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Low carbon scenarios: modelling the co-evolution of domestic energy practices

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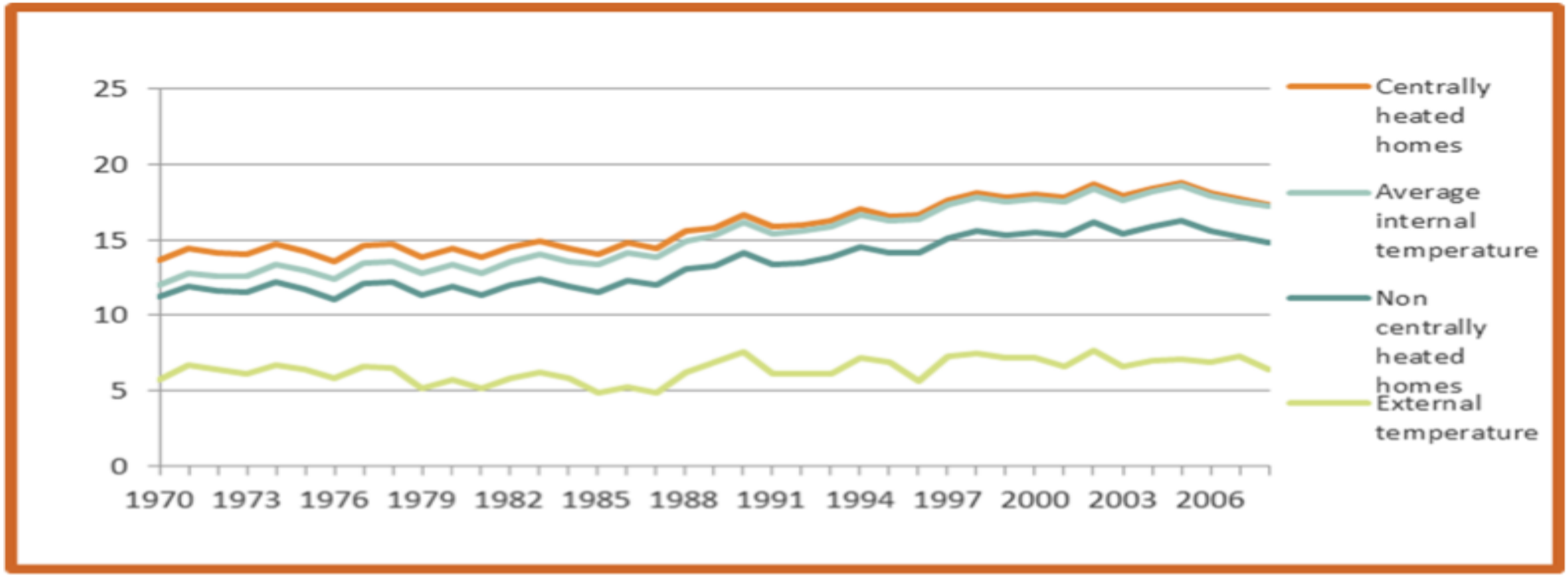
The problem

- Approximately one third of all energy consumed in the UK is used in domestic homes (DECC 2013).
- What energy is used for, and the amount that is used, has changed dramatically over the last 40 years.
- It could change in the future, towards lower overall demand, and/or lower peak demand
- But we don't know how to influence this, because we have a poor understanding of what drives domestic energy demand

