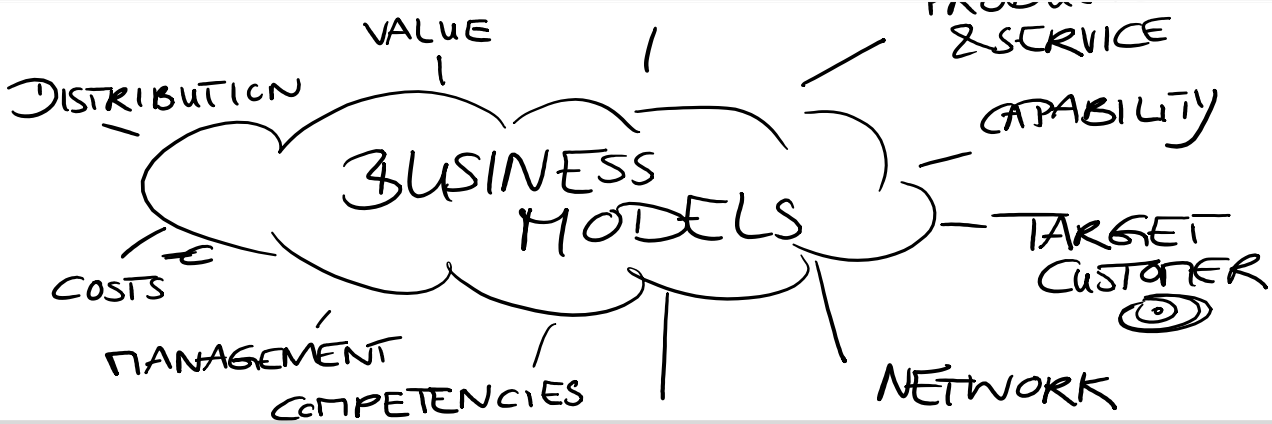
Karlsruhe Institute of Technology

New business models to support sustainable development: The case of energy efficiency measures in buildings

Anika Honold and Thomas Lützkendorf
SBE19 Graz

Institute of Information Systems and Marketing (IISM)
Marketing & Sales Research Group

Institute for Sustainable Management of Housing and Real Estate



Motivation

- Climate protection targets 2050:
  - Almost climate-neutral building stock; particularly buildings, which are responsible for more than 20% of CO_2 emissions
  - Increasing pressure to act (IPCC intergovernmental panel on climate change 2018):
    […] Global net human-caused emissions of carbon dioxide (CO_2) would need to fall by about 45 percent from 2010 levels by 2030, reaching 'net zero' around 2050. This means that any remaining emissions would need to be balanced by removing CO_2 from the air.”
  - Achieving the targets requires specific modernisation measures, but at the same time there are barriers to the implementation of energy-efficient measures by the stakeholder

Barriers:
Lack of knowledge due to inadequate provision of information, lack of trust, and problems regarding financing possibilities

Goal:
Business models that offer expert knowledge, savings guarantees and innovative financing models

