EBC
Energy in Buildings and Communities Programme

Do Occupants Matter?

Comfort and Occupant Behavior as Relevant Drivers for Building Energy Performance

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Potential Influence of Comfort Conditions and Occupancy on Building Energy Performance

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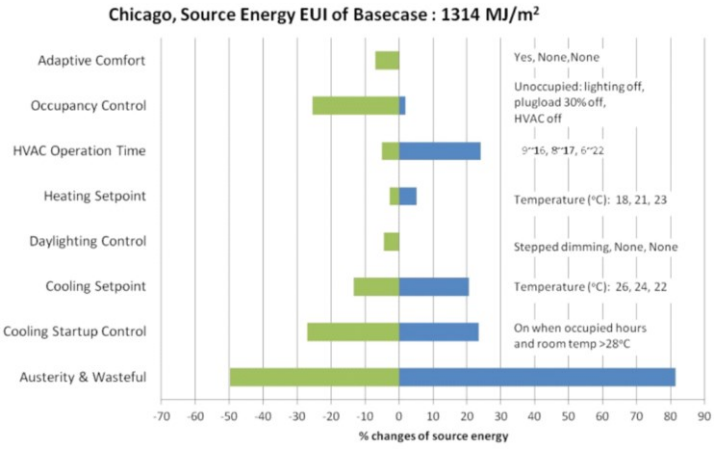


Hong and Lin, 2013

Role of Occupants in Building Energy Performance Gap

Study by A. Mahdavi, Ch. Berger et al. in Subtask 1 of Annex 79:

144 articles reviewed in search of evidence for the alleged role of occupants as the cause of the performance gap

Central finding:
Existing studies do not provide a convincing evidence for the purported significant contribution of occupants to energy performance gap

Only 40% of studies meet the minimum credibility criteria
Only 14% entail actual monitored data on occupant behavior

Publication link: https://doi.org/10.3390/su13063146

Occupants' Interventions and Building Energy Performance

Reasons for occupants' interventions:

- dissatisfaction with building automation
- interfaces are not designed/equipped for intended purpose
- planners do not consider occupants' needs in building design (same is true for building operation)
- intended interventions in buildings with occupant-centric design concept

Source:Schakib

Source: Gilani and O'Brien

→ **Occupants have to be included into overall building concept and into control strategy**
→ **Better understanding of occupant behaviour is essential**

Lessons Learned in Annex 66 and Open Questions

IEA EBC Annex 66 provided sound framework for:

- experimentally studying and modeling different behavioral actions
- implementation of occupant behavior models into simulation platforms

But: discrepancy with design and building operation practice and open questions:

- What is impact of multiple indoor environmental parameters on human perception and resulting behavioral reactions?
- How do building controls' interfaces and their underlying logic affect behavior?
- How can building automation systems and other readily-available data sources be better leveraged for improving occupant-centric building concepts?
- What kind of information has to be provided to better inform designers and building managers on how to apply occupant behavior knowledge and models in practice?

Objectives of Annex 79

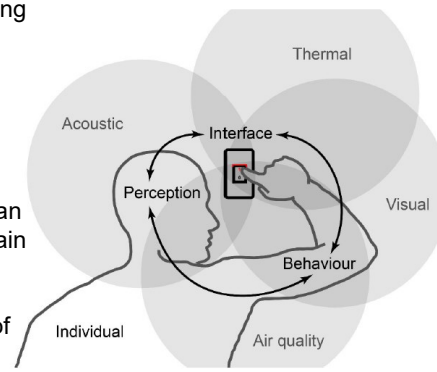
- **Improvement of knowledge about occupants' interactions with building technologies**. Specific focus on:
  - comfort-driven actions caused by **multiple and interdependent environmental influences** which are not yet covered by current models
  - **building technologies' interfaces** in terms of their suitability for taking advantage of adaptive opportunities, and their effect on building energy consumption
- **Deployment of 'big data'** (data mining and machine learning) for the building sector based on various sources of building and occupant data as well as sensing technologies
- Sustainable **implementation of occupant behaviour models** in building practice
  - guidelines / recommendations for **standards for applying occupant behaviour models and new knowledge on occupants during building design and operation**
  - focused **case studies** to **implement and test the new models** in different design and operation phases in order to get valuable feedback

Participating Countries

1	Australia
2	Austria
3	Belgium
4	Brazil
5	Canada
6	China
7	Denmark
8	France
9	Germany
10	Italy
11	Netherlands
12	Norway
13	Singapore
14	Sweden
15	Turkey
16	UK
17	USA
18	Switzerland

Ongoing Activities

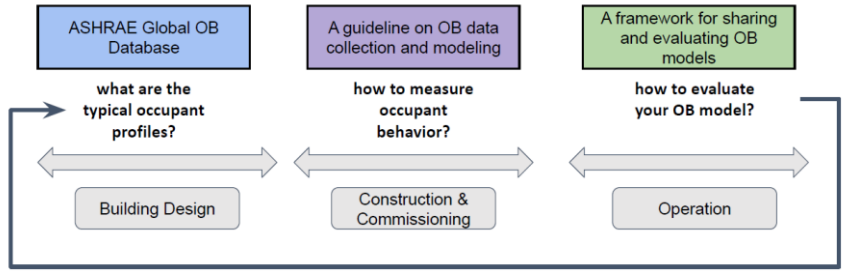
- Collecting information on human-building interaction in multi-domain studies
- Defining necessary conditions for multi-domain indoor environmental quality standards
- Indoor environmental factors and human responses: a framework for multi-domain studies
- A COVID-19 pandemic-driven review of multi-domain IEQ studies in residential buildings and work-from-home settings



