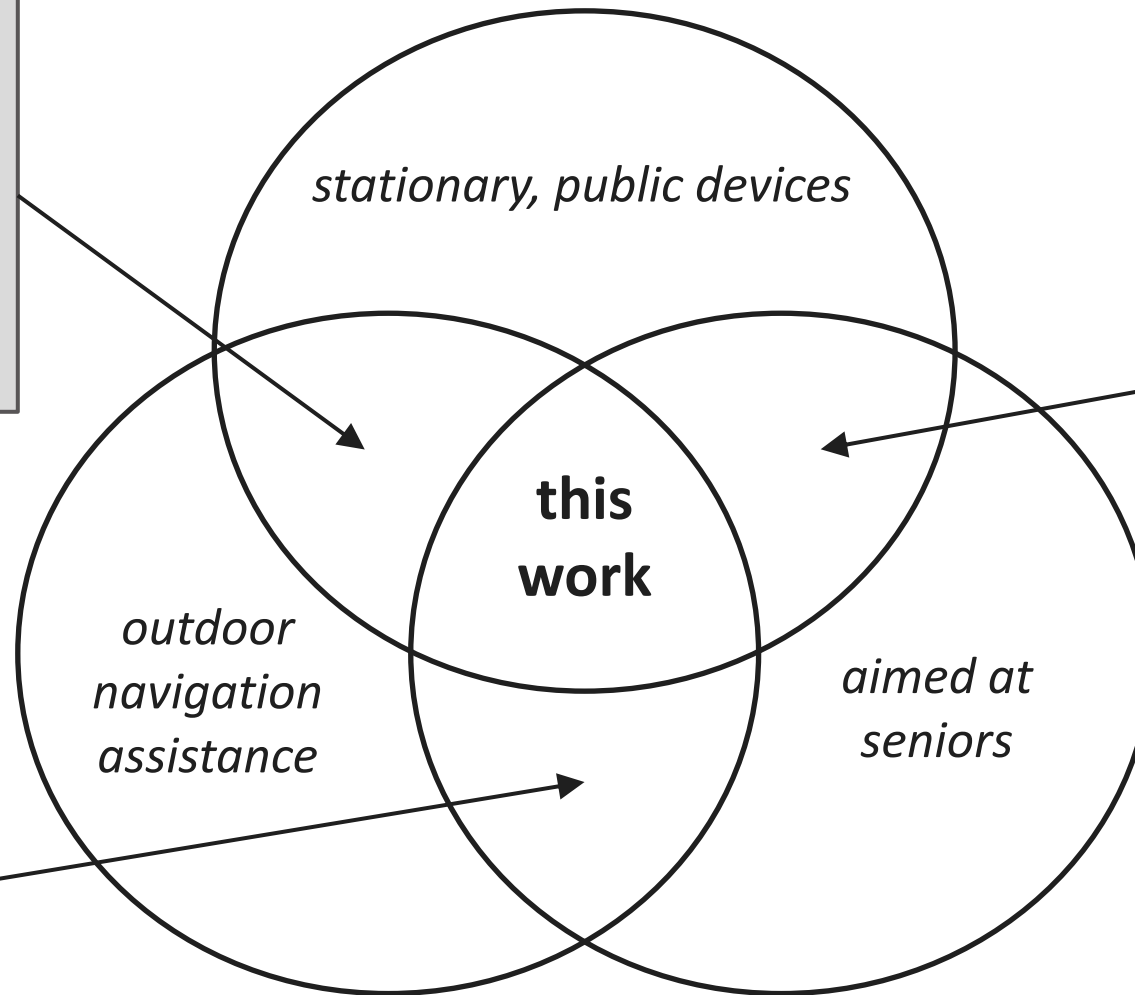


<https://www.urbanlifeplus.de/2017/09/ergebnisse-der-buergerbefragung-jetzt-online/>