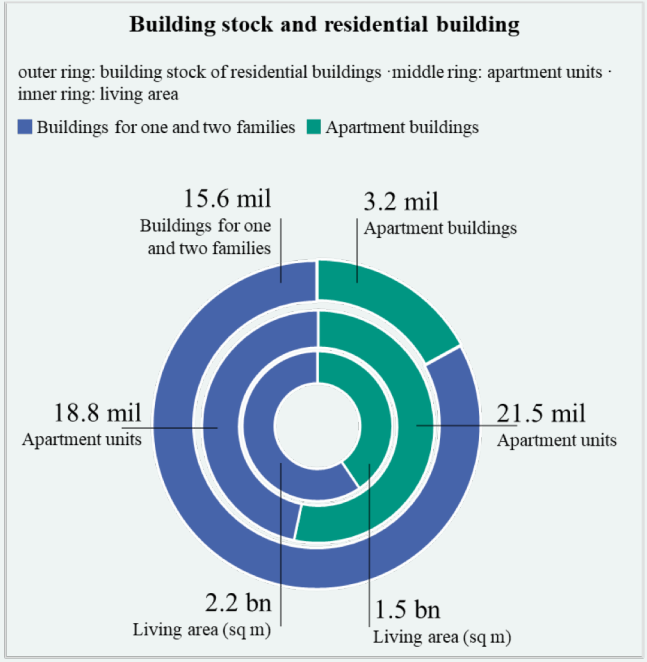
Relevance

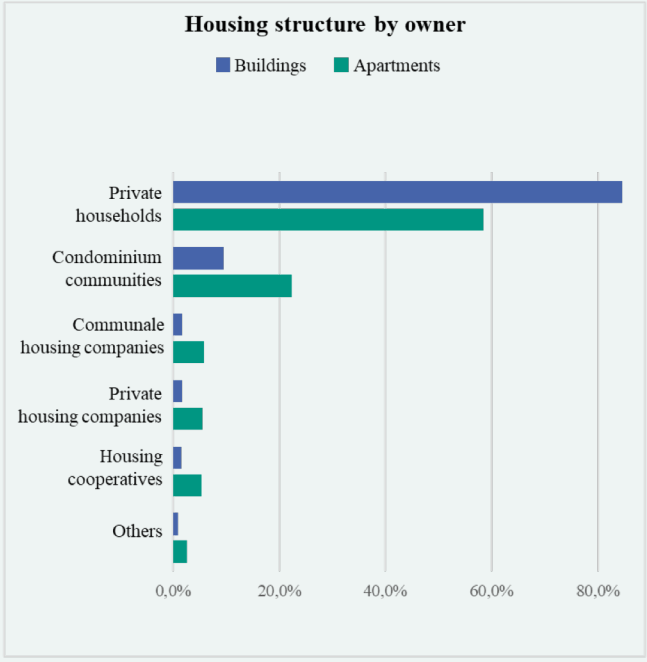
- SDGs: Highlights relevance for development of strategies for SDGs implications also for Germany (e.g. Germanys Climate Action Plan 2050 identifies five areas of action: Energy Sector, Transport, Industry, Argriculture, and Building)
  - By 2030, GHG emissions in buildings are to be reduced from 1990 levels by 67%
  - A budget of 70 million metric tons of CO2-equivalent will be available in 2030 (BMWi 2016)
- Crucial: **Improving the energy performance of existing buildings**
  - Annual renovation rate of 2%, but in Germany, an annual renovation rate of less than 1% is currently being achieved in the field of energy-efficient modernization of residential buildings (Lange 2018)
  - One possible approach is the establishment and extension of new business models to improve energy efficiency in buildings.

➢ RQ: Which business models support the approach? Is there a methodology how business models can be typologized? Does the systematization provide information for start-ups? What elements should future BMs contain to support EE?

Assessment of the status quo and development of a systematization of business models: 3-step approach

1. Status quo building stock/ stakeholder structure in Germany
2. Identification of barriers
3. Development of systematization





Assessment of the status quo and development of a systematization of business models: 3-step approach

1. Status quo building stock/ stakeholder structure in Germany
2. Identification of barriers
3. Development of systematization

- Identification of existing barriers, which occur during the decision about an energetic retrofit
- Most challenging barriers: Lack of knowledge and trust, financing problems, but also time-related factors or the investor/user dilemmas

FINANCING PROBLEMS

Friedrich et al. 2007, Jakob 2007, Renz and Hacke 2014, Vögele et al. 2017

DOUBT OF SAVING POTENTIAL

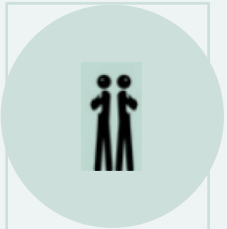
Friedrich et al. 2007, Renz and Hake 2014

TIME FACTORS

Friedrich et al. 2007, Renz and Hake 2014

INSUFFICIENT KNOWLEDGE

Friedrich et al. 2007, Jakob 2007, Renz and Hacke 2014, Vögele et al. 2017



INVESTOR USER DILEMMA

Jakob 2007, Kesternich 2010, Steiß et al. 2010, Renz and Hacke 2014 Vögele et al 2017

Assessment of the status quo and development of a systematization of business models: 3-step approach

1. Status quo building stock/ stakeholder structure in Germany
2. Identification of barriers
3. Development of systematization

- Business Models which improve energy efficiency in buildings (EEiB) and considers elements like

VALUE PROPOSITION

FUNCTIONS:
- Provision of innovative products and services, development of planning concepts or approaches to optimize existing systems

