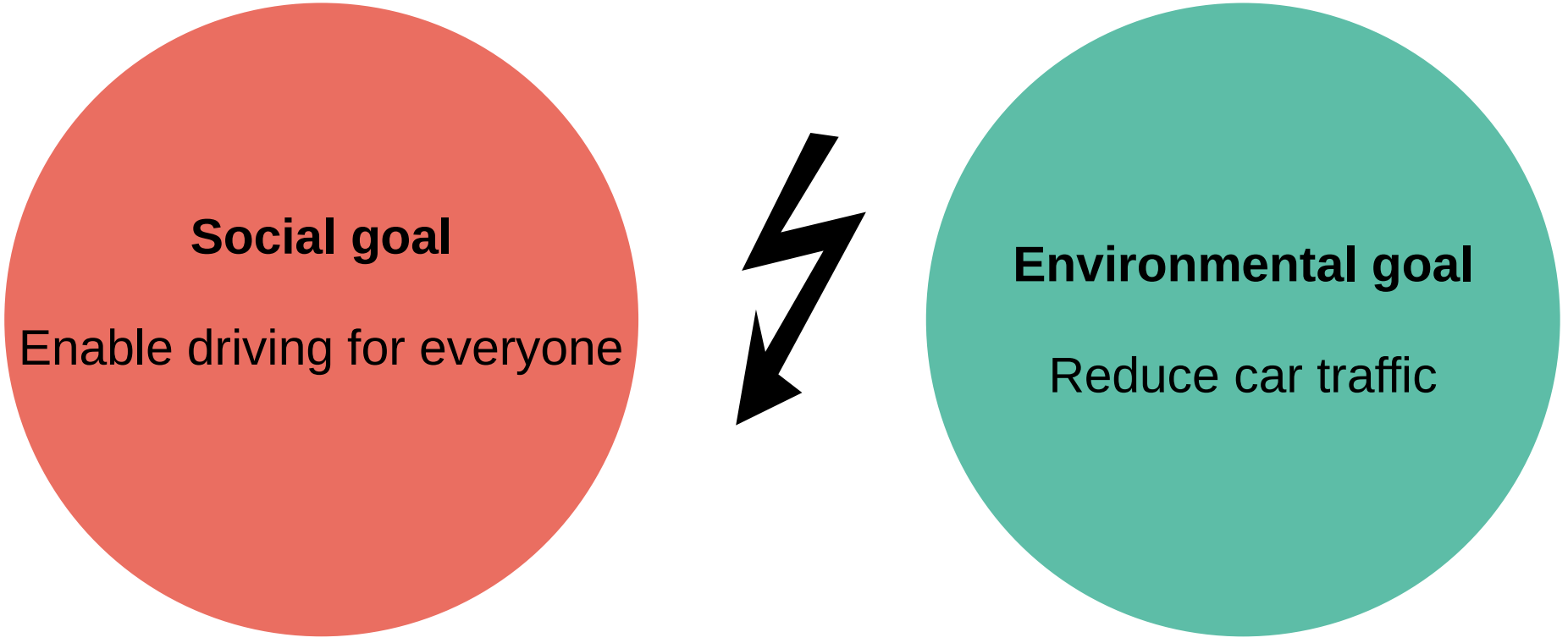
Conflicting Goals enabled by Digitalisation

