Smart Urban Objects and the Internet of Things

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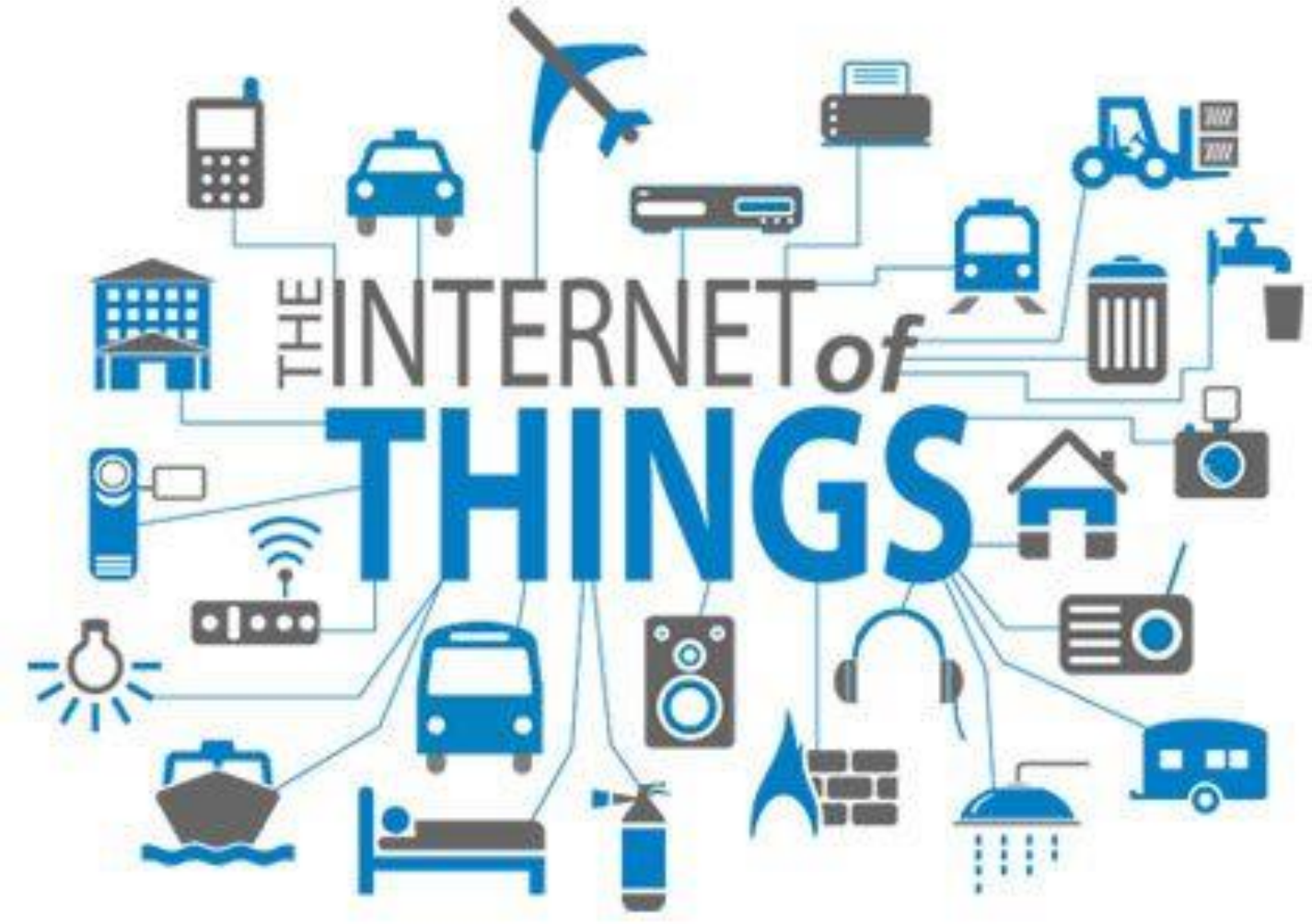
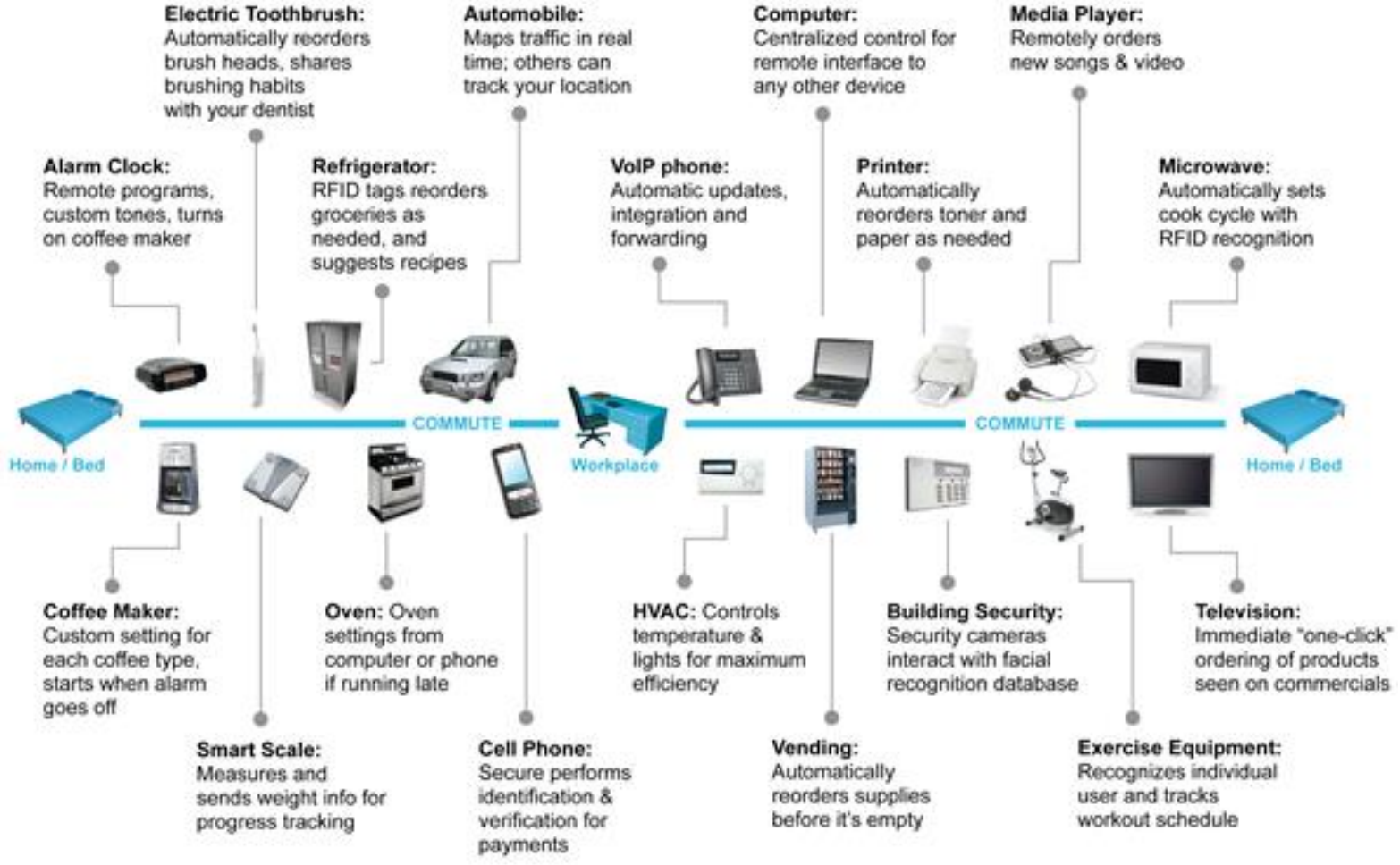
Internet of Things (1)



