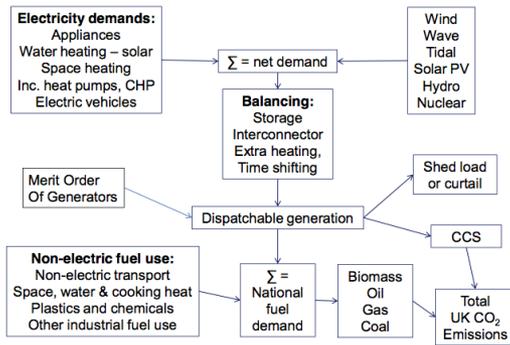
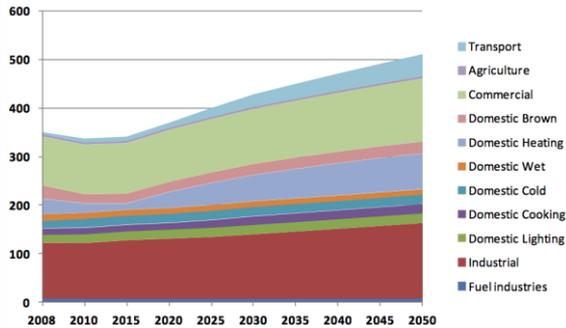


# Interdisciplinary experiments in energy modelling: co-producing social science and engineering insights on energy demand

Tom Hargreaves, Jason Chilvers, Noel Longhurst, Sarah Higginson, Eoghan McKenna, John Barton, Murray Thomson, Matthew Leach, Damiete Emmanuel-Yusuf

# The energy integration challenge



*“One of the main challenges...is to identify and integrate the social aspects and governance implications...with the body of knowledge on technical feasibility.” (Darby and McKenna 2012)*



# Integration and Interdisciplinarity

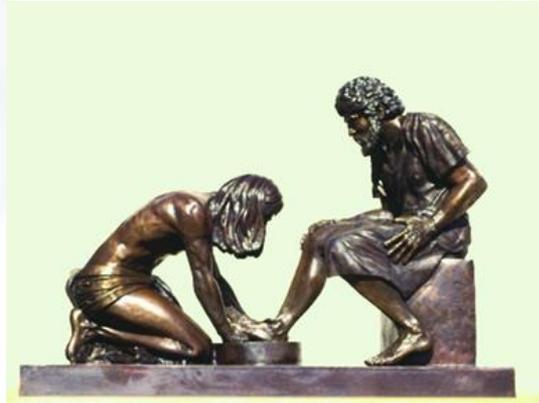
- Interdisciplinary (ID) research is often evaluated for the *extent* of integration between the disciplines.
  - A spectrum from Multi-, through Inter-, to Trans-disciplinarity.
- This leads to the development of ‘*best practice*’ guidelines for ID research.
  - E.g. ‘right’ team, ‘right’ space, ‘right’ time, ‘common’ language, open and trusting environment etc. (e.g. Sinnett and Williams 2011)
- This approach assumes that ‘integration’ is always desirable, that it is the only appropriate goal for ID research.

# Diverse modes/styles of interdisciplinarity



## **Integrative-synthesis:**

“the integration of two or more antecedent disciplines in relatively symmetrical form.”



## **Subordination-service:**

“service discipline(s) making up for an absence of lack in the other, (master) discipline(s).”



## **Agonistic-antagonistic:**

“driven by an ...antagonistic relation to existing forms of disciplinary knowledge.”