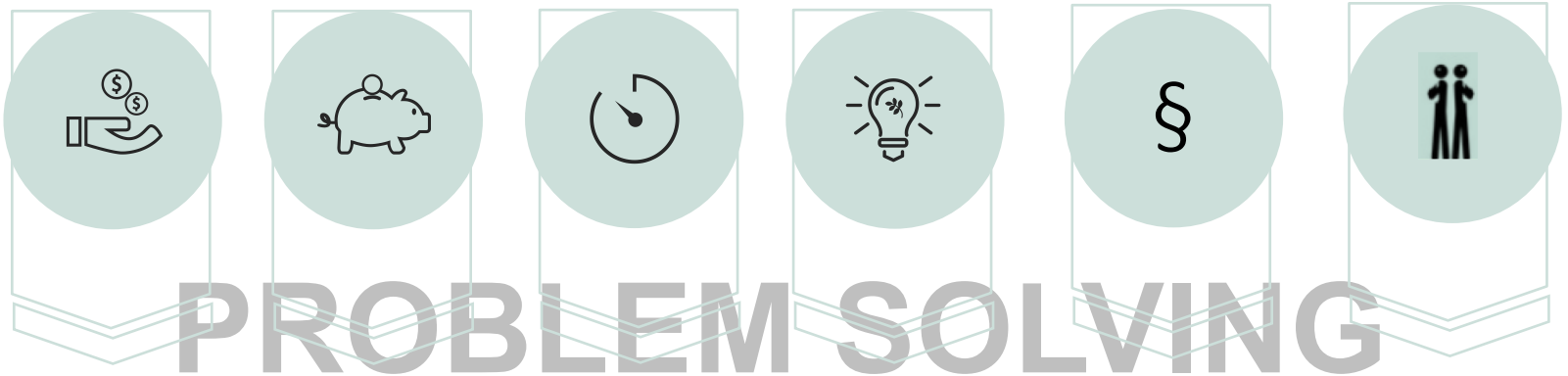
EFFECTS:
- Result which emerges from the special business model, e.g. investment preference, savings potential, provision of information

BENEFITS:
- Ecological, economic, social, technological, organizational advantages resulting from the business model

- Systematization of different elements of value proposition to identify new EEIB business models

SIMPLE APPROACH

BARRIERS



PROBLEM SOLVING

FUNCTION

APPLICATIONS FOR GRANTS AND SUBSIDIES

ENERGETIC ANALYSIS

PROJECT MANAGEMENT

ENERGY AUDIT, DEVELOPMENT OF ENERGY CONCEPTS

CONSULTING

ECONOMIC EFFICIENCY CALCULATIONS

Systematization of EEiB Business Model

BARRIERS

FINANCING PROBLEMS
Friedrich et al. 2007, Jakob 2007, Renz and Hacke 2014, Vögele et al. 2017

INSUFFICIENT KNOWLEDGE
Friedrich et al. 2007, Jakob 2007, Renz and Hacke 2014, Vögele et al. 2017

