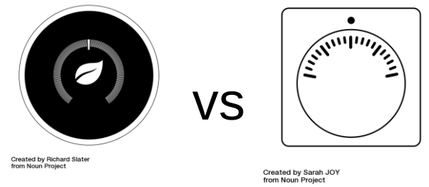
Behaviour and Energy Efficiency:
Systems tell people how to act - people tell systems how to change

IEA Demand-Side Management Technology Collaboration Programme

Professor David Shipworth
University College London

Introduction: Human behaviour and energy efficiency

- Humans use energy through technologies to fulfil social functions. We shape, and are shaped by, the technologies we use.
- All technologies contain a model of human behaviour.
- All business models contain a model of human behaviour.
- All energy policies contain a model of behaviour.
- All energy programmes contain a theory of behaviour change.
- Addressing these implicit models of behaviour can make policies and programmes deliver better outcomes and lower social, economic, environmental and political cost.
- DSM Task 24: "*We pose that the Energy System begins and ends with the human need for the services derived from energy (warmth, comfort, entertainment, mobility, hygiene, safety etc.) and that behavioural interventions using technology, market and business models and changes to supply and delivery of energy are the all-important means to that end.*"



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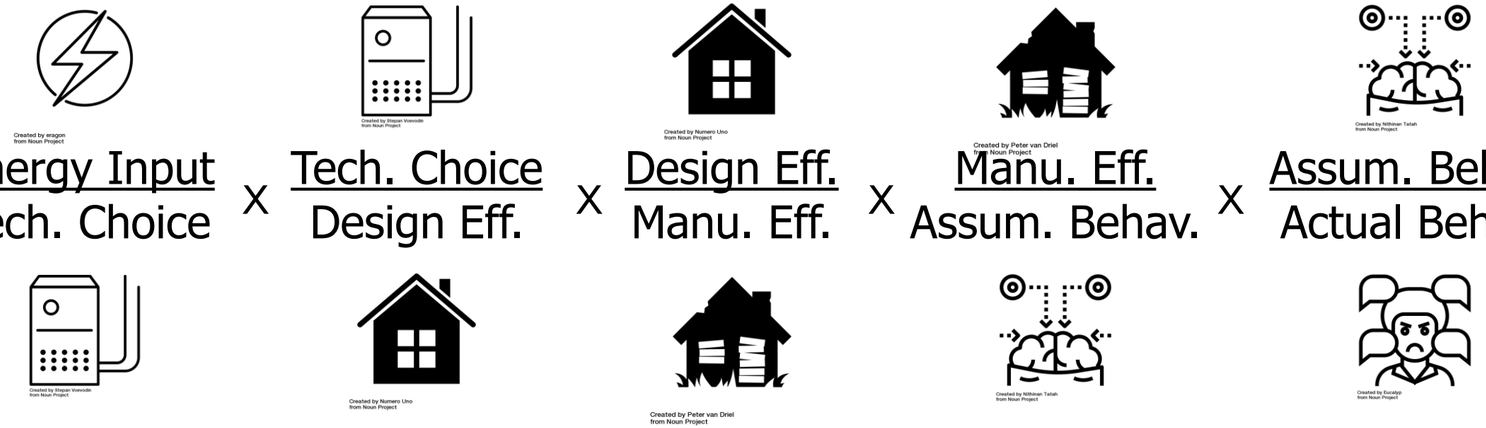
Behaviour in context.

$$\text{National energy} \equiv \underbrace{\frac{\text{Energy Input}}{\text{Service Unit}}}_{\text{Energy Intensity}} \times \underbrace{\frac{\text{Service Demand}}{\text{Capita}}}_{\text{Consumption Intensity}} \times \underbrace{\text{Number of Citizens}}_{\text{Population Size}}$$

$$\frac{\text{Energy Input}}{\text{Service Unit}} \equiv \frac{\text{Energy Input}}{\text{Tech. Choice}} \times \frac{\text{Tech. Choice}}{\text{Design Eff.}} \times \frac{\text{Design Eff.}}{\text{Manu. Eff.}} \times \frac{\text{Manu. Eff.}}{\text{Assum. Behav.}} \times \frac{\text{Assum. Behav.}}{\text{Actual Behav.}}$$