Heating the home



Source: DECC (2012) United Kingdom energy fact file

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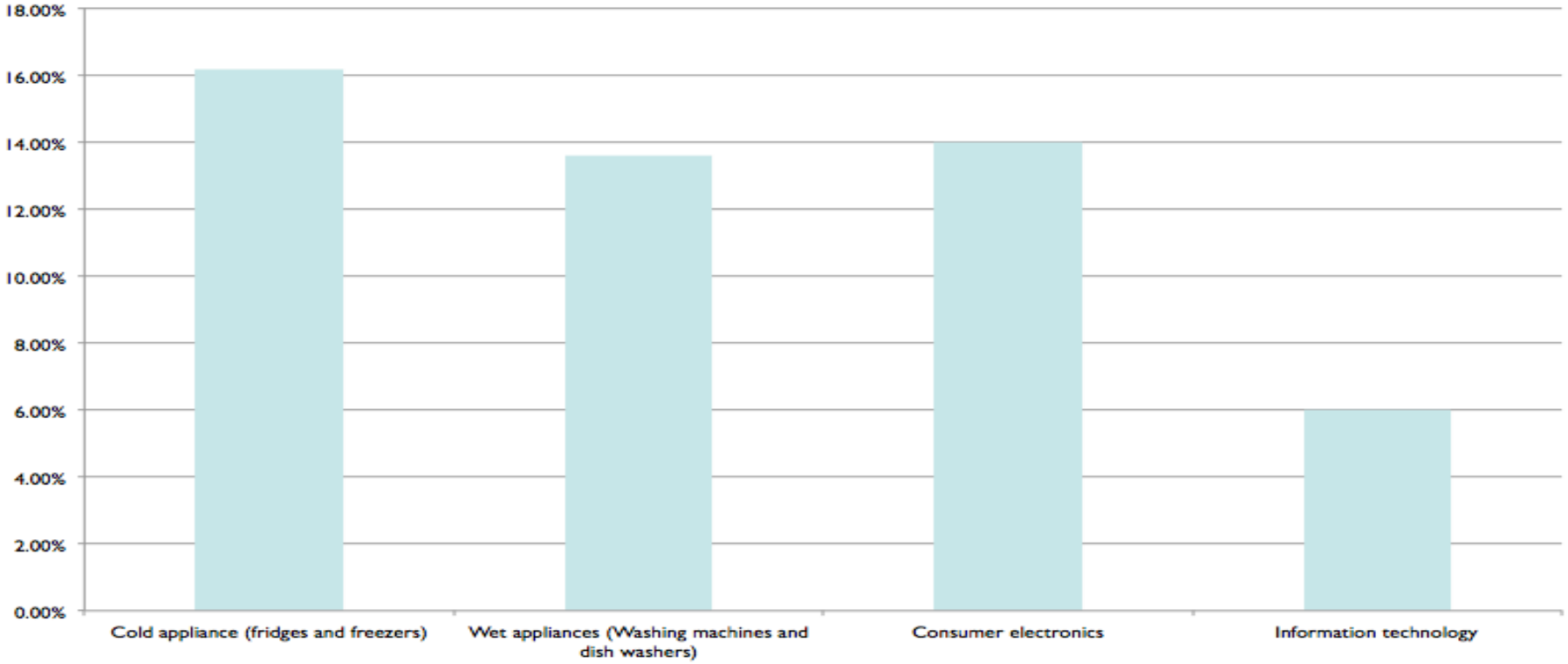
Domestic Appliances

In 2010, 50% of energy was used to run appliances which were not commonly available in 1970:



Source: DECC (2012) United Kingdom energy fact file

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What we do know

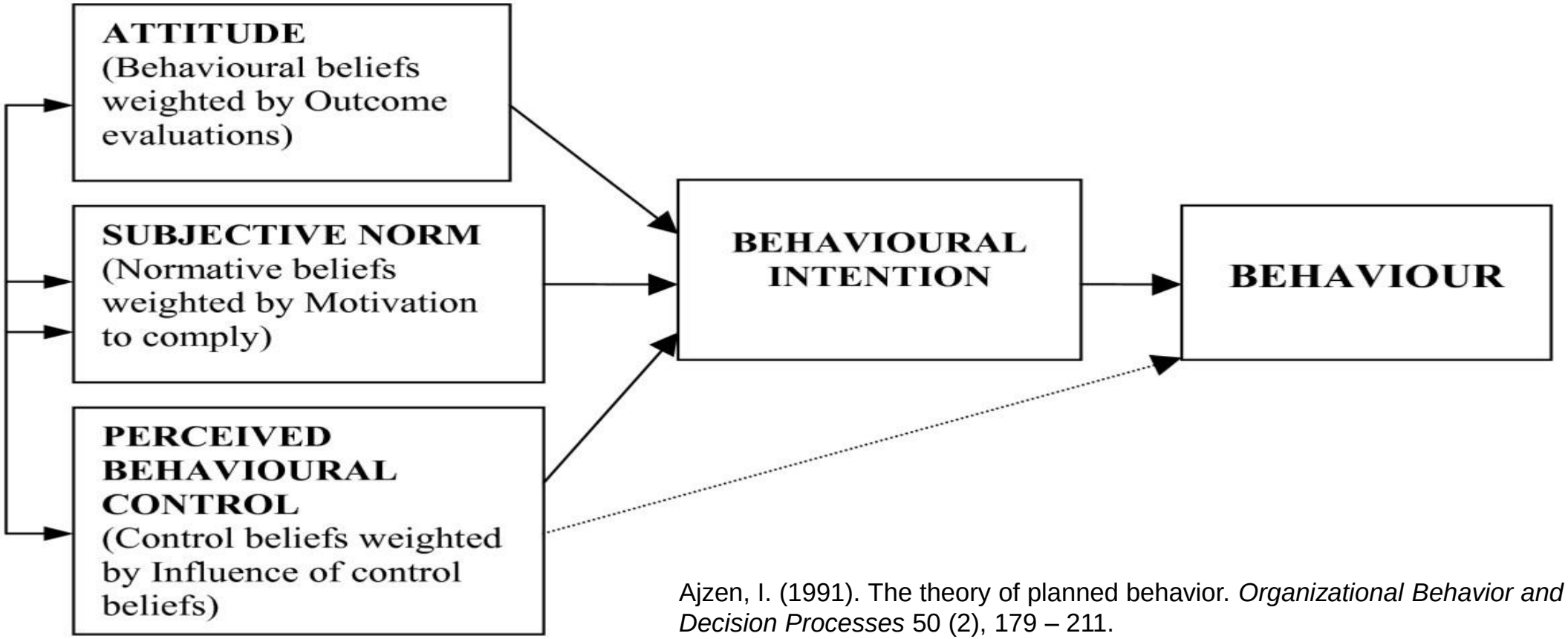
- Domestic energy demand differs according to:
  - Size of household (how many adults, children, and their ages)
  - Size of home (ground area, number of rooms, tenure, type of accommodation)
  - Household income
  - Stage of life course (parents, working age, retired)

- But there is no or only modest correlations with
  - ‘green’ attitudes
  - Education

Energy demand is only weakly related to cost

- Lots of evidence that energy demand is not price sensitive in a straightforward way
  - Low rate of supplier switching
  - Green deal not successful
- If energy cost decreases (e.g after installation of insulation, more efficient boilers etc.), there is a rebound effect
- Making energy use (and cost) visible is not very effective
  - Providing an energy monitor in the home has a limited and short term effects on usage
- So simple 'rational' economic models won't work

The standard psychological approach

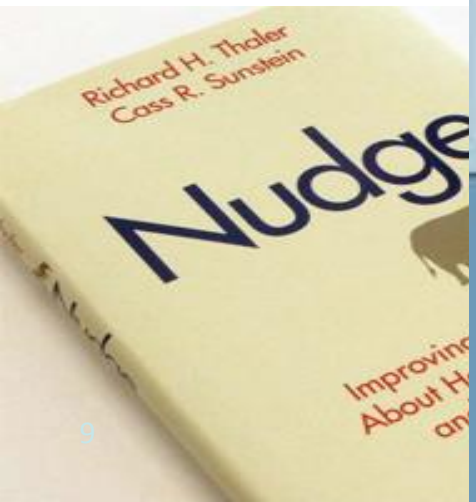


Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes* 50 (2), 179 – 211.