# Pedestrian navigation assistance: related work

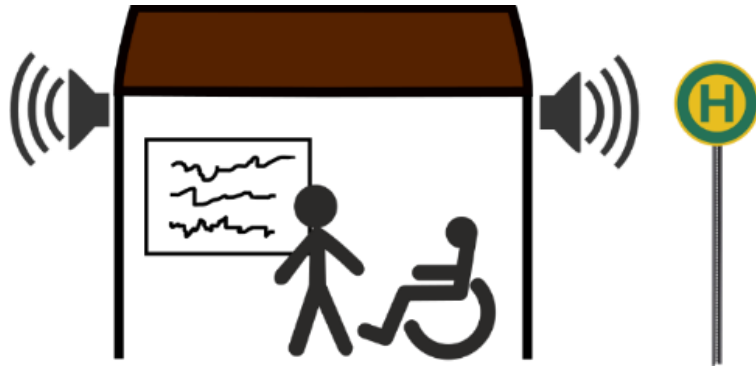
Bundesministerium für Bildung und Forschung. 2013. Kommunen in neuem Licht. <https://www.bundesregierung.de/bregde/themen/forschung/kommunen-in-neuem-licht-393036>



Kempton, G., W. Ritter, and A. Künz (2014): 'Guiding Light for the Mobility Support of Seniors'. In: R. Wichert and H. Klausing (eds.): *Ambient Assisted Living*. Berlin, Heidelberg, pp. 35–45, Springer Berlin Heidelberg.

Krieg-Brückner, B., C. Mandel, C. Budelmann, B. Gersdorf, and A. B. Martínez (2015): *Indoor and Outdoor Mobility Assistance*, pp. 33–52. Cham: Springer International Publishing.

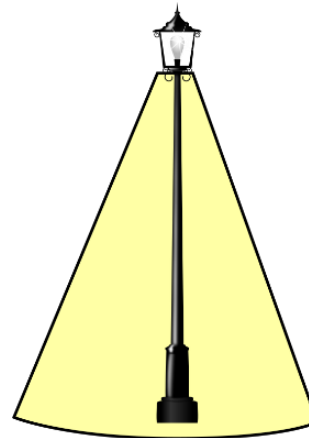
# Smart urban objects



Skowron, P., M. Aleithe, S. Wallrafen, M. Hubl, J. Fietkau, and B. Franczyk (2019): 'Smart Urban Design Space'. In: *2019 Federated Conference on Computer Science and Information Systems (FedCSIS)*. Vol. 18. pp. 493–496.



Hubl, M. (2019): 'An adaptive park bench system to enhance availability of appropriate seats for the elderly: a safety engineering approach for smart city'. In: *2019 IEEE 21st Conference on Business Informatics (CBI)*, Vol. 01. pp. 373–382.



Aleithe, M., P. Skowron, E. Schöne, and B. Franczyk (2018): 'Adaptive Lighting System as a Smart Urban Object'. In: M. Ganzha, L. A. Maciaszek, and M. Paprzycki (eds.): *Communication Papers of the 2018 Federated Conference on Computer Science and Information Systems (FedCSIS 2018)*, Vol. 17. pp. 145–149.