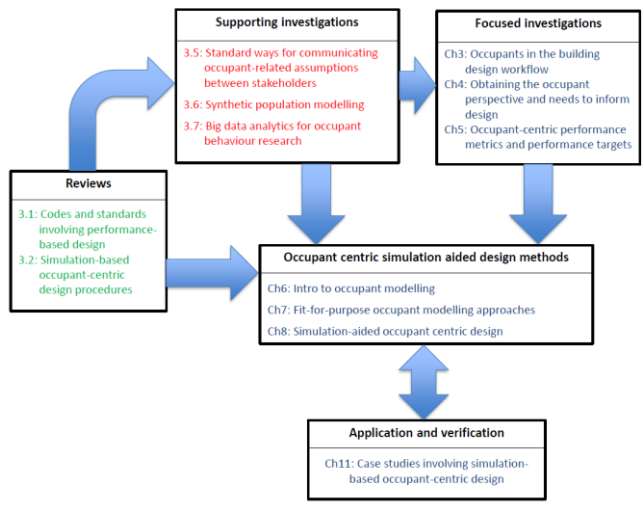
Marcel Schweiker

Ongoing Activities

Goal: Advance methodologies and tools for data-driven Occupant Presence and Action (OPA) modelling and implementation



Ongoing Activities

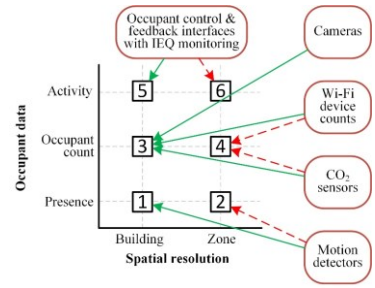


Ongoing Activities

- Literature reviews on OCC
- Operator interviews

- OCC case study descriptors survey
- OCC taxonomy
- OCC in simulation
- *Demand response & OCC*
- *COVID-19 & OCC*

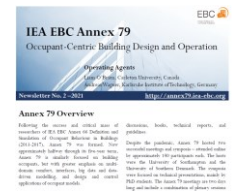
- Synthesis of OCC case study findings



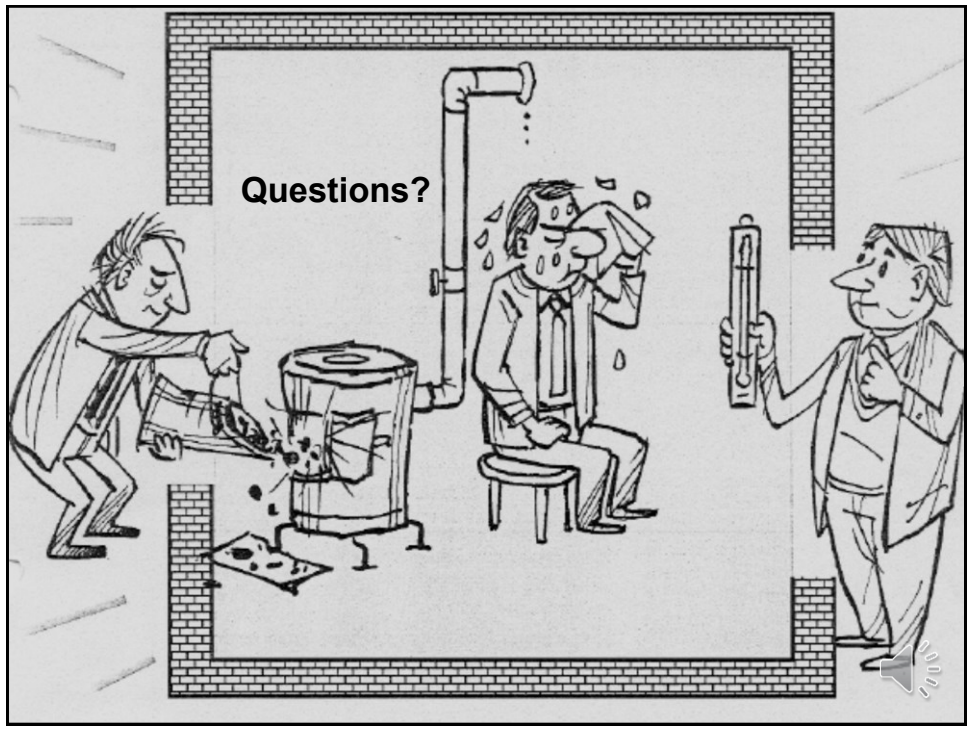
Important Outputs so far

- Special issue on review papers in Journal Building and Environment complete
- On-going special issue on occupant-centric controls in the Journal of Building Performance Simulation
- Contribution to ASHRAE handbooks (2021 Fundamentals new section on occupant modeling in Chapter 19)

- REHVA Guidebook planned
- 29 journal papers in total 2020 and 2021



- Annex 79 Newsletter for 2020 published (https://www.dropbox.com/s/4fyp0yz4jkjcams/Annex%2079%20newsletter%202021.pdf?dl=0)
- **More information on IEA EBC Annex 79: https://annex79.iea-ebc.org/**


Questions?