CONTRACTING

ESSENTIAL ELEMENTS

VALUE PROPOSITION

FUNCTION

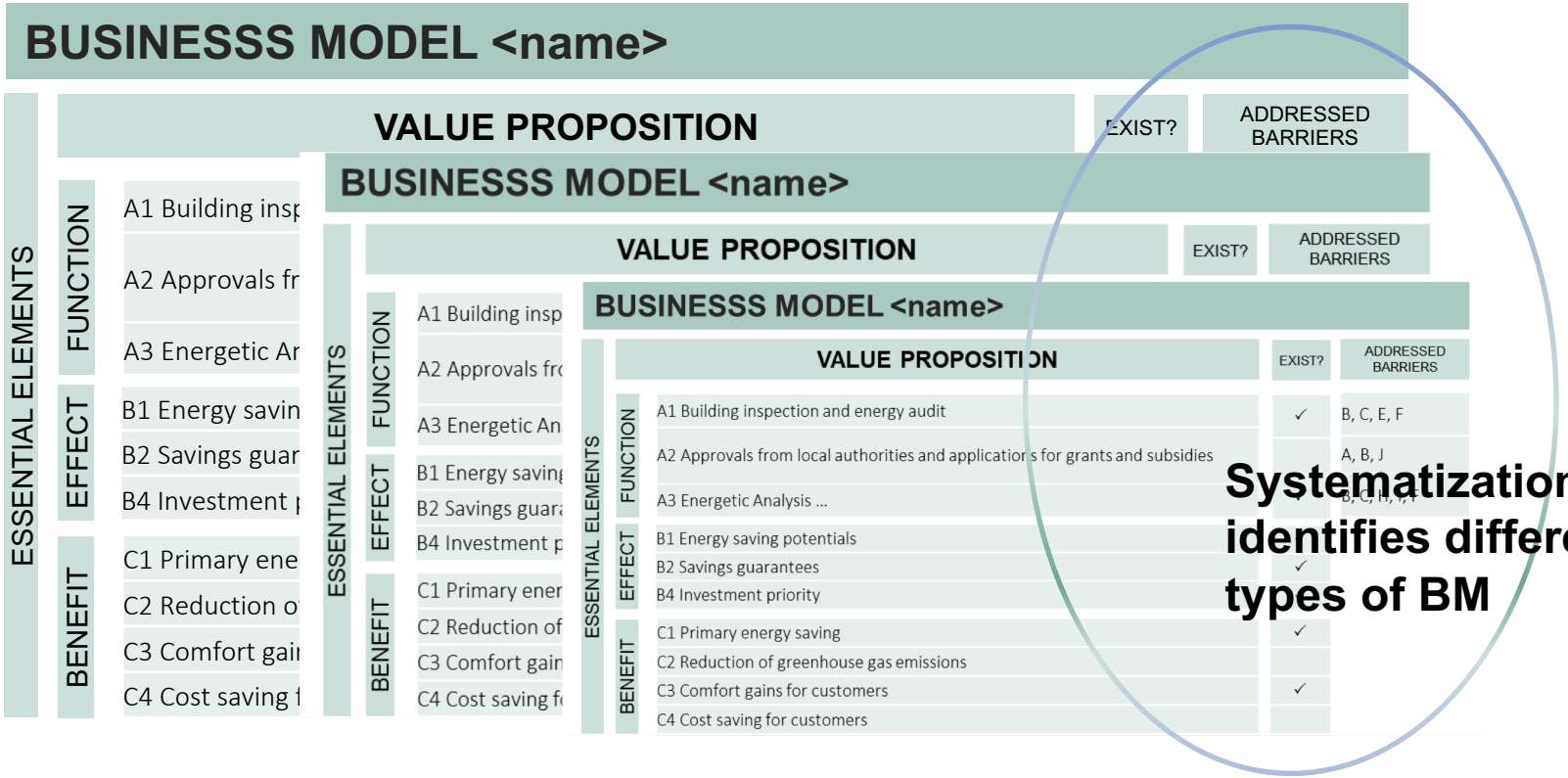
EFFECT

- Energy saving potentials
- Saving guarantees
- Retrofitting becomes investment priority

BENEFIT

- Ecological : primary energy saving, reduction of ghg emissions
- Economic: cost reduction, value retention of the property
- Social: reduction of external effects
- Structural: structural effects, supply security