# Information radiators

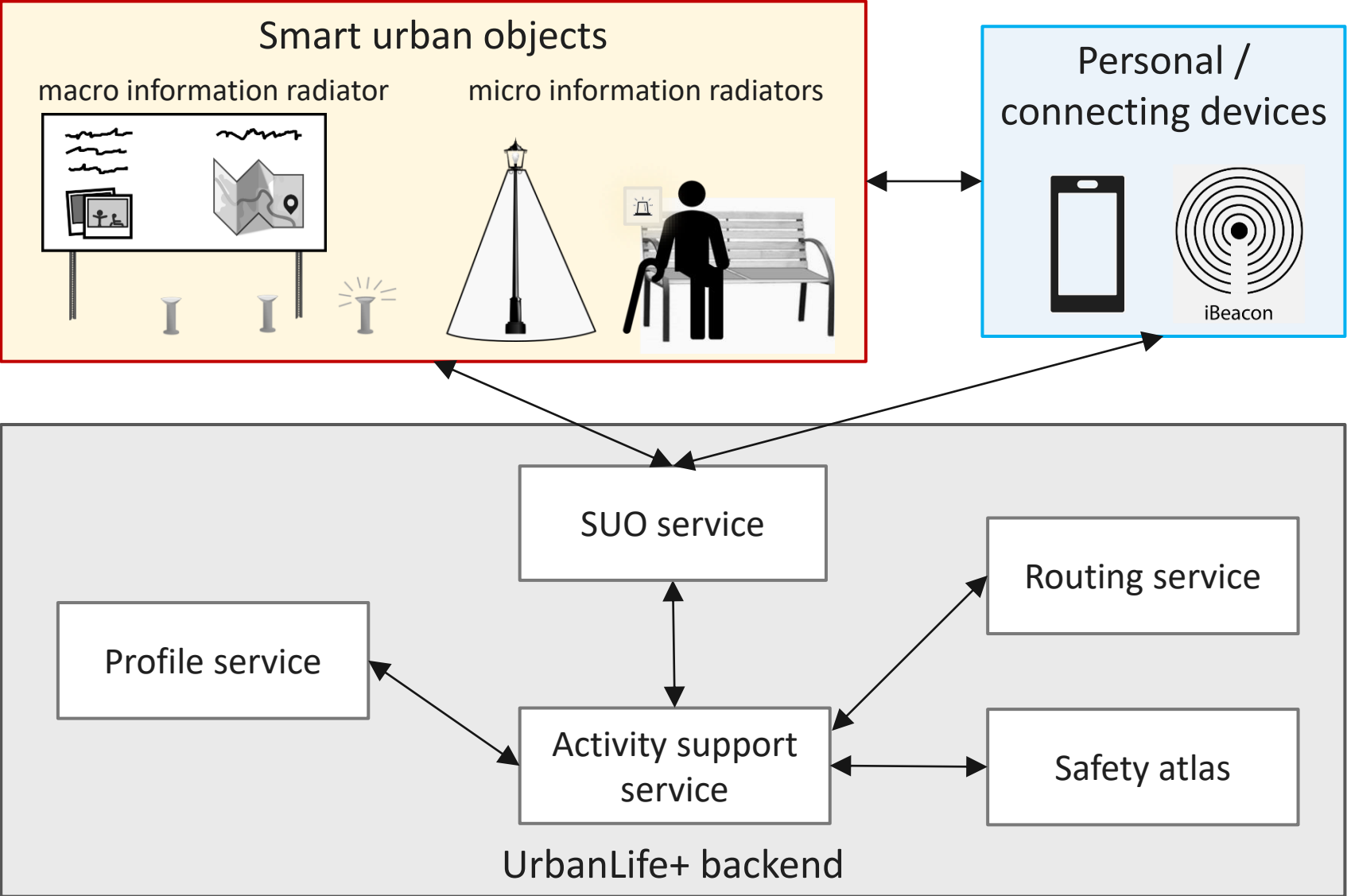
- Smart urban objects that broadcast audiovisual information into the public space
- Increase safety and awareness
- Various kinds of stationary devices

Fietkau, J., Kötteritzsch, A., and Koch, M. (2016): 'Smarte Städtebauliche Objekte zur Erhöhung der Teilhabe von Senioren'. In: B. Weyers and A. Dittmar (eds.): *Mensch und Computer 2016 – Workshopband*. Aachen, Gesellschaft für Informatik e.V.

Kötteritzsch, A., Koch, M., and Wallrafen, S. (2016): 'Expand Your Comfort Zone! Smart Urban Objects to Promote Safety in Public Spaces for Older Adults'. In: *Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing: Adjunct*. New York, NY, USA, p. 1399–1407, Association for Computing Machinery.