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- Service demand depends how we structure society:
  - **Physical Infrastructures:** Cycling lanes; heat networks; etc
  - **Temporal structures:** Work times; School times; holidays; etc
  - **Social structures:** Social norms; cultural expectations; social practices;
  - **Psychological structures:** Habits and outines; role modelling; etc
  - **Legal structures:** speed limits; property ownership; collab.econ; etc
  - **Economic structures:** taxes & charges; subsidies; etc
  - **Knowledge and skills:** Information campaigns; skills training; etc

Created by Pierre-Luc Auclair from Noun Project

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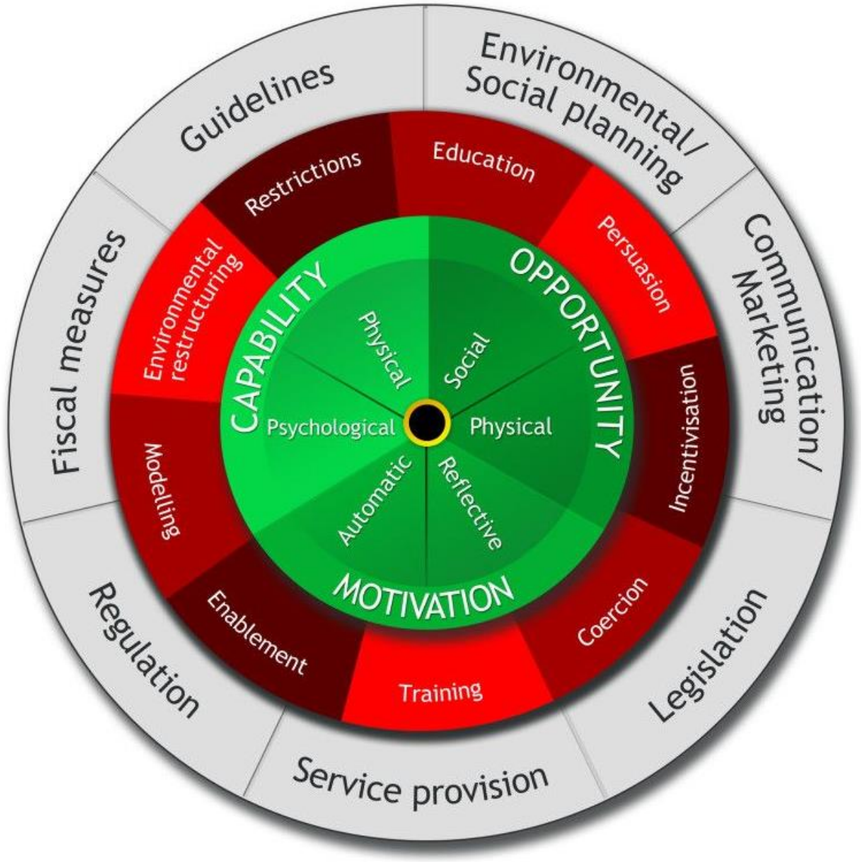
Focus on the individual

Focus on the social



Michie et al. (2011) 'The behaviour change wheel', *Implementation Science* Vol.6 p.42

A Social-Ecological Model for Physical Activity – Adapted from Heise et al 1999

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There are lots of strategies for changing behaviour

To change behavior people need the *capability*, the *opportunity* and the *motivation* to do so.