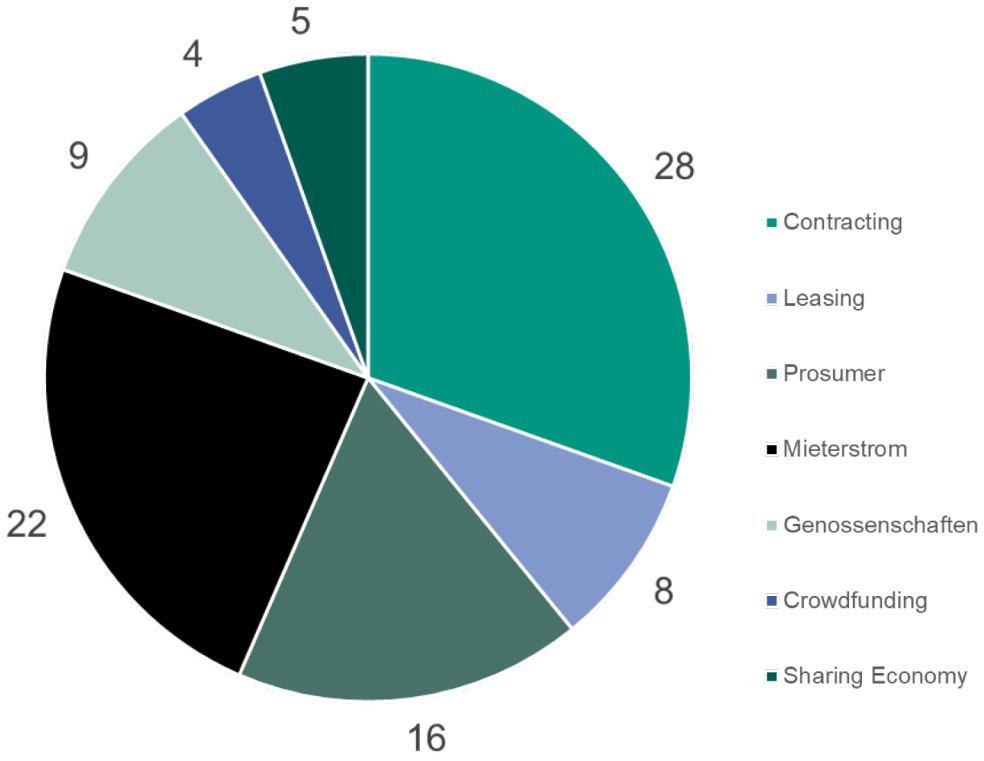
Systematization of EEiB Business Model



Systematization identifies different types of BM

Types of Business Models

LEASING
PROSUMER
PRODUCT CONCEPT
LICENSES
SHARING
SOFTWARE AS A SERVICE
CROWDFUNDING
FULL SERVICE
CONTRACTING



Discussion and outlook

THEORETICAL IMPLICATIONS

- Offers an approach to linking the theoretical concept of (sustainable) BM with the problem of the barriers that arise during the energetic refurbishment.
- Identified functions, effects, and benefits have the potential to represent future value-proposition formulations for the customer
- Potential problems:
  - Proposed systematization has its limits in terms of completeness.
  - Conflicts of objectives that may arise among initiators must be examined (e.g. IP)

PRACTICAL IMPLICATIONS

- Companies and startups can use combinations of the identified systematization to design their own business model.
- A guideline for startups is also provided, to help startups on their way from an idea to an economical and ecological business model.

THANK YOU FOR YOUR ATTENTION.

Anika Honold

Karlsruhe Institute of Technology (KIT)
Institute of Information Systems and Marketing (IISM)
Zirkel 2 - 76131 Karlsruhe
anika.honold@kit.edu

Web: http://marketing.iism.kit.edu/

Thomas Lützkendorf

Karlsruhe Institute of Technology (KIT)
Institute for Sustainable Management of Housing and Real Estate
Engesserstraße 6 - 76131 Karlsruhe
thomas.luetzkendorf@kit.edu

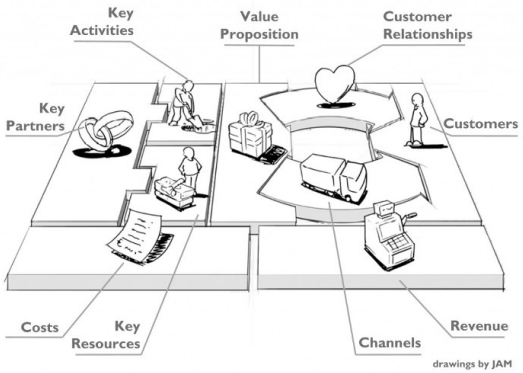
Web: https://www.oew.kit.edu/i

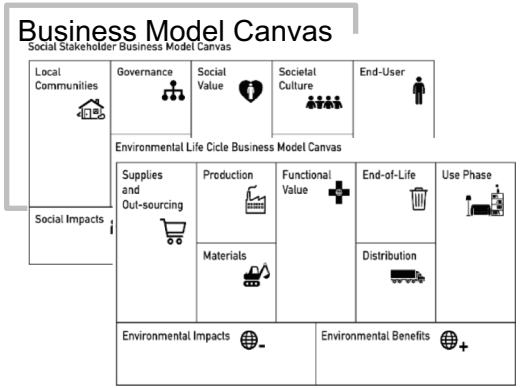
Acknowledgement
This research has been supported by the Research College EnEff.Gebäude.2050, which is part of the project “EnEff.2050.Begleit” (FKZ 03EGB0006B) and financed by the Federal Ministry for Economic Affairs and Energy (BMWi). The authors would like to thank all members of the research college and Project Management Jülich for the support, and the BMWi for the encouragement.

BACK UP

Breaking down barriers with business models

To date: Concentration on sustainable development of business models that essentially address the optimization of internal/organizational processes.



