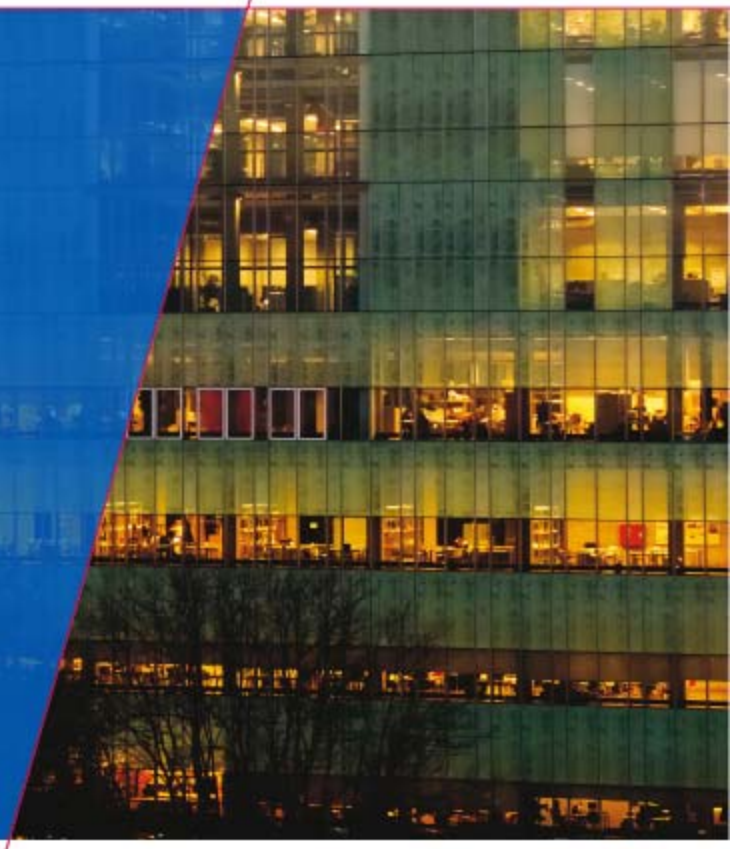
Individual comfort systems

Process Control on a Workplace Level



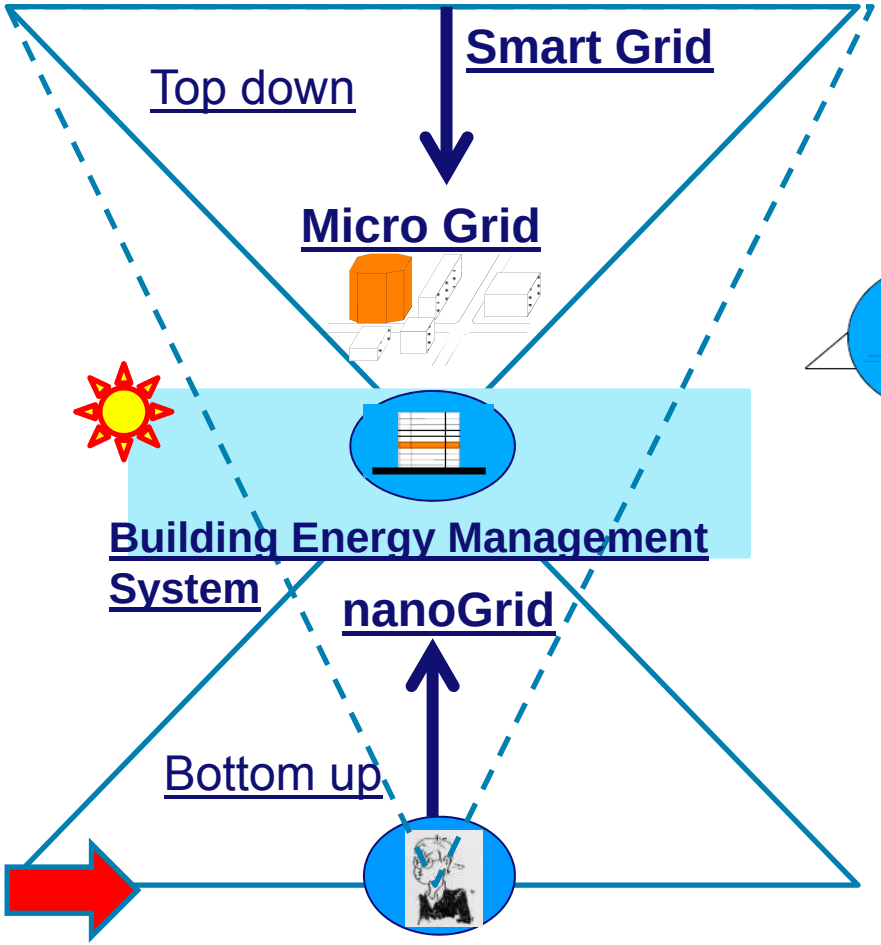
ICEBO Montréal 11 October 2013

Jacob Verhaart, MSc.
Wim Zeiler
Gert Boxem

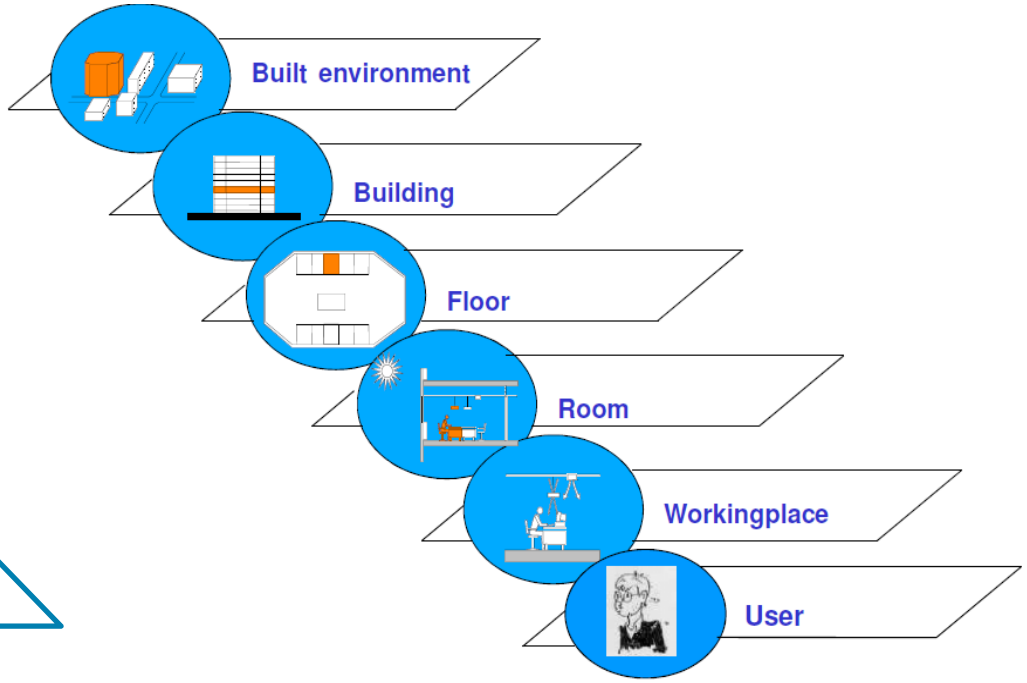
TU/e Technische Universiteit Eindhoven University of Technology

Where innovation starts

Project context



Different levels of functional abstraction



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Problem definition

Problems:

- **Building sector:**
  - **40 % of the primary energy use in the world**
  - **24 % of CO_2 emissions in the world**
- **Comfort levels of higher then 90 % hardly ever reached**

Goals:

- **Reduce energy use**
- **Increase Individual comfort level**

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State of the art comfort technology

Building Technology

&

Installation Technology

user behavior

Potential:
20 - 30% reduction

Actual:
0 - 10% reduction

Users are the key!