Digitalisation and the Rebound Effect – Seminar HS2020

Lukas Käppeli

Conflicting Goals



Reduce CO_2 Emissions with Data

https://www.nytimes.com/2009/01/31/science/earth/31compete.html

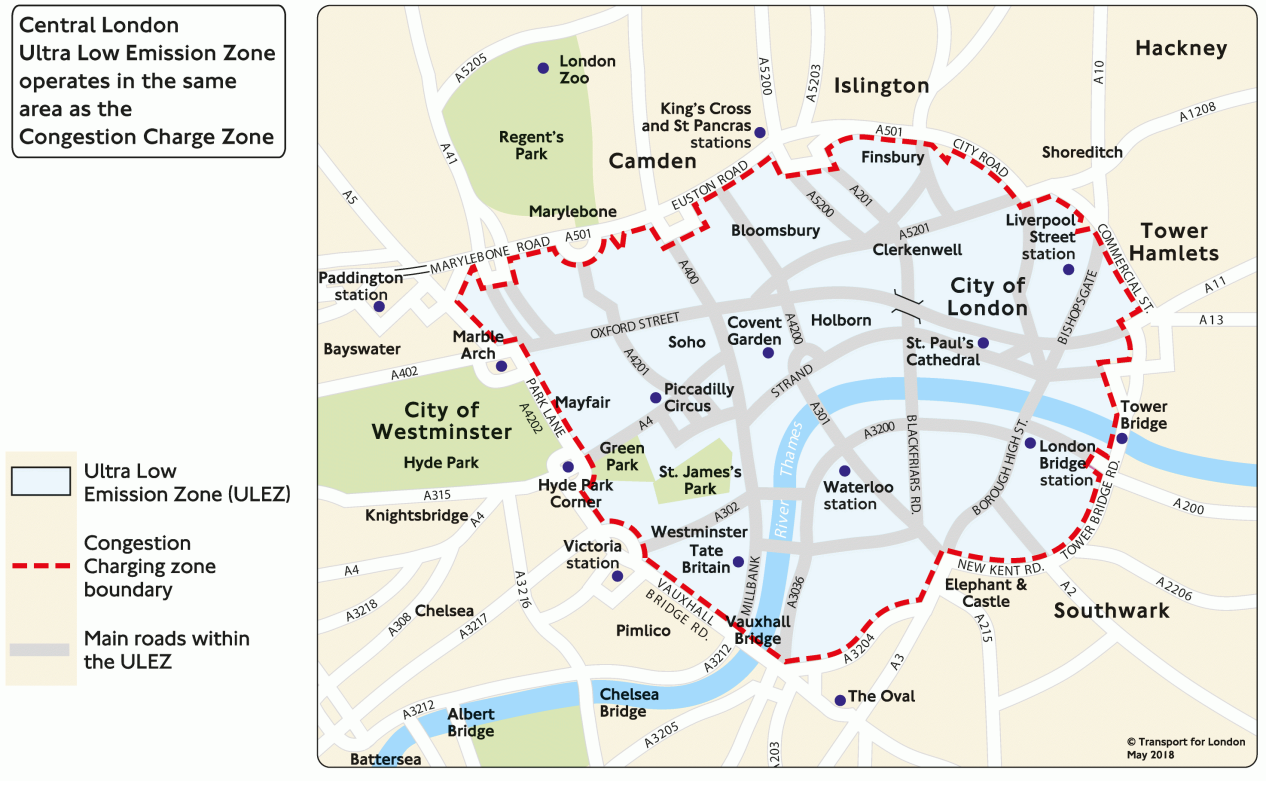
Reduce CO_2 Emissions with Data

https://www.reichelt.com/magazin/en/smart-heating-system-right-one/

Overview

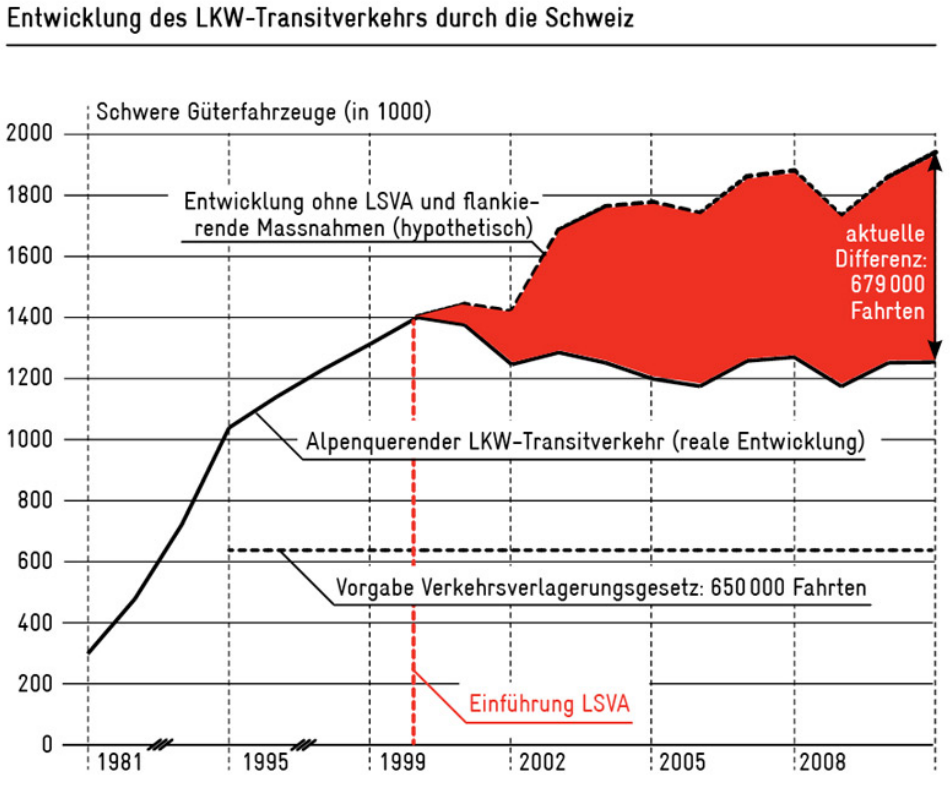
- Reduce car traffic
  - Road Pricing
  - Smart Tachograph
- Reduce electricity usage
  - Shower Meters
  - Feedback
- Conclusion

London Congestion Charge



https://www.driving.co.uk/news/london-introduces-ulez-daily-12-50-charge-older-polluting-vehicles/

LSVA



https://www.avenir-suisse.ch/die-lsva-das-erste-erfolgreiche-mobility-pricing-der-schweiz/

Car Insurance

f(Age, Gender, Driving experience, Car model, …) = Risk category

- Driver has “no” motivation to drive carefully
- Correlation between VMT and accident risk

“The best way to help Humans improve their performance is to provide feedback.”