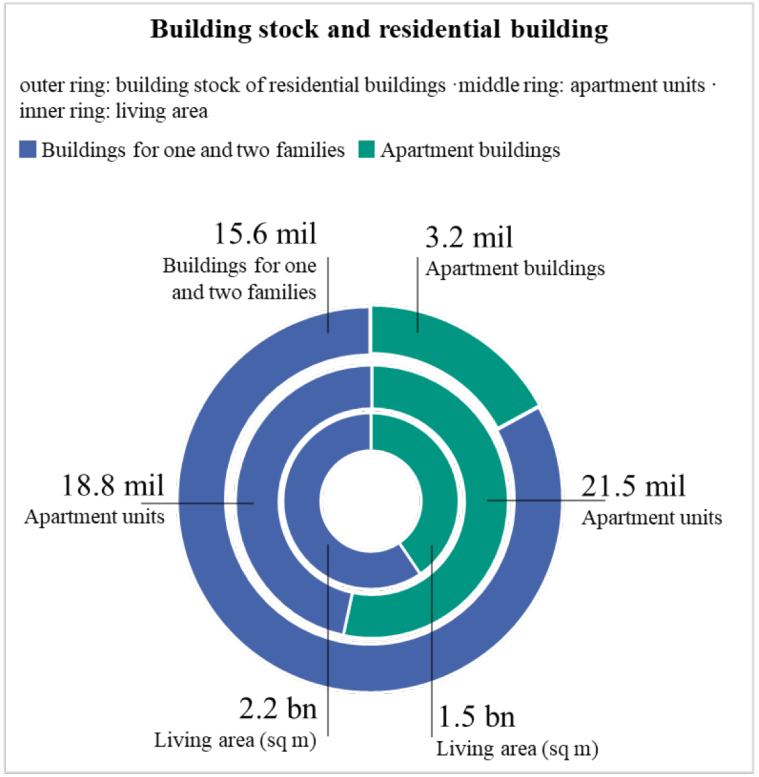


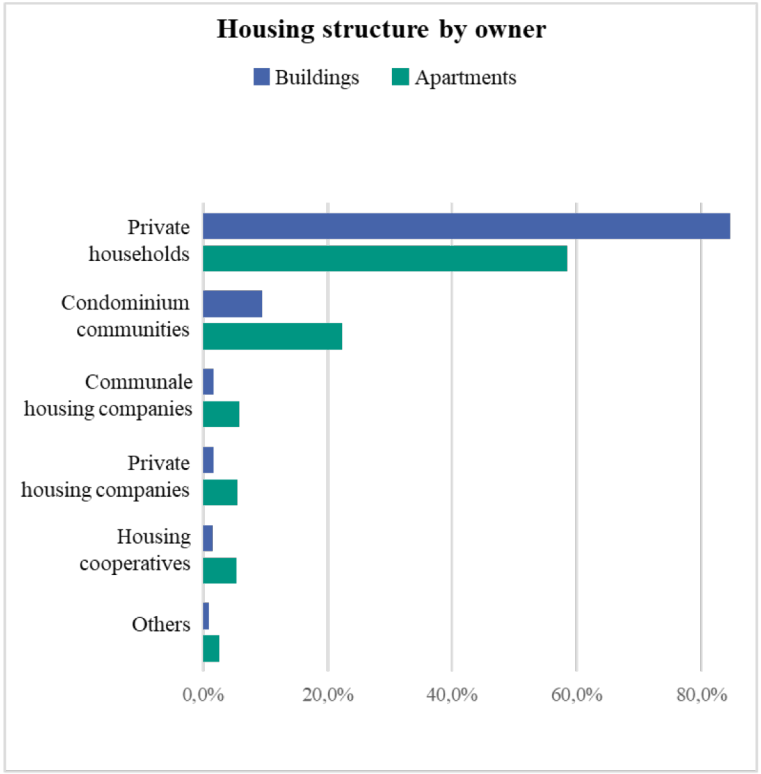
Research approach: Focus on business models, under the constraint that a concept that supports sustainable development at the customer.

Assessment of the status quo and development of a systematization of business models: 3-step approach

1 Status quo building stock/ stakeholder structure in Germany	**Of particular interest**: ▪ Residential buildings = 63 percent of total building energy consumption; Residental buildings built before 1979 ▪ Private households and “Amateur Vermieter”
2 Identification of barriers	▪ Identification of existing barriers, which occur during the decision about an energetic retrofit ▪ **The most challenging barriers:** Lack of knowledge and trust, financing problems, but also time-related factors or the landlord/tenant dilemmas
3 Development of systematization	▪ Breaking down barriers with business models ▪ To date: Concentration on sustainable development of business models that essentially address the optimization of internal/organizational processes ▪ Research approach: Focus on business models, under the constraint that a concept that supports sustainable development at the customer

Step 1: Building stock & housing structure





Assessment of the status quo and development of a systematization of business models: 3-step approach