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Individual comfort

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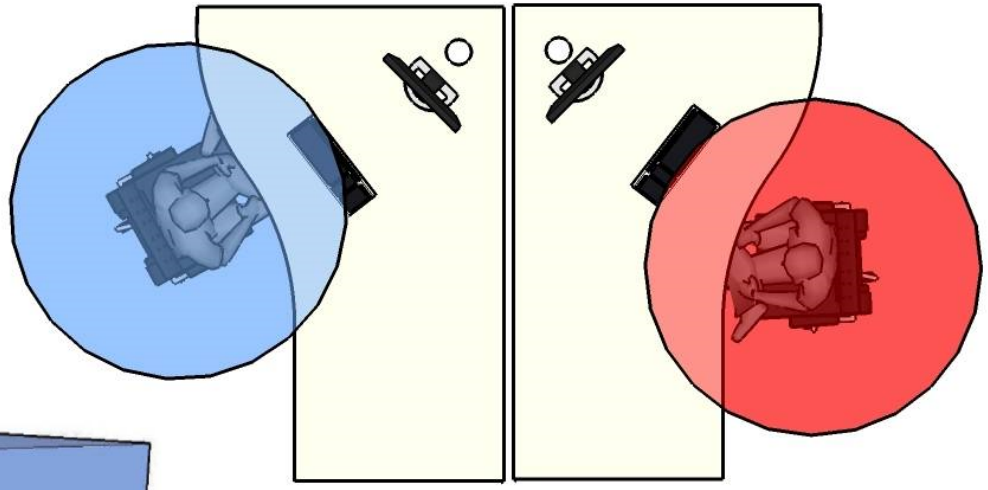
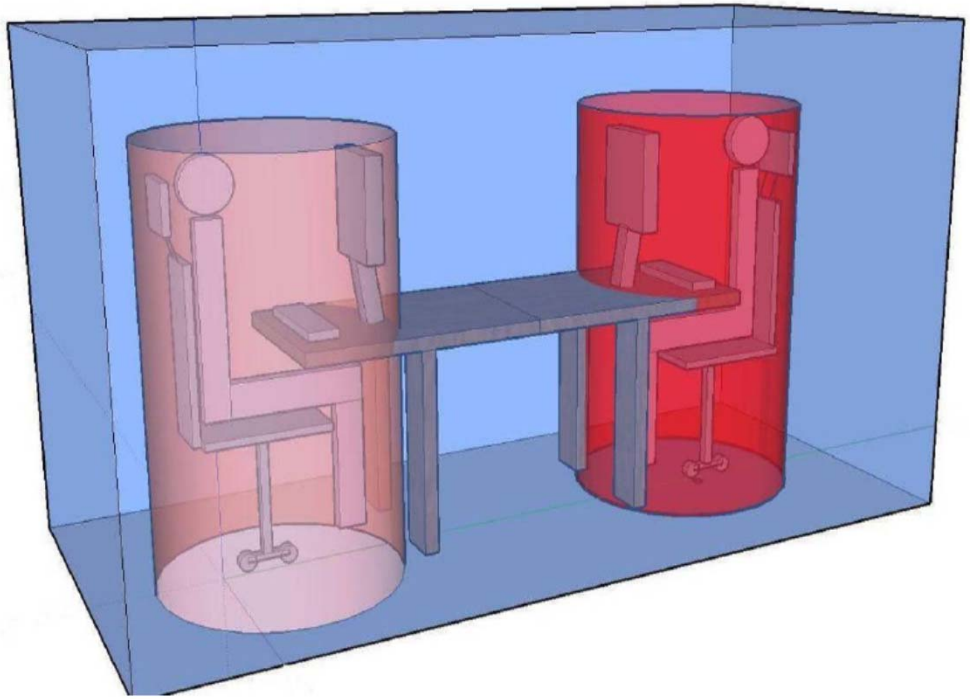
Individual differences