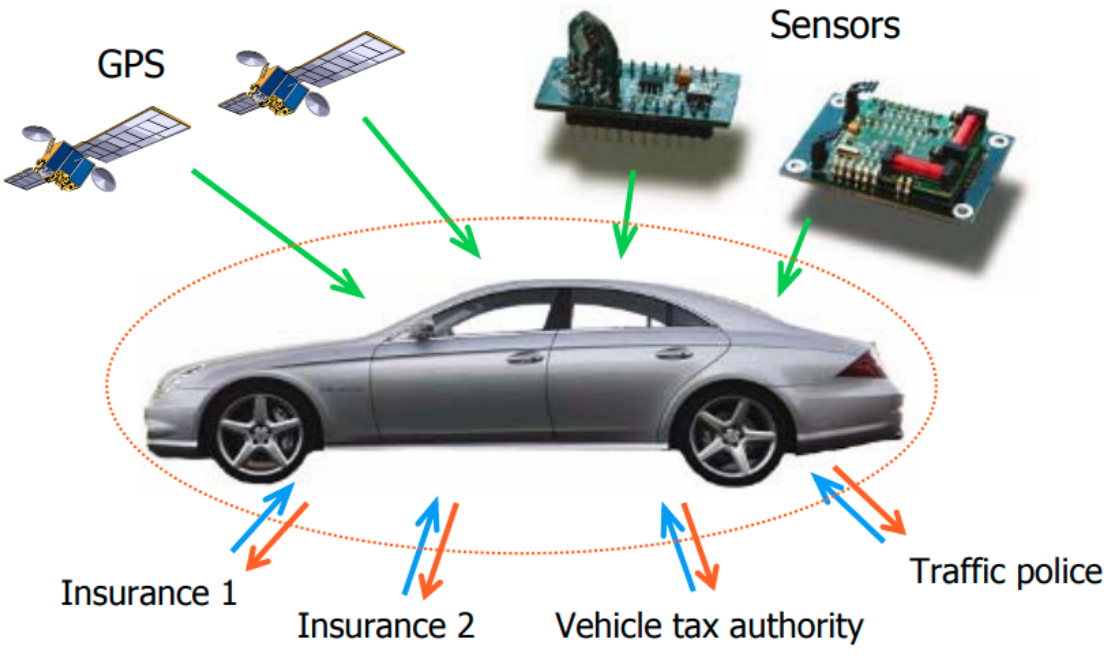
Thaler, R. H., & Sunstein, C. (2008). Nudge: Improving decisions about health, wealth, and happiness. New Haven, CT: Yale University Press.

Digitalisation

Enables gathering of data…

… and giving the driver a direct **feedback**

Smart Tachograph



Vlad Coroama, The Smart Tachograph – Individual Accounting of Traffic Costs and its Implications, Proceedings of Pervasive 2006. pp. 135-152, Dublin, Ireland, May 07-10, 2006

Smart Tachograph

f(Speed, Acceleration, Time, Temperature, …)

= Accident Risk

- Insurance rate inferred from accident risk
- Insurance tax = insurance rate * VMT

Vlad Coroama, The Smart Tachograph – Individual Accounting of Traffic Costs and its Implications, Proceedings of Pervasive 2006. pp. 135-152, Dublin, Ireland, May 07-10, 2006