Karlsruhe Institute of Technology

1. Status quo building stock/ stakeholder structure in Germany

Of particular interest:
- Residential buildings = 63 percent of total building energy consumption; Residental buildings built before 1979
- Private households and “Amateur Vermieter”

2. Identification of barriers

- Identification of existing barriers, which occur during the decision about an energetic retrofit
- **The most challenging barriers:** Lack of knowledge and trust, financing problems, but also time-related factors or the landlord/tenant dilemmas

3. Development of EEIB Business Model and systematization

- Breaking down barriers with business models
- To date: Concentration on sustainable development of business models that essentially address the optimization of internal/organizational processes
- Research approach: Focus on business models, under the constraint that a concept that supports sustainable development at the customer

Assessment of the status quo and development of a systematization of business models: 3-step approach

1. Status quo building stock/ stakeholder structure in Germany
2. Identification of barriers
3. Development of systematization

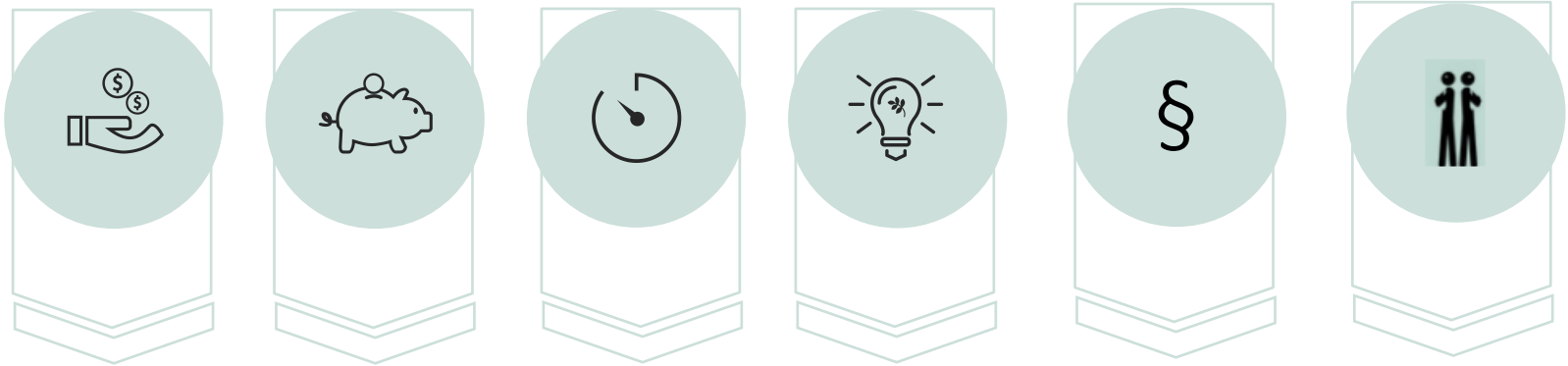
- Identification of existing barriers, which occur during the decision about an energetic retrofit
- Most challenging barriers: Lack of knowledge and trust, financing problems, but also time-related factors or the investor/user dilemmas

	Barriers	confirmed in literature							
		Friedrich et al. (2007)	Jakob (2007)	Kesternich (2010)	Stieß et al. (2010)	Beilan et al. (2011)	Meyer et al. (2014)	Renz/Hacke (2014)	Vögele et al. (2017)
A	Financing problems (e.g. no money, no monetary incentives, uneconomical)	✓	✓	✓	✓			✓	✓
B	Insufficient knowledge (e.g. about possible savings and energetic condition)	✓	✓	✓	✓	✓	✓	✓	✓
C	No discussion of the topic of energetic refurbishment (e.g. lack of knowledge about possible solutions)			✓	✓	✓	✓	✓	✓
D	Lack of knowledge in the operating phase and operational optimisation (lack of problem awareness, no need to refurbish)	✓	✓		✓	✓		✓	
E	Time factors (uninhabitability of the apartment, lack of time for planning and coordination, etc.)	✓	✓	✓	✓	✓		✓	✓
F	Underestimation or doubt of savings potential	✓						✓	
G	Missing technical and satisfactory solution (e.g. loss of comfort, no holistic solution)							✓	
H	Missing planning tools								
I	Lack of reason for renovation (e.g. low price level of fossil energies)		✓		✓			✓	✓
J	Architectural and constructional reasons (e.g. Restriction by monument protection and other technical factors)		✓	✓	✓			✓	
K	Investor-user-dilemma	✓	✓	✓	✓		✓	✓	✓