Quelle: http://cdn2.business2community.com/wp-content/uploads/2016/06/internet-of-things.jpg

Internet of Things (2)



Quelle: https://www.getcujo.com/wp-content/uploads/2015/11/internet-of-things-list.png

Smart Urban Objects

- What about expanding the Internet of Things to the Urban Space?

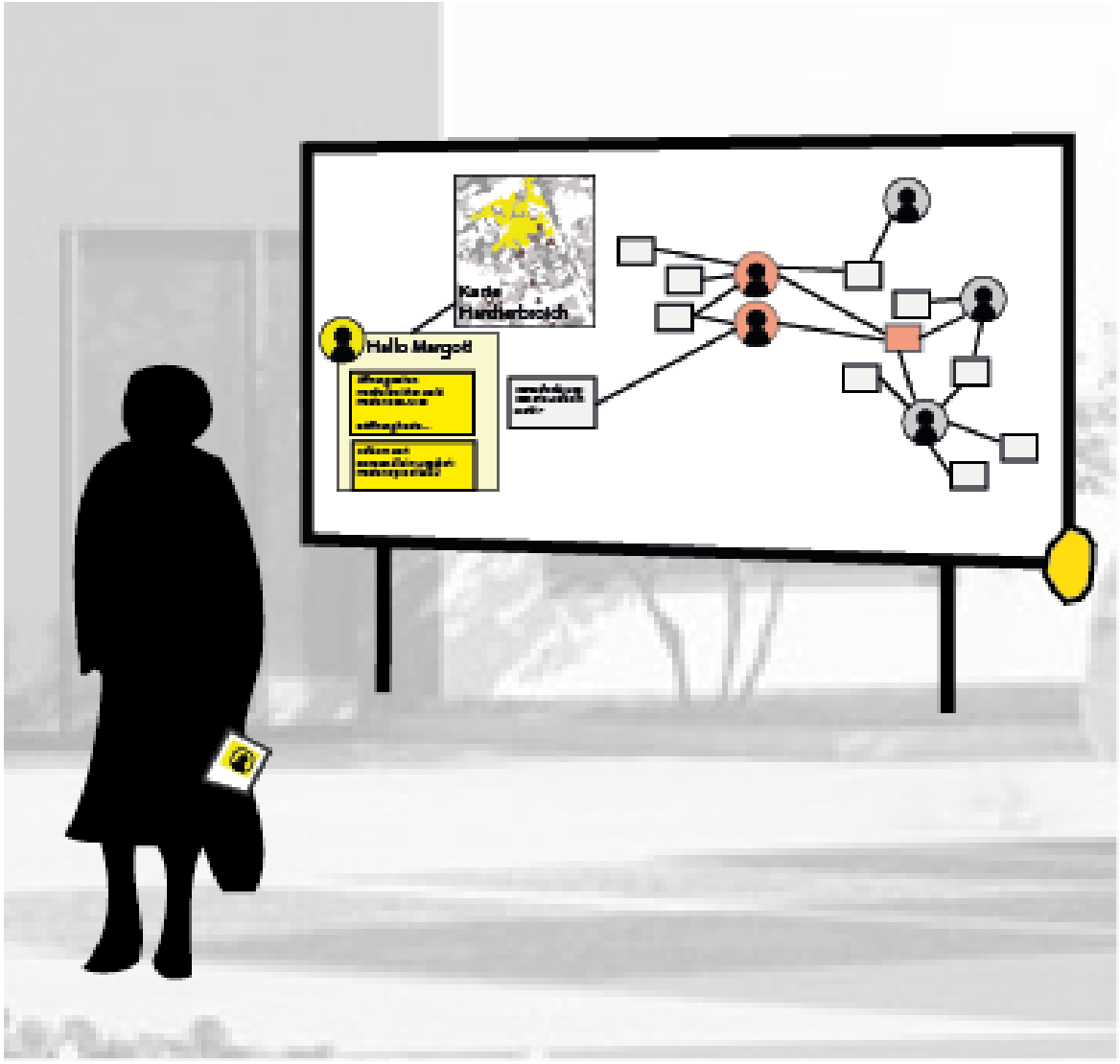
Source:
Responsive Street Furniture / Clever City
http://www.rossatkin.com/wp/?portfolio=responsive-street-furniture

Project Background ...

- Project **UrbanLife+** (www.urbanlifeplus.de): Design, build and evaluate **smart urban objects** to promote safety in public spaces (for older adults)
- … bringing AAL into the city (public space)
- Idea:
  - More safety by more awareness …
  - Expand older adults comfort zones

Scenario: Expanding the Comfort Zone (1)

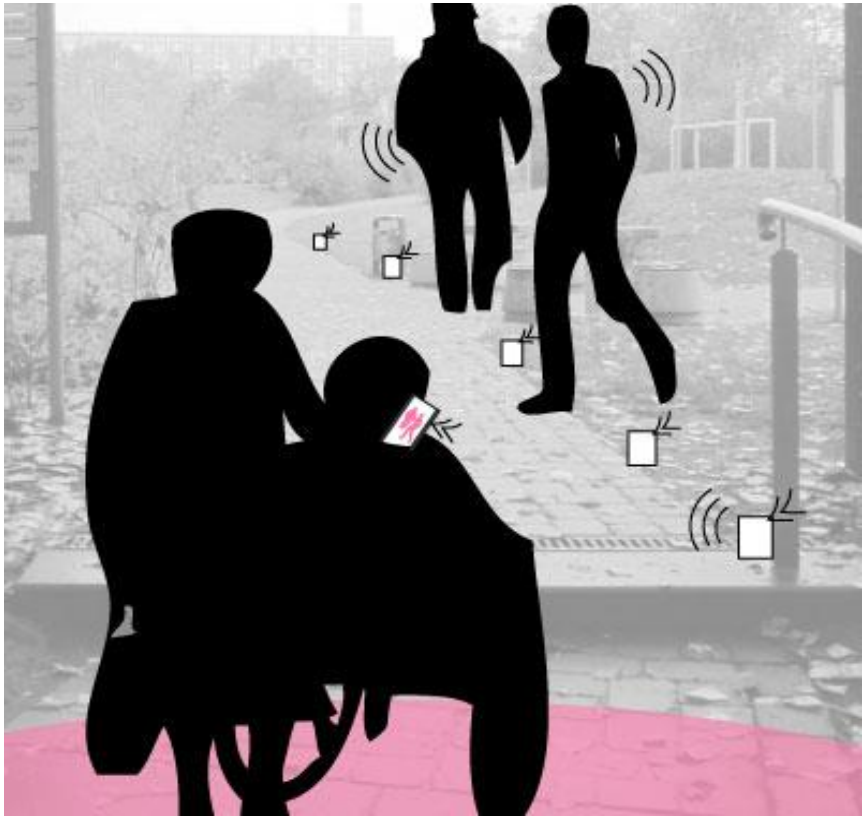
Scenario: Expanding the Comfort Zone (2)



