

A DYNAMIC WAY OF LIVING THROUGHOUT THE SEASONS, AS AN ALTERNATIVE DESIGN APPROACH FOR CURRENT ENERGY-EFFICIENT HOUSING CONCEPTS: A CONCEPTUAL FRAMEWORK

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► RESEARCH INFORMATION

KEYWORDS

User-centered design approach, dynamic resident, efficient occupant behavior, user interaction, actual energy consumption, energy-efficient housing concepts

INTRODUCTION / CONTEXT

Strong focus on energy-efficiency leads to an **object-centred design approach** where the resident is considered as passive:

- High influence of user practices on actual energy demand due to inefficient occupant behaviour and lack of user interaction

GOAL

Overview of the current **design challenges** in traditional energy-efficient housing concepts in view of user practices and proposition of **design criteria** by means of a **user-centred design approach**

- Development of a **conceptual framework** to promote more dynamic, efficient use in the living environment as an incentive for further development of an alternative dwelling concept

METHODOLOGY

By means of a **literature study**:

- Dynamic architecture: clarify **complex user interaction between static building, dynamic resident and seasonal changes**
- Studies on occupant behaviour and comfort: investigation of lack of user interaction in current object-centred design approach (design challenges)
- User-centred design methodology: promoting effective user interaction (design criteria)

RESULTS

- Complex interaction between resident, building and climate (Fig. 1)

- An intrinsically **static built environment** needs to respond to a **dynamic resident** and seasonal changes

- An object-centred design approach: design challenges (Fig. 2)

- Controlling** the resident, keeping a **constant indoor climate** and a **static built environment** due to high quantities of materials and complex systems

- In conflict with a **dynamic resident and seasonal changes** leading to a lack of user interaction and inefficient occupant behaviour

- A user-centred design approach: design criteria (Fig. 2)

- Guiding and supporting** the resident, accommodating **varying climatic conditions** and promoting and **adaptable space plan and flexible structure**

- Taking into account **the seasonal user pattern and diversified occupation pattern** of the dynamic resident throughout the seasons

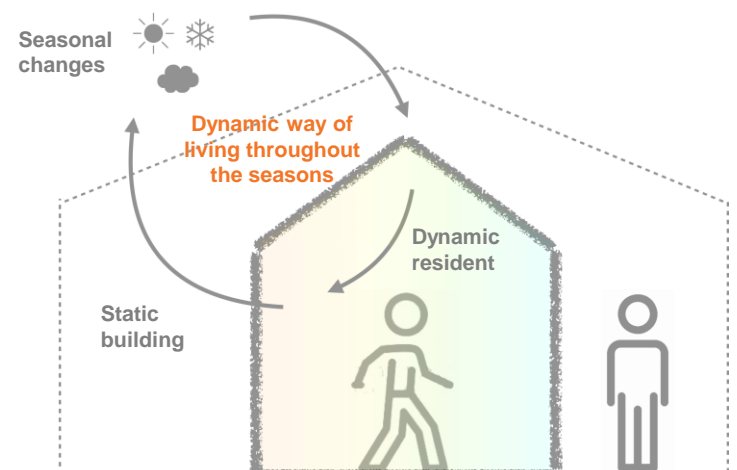
CONCLUSION

Enabling a dynamic way of living throughout the seasons

- Responding to seasonal comfort and spatial needs of a dynamic resident for more user interaction and efficient use of the indoor living environment as an alternative design approach

FOCUS ON LITERATURE REVIEW (PHD-TRACK)

Year 1	Year 2	Year 3	Year 4
Phase 1: Knowledge development Conceptual framework for a dynamic way of living	Phase 2: Development and evaluation Resource-efficient housing concepts	Phase 3: Implementation Alternative renovation model	
Literature review User interaction between resident, building and climate	Case study research (2) Critical overview of innovative sustainable housing concepts in practice	Research by design Life projects with residents from case studies for development of renovation model (design phase, quantitative tools and interviews for evaluation, user-tests)	
Educational pilot studies (1) Evaluation of conceptual framework: the dynamic building (2) Exploring a user-centred design approach: the dynamic resident	Research by design Development of resource-efficient housing concepts by enabling a dynamic way of living (workshops, with architects, quantitative tools and focus groups for evaluation and user-tests)		
Case study research (1) Mapping dynamic, seasonal living patterns of residents			Synthesis Dwelling concept



► Fig. 1: Dynamic way of living throughout the seasons



	Resident	Climate	Building
Design challenges	An actively controlled environment , where the lack of knowledge of the resident about the operation of the complex mechanical systems results in dissatisfaction for the resident and inefficient occupant behavior .	A constant internal climate , throughout the seasons results in a living environment which is not adapted to the dynamic outdoor climate and lacks thermal sensation for the resident.	A static indoor living environment , which does not respond to the active living pattern of the resident such as the changing housing needs or household sizes.
Design criteria	Design criterion 1: Creating an intuitive and user-friendly living environment by supporting and guiding the resident when living in a energy-efficient environment	Design criterion 2: Accommodating an internal climate with varying climatic conditions that enables a seasonal user pattern (heat, cool, ventilate).	Design criterion 3: Promoting an adaptable space plan and flexible structure that promotes a diversified occupation pattern for an active resident

► Fig. 2: Conceptual framework

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