

# Smarter homes for a smarter future webinar

Collaboration between:

- Northern Gas Networks (NGN)
- Newcastle University
- National Energy Action (NEA)



*Action for Warm Homes*



# Housekeeping

# Introductions



Action for Warm Homes

**National Energy Action (NEA)** is a national fuel poverty charity that has successfully campaigned for 40 years to strengthen policy responses and greater investment for solutions to fuel poverty from Government (and other responsible bodies) and is a key partner in the implementation of those policies.



**Northern Gas Networks (NGN)** are the gas distribution network for the North of England. They transport energy for cooking, hot water and heating to 6.8 million people. Their network spans 25,000km<sup>2</sup> from the Scottish borders to South Yorkshire and the North East coast to northern Cumbria.



**Newcastle University Business School** is a hub of academic excellence and world-leading research. They are a founding member of the Russell Group, an association of the UK's 24 leading universities.

The **Strategic Innovation Fund (SIF)** aims to find and fund ambitious, innovative projects with the potential to accelerate the transition to net zero. These projects should help shape the future of the gas and electricity networks and succeed commercially where possible.



Heat

Transport

Data & Digital

Whole Systems

**Discovery**  
March 22 to April 22  
  
Up to £150k  
8 weeks

**Alpha**  
August 22 – Jan 23  
  
Up to £500k  
6 months

**Beta**  
Spring 2023  
  
Multi million  
Multi year

# The project

# Why is it important to look at user experience?

20,000 homes



Need to be decarbonised  
**each week** for the next 25  
years to reach net-zero by  
2050

Small **behavioural changes** at household level are a part of this, making consumers a vital part of the decarbonisation journey

Huge **potential benefits** for consumers derived from greater energy efficiency

# The challenge of those left behind by the smart energy transition

- Specific groups with unique vulnerabilities to fuel poverty are **more likely to be left behind** by the decarbonisation of domestic heating
- Includes those with **difficulties accessing the benefits of the energy market** such as digitally excluded households, households who speak English as an additional language, those in the social and private rented sectors or in rural or remote locations, and prepayment customers.
- Also includes those that can have distinct energy and communication needs, such as households with occupants who have disabilities, long-term illnesses, learning disabilities, or visual impairments.
- Making the **transition just and affordable** for fuel poor households will be the key litmus test for its success.
- Important that the research assess what the **main enablers and barriers to adoption of smart technologies** may be when it comes to vulnerable consumers.



# Methodology

## Plan the review

- Define research questions
- Define search criteria
- Define exclusion criteria

## Synthesise the reviews into a Framework

- Identify areas of interest

## Conduct the review by analysing papers

- Academic review
- Industry review

## Report emerging themes and recommendations



# Methodology

## Academic Literature

- The electronic database Scopus was selected.
- The key word selection revolved around the term “*smart home*”. The term 'energy' was not used in the first instance in order to ensure that an inclusive approach was adopted. The open search resulted in a data set of 15,878 documents.
- An advanced search option was enabled that limited results to document types in the form of “articles” and “reviews” published between 2015 to 2022 in the English language.
- Additional filtering was applied based on the subject areas. These included computer science, engineering, energy, material sciences, social sciences, business and management, etc. This resulted in 2826 papers.
- We filtered documents based on keywords that were related to energy such as energy management, energy efficiency, energy management systems, energy conservation, heating. Similarly, we excluded keywords that were not deemed sufficiently relevant, e.g. Low Power Electronics, Network Architecture, Stochastic Systems . This resulted in a set of 167 papers.
- The papers were then manually screen and 70 of them were included for the review.

# Methodology

## Industry and Policy-Based Literature

### Approach

As there is no single database used to conduct the review of the industry and policy-based literature (often referred to as grey literature), a broader strategy for searching for relevant publications was deployed.

### Evidence review

The evidence review included publications and resources that had a primary focus on the following:

- \*smart homes*
- \*smart technology*
- \*adoption (enablers/barriers)*
- \*water and/or energy*

### Inclusion criteria

The inclusion criteria for all resources and reports were as follows:

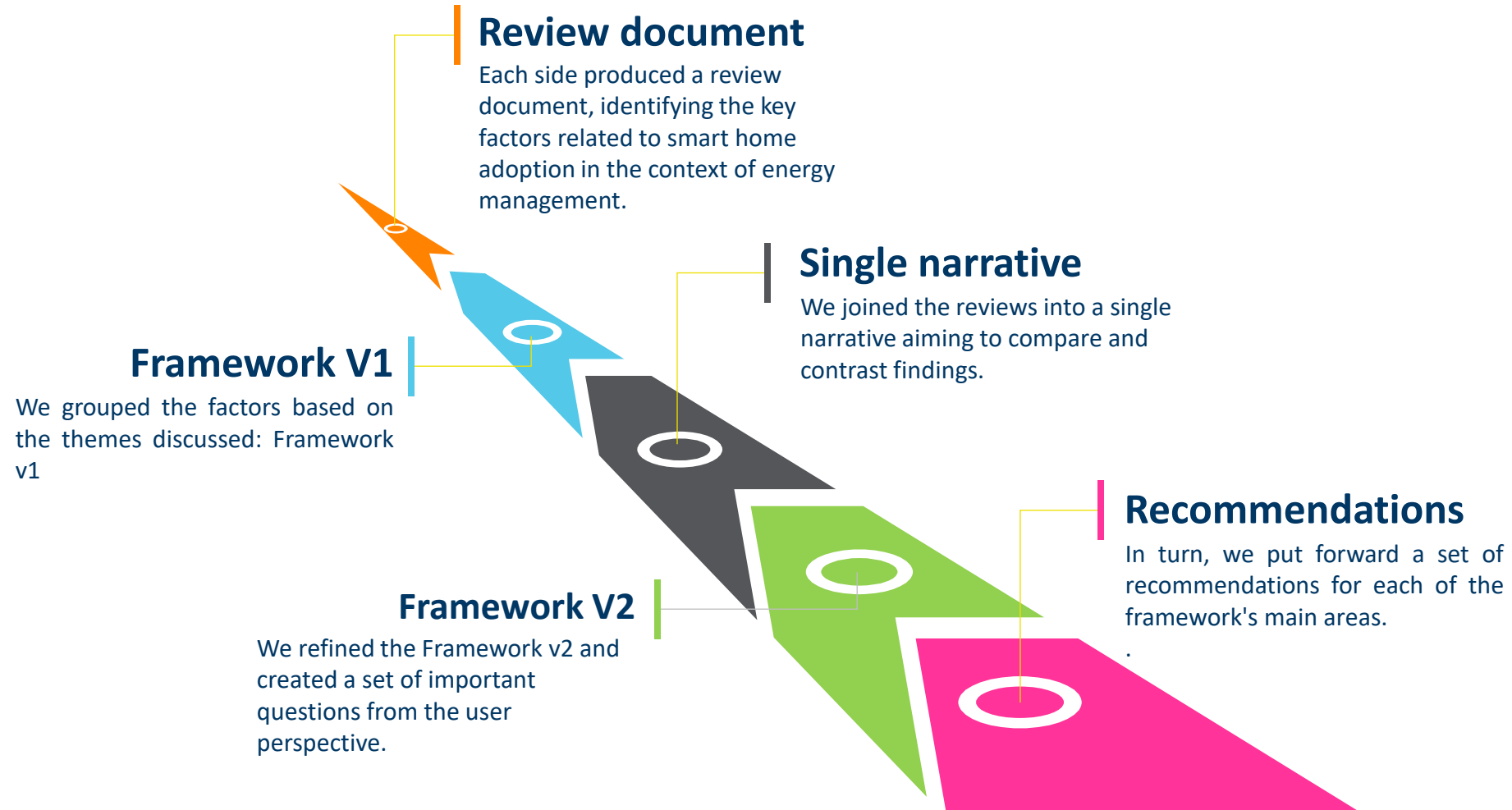
- \*Non-academic grey and industry or policy-based literature*
- \*Published/produced since 2012*
- \*Published/produced in English*
- \*Focused primarily but not exclusively on the UK context*

### Results

A total of **69 sources** were identified and used in the industry and policy-oriented report.

# Methodology

## Conducting and reporting



# Key Adoption Factors 1/6

## Smart Home Systems

- Perceived Usefulness
- Perceived Ease of Use
- Perceived Risks
- Trust
- Reliability and Interoperability



# Key Adoption Factors 2/6

## Costs and Benefits

- Perceived Costs
- Perceived Monetary Value and Saving
- Feedback about Energy Consumption
  
- Perceived Benefits
- Functionality / Perceived Features
- Health Benefits



# Key Adoption Factors 3/6

## Environmental

- Pro-Environmental Beliefs
- Perceived Green Value
- Environmental Knowledge
- Adjustable Green Defaults



# Key Adoption Factors 4/6

## User

- ‘Likely Adopters’ and Different User Groups
- Technological Knowledge, Experience and Engagement
- Digital Poverty and Exclusion
- Autonomy with Control
- User Comfort: Thermal Preference, and Sensitivity
- Enjoyment and Pleasure