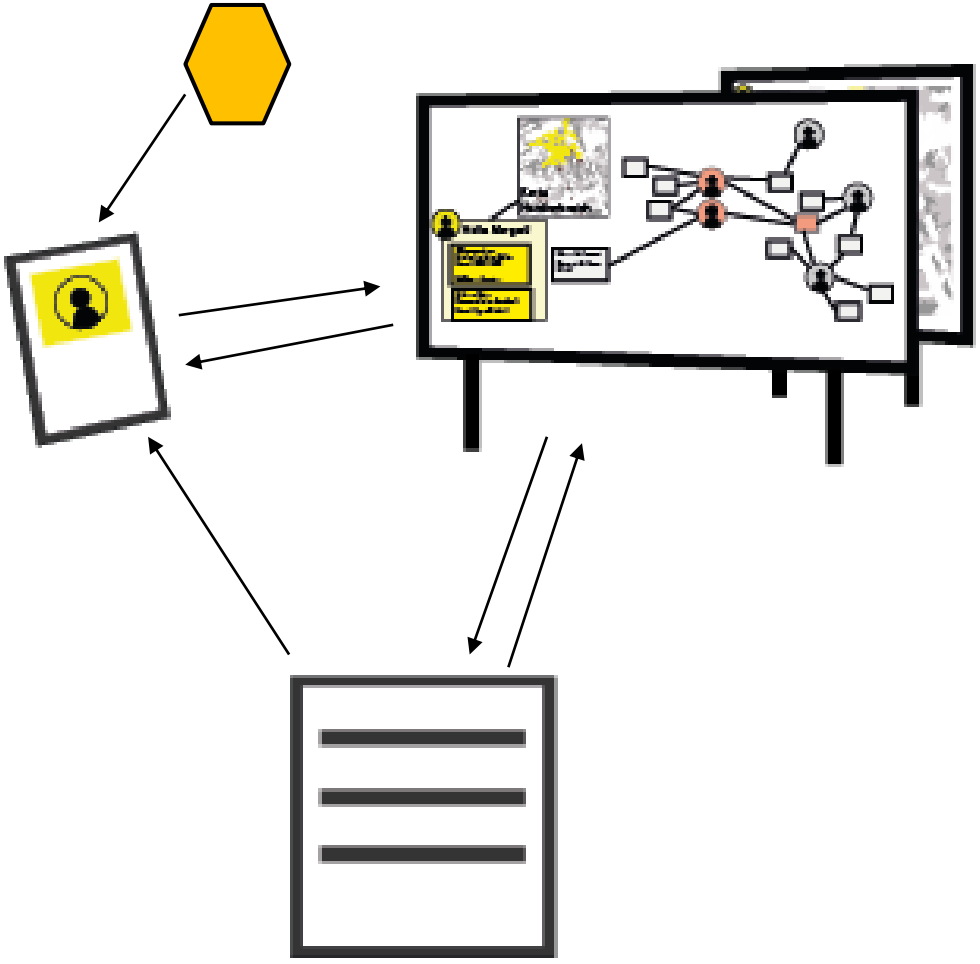
Scenario: Expanding the Comfort Zone (3)

Scenario: Expanding the Comfort Zone (4)

Scenario: Expanding the Comfort Zone (5)



UrbanLife+ Overview



UrbanLife+ - HCI Research Challenges

- Generic challenges for human computer interaction design of smart urban objects
  - Adaptivity
  - Multi-User
  - Walk-Up-and-Use
  - Joy-of-Use