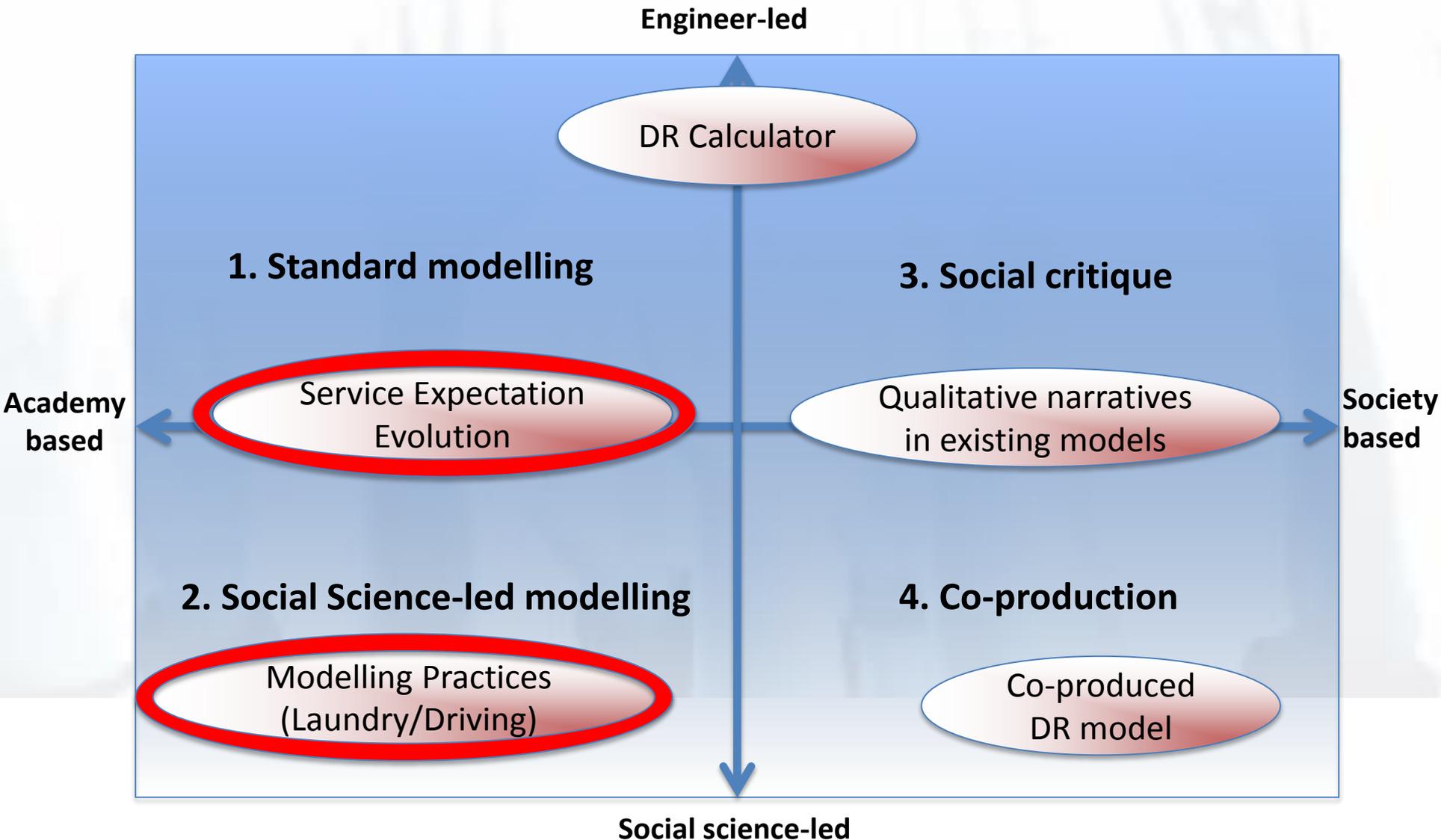
(Source: Barry et al 2008, p28-29)

# Realising Transition Pathways

- “To undertake historically-informed, forward-looking analysis of energy system transitions, bringing together quantitative and qualitative research methods.”
- Explicit research on ID during the first phase concluded that, despite willingness, the consortium struggled with ‘on-model’ collaboration.
- Phase 2 has sought actively to experiment with different kinds of on-model interdisciplinarity in relation to demand response.
  - Workshop 1: explored model ‘assumptions’
  - Workshop 2: devised range of ID experiments
  - Workshop 3: To evaluate process.