Smart Tachograph

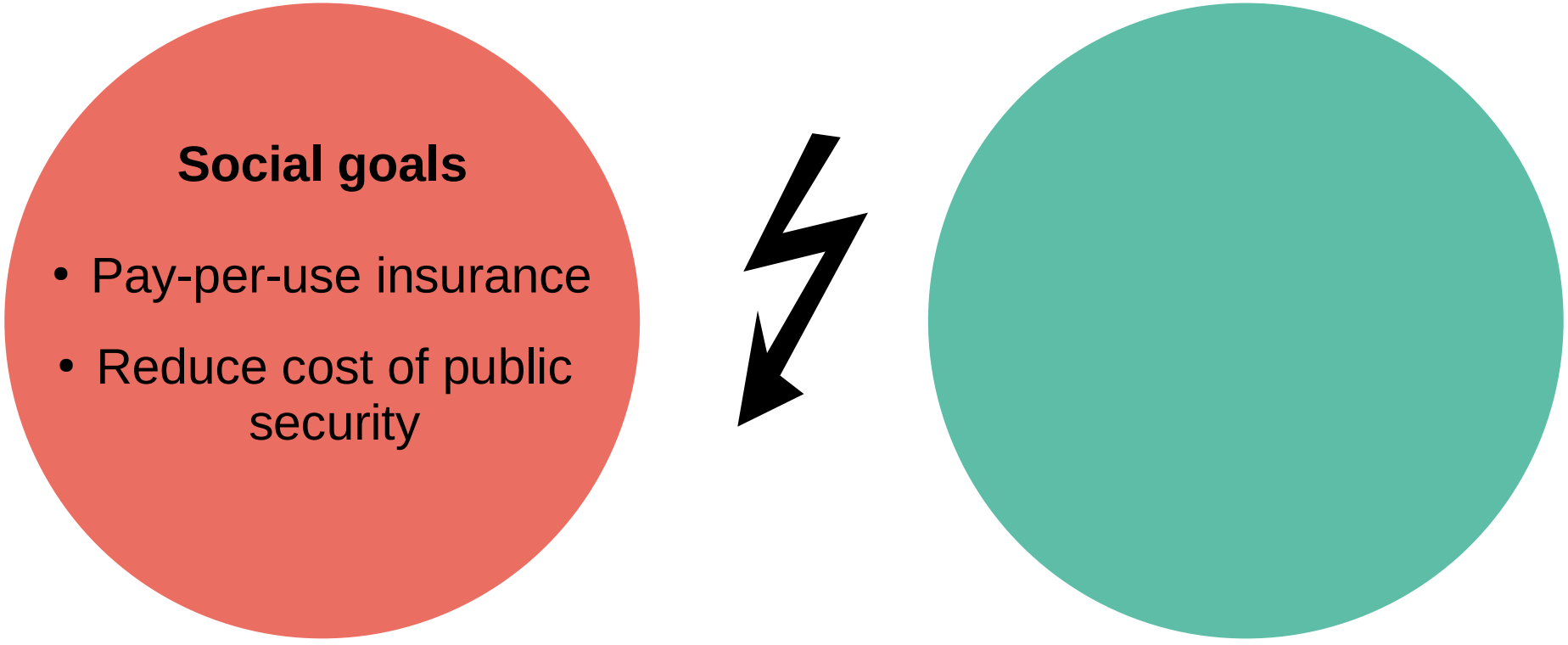
- Feedback to driver
- Show current:
  - Speed
  - Accident risk
  - Insurance rate
  - Road tax

Moral Hazard

Smart Tachograph

- Enabled by digitalisation
- Gives a monetary motivation
  - To drive less
  - To drive more carefully

Conflicting Goals



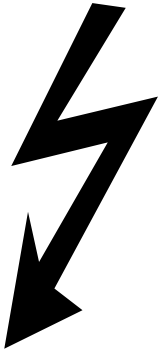
- Pay-per-use insurance
  - No cross financing of aggressive drivers
  - Less accidents
- Reduce cost of public security
  - Send traffic offenses directly to police

- Where is the data stored?
  - Local or at the insurance
- How can the data be used?
  - Accidents
  - Law suites
- How can I validate data protection?

Conflicting Goals

Social goals

- Pay-per-use insurance
- Reduce cost of public security



Data protection goals

- Let customer verify how data is used
- Do not disclose collected data

For how much money...

... do you share the location of your car?

Existing offers

- CleverDrive:
  - 15% - 25% discount
  - Data saved according to swiss data protection law

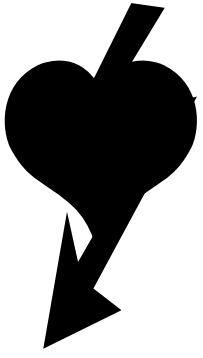
- DrivePartner
  - 15% discount + vouchers based on driving style
  - *“always know and let others know where you are located and where the car is parked”*

https://www.mobiliar.ch/
https://www.axa.ch/

Let us assume that…

Social goals

- Pay-per-use insurance
- Reduce cost of public security



Data protection goals

- Let customer verify how data is used
- Do not disclose collected data

Punishing Smartless Cars

- Can everybody pay less?
- What if 80% have a Smart Tachograph?
- Is no reduction already a punishment?