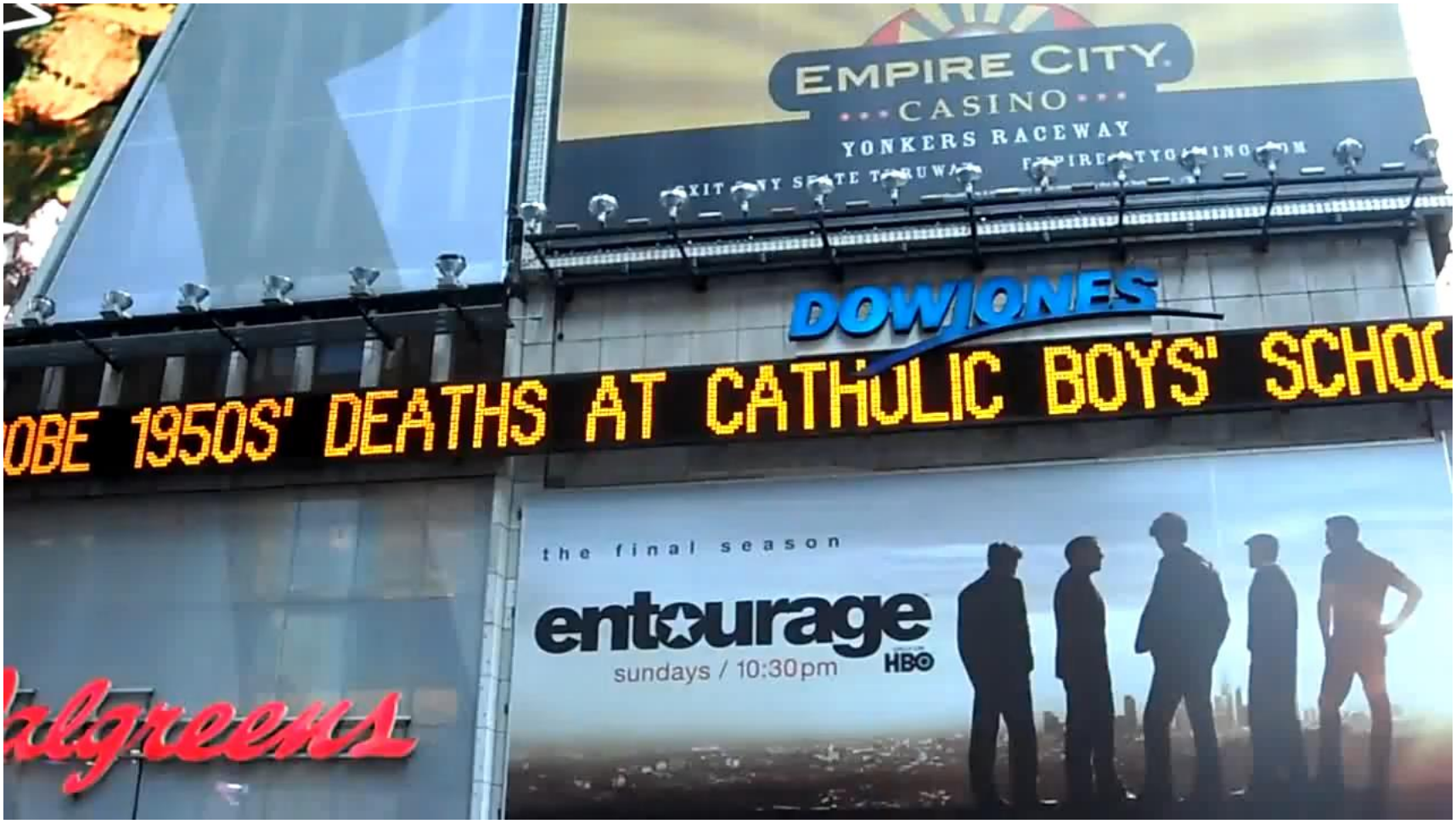
- Already some solutions for single-user and indoor – but quite new for multi-user and outdoor

Example (1) for in depth research

- Multi-User readability
  with smart information displays in semi-public spaces

  see for example:
  Andrea Nutsi and Michael Koch (2016): Readability in Multi-User Large-Screen Scenarios. In Proc. NordiCHI. http://doi.org/10.1145/2971485.2971491