One person is cold, while the other is warm

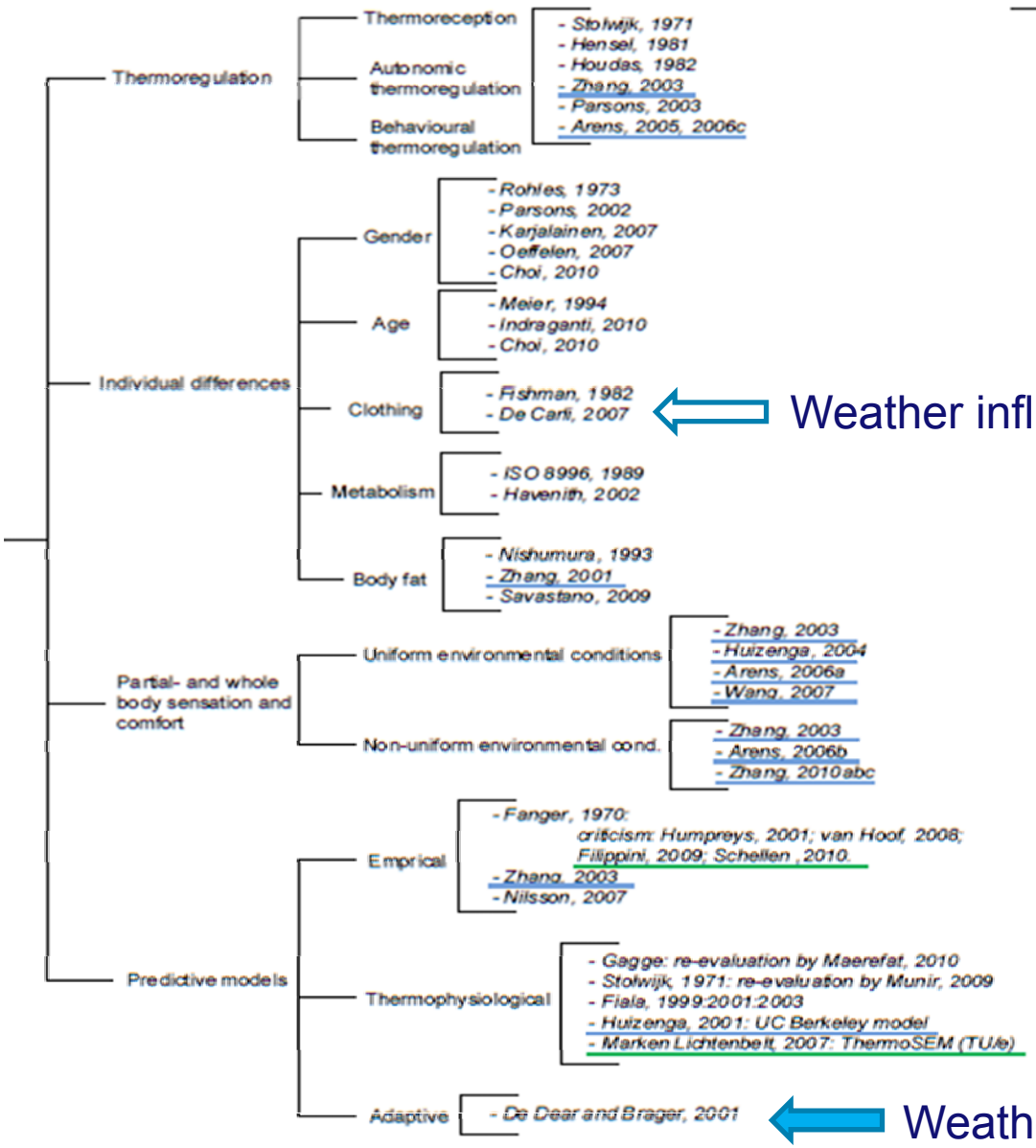




Individual conditioning on top of base-level comfort

Thermal comfort research

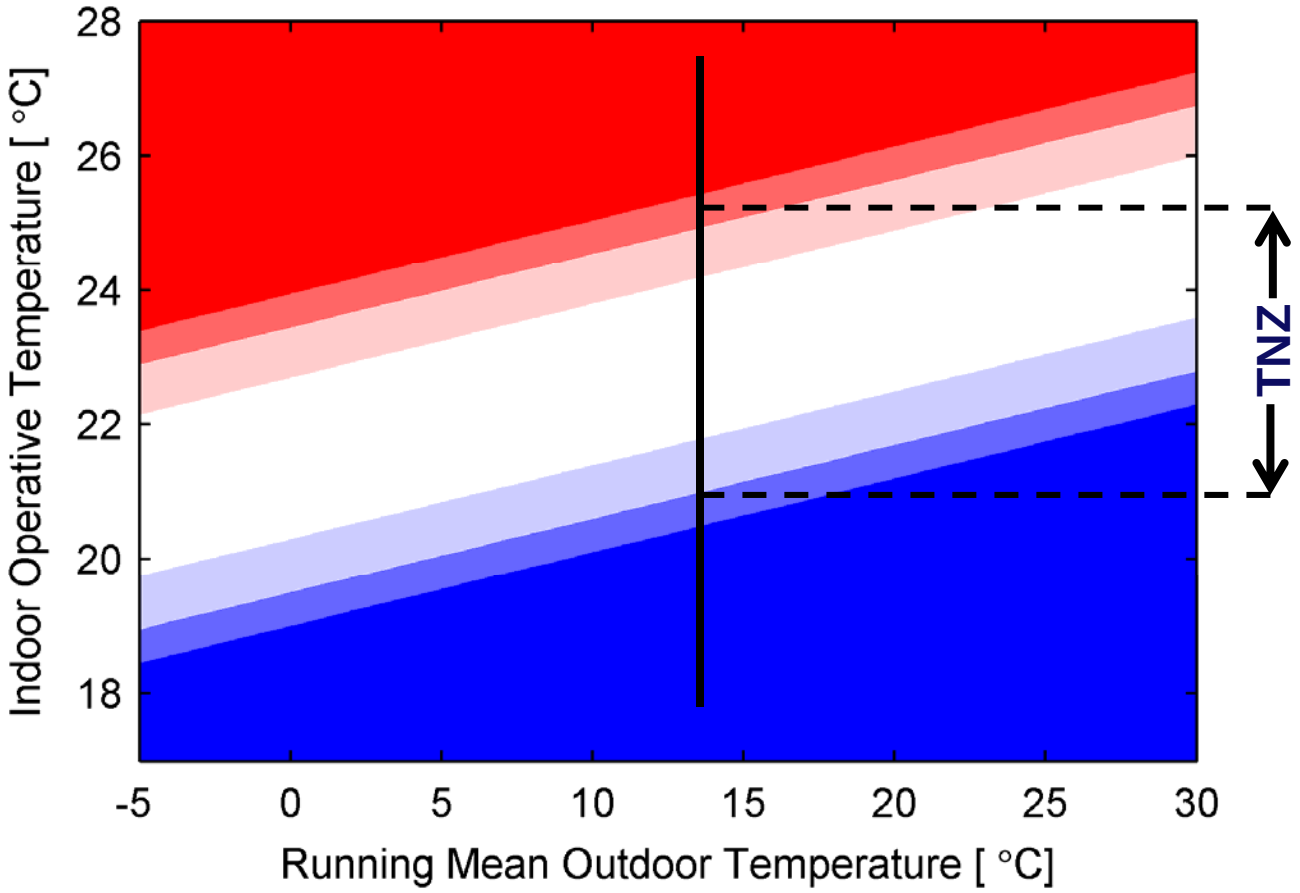
Thermal comfort



Weather influence!

