

# Factors that influence the adoption of sustainable renovations in listed cultural heritage buildings



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Ministerie van Onderwijs, Cultuur en  
Wetenschap



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# Terminology

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- ❖ LCHB = Listed cultural heritage building (in Dutch: Monumentaal pand)
- ❖ Sustainable renovation = Energy-saving renovation taking cultural heritage value and more into account
- ❖ Owner = An owner-occupier of a LCHBs, decision-making unit.
- ❖ Change agent = Government officials with the goal of promoting sustainable renovation in LCHBs
- ❖ Change agency = The Cultural Heritage Agency of the Netherlands

# Introduction

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- ❖ Europe, 1 million+ LCHBs
- ❖ 120.000 in the Netherlands; ~60.000 owner-occupied
- ❖ A LCHB status is not a preservation order, it simply means that the owner needs to apply for a permit
- ❖ Buildings are designated as LCHBs because of their beauty, meaning for science and cultural heritage value
- ❖ National LCHBs: The Minister of Culture in consultation with Mayor and Alderman of the municipality
- ❖ Municipal LCHBs: The Municipal Council

# Introduction



❖ The following measures are already carried out in LCHBs

Basic measures	2022	Energy supplies	2022	Insulating measures	2022
Energy efficient lighting	80%	HE boilers	69%	Insulated roof	57%
Draft sealing	66%	Solar/PV panels	31%	increase the insulation value of windows	37%
Smart radiator valves	55%	Wood-burning installation	21%	Floor insulation	41%
Pipe insulation	49%	Heat pump	9%	Facade insulation	36%
Smart thermostat	46%	Solar boiler	5%	Added interior or exterior windows	32%
Energy efficient appliances	50%	Hybrid heat pump	3%		
Thick insulating curtains or window shutters	37%	Fuel cell	0%		
Radiator foil	32%				
Chimney damper	13%				5

Table 1. Sustainable renovation measures carried out in LCHBs, N=526 (translated from Hamstra, 2022, p. 17)

# Problem statement

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- ❖ Why?
- ❖ Sustainability is about meeting the interests of people of here and now, and of there and later (Van Hal, 2014).
- ❖ Dutch climate agreement
- ❖ Future use is depended on a realistic upkeep
- ❖ More feedback needed from LCHB owners

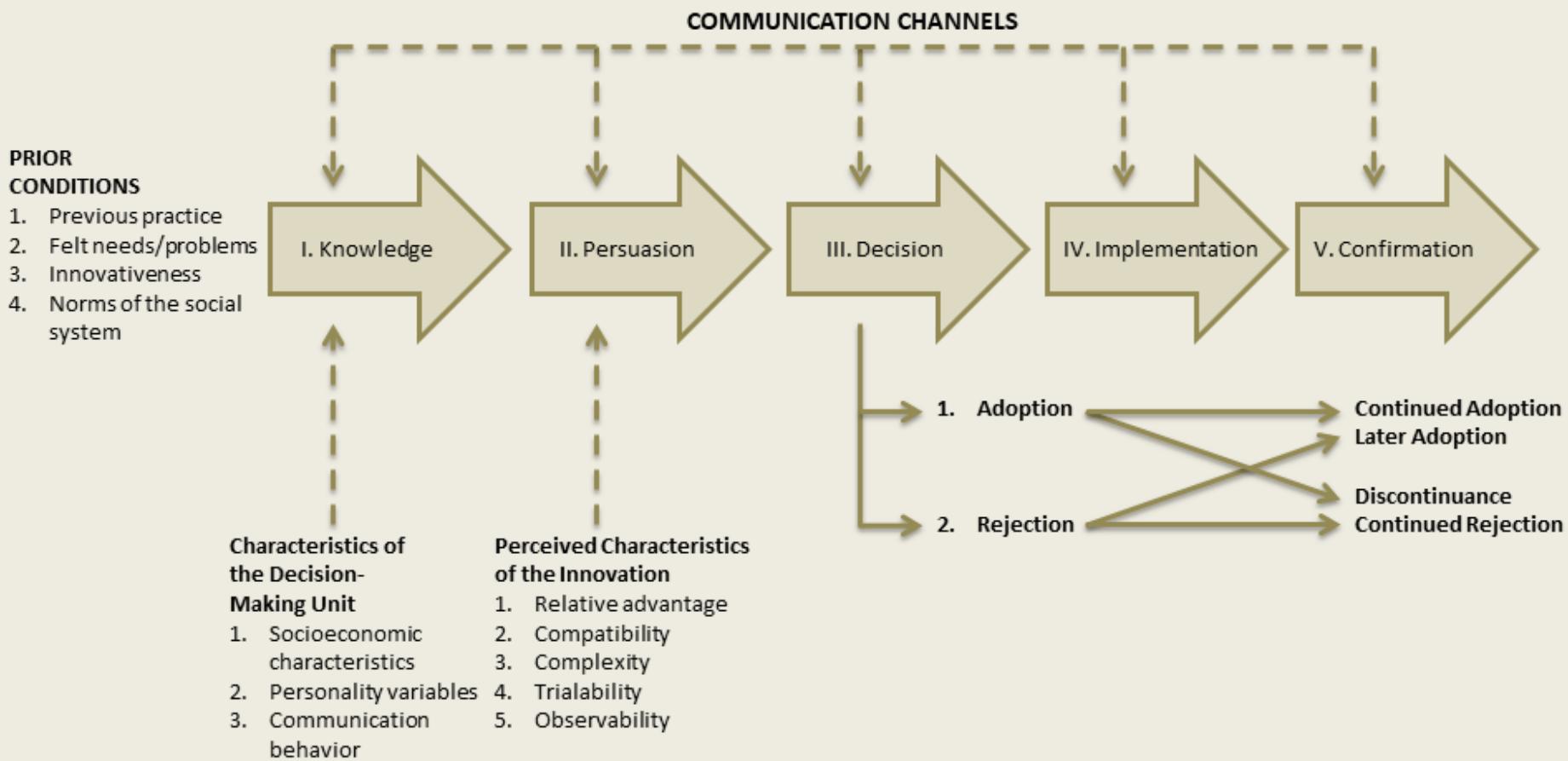
# Research questions

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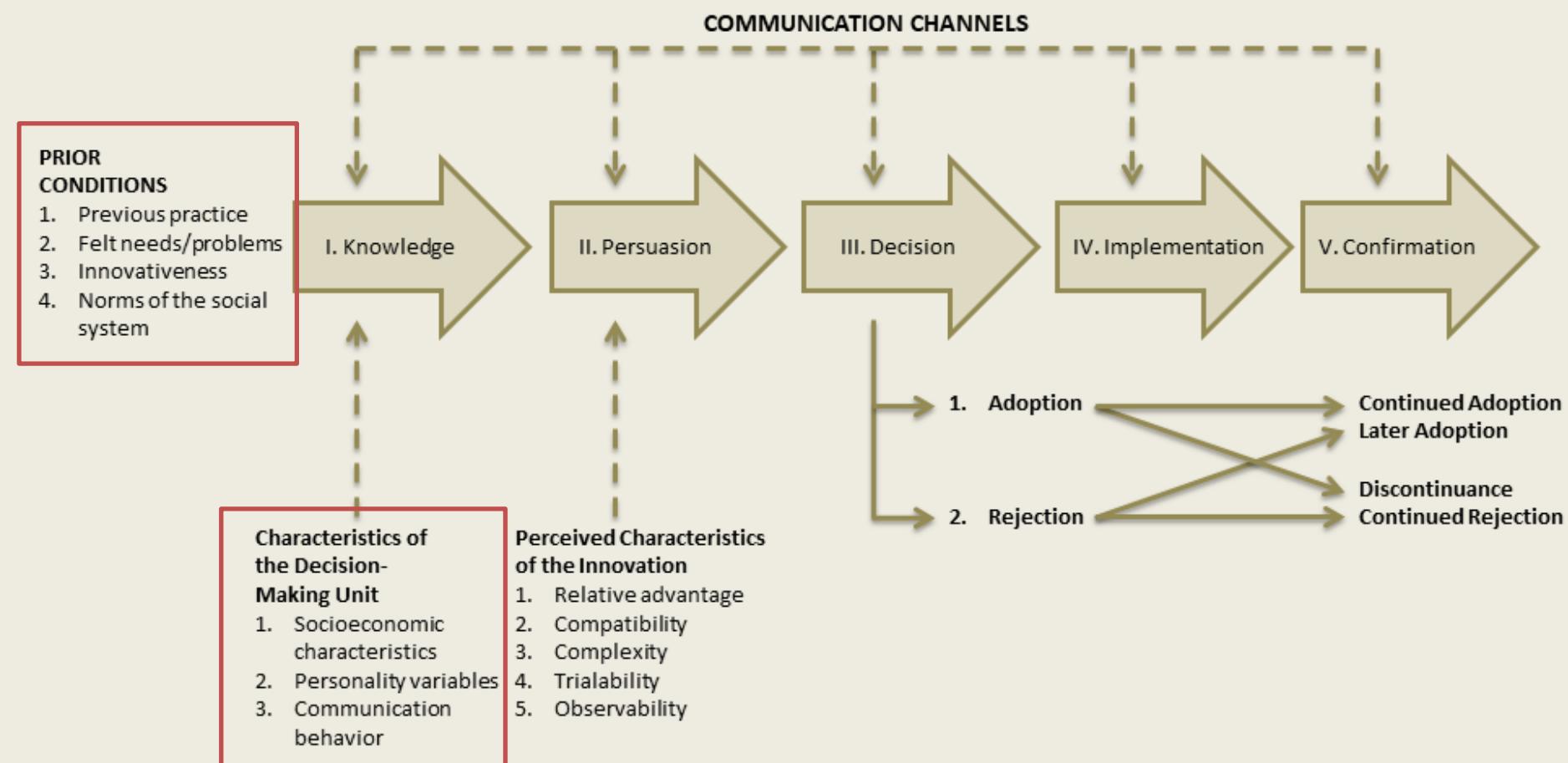
❖ Main: How to increase the adoption of sustainable renovations in LCHBs by providing insight into the decision-making process of owner-occupiers?

# Decision-making process of Rogers (2003)



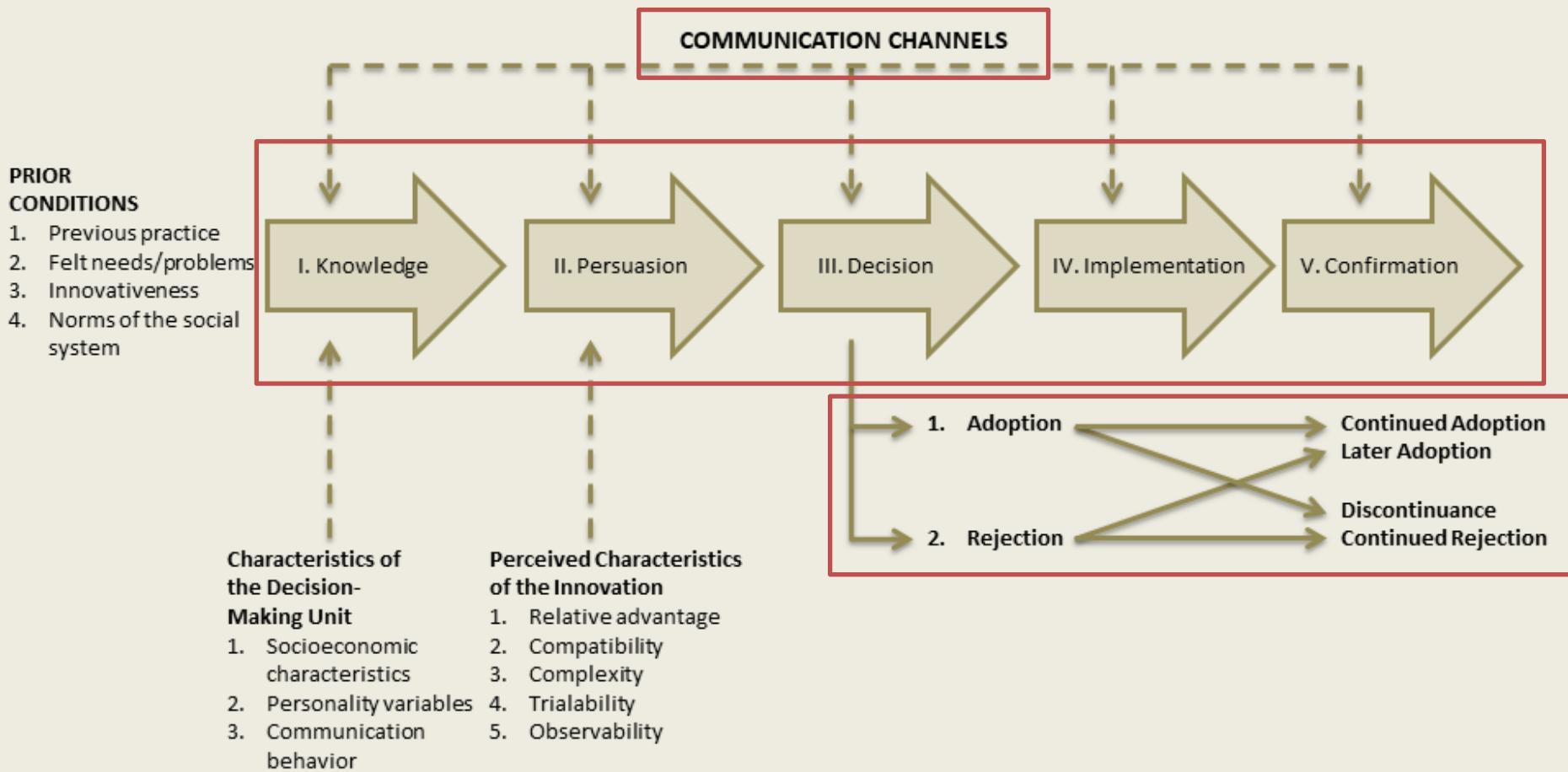
**Figure 1.** The decision-making process (innovation-decision process) by Rogers (2003, p. 171)

# Decision-making process of Rogers (2003)



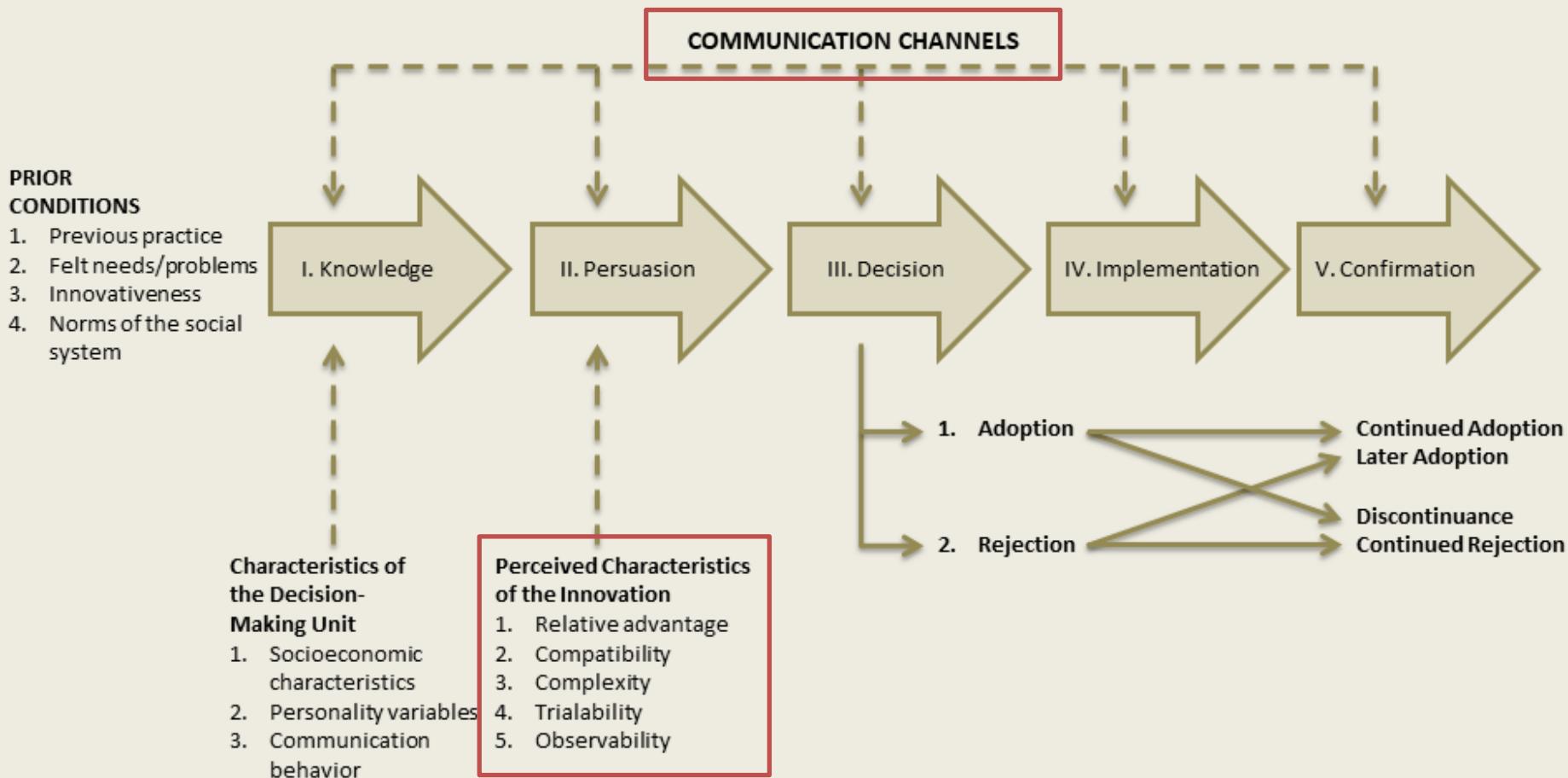
1. What are the prior conditions of the decision-making process and the characteristics of the decision-making unit?

# Decision-making process of Rogers (2003)



2. What is the decision-making process?

# Decision-making process of Rogers (2003)



3. What are the factors and variables that influence the sustainable renovation decision-making process? (Driver, barriers & opportunities)

# Research questions

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- ❖ Main: How to increase the adoption of sustainable renovations in LCHBs by providing insight into the decision-making process of owner-occupiers?
  1. What are the prior conditions of the decision-making process and the characteristics of the decision-making unit?
  2. What is the decision-making process?
  3. What are the factors and variables that influence the sustainable renovation decision-making process? (Driver, barriers & opportunities)
  4. What are the personas of LCHB owners and how can they be used to increase adoption of sustainable renovations?

# Research method

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- ❖ Data collection
- ❖ Data analysis
- ❖ Data plan & ethics
- ❖ Research output

# Data collection

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- ❖ Theoretical research
- ❖ Semi-structured interviews with:
  - ❖ 1st round of professionals (N=7) (approx. 1 hour)
  - ❖ LCHB owners (N=9) (approx. 2 hours)
  - ❖ 2nd round of professionals (N=7) (approx. 1,5 hours)
- ❖ Workshop with professionals (N=25)

# Data collection

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- ❖ LCHB owners
  - ❖ 'Monumenten Community' forum
- ❖ Professionals
  - ❖ Contacting organizations and officials
- ❖ Workshop
  - ❖ Organized by the Municipality of Haarlem

# Data analysis

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- ❖ The interviews were audio recorded and transcribed
- ❖ Qualitative content analysis using Atlas.ti

The screenshot shows a software interface for qualitative data analysis. On the left, there's a vertical toolbar with icons for search, export, and other functions. The main area is divided into two columns. The left column contains the interview transcript and the right column contains the analysis. The transcript is from Interviewee 8 and discusses energy consumption and metering. The analysis on the right is labeled 'Question: Information gathering 1' and 'Answer: Information gathering 1'.

Fabian Castenmiller

Oké. Nog andere vormen van informatie verzamelen? Oh ja natuurlijk, de inventarisatie van uw huis; dat is toen u daar kwam wonen. Heeft u een rapport gekregen of gemaakt? Of heeft u gewoon heel veel gelezen of erover gesproken? Hoe heeft u uw pand geïnventariseerd?

+ Interviewee 8

Je kijkt naar de gas en elektriciteitsmeter, dus gewoon je energieverbruik van het huis is daarin leidend. Want dan ga je gewoon bij jezelf je afvragen van waar moet ik het hardste aan werken om dat omlaag te brengen? En niet verrassend, het eerst wat je dan doet is

Question: Information gathering 1

Answer: Information gathering 1

- ❖ Which provides a clear oversight of the factors and variables that influence the decision-making process
- ❖ Creating personas based on the patterns of characteristics and barriers of LCHB owners

# Data plan and ethics

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- ❖ The thesis will be accessible for everyone in the TU Delft repository
- ❖ Personal data of participants is kept private, which mitigates risks for them and may have provided more truthful responses.
- ❖ Data is stored securely and only accessible by the research team.
- ❖ Fully informed and written consent was required for each LCHB owner who participated.

# Research output

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- ❖ Creating a sustainable renovation decision-making process for LCHB owners.
- ❖ Finding and structuring the factors and variables that influence the decision-making process of owners.
- ❖ Recommendations to help LCHB owners in their sustainable renovation decision-making process.

# Results

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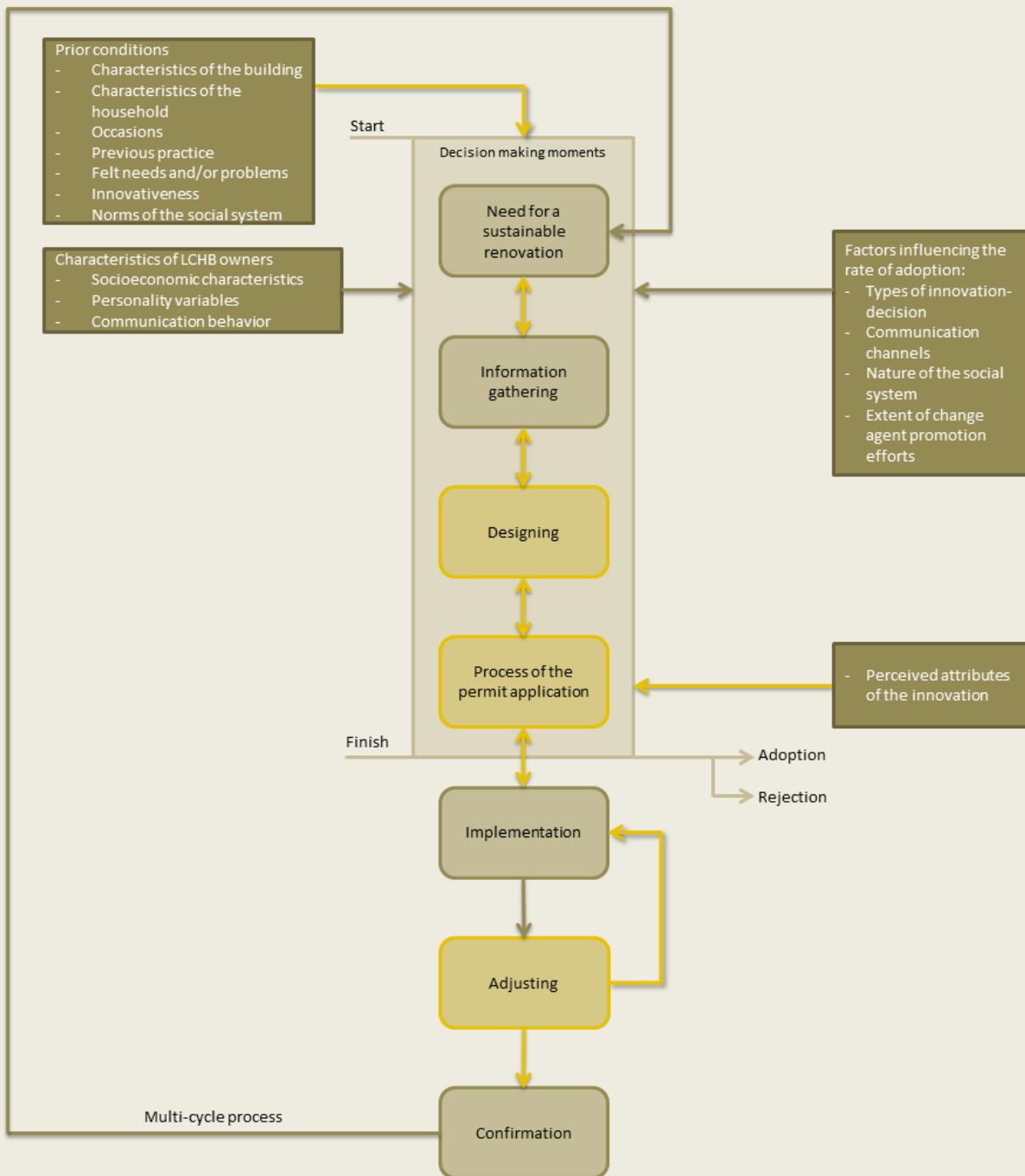
- ❖ Characteristics
- ❖ Decision-making process
- ❖ Drivers & barriers
- ❖ Personas

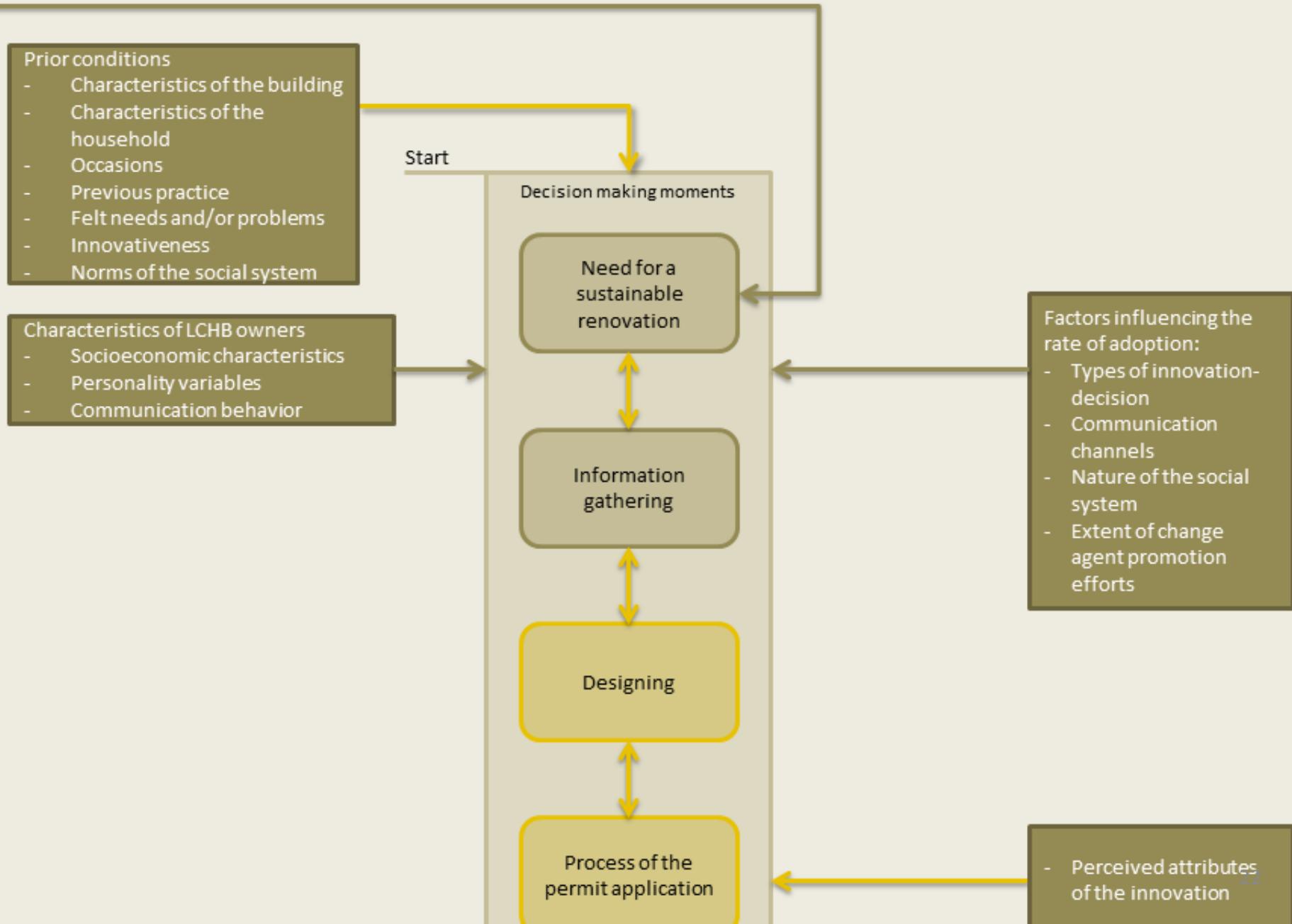
# Characteristics

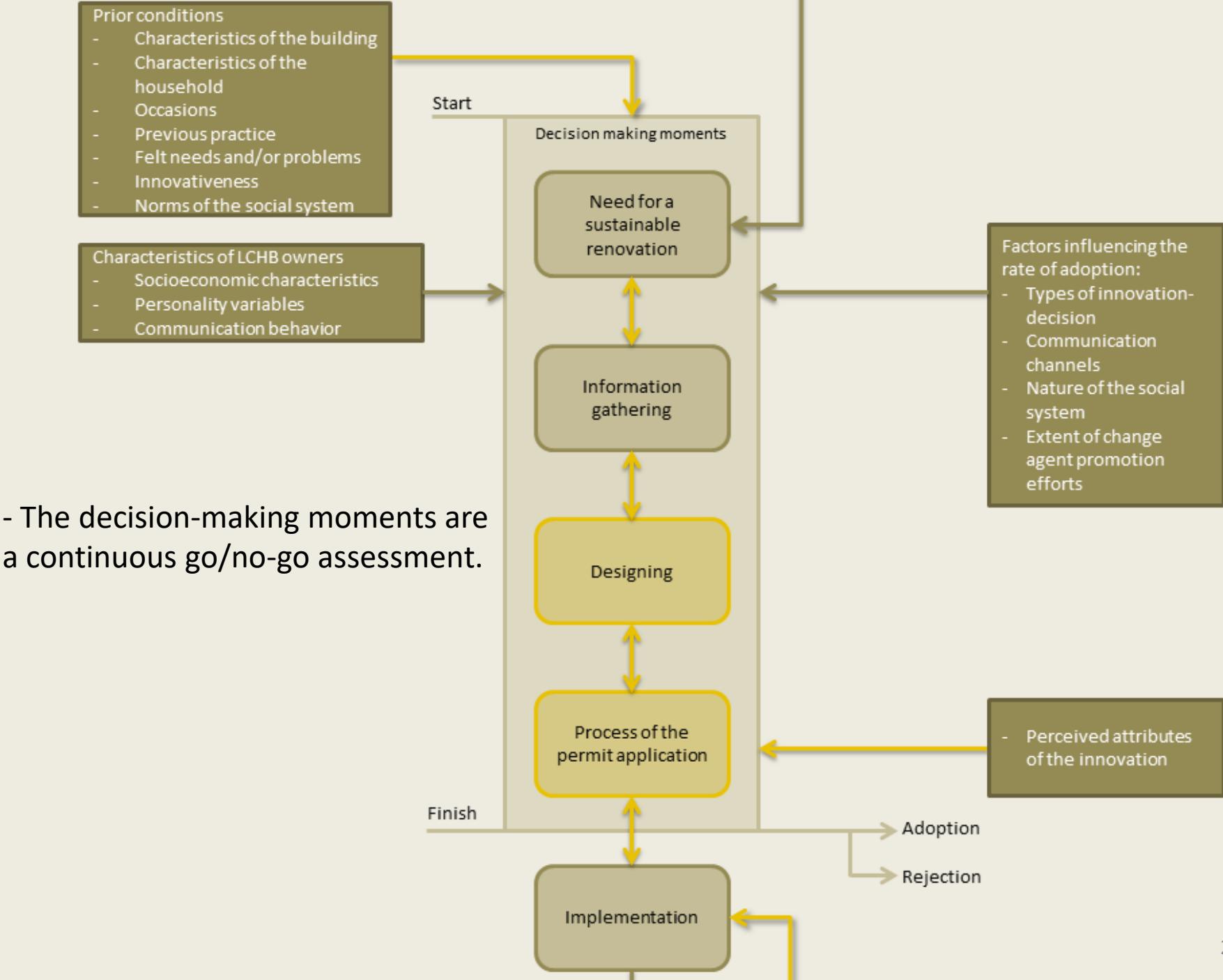
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- ❖ 3 building technical background
- ❖ Ages between 50 and 77 years (65)
- ❖ Years of ownership between 3 and 43 years (18)
- ❖ All were interested in saving energy
- ❖ All had concerns relating the environment from different perspectives
- ❖ Comfort expectations ranged widely, from 17°C to 22,5°C
- ❖ 7 out of 9 owners were extensively looking for information
- ❖ 7 out of 9 owners were actively sharing acquired information on

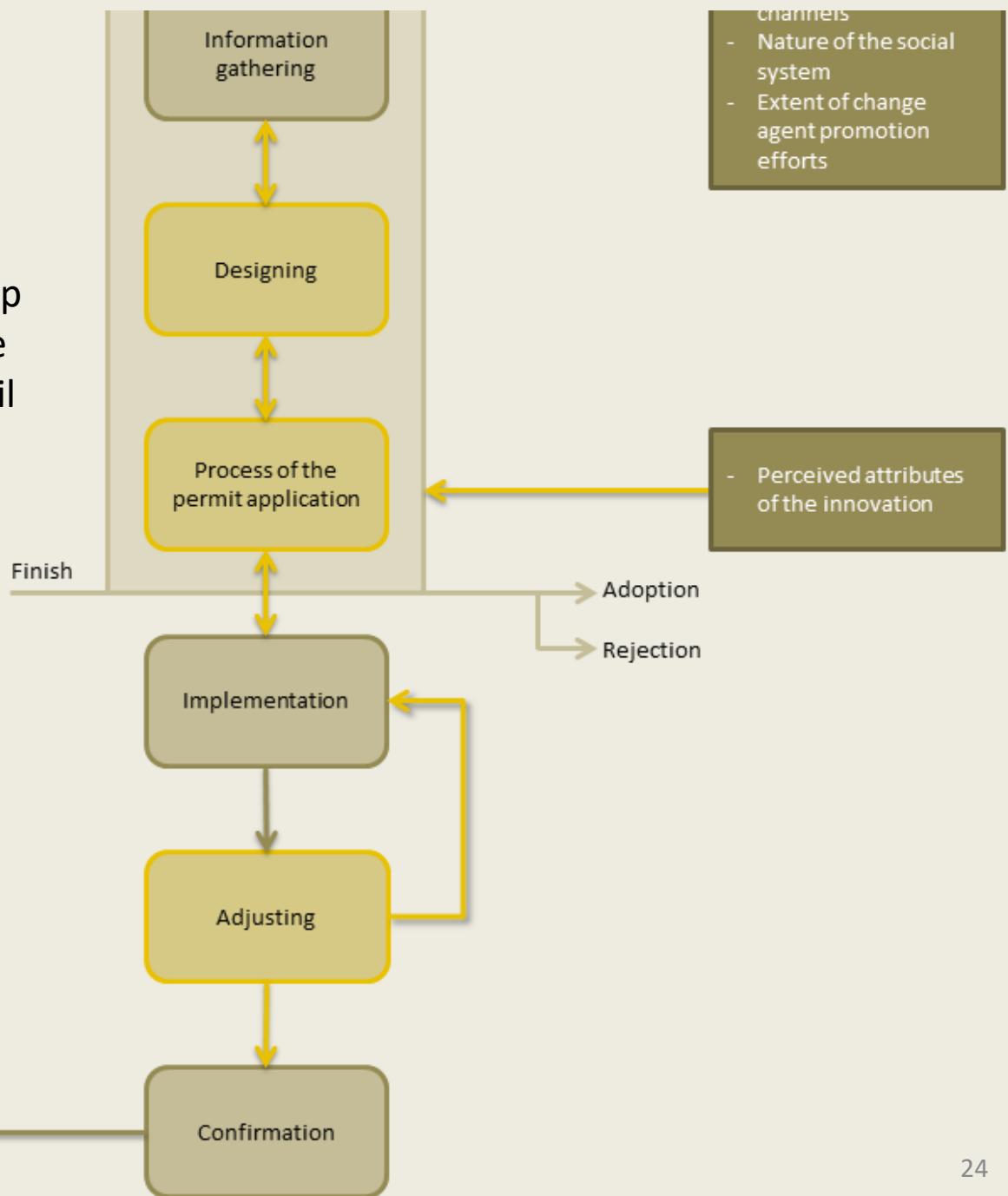


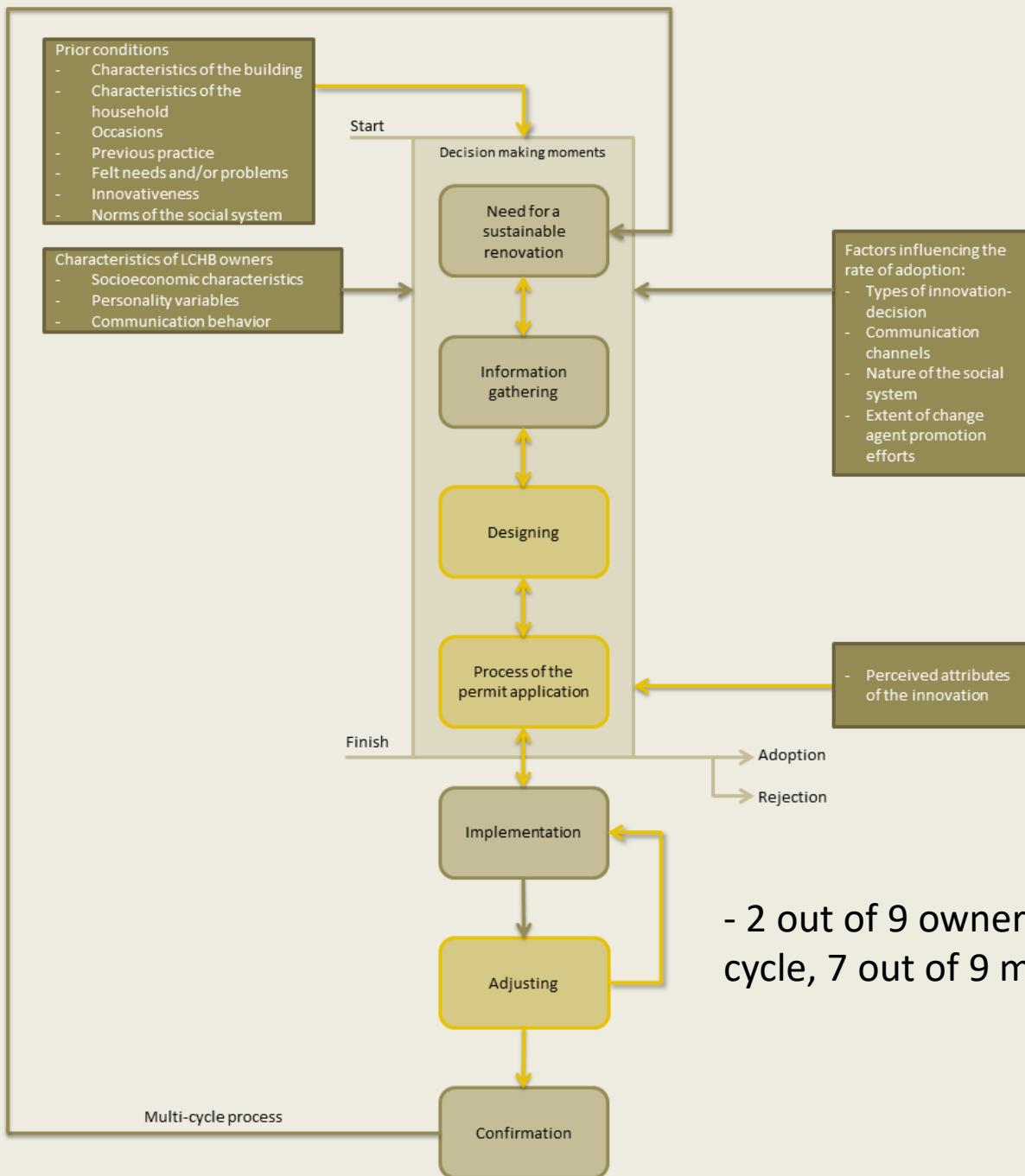




- The decision-making moments are a continuous go/no-go assessment.

Each decision-making step may go back towards one of the previous steps until the complete implementation.





- 2 out of 9 owners used one cycle, 7 out of 9 multiple cycles.

# Main drivers



	Participant	1	2	3	4	5	6	7	8	9
Main drivers										
Energy cost savings	X	X		X					X	X
Comfort	X	X			X	X	X	X		
Environment				X	X		X	X		
Making it beautiful			X		X	X		X	X	
Future proofing/adjusting the building to the time period	X				X					
Financial incentives		X								

# Main barriers

	Participant	1	2	3	4	5	6	7	8	9	Workshop
<b>Main barriers</b>											
Costs of a sustainable renovation as a barrier	X	X				X			X	X	
Waiting for improved technology	X	X			X						
Time and effort it takes to apply for subsidies and loans		X								X	
Finding a reliable contractor for the work			X		X			X		X	
Knowledge and skills required for the work										X	
Examining the reliability of the information		X								X	
Mess and nuisance because of the work							X			X	
Communication of the municipality	X	X									
Permit application of the municipality/cultural heritage committee	X		X		X	X		X	X		
Information about a vision for energy policy (subsidies/type of energy)		X						X	X		

- ❖ The workshop results also highlighted the importance of designing from several perspectives as a barrier.

# Results personas

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- ❖ Personas can be used to create a strategy
  - ❖ Information messaging
  - ❖ Responding to drivers
  - ❖ Tackling barriers
- ❖ There are two types of personas have been identified based on the characteristics and barriers of the LCHB owners.

# Making ends meet, younger and DIY

- Interviewee 1, 2, 6 and 9
- Average age of first sustainable renovation: 40
- Main barriers:
  - Costs of a sustainable renovation (2, 6, 9)
  - Less positive about current subsidies (2, 9)
- Key variables:
  - Trust in professionals: average
  - Tolerance of disruption: high
  - Price sensitivity: high
  - Income: average
  - Wealth: average
  - Hired contractors: yes, sometimes
  - Hired architects: none
  - It wouldn't have been possible with a sustainable renovation obligation



Photo 1. Kastelic, M. (2016).

# Affluent, middle-aged and clients of professionals

- Interviewee 3, 4, 5, 7 and 8
- Average age of first sustainable renovation: 55
- Main driver and barrier:
  - The environment as one of the main drivers: (4, 5, 7 and 8)
  - Finding the right contractors as a main barrier: (3, 5, 8)
- Key variables:
  - Trust in professionals: high
  - Tolerance of disruption: average
  - Price sensitivity: low
  - Income: above average
  - Wealth: above average
  - Hired contractors: yes, often
  - Hired architects: 3, 4, 5 and 7
  - Generally positive about a sustainable renovation obligation



Photo 2. Rijksdienst voor het Cultureel Erfgoed. (2023).

# Discussion

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- ❖ Persona strategy
- ❖ 3rd & 4th persona: without DIY knowledge or interest; someone who just happens to live in a LCHB
- ❖ The workshop results architects
- ❖ Hamstra (2023) found that 47% of owners were in need of information, and categorized the specific needs but left out the vision on energy policy
- ❖ A very important driver LCHB owners have is making the LCHB beautiful again or more beautiful. This maybe more prominent for LCHBs, but it can also be something that needs to be highlighted more when it comes to promoting sustainability in LCHBs.

# Limitations

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- ❖ Small sample
- ❖ The interview participants may have been a bit more polarized in their views and less representable, because people with the biggest axe to grind will want to share their experience.

# Conclusion

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- ❖ Main: How to increase the adoption of sustainable renovations in LCHBs by providing insight into the decision-making process of owner-occupiers?
- ❖ Make better use of the drivers:
  - ❖ Comfort
  - ❖ Energy cost savings
  - ❖ Making it beautiful
  - ❖ For the environment
- ❖ Overcoming the barriers:
  - ❖ Costs
  - ❖ Cultural heritage committee
  - ❖ Finding contractors
  - ❖ Vision on energy policy

# Policy recommendations

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Further investigation into:

- ❖ DIY subsidy, because:
  - ❖ Labor shortage
  - ❖ It helps both Personas
  - ❖ Inequalities are inherent to new innovations.
  - ❖ Main agreement of the new Dutch government, focus on the energy transition for middle and low incomes
  - ❖ Contractors do not necessarily do it better
  - ❖ Fraud
  - ❖ Funds to construction industry

# Policy recommendations

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Further investigation into:

- ❖ Making it beautiful
  - ❖ Information messaging
- ❖ Adding a building technology expert or expertise to the cultural heritage committee
- ❖ Social gatherings organized locally
- ❖ Municipality as a connector
- ❖ Infra-red imaging for promoting
- ❖ More municipal cooperation

Thanks for your attention



Photo 3. Peuscher, J. (1986).