# Experiments in interdisciplinarity



# Service Expectation Evolution

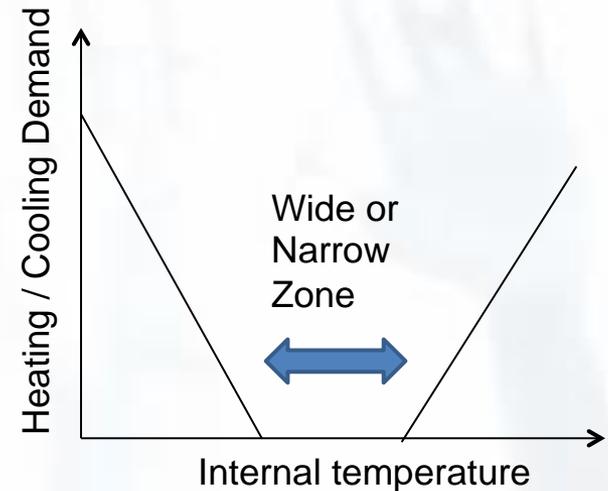
- Designed to provide social science input into existing RTP models in order to 'improve' their assumptions about indoor comfort expectations.
- Service expectations often held to be stable and constant in models, but social science literature suggests they vary in different ways:
- Process:
  1. Review of social science literature on indoor comfort expectations
  2. Devise range of modelling scenarios all backed by evidence (stabilise and standardize; more demanding standards; wider comfort zone; local diversity)
  3. Modelling variable service expectations
  4. Evaluate process (Summer 2015)

# Service Expectation Evolution

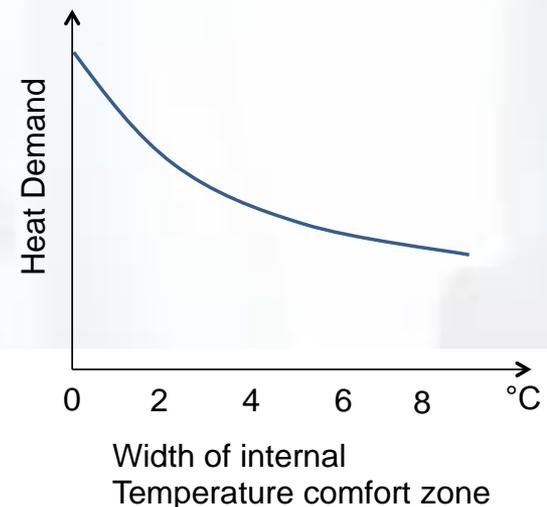
## Ongoing Learning:

- Opens up new scenarios for models. Introducing new parameters and re-framing boundary conditions.
- Demands new levels of detail in existing models (e.g. around heating/cooling technologies, housing stock etc.)
- Forces social scientists to appreciate complexity of models and difficulty of making even small changes to assumptions.
- Generates a new understanding of model outputs with stronger awareness of what's been left out and why.

In each hour:



Annual total energy demand:



# Modelling Practices

- Social-science-led experiment designed to develop new approaches to modelling based on social science understandings of, and data about, social practices.
- Process:
  1. Identify key assumptions/understandings of social practice theory.
  2. Gather data in relation to laundry practices (and subsequently driving practices)
  3. Explore ways of representing/modelling data based on network theory.
  4. Evaluate process (Summer 2015)