Weather influence!

Adaptive vs. Individual comfort



Factors:

- **Metabolism**
- **Clothing**
- Gender
- Age
- BMI
- Personal preference

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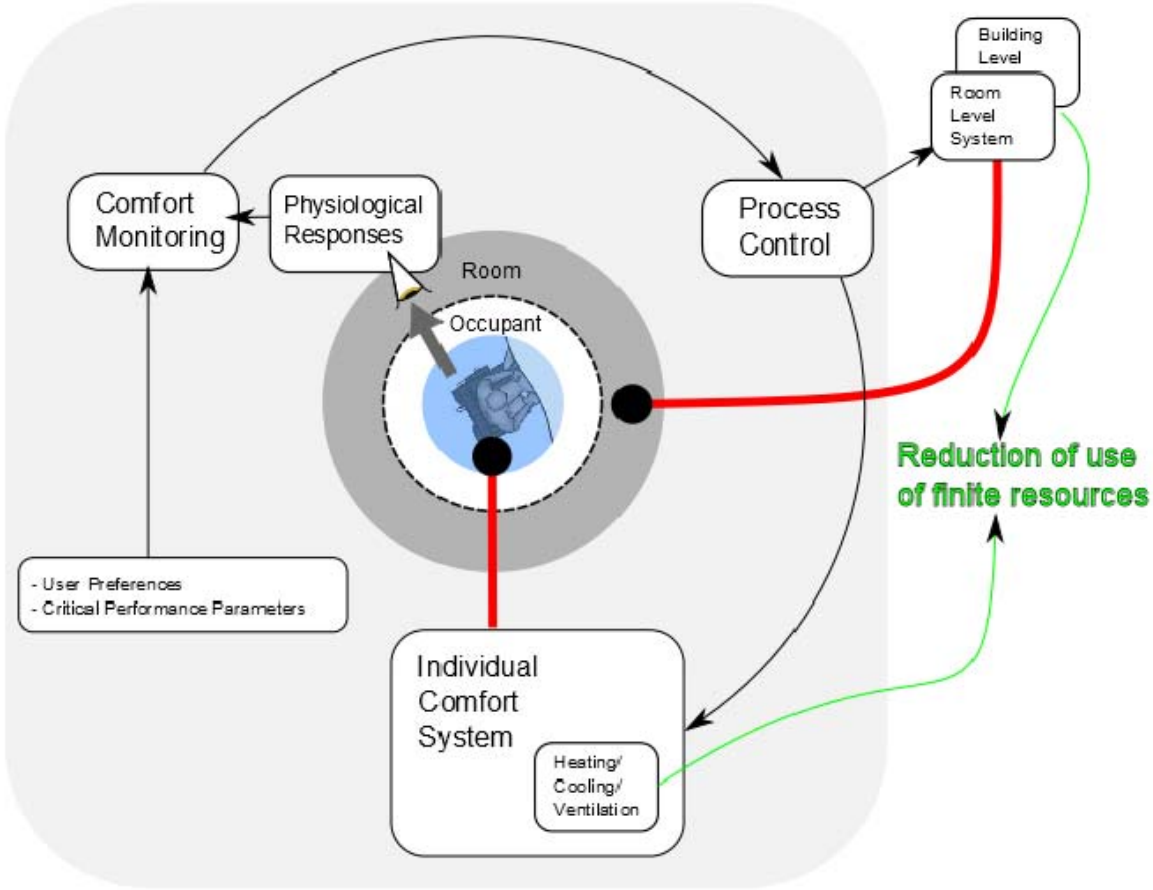
Individual Comfort System



