Designing tailored interventions. A pragmatic segmentation approach to change energy behavior in residential buildings

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UtilitEE

Utility Business Model Transformation through human-centric behavioural interventions and ICT tools for Energy Efficiency

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1. Background

- **Problem:** Interventions to change highly routinized energy consumption behavior - *One size does not fit all*
- **Rationales for tailoring interventions:**
  - *People are heterogeneous*
    → interventions tailored to different consumer segments
  - *People show different types of energy-related behaviours*
    → Tailoring according to diversity of existing behaviours
  - *People respond differently to behavioural factors/triggers*
    → can be stimulated through tailored interventions
  - *People do not change their behaviour continuously/linearly*
    → phase-based interventions with bigger effect than temporally cross-cutting ones
  - *People respond differently to different types and combinations of interventions*
    → Designing tailored interventions and policy mixes

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2. Approach

- **Aim**: develop a pragmatic approach to systematically set up tailored intervention strategies.
- **Research** question: How can different types and packages of instruments be tailored to different groups of people, different types of ECB, different trigger points and different behavioural phases?
- Develop a **framework** for tailored interventions and a real-world application in a **recommendation engine**, based on a literature review and two precedent frameworks, Burger et al. (2015) and Bornemann et al. (2018)
- **Discussed in living labs and tested in pilot sites** in five European countries (Horizon 2020 Project UtilitEE; https://www.utilitee.eu/).

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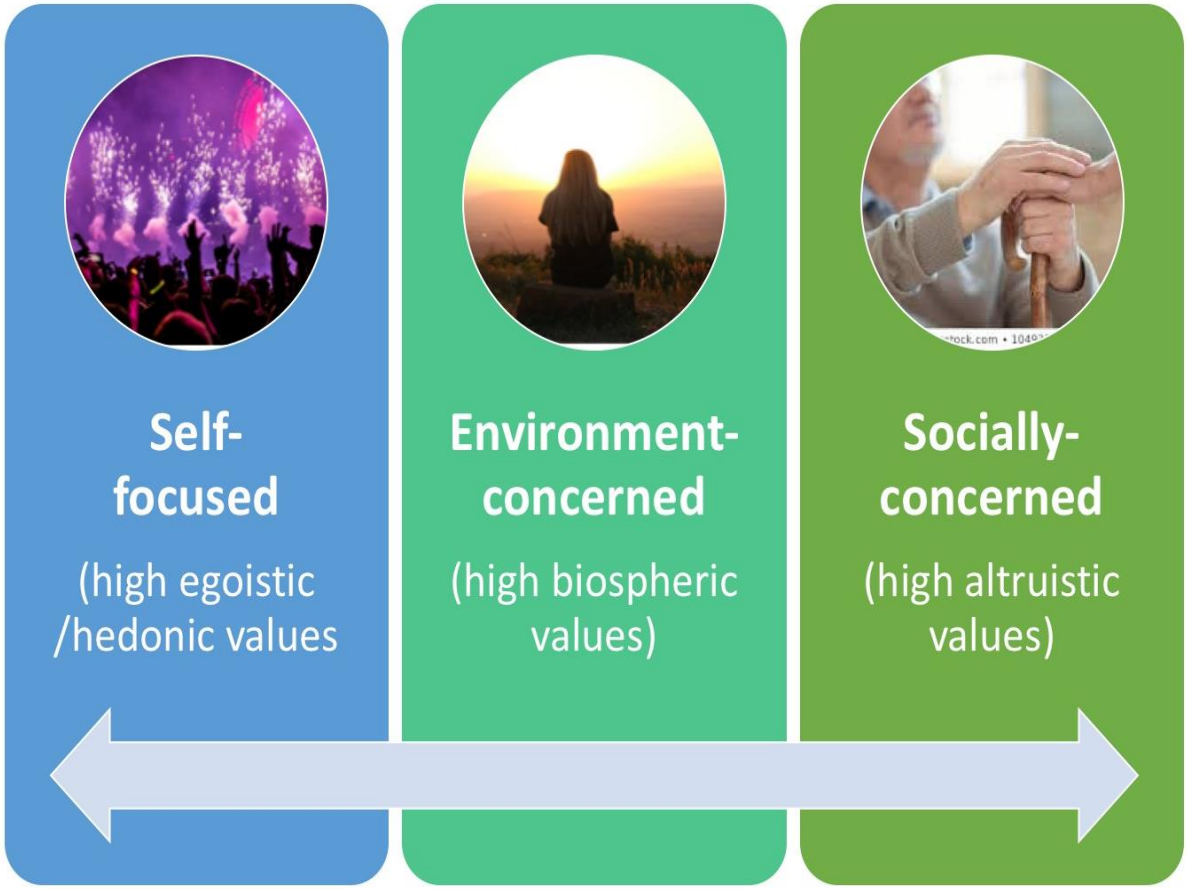
3. Tailoring by segmentation of consumers