Possible Consequence

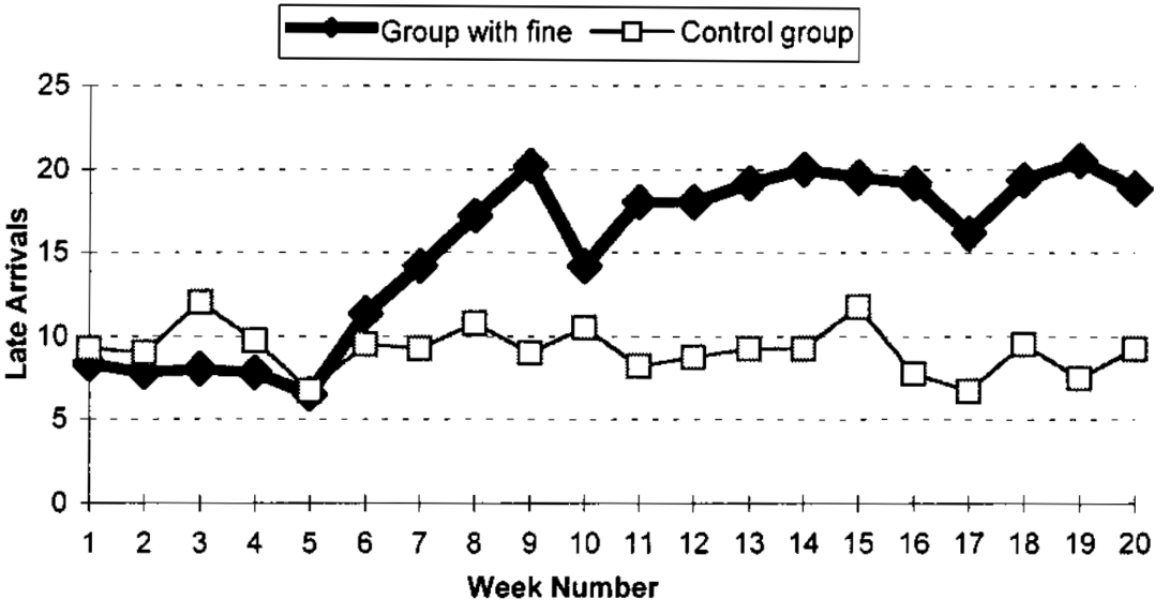


FIGURE 1.—Average number of late-coming parents, per week

Gneezy, U. and Rustichini, A., 2000. “A Fine is a Price”. J. of Legal Studies 29:1-17.

Another Approach

"… the underlying problem is that energy is invisible, so people do not know when they are using a lot of it."

Thaler, R. H., & Sunstein, C. (2008). Nudge: Improving decisions about health, wealth, and happiness. New Haven, CT: Yale University Press.

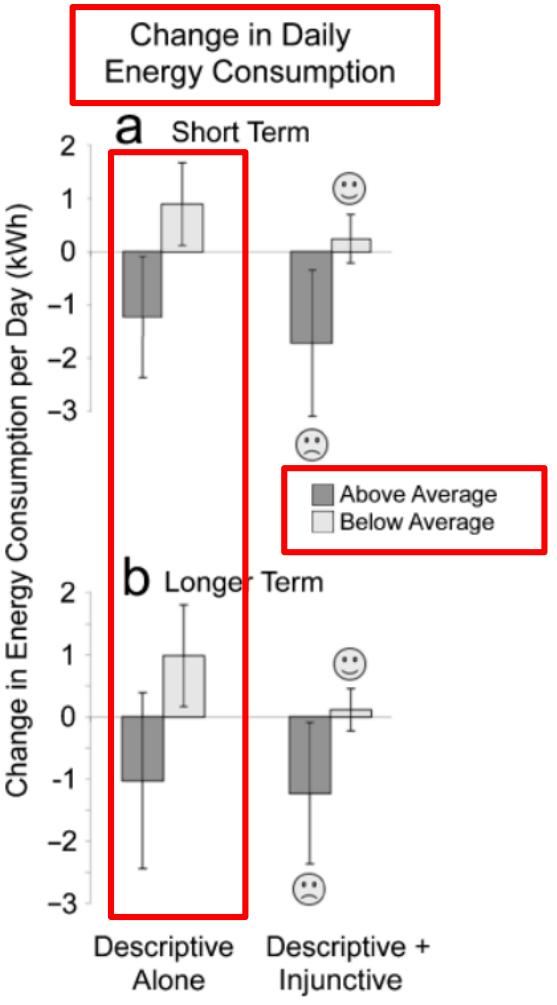
Do you remember this image?

https://www.nytimes.com/2009/01/31/science/earth/31compete.html

Social Norms

Savings/Year:

- 215 kWh
- 3,500 liters
- 47 kg CO_2

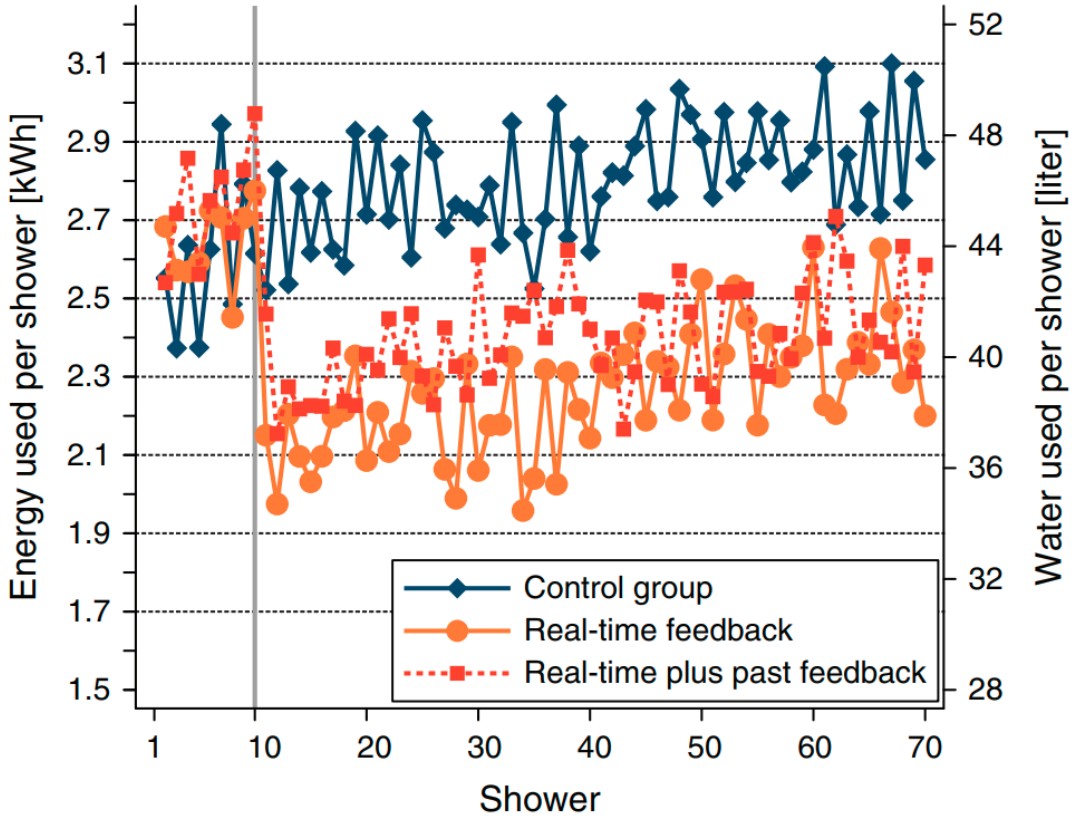


Schultz et al., "The Constructive, Destructive and Reconstructive Power of Social Norms." Psychological Science 18 (2007): 429–34

Shower Meter

https://smart-home-geraete.de/2015/02/amphiro-a1-der-smarte-warmwasserzaehler/

Impact of Real-Time Feedback

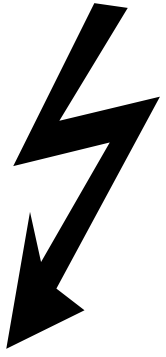


Verena Tiefenbeck et al., 2018. Overcoming Salience Bias: How RealTime Feedback Fosters Resource Conservation. Management Science 64, 3 (2018), 1458–1476. https://doi.org/10.1287/mnsc.2016.2646