Challenges:

- **Mitigation**
- **Control**
- **Detection**
- **Building Integration**

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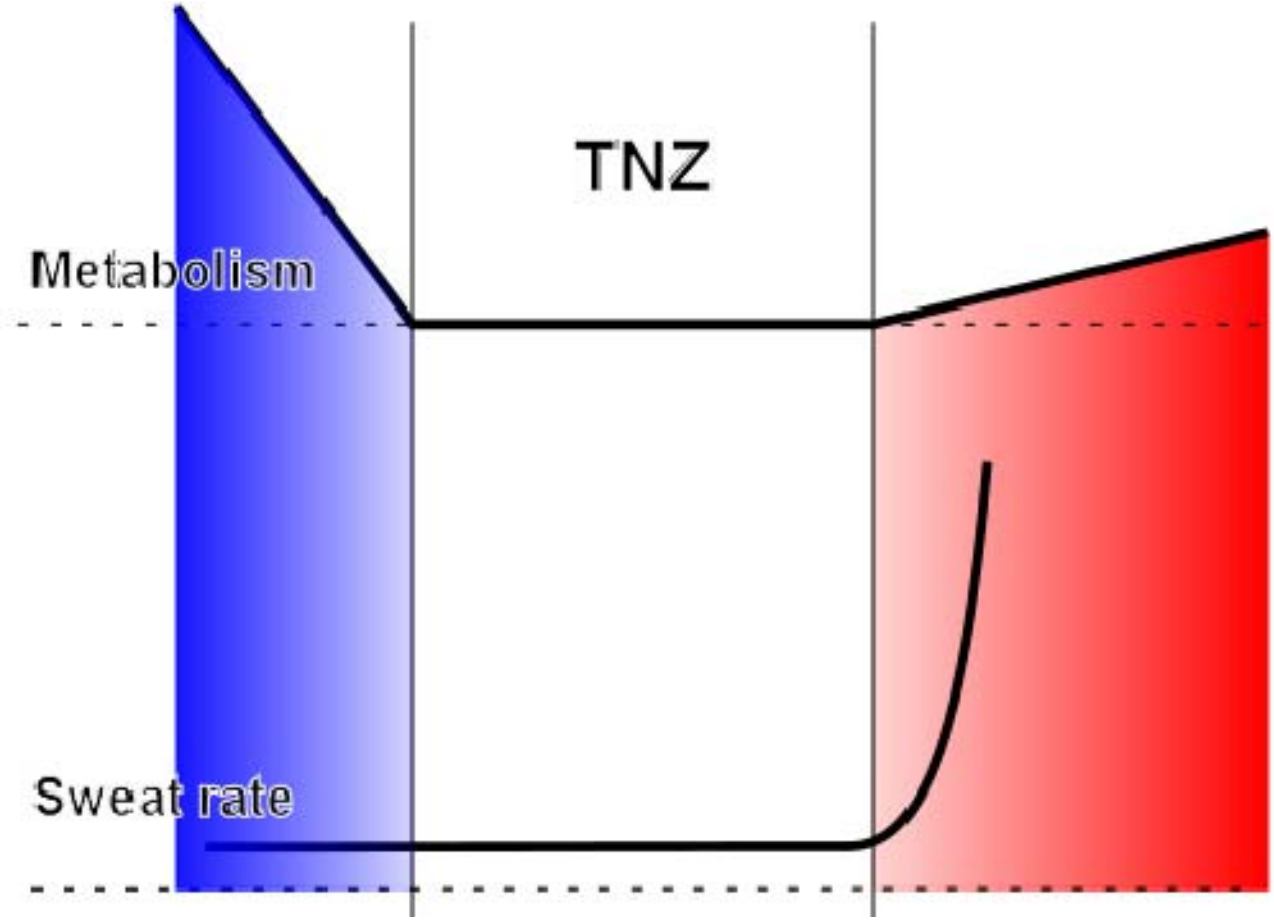
Thermal comfort (warm side)