"Group-specificity": Segmentation approach along the **core values (egoistic, hedonistic**, altruistic, biospheric) and finally distilled into three group "self-focused", "environmentally concerned" and "socially concerned" → tailoring accordingly, e.g. recommendations

"Type-specifity": energy services and focusses mainly on habitual behaviours in the fields of electricity and heating as main consumption domains → tailoring accordingly

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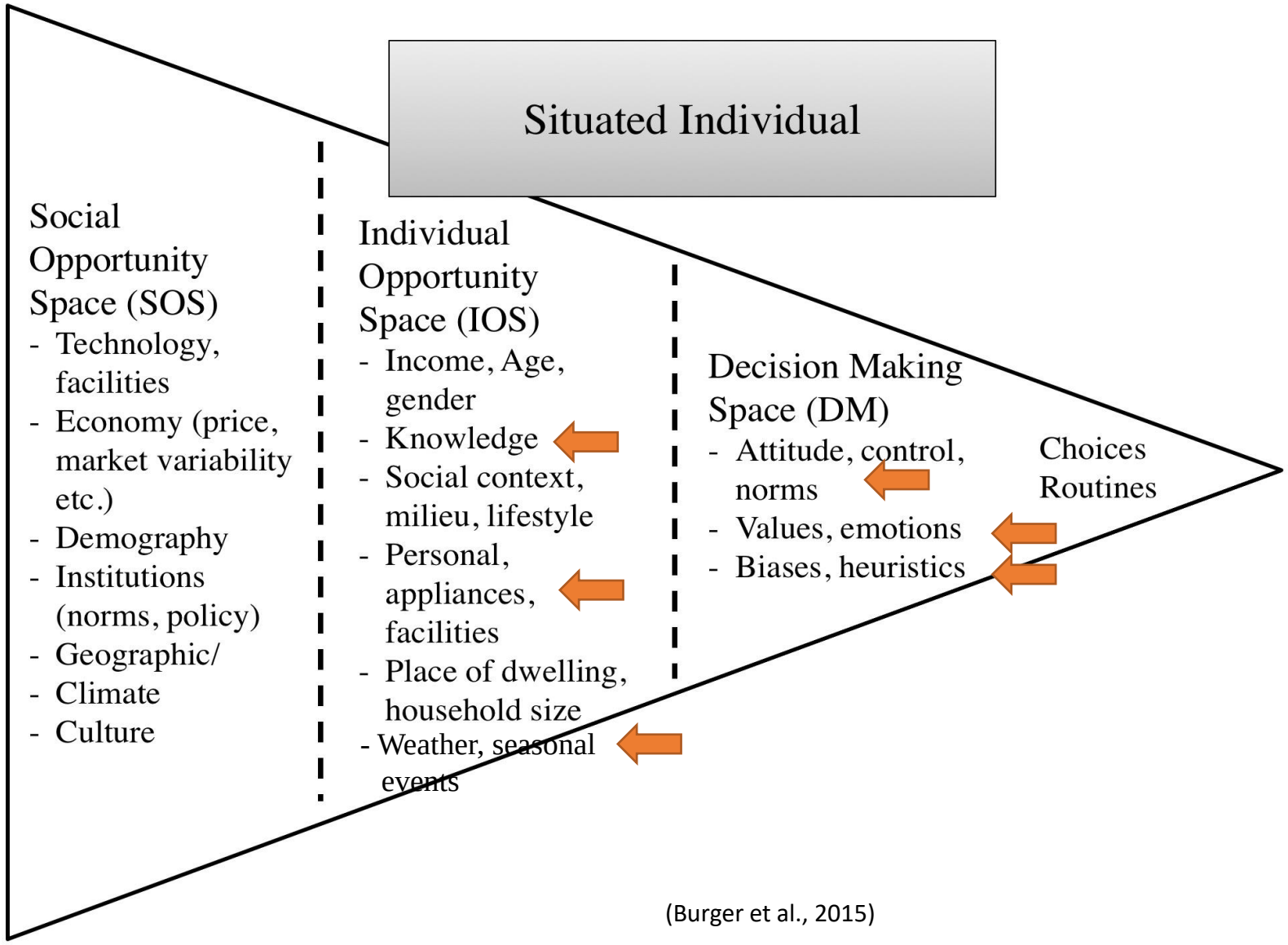
4. Tailoring to trigger points