Motivation



Source: https://youtu.be/qp9-dSrtgGA

Motivation

Source: https://www.infoscreen.de/fileadmin/user_upload/SV-Berlin-Hbf.jpg

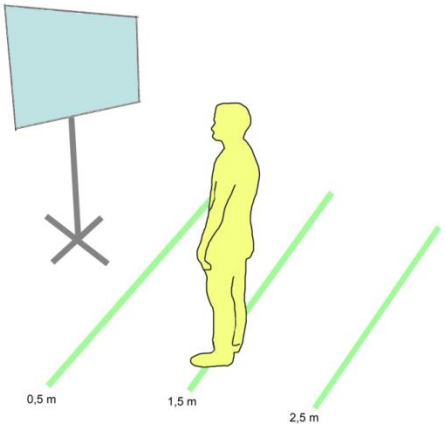
Laboratory Study Readability

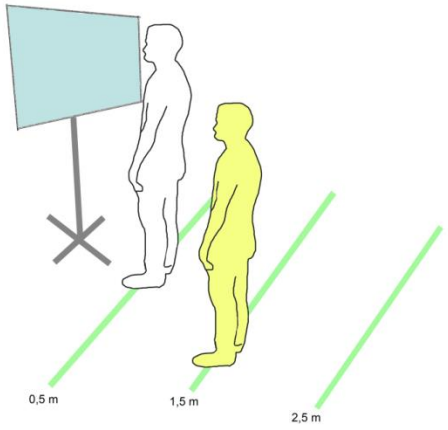
Laboratory Study - Overview

Single-User

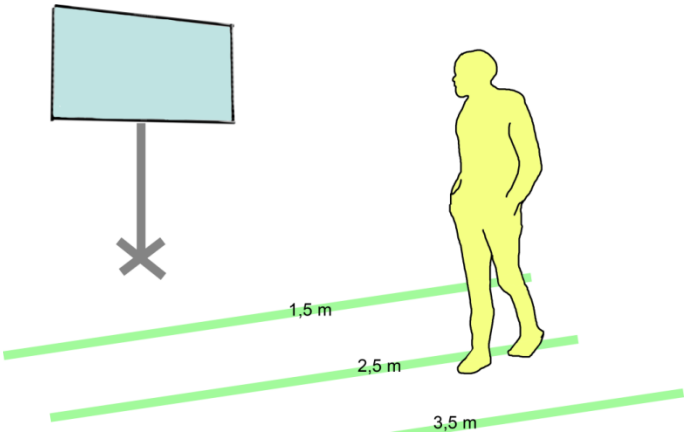
Multi-User

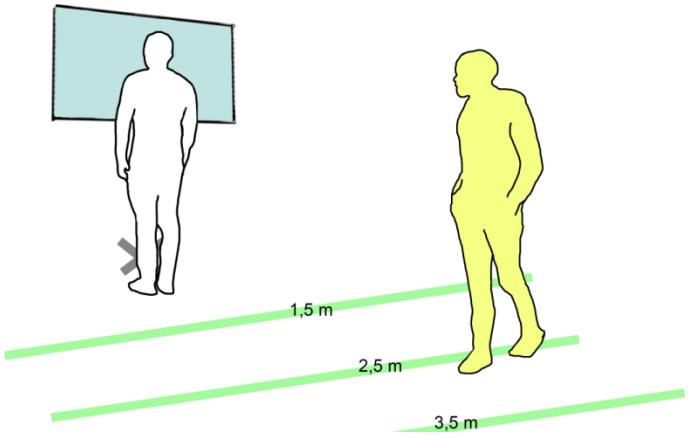
Standing





Walking

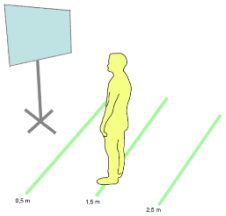


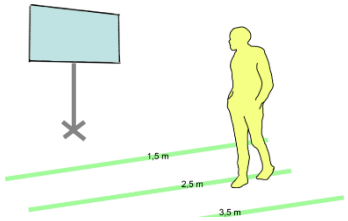


Hypotheses 1/4

I. *Subjective readability is better in a single user setting than in a multi-user setting (where parts of the screen are hidden from view by another user).* ✓

Single-User

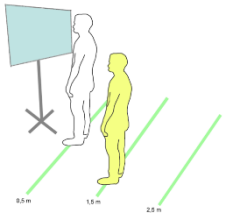


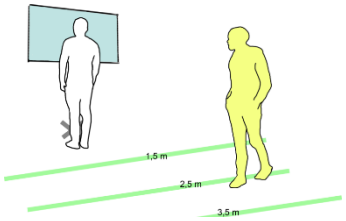


M = 1.63, *sd* = 0.66

vs.

Multi-User





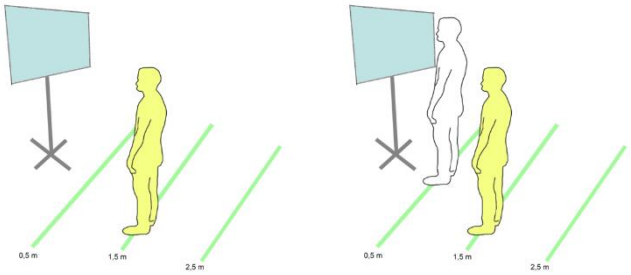
M = 2.13, *sd* = 0.90

F(1,486) = 48.31, p<.000005

Hypotheses 2/4

II. Subjective readability is better in case a person stands in front of the screen than he/she is walking past the screen. **X**