Conflicting Goals

Environmental goals

- Reduce electricity usage
- Reduce hot water usage



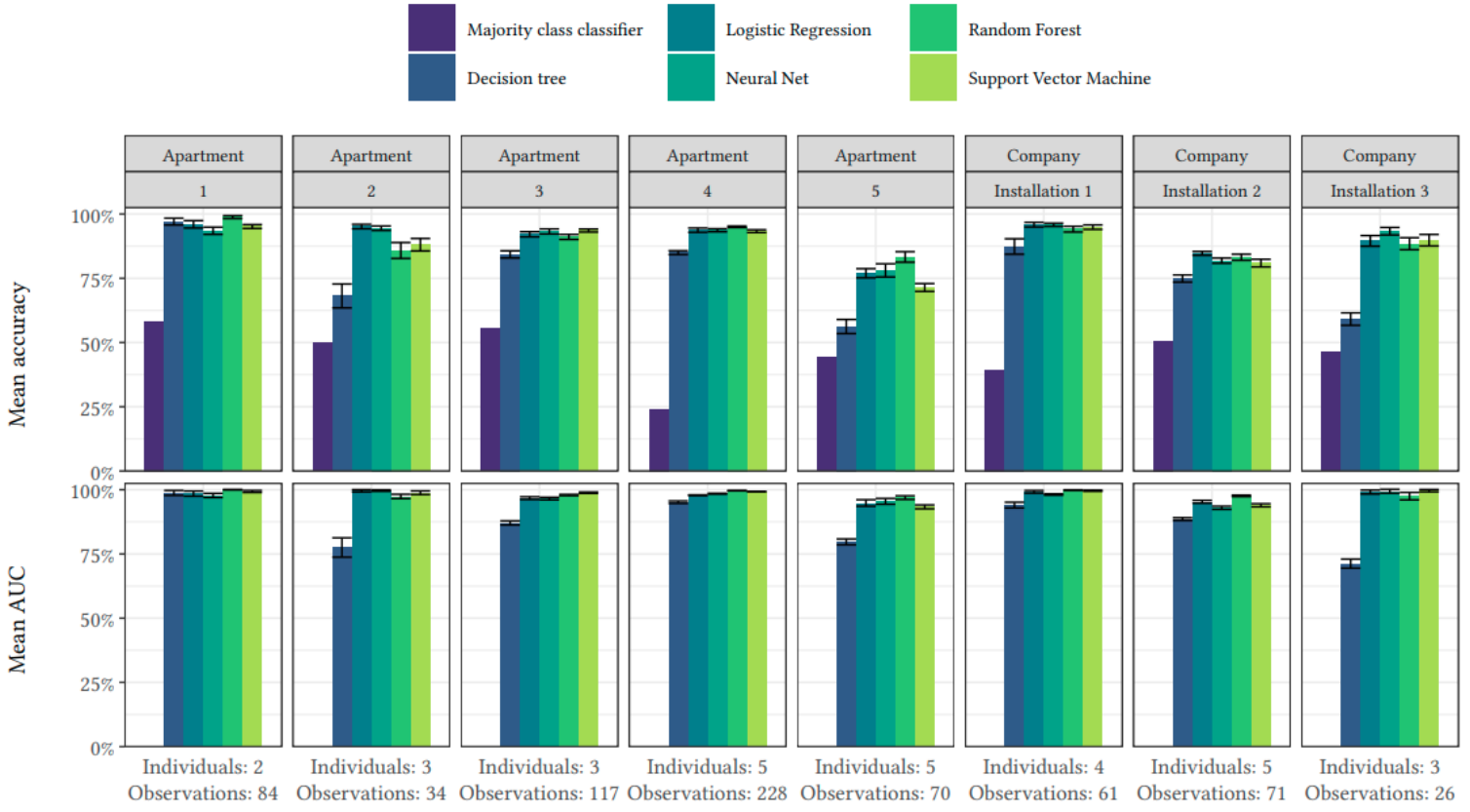
?

Data Protection

- Measure water and energy consumption
- Collect this data from:
  - Housholds of 2 – 5 persons
  - Company showers with 3 – 5 users

S. Günther et al,Empowering personalized feedback on hot water usage: a field study with shower meters In SAC '20: Proceedings of the 35th Annual ACM Symposium on Applied Computing, pp. 763-766, 2020

Data Protection



S. Günther et al,Empowering personalized feedback on hot water usage: a field study with shower meters In SAC '20: Proceedings of the 35th Annual ACM Symposium on Applied Computing, pp. 763-766, 2020