Interventions	Definition
Education	Increasing knowledge or understanding
Persuasion	Using communication to induce positive or negative feelings or stimulate action
Incentivisation	Creating expectation of reward
Coercion	Creating expectation of punishment or cost
Training	Imparting skills
Restriction	Using rules to reduce the opportunity to engage in the target behaviour (or to reduce the opportunity to engage in competing behaviours)
Environmental restructuring	Changing the physical or social context
Modelling	Providing an example for people to aspire to or imitate
Enablement	Increasing means/reducing barriers to increase capability or opportunity

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Behavioural psychology and economics

- A lot of our models of humans are wrong. Humans:
  - Place more value on the present than the future (Hyperbolic discounting)
    - Allowing people to make commitments to act in the future more easily than the present.
  - Think a bird in the hand is worth two in the bush. (Loss aversion)
    - Allowing framing of inefficient technologies as losing them money now.
  - Know their limits (Perceived behavioural control)
    - Personal comfort systems increase tolerance of temperature variations
  - Are social animals (Social norms)
    - Social comparison and social role modelling motivate behaviour change.
  - Use autopilot for routine tasks (Habits)
    - Timing interventions to life-stage changes can break and reshape habits
    - Automation can provide convenience and reshape energy habits
  - Don’t believe everything they’re told by ‘authorities’ (Discredence)
    - Using trusted local intermediaries, social role models, and multiple channels of communication is important.