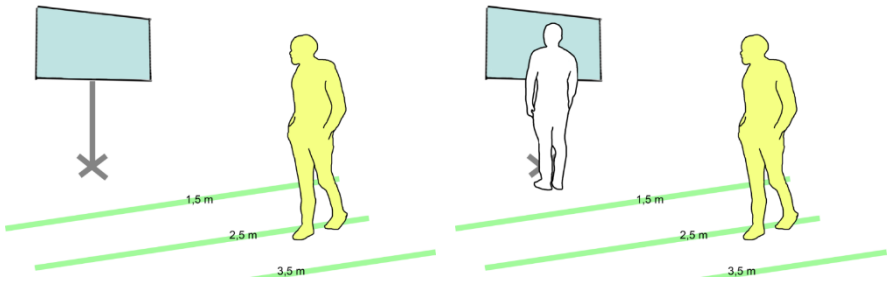
Standing



M = 2.09, *sd* = 0.89

vs.

Walking

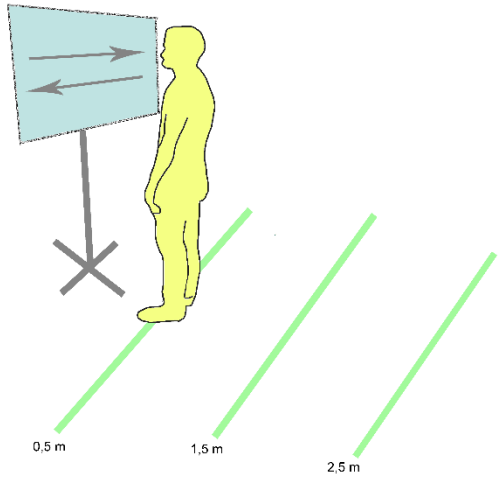


M = 1.83, *sd* = 0.82

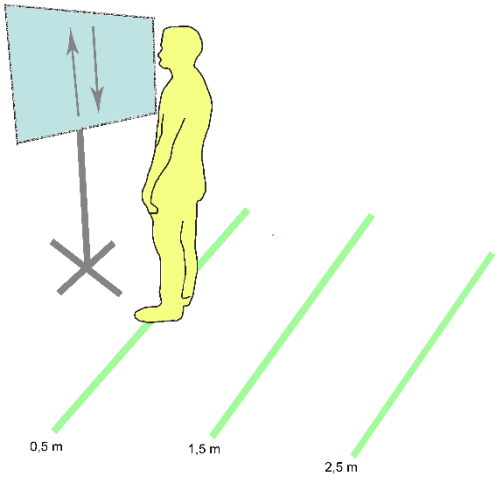
F(1,646) = 14.36, p<.0005

Hypotheses 3/4

III. Standing directly in front (0.5m) of the large screen, a vertical text moving direction is preferred over a horizontal text moving direction. ✓



vs.



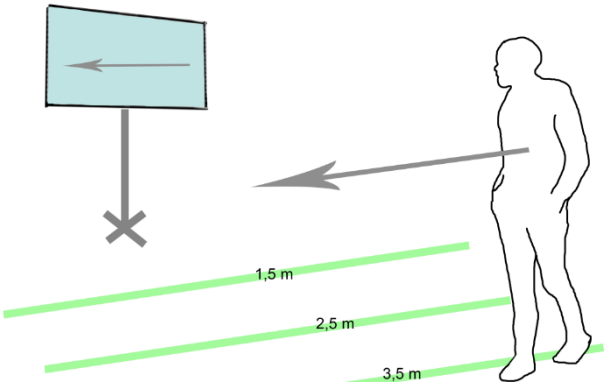
M = 3.10, *sd* = 0.89

M = 1.80, *sd* = 0.68

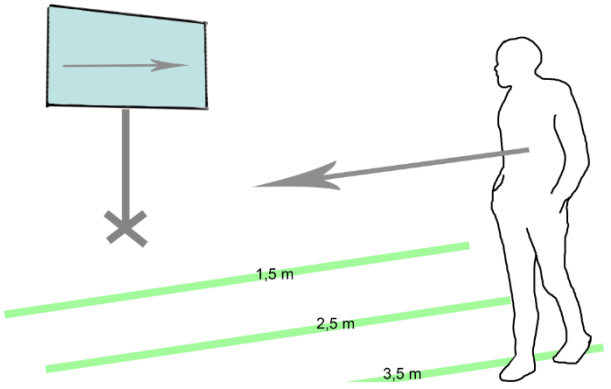
F(1,38) = 25.69, p<.00005

Hypotheses 4/4

IV. Walking past the screen, a horizontal text moving direction matching the walking direction is preferred. ✓



vs.