In summary

Attitudes -> Behaviour -> Change

Nudge


Richard H. Thaler
Cass R. Sunstein
Nudge


D'oh, the donuts are wayy over there.
Think I'll have fruit
My cunning choice architecture will soon have Homer eating healthy
JACK POT
$$$$
KEEP OUT
HEALTHY FRESH FRUIT
$$$
$

An alternative approach: Social practices

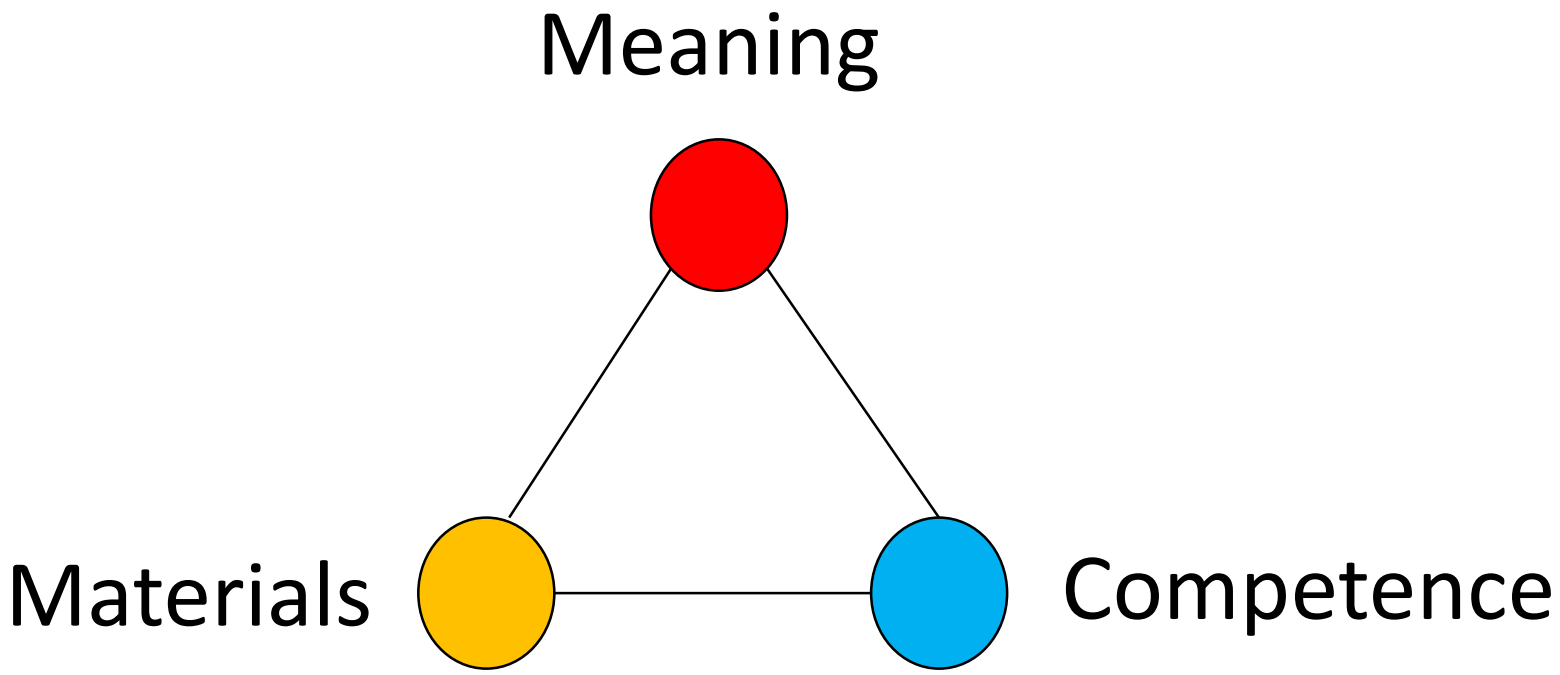
- Actions such as
  - Leaving the lights on,
  - Showering every day
  - Turning the heating up
- are not best analysed as individual behaviours, but as embedded within and occurring as part of social practices, such as:
  - Worries and concerns about security
  - Conventions about cleanliness
  - Conventions about appropriate dress in different settings

Social practices

- Energy use is a by-product of social practices rather than a result of specific behaviour.
- Key question is not:
  - *'why is domestic energy demand rising?'*

  but,
  - *'how have domestic social practices changed?*
- Focus should therefore be on how *social practices* evolve, not the behaviour of individuals.