Relevance III: Barriers related to energy retrofit

	Barriers	confirmed in literature							
		Friedrich et al. (2007)	Jakob (2007)	Kesternich (2010)	Stieß et al. (2010)	Beilan et al. (2011)	Meyer et al. (2014)	Renz/Hacke (2014)	Vögele et al. (2017)
A	Financing problems (e.g. no money, no monetary incentives, uneconomical)	✓	✓	✓	✓			✓	✓
B	Insufficient knowledge (e.g. about possible savings and energetic condition)	✓	✓	✓	✓	✓	✓	✓	✓
C	No discussion of the topic of energetic refurbishment (e.g. lack of knowledge about possible solutions)			✓	✓	✓	✓	✓	✓
D	Lack of knowledge in the operating phase and operational optimisation (lack of problem awareness, no need to refurbish)	✓	✓		✓	✓		✓	
E	Time factors (uninhabitability of the apartment, lack of time for planning and coordination, etc.)	✓	✓	✓	✓	✓		✓	✓
F	Underestimation or doubt of savings potential	✓						✓	
G	Missing technical and satisfactory solution (e.g. loss of comfort, no holistic solution)							✓	
H	Missing planning tools								
I	Lack of reason for renovation (e.g. low price level of fossil energies)		✓		✓			✓	✓
J	Architectural and constructional reasons (e.g. Restriction by monument protection and other technical factors)		✓	✓	✓			✓	
K	Investor-user-dilemma	✓	✓	✓	✓		✓	✓	✓

Step 2: Identification of Barriers



FINANCING PROBLEMS
Friedrich et al. 2007, Jakob 2007, Renz and Hacke 2014, Vögele et al. 2017

DOUBT OF SAVING POTENTIAL
Friedrich et al. 2007, Renz and Hake 2014

TIME FACTORS
Friedrich et al. 2007, Renz and Hake 2014

INSUFFICIENT KNOWLEDGE
Friedrich et al. 2007, Jakob 2007, Renz and Hacke 2014, Vögele et al. 2017

RESTRICTION
Jakob 2007, Kesternich 2010, Steiß et al. 2010, Renz and Hacke 2014

INVESTOR USER DILEMMA
Jakob 2007, Kesternich 2010, Steiß et al. 2010, Renz and Hacke 2014 Vögele et al 2017

Assessment of the status quo and development of a systematization of business models: 3-step approach

Karlsruhe Institute of Technology

1 Status quo building stock/ stakeholder structure in Germany	**Of particular interest**: ▪ Residential buildings = 63 percent of total building energy consumption; Residental buildings built before 1979 ▪ Private households and “Amateur Vermieter”
2 Identification of barriers	▪ Identification of existing barriers, which occur during the decision about an energetic retrofit ▪ **The most challenging barriers:** Lack of knowledge and trust, financing problems, but also time-related factors or the landlord/tenant dilemmas
3 Development of EEIB Business Model and systematization	▪ Breaking down barriers with business models ▪ To date: Concentration on sustainable development of business models that essentially address the optimization of internal/organizational processes ▪ Research approach: Focus on business models, under the constraint that a concept that supports sustainable development at the customer

Step 3: Development of EEiB-Business Model

- Business Models which improve energy efficiency in buildings (EEiB) and considers elements like

VALUE PROPOSITION

Functions:
- Provision of innovative products and services, development of planning concepts or approaches to optimize existing systems

Effects:
- Result which emerges from the special business model, e.g. investment preference, savings potential, provision of information

Benefits:
- Ecological, economic, social, technological, organizational advantages resulting from the business model

- Systematization of different elements of value proposition to identify new EEIB business models

Systematization of EEiB Business Model

BUSINESSS MODEL <name>

ESSENTIAL ELEMENTS		VALUE PROPOSITION	EXIST?	ADDRESSED BARRIERS
	FUNCTION	A1 Building inspection and energy audit	✓	B, C, E, F
		A2 Approvals from local authorities and applications for grants and subsidies		A, B, J
		A3 Energetic Analysis …	✓	B, C, H, I, F
	EFFECT	B1 Energy saving potentials	✓	
		B2 Savings guarantees	✓	
		B4 Investment priority	✓	
	BENEFIT	C1 Primary energy saving	✓	
		C2 Reduction of greenhouse gas emissions		
		C3 Comfort gains for customers	✓	
		C4 Cost saving for customers		

Systematization identifies different types of BM