DS

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How? 7 years o
- ➔ Empirical over
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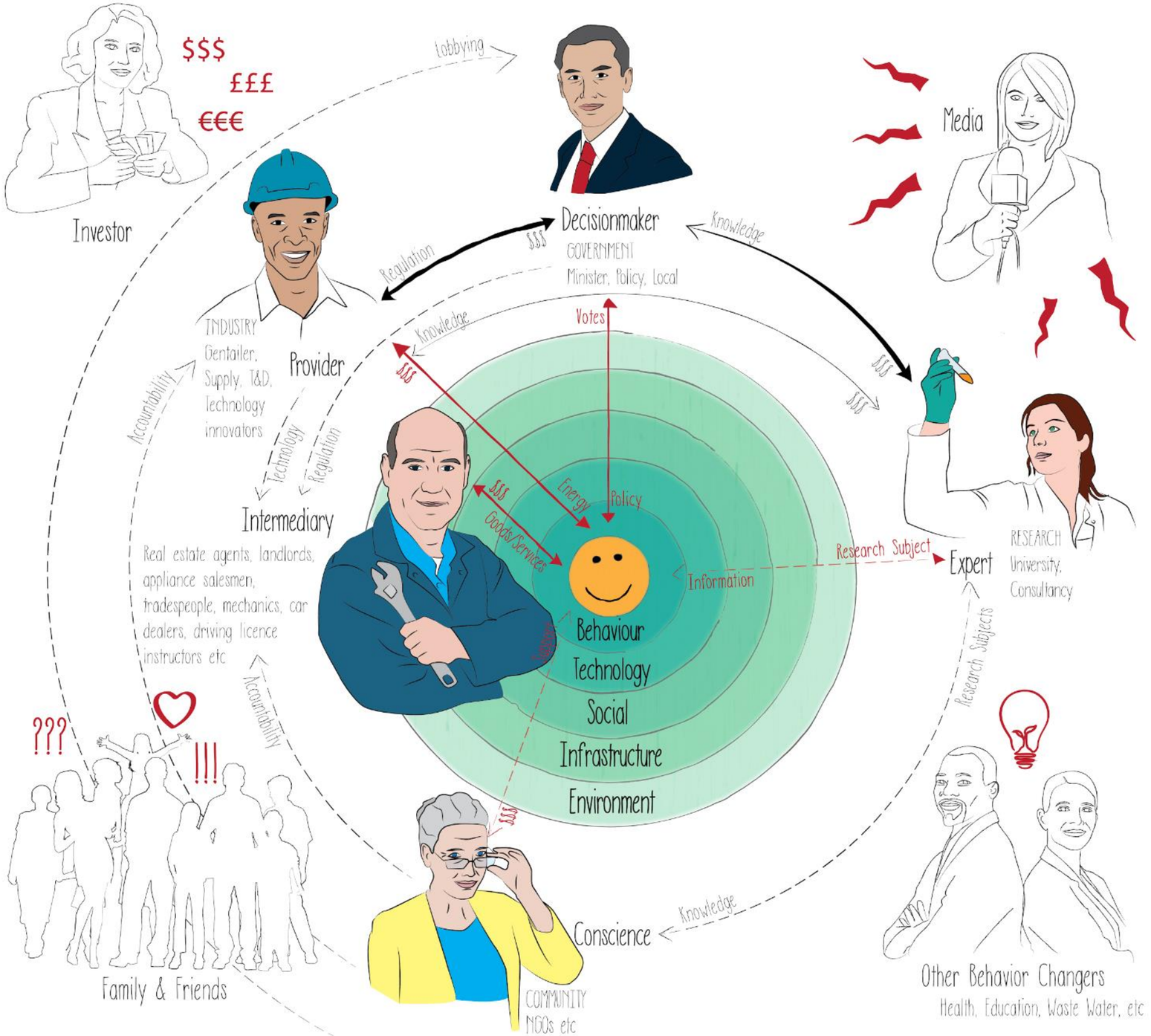
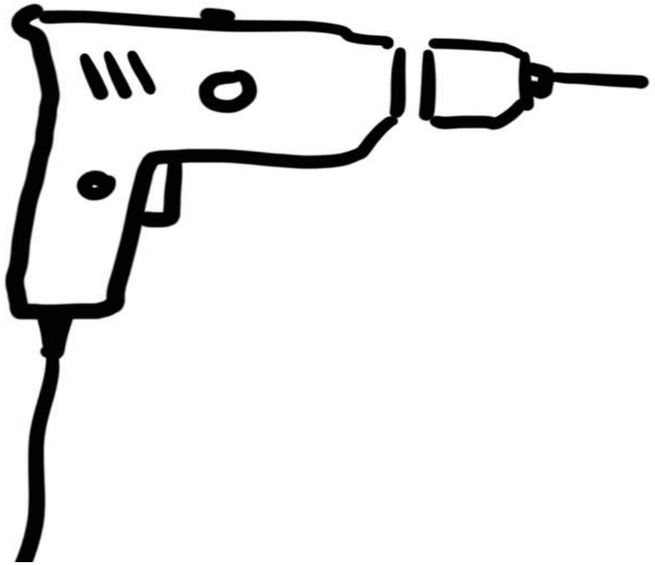
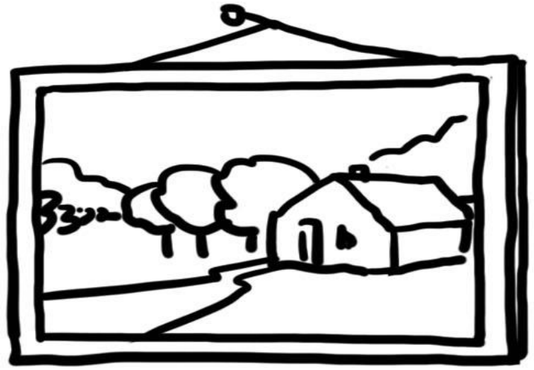


Watch how the "magic carpet" works: https://youtu.be/E3A92eFyvNw

DSM Task 25: Business Models for a more effective market uptake of DSM energy services





International collaboration on human behaviour in the energy transition.

- *Systems tell people how to act - people tell systems how to change.*
- In the energy transition this interplay governs the direction and rate of change.
- Research on economic path-dependence; energy transitions, and socio-technical systems and diffusion of innovations and factors governing technology adoption is needed.
- We need human factors international comparative studies including of:
  - Technology adoption case-studies, identifying key social factors governing uptake and use.
  - The impact of standards on technology design and consumer acceptance.
  - Outcome based policies driven by repeated evaluation and testing through social data analytics
  - Principles based regulation to simplify and accelerate creation of new business models while providing consumer protection.
  - Maximising consumer engagement in infrastructure investments such as smart metering
  - Rapid modal or technology shifts such as as post-Fukushima in Japan and Germany

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Any Questions?

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