"Multi-factorial" designs: **Tailoring to different trigger points** or factors, to be influenced by the interventions

→ Tailoring interventions, e.g., recommendations to weather ("weather pack"), to emotions (pictures) or to biases (remote control functions)



(Burger et al., 2015)

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5. Tailoring to phases of behavioural change

"Dynamic": divide change as dynamic phenomenon into **three phases**:

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Unfreeze: Induce change towards more sustainable routines → tailoring interventions to engage with the consumer

Change: ...routines into more sustainable behaviours → flexibility required

Refreeze: Establish more sustainable routines without falling back into the old ones → tailoring interventions to provide continuity by according messages

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6. Tailored interventions

Tailoring different types and combinations of **instruments** → **"integrated"** approach

Control group (just measuring overall energy consum-ption)

No inter-ventions

UNFREEZE: get people involved

Segmentation questionnaire, first interaction/information

CHANGE

Situational, tailored & recommendations (tips & advices): **Packs** for trigger events

Information & Feedback: Weekly feedback notifications with personal data/ graphs (kWh, price, CO_2, current consumption, historic comparison, target related comparison, projections)

Information & Feedback: Interface with personal data/ graphs (kWh, price, CO_2, current consumption, historic comparison, target related comparison, projections)

Nudging: Automation/remote control with opting out option and notification

Tailored to segments, types of behaviours, trigger points

No interaction: repeat UNFREEZE

Too little behavioral changes: continue CHANGE

Behavioral change (reduction): REFREEZE

Continued feedback: interface & weekly report plus tailored confirmation messages

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7. Recommendation engine

Message	Segments	Goal of message
Use timers to turn off stand-by power. This saves energy and helps create a better world for our children and future generations.	Seg3: Socially concerned (high	Energy efficiency
Charge gadgets at night	Generic	Demand response
TVs especially larger ones can be the most power hungry of all entertainment appliances when switched on. Don't leave them on all the time to avoid surprises in your electricity bill.	Seg1: Self-focused (high egoist	Energy efficiency
TVs especially larger ones can be the most power hungry of all entertainment appliances when switched on. Don't leave them on all the time to save energy and help the save the planet.	Seg2: Environmentally-concern	Energy efficiency
TVs especially larger ones can be the most power hungry of all entertainment appliances when switched on. Don't leave them on all the time to save energy and look after future generations.	Seg3: Socially concerned (high	Energy efficiency
Most of the cost of operating washing machines is for heating the water. Buy detergents that dissolve in cold water and use colder washing programs. This will also provide clean clothes.	Seg1: Self-focused (high egoist	Energy efficiency

Elements	Levels
Types of interventions	Recommendation, information, confirmation, feedback, control
User segments	Self focussed, environmentally concerned, socially concerned, generic
Types of ECB: Activity addressed	Cleaning, lighting, cooking, entertainment, heating, cooling, ventilation, stand-by, appliances replacement, hot water, others, total
Types of ECB: Appliances targeted	Washing machine, dishwasher, electric water boiler, lights, oven, electric stoves, kettle, PCs/laptops, small electronics, heaters, AC, exhaust fans, refrigerators, freezers, TV, home appliances in general, total
Behavioural phases	Unfreeze, change, refreeze
Trigger	Abnormal consumption, installation of app, app inactivity for 2 weeks, Monday morning (weekly summary), cold day (below x degrees), hot day (above x degrees), rainy day, calendar (vacation season, public holiday), indoor temperature vs. outside, message rating/comment, high night consumption, other
Frequency	When trigger is met, daily, weekly, monthly, hourly
Business models	Engagement, energy efficiency, demand response
Technical requirements/ level of service	None, smart meter, appliances/ heating/ HVAC/ luminance plugged to smart meter
Pilot sites	Residential, commercial, residential and commercial
Success definitions (KPI)	Read message/high rating, tool analytics, energy consumption reductions, remand shifted

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8. Conclusion

- Proved to be a **sound foundation** for tailored intervention strategies (data is about to be analyzed)
- **Tailoring** is **limited by and has to be adapted to real-world contexts**, e.g., business models vs. interventions to reduce energy consumption, technological conditions (HVAC), cultural differences
- **Profitable, however challenging, i.e. time-consuming and costly issue**, e.g. selection of a segmentation model, design of questionnaire and design of messages

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Comments, questions?

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Thank you for your attention

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UtilitEE Partners

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