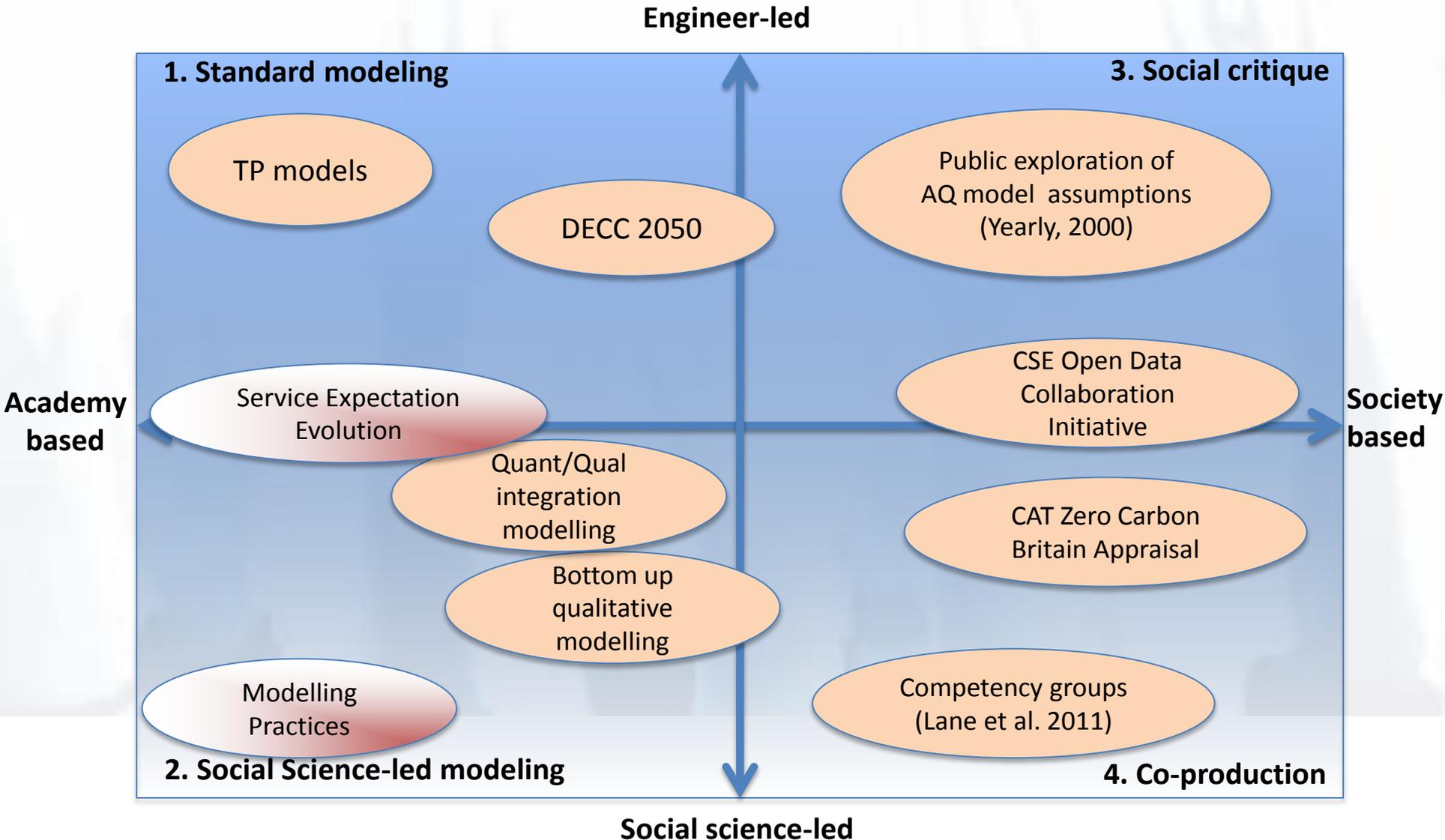


# Modelling Practices

## Ongoing Learning:

- Forces engineers to explore wholly new understandings of socio-technical change and question their model-ability.
- Forces social scientists to move beyond situated/in-depth case studies and engage with new ways of 'scaling up' and communicating about practices.
- Opens up new discussions about core/periphery elements, variants of practice etc. but also closes down discussion about the situatedness of practices.

# Conclusions



# Conclusions

1. There is no single 'best practice' approach... diversity matters.
  - The challenge is to experiment with a range of approaches and to be reflexive about their effects and implications.
2. This will help to develop a broader range of evaluative criteria for ID work. E.g:
  - Transformations of actors/inputs to ID working
  - Styles/Modes of ID working
  - Opening up of ID outputs

# Thanks

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