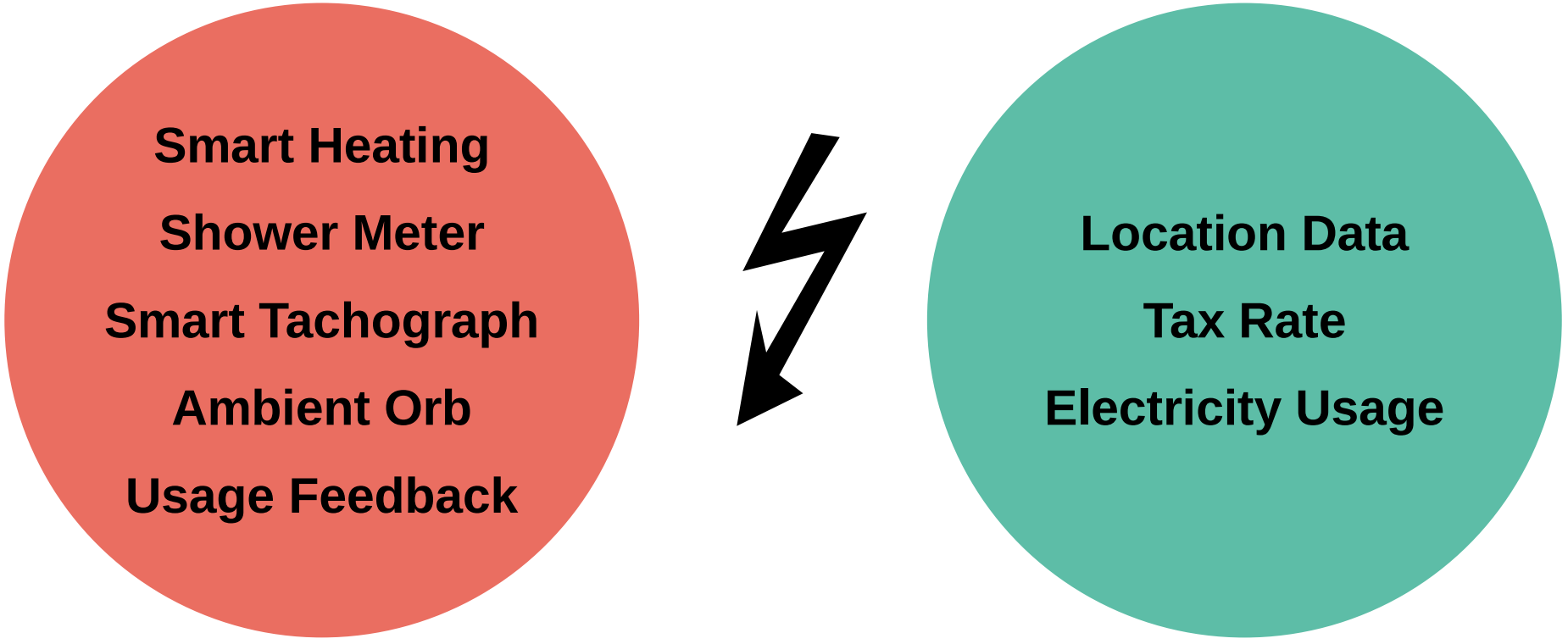
Realtime Feedback

https://greatestideaever.wordpress.com/2017/01/24/1023-ambient-orb/

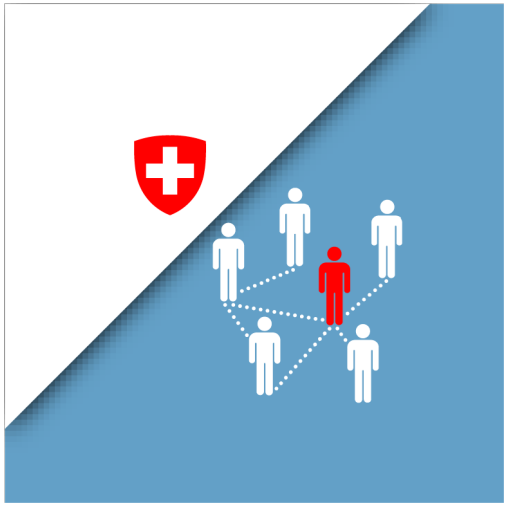
"We think it might work even better if, when energy use went over a certain threshold, the device made annoying sounds, such as cuts from ABBA's Gold: Greatest Hits"

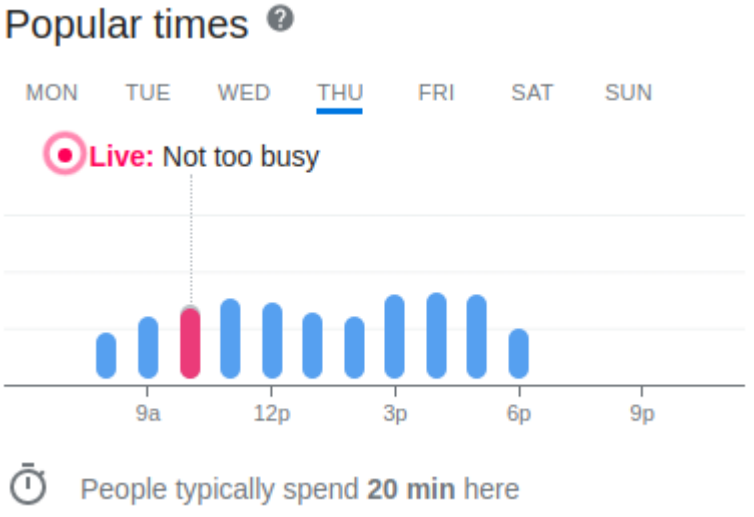
Thaler, R. H., & Sunstein, C. (2008). Nudge: Improving decisions about health, wealth, and happiness. New Haven, CT: Yale University Press.

Summary


Smart Heating
Shower Meter
Smart Tachograph
Ambient Orb
Usage Feedback
Location Data
Tax Rate
Electricity Usage

More examples





https://bag-coronavirus.ch/swisscovid-app/
https://google.com/

Conclusion

Digitalisation as enabler for new solutions…

… if used in the right way