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Warm discomfort, detection

Aspects of the onset of sweating:

- Thermal Neutral Zone / Thermal Comfort Zone
- Increase in sweat gland activity
- Skin wettedness, depending on:
    - Air velocity at the exposed skin
    - Relative Humidity

To be studied:

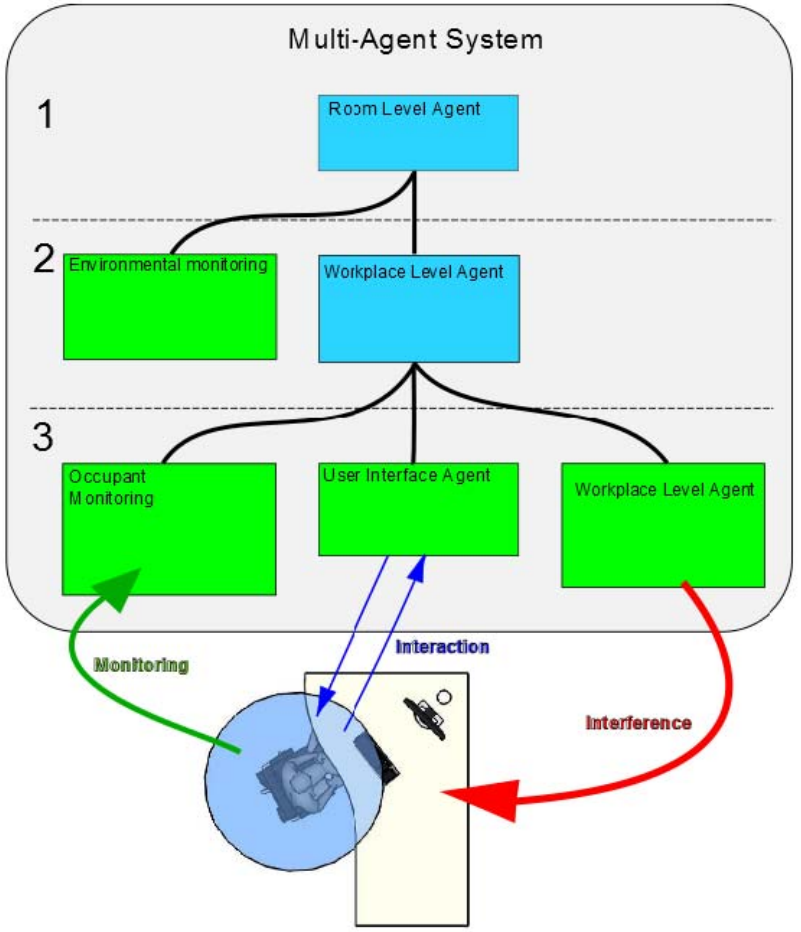
- Order of mechanism
- Detectability of sweat under different circumstances

Building Integration

Multi-Agent System

Distributed control system with

1. Base-level comfort provided by room level agent
2. Workplace level comfort control agent
3. Local intervention and comfort monitoring at WL



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