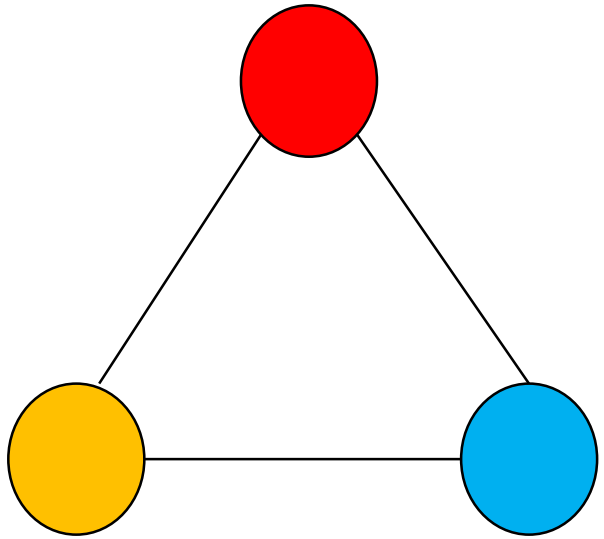
Meaning, materials and competence



From baths to showers

Meaning: what it means to be clean

Materials:
Showers, shower gel,
frequent use shampoo



Competence:
how to shower

An initial exploration

- 20 semi-structured interviews with households during the winter of 2013-4.
- Interviews consisted of two parts:
  - Semi-structured interviews in which the participants were asked about their domestic lifestyles, their home, the appliances they owned and their attitudes about energy use.
  - Walking interviews in which the participants were asked to walk the researcher through their daily routine and explain how they used energy at different points in the day.

Identifying Practices

- The research revealed a wide and varied range of practices being undertaken in the home.
- Five dominated much of the interview discussions:
  - Heating,
  - Preparing food,
  - Laundry,
  - Visual entertainment (TV), and
  - Electronic communication.

Examples of Co-evolution

- All five practices contribute to the ‘rhythm’ of domestic life and to some extent have co-evolved

`We now have a TV in the kitchen as well, it’s a flat screen so doesn't take up much space. I always stick it on while I’m cooking dinner. ….sometimes I watch cooking programmes while I'm cooking and think, `oh that looks much better than what we are eating, maybe I will try that at the weekend’

the radiators´

Implications

- To understand domestic energy demand it is necessary to focus on practices rather than behaviour.
- Exploring individual practices can provide a useful insight into the nature of those practices.
- However, the co-evolution and shared elements of domestic practices means that if they are to be re-configured in a more sustainable way we need also to focus on how they are related.
- How? Agent-based models…

Agent-based models: an instant introduction

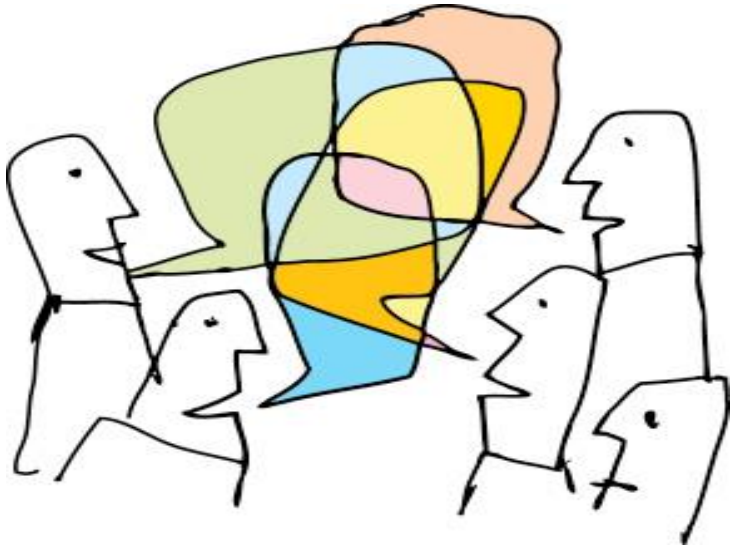
- Distinct parts of a computer program, each of which represents a social actor
- Agents may model any type of social actor
  - Individuals
  - Firms
  - Nations
  - Or even *Practices*