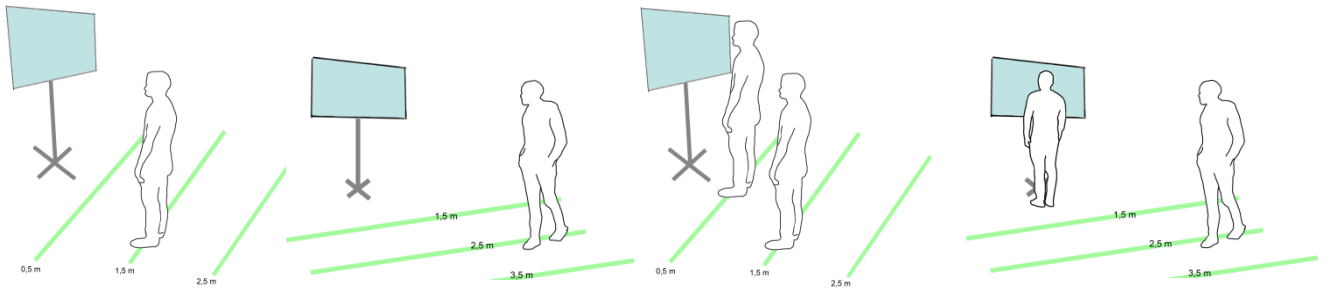


M = 1.47, sd = 0.64

M = 2.04, sd = 0.81

$F(1,142) = 21.58, p<.00005$

Recommendations for Text Moving Direction



0.5m (1.5m)	↓ ↑	↑	←	→
1.5m (2.5m)	↑	← → *	←	← → *
2.5m (3.5m)	↑ ←	←	←	← → *

* = matching walking direction

Example (2) for in depth research

- Walk-Up-And-Use
- Design for
  - Visual attention
  - Communication of „touchability“

Idea

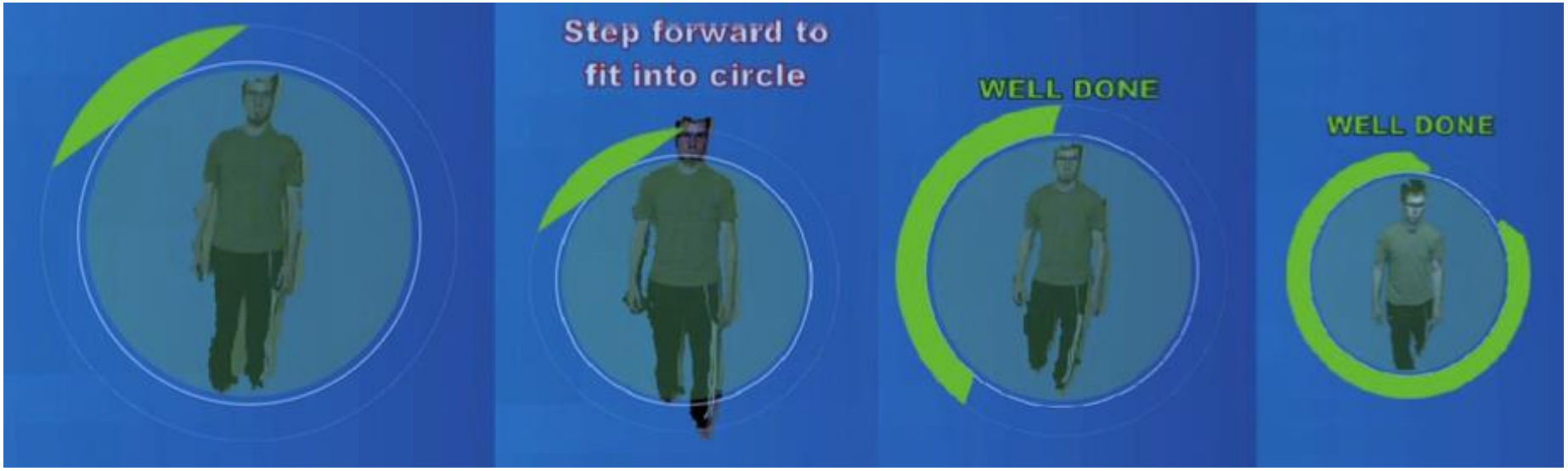
- Visual (Shadow) Representations to catch attention and call for action

Source: Looking Glass, Müller et al. (2012)

Our solution (1)

Our solution (2)

Our solution (2)



Summary

- Design of Smart Urban Objects
  - (Semi-)public, but also private mobile devices
  - Outdoor, public spaces
- Interesting HCI questions
  - Multi-User
  - Walk-Up-And-Use
  - Adaptation
  - Joy-Of-Use
- And interesting infrastructure challenges
  - Identification of users
  - Including (personal) mobile devices in the setting