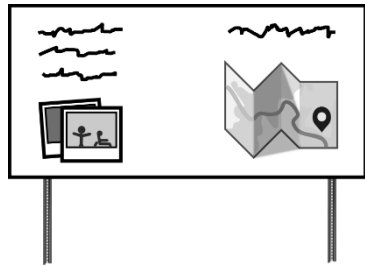


# SUO network and user identification

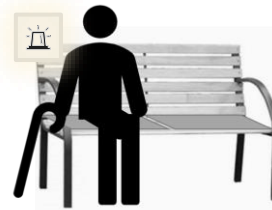


# Activity planning and support (1)

macro information radiator

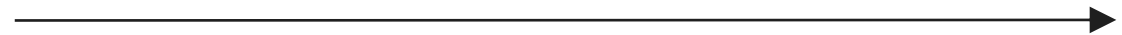


Activity  
planning

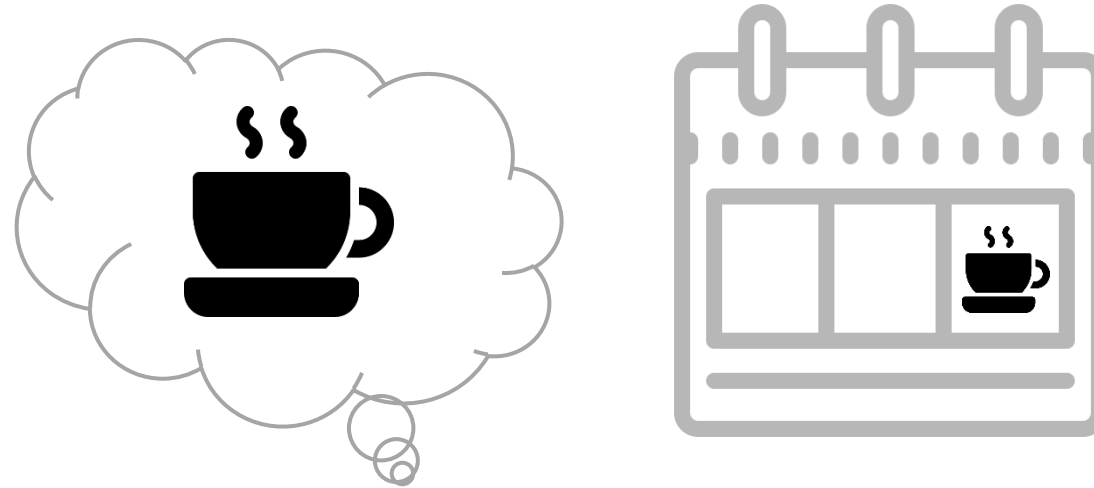


Activity  
support

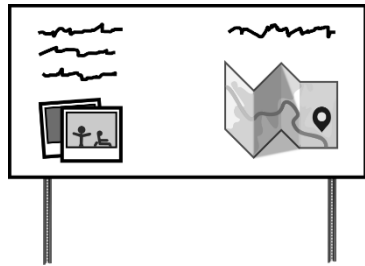
micro information radiators



# Activity planning and support (2)



macro information radiator

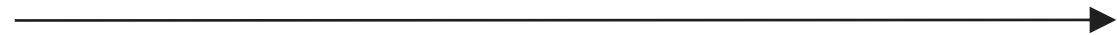


Activity  
planning



Activity  
support

micro information radiators





# User autonomy and privacy

- Design for choice, not for manipulation
- Minimize data collection, secure data storage
- Cultural norms regarding technology and privacy might continue to shift

# Reflecting on our goals

- Do our ideas ...
  - ... increase the safety of seniors in urban space?
  - ... increase users' motivation for outside activities?
- How do we measure a (possible) change?
- Main assumption:
  - increased motivation for repeated use of networked SUOs for outside activity support --> increased motivation for outside activities

# Planned evaluations

- 1-on-1 usability studies on parts of the system
- Long-term deployments with anonymized usage statistics
- Working with activity providers to gather observations about increased senior activity over time

# COVID-19 and evaluation revamp

- Evaluations with seniors in public urban space can currently not be conducted safely
- Throw out all evaluation plans and start from the top!

# Can simulation fill some of the gaps?

- Smaller-scale scenarios
- Replace (some or all) physical elements of the scenario with virtual ones, simulate interactions
- Try to glean as many structural and behavioral insights as possible

# Summary

- Provide activity support to seniors via networked smart urban objects
- Increase safety and motivation by overcoming real barriers
- Gather findings on outside navigation assistance in urban space



<https://www.urbanlifeplus.de/>

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