Environment

- Options:
  - Geographic space
  - Network (links, but no position)
- The environment provides
  - Resources
  - Communication medium

Interaction

- Information flows or is passed from one agent to another through
  - (coded) messages
  - direct transfer of knowledge
  - by-products of action



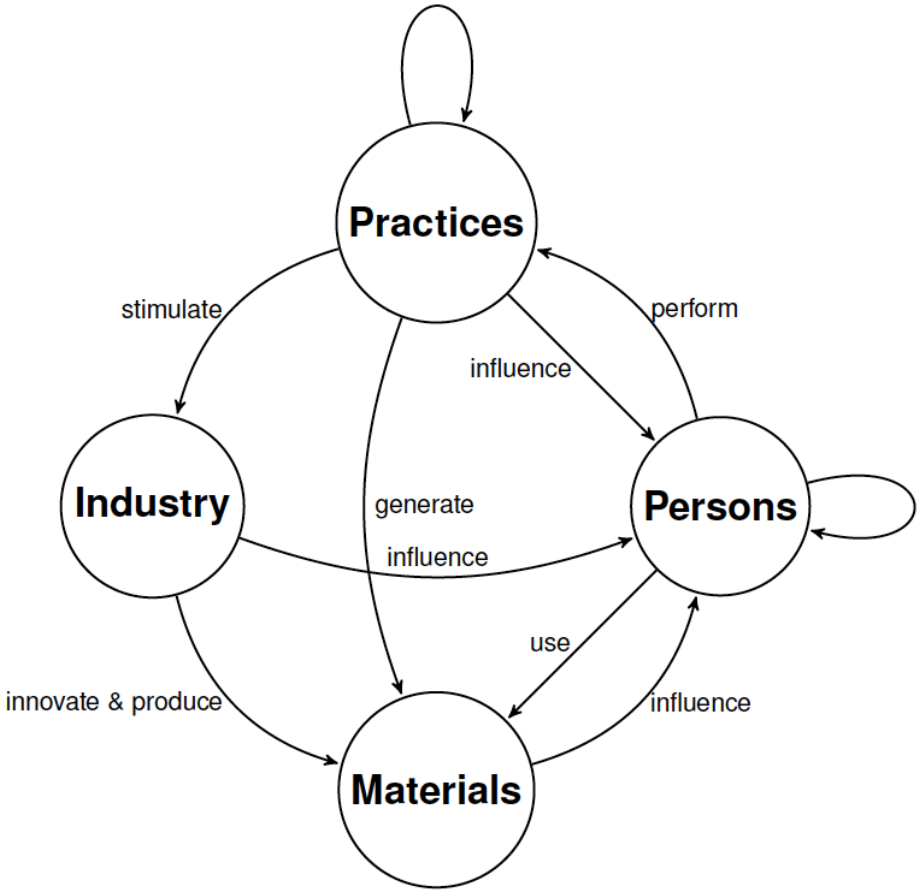
An agent-based model of social practices

- Social practices are represented as agents
  - Which have meaning, materials and competences as their properties
- Social practices influence each other
- Social practices emerge, change and die
- People are also agents
  - People agents learn as a result of feedback from their actions
  - Their properties include competences and a set of meanings
- The agents act in a common environment which is filled with resources

An agent-based model of social practices II

- Practices are performed by people combining their competences and meanings with the materials available to them
- People agents performing practices influence the strength of practices
- Strength of practices indicates to what degree they can encourage people to acquire respective competences and meanings and industry to develop materials for them
- Innovation (e.g. industry driven) can alter existing resources and induce new resources into the environment

An agent-based model of social practices



Next steps

- Collection of empirical data for model conceptualization
- Development of more sophisticated models showing interaction between practices
- Integration with other energy models (e.g. looking at both demand and supply and innovation)
- Interaction with stakeholders to determine in- and output interfaces

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Thank you

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