# Key Adoption Factors 5/6

## Support Networks and Communities

- Engagement
- Advice, Information and Support
- Tenure Relations





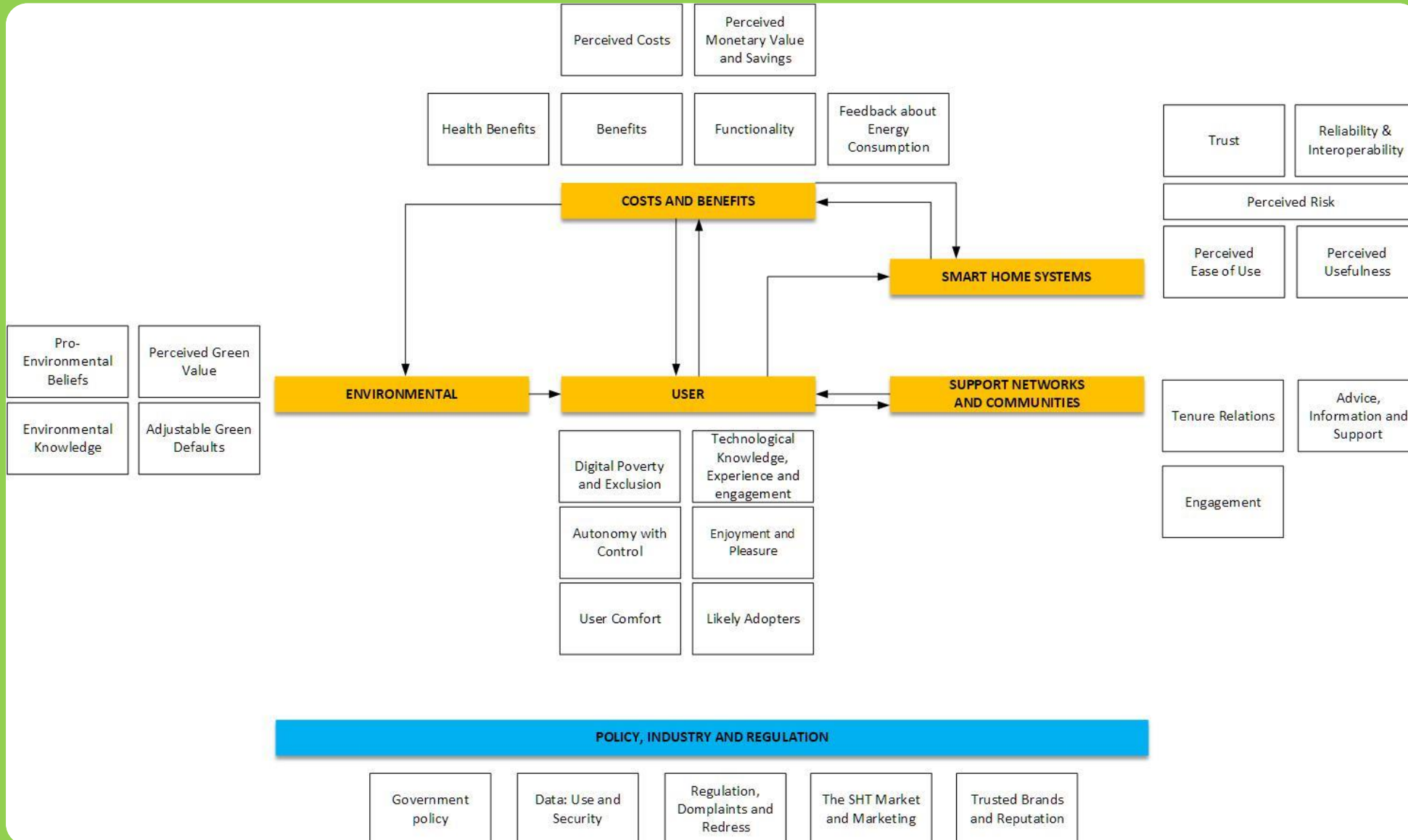
# Key Adoption Factors 6/6

## Policy, Industry and Regulation

- Government Policy
- Data – Use and Security
- Regulation, Complaints and Redress
- The Smart Home Technology Market and Marketing
- Trusted Brands and Reputation



# Output: Framework



# Creating a tool to enable adoption and identifying where action is required

	Awareness	Persuasion	Decision	Implementation	Continuation
Costs and Benefits	<ul style="list-style-type: none"> <li>- What does it do?</li> <li>- How many devices do I need to create a smart home?</li> <li>- How much will it cost me in total?</li> <li>- How much will it save me?</li> </ul>	<ul style="list-style-type: none"> <li>- What difference will this make to my daily life?</li> <li>- Will my house still be warm?</li> <li>- Can I trial smart home devices?</li> </ul>	<ul style="list-style-type: none"> <li>- Can I afford it?</li> <li>- Can it cover all my needs and requirements?</li> </ul>	<ul style="list-style-type: none"> <li>- Do I have to install it on my own?</li> <li>- Are there any installation costs?</li> <li>- Is there going to be a lot of upheaval to install it?</li> </ul>	<ul style="list-style-type: none"> <li>- How much does it cost to run?</li> <li>- Am I seeing savings on my bills?</li> </ul>
Smart Home Systems	<ul style="list-style-type: none"> <li>- Is it a scam?</li> <li>- Can I trust the vendors?</li> <li>- What kind of devices exist?</li> <li>- Can different devices work together?</li> <li>- What will happen to my data?</li> <li>- Is it better to buy devices from the same vendor or different ones?</li> </ul>	<ul style="list-style-type: none"> <li>- Do I know other people who use this?</li> <li>- Is it straightforward to use?</li> <li>- Can it do everything I need it to do?</li> <li>- Will it be as reliable as my current system?</li> <li>- Which platform is better for me?</li> </ul>	<ul style="list-style-type: none"> <li>- Do I still have overall control of the system?</li> <li>- Will I get a return on my investment?</li> <li>- Does it do everything my current system does?</li> </ul>	<ul style="list-style-type: none"> <li>- Is it difficult to program/ learn to use?</li> <li>- Is it interoperable with other appliances in my home?</li> <li>- How do I learn how to use the system for maximum gain?</li> </ul>	<ul style="list-style-type: none"> <li>- Is it working as it's supposed to?</li> <li>- How can I adapt or extend the system?</li> </ul>
The User and The Home	<ul style="list-style-type: none"> <li>- Is there something missing or something that could be improved in my home?</li> </ul>	<ul style="list-style-type: none"> <li>- Can it be fitted in my home without causing too much disruption?</li> <li>- Will it fit with my current routine?</li> </ul>	<ul style="list-style-type: none"> <li>- Do members of my household support the idea of implementing a smart home?</li> <li>- Does my landlord have to say 'yes'?</li> </ul>	<ul style="list-style-type: none"> <li>- Can everyone in my household use it easily?</li> </ul>	<ul style="list-style-type: none"> <li>- What happens if I move house? Can I take it with me?</li> </ul>
Support Networks and Communities	<ul style="list-style-type: none"> <li>- Is it recommended by my support networks/ community groups?</li> <li>- Are there any examples of how things could work in similar cases to mine?</li> </ul>	<ul style="list-style-type: none"> <li>- What does my landlord/ housing association (etc.) think of it?</li> <li>- Was it co-designed by people with similar needs to my own?</li> </ul>	<ul style="list-style-type: none"> <li>- Are those in my community who use smart homes satisfied with them?</li> </ul>	<ul style="list-style-type: none"> <li>- Can relevant communities support me if I have a problem with the installation or using the system?</li> </ul>	<ul style="list-style-type: none"> <li>- Who do I contact if it stops working?</li> <li>- How easy is it to remove everything?</li> </ul>
Environmental	<ul style="list-style-type: none"> <li>- How can I contribute to fixing climate change?</li> </ul>	<ul style="list-style-type: none"> <li>- Will this really make a difference to my carbon footprint?</li> </ul>	<ul style="list-style-type: none"> <li>- Do experts on environmental issues recommend this product?</li> </ul>	<ul style="list-style-type: none"> <li>- Will it always be efficient, or only if I use certain settings?</li> </ul>	<ul style="list-style-type: none"> <li>- How do I know it's still working effectively?</li> </ul>
Policy, Industry, and Regulation	<ul style="list-style-type: none"> <li>- How does me having a smarter home help the bigger picture?</li> </ul>	<ul style="list-style-type: none"> <li>- Are there Government/ Industry schemes to help me access these technologies?</li> </ul>	<ul style="list-style-type: none"> <li>- Are there any subsidies available to me to pay for it?</li> </ul>	<ul style="list-style-type: none"> <li>- How can I be sure the installers are trustworthy and will do a proper job?</li> <li>- Who do I speak to if they leave the job incomplete?</li> </ul>	<ul style="list-style-type: none"> <li>- What happens if something goes wrong? How do I get my issues resolved?</li> <li>- How can I make a complaint?</li> </ul>

# Recommendations for a fair and inclusive smart transition

- Giving customers adequate information on both financial and non-financial benefits of smart technologies
- Appropriate controls and safeguards to allow tailored use dependent on individual needs
- Building smart home systems with flexibility and interoperability
- Following the principle of inclusion by design
- Engagement strategies for users experiencing digital exclusion and/or technology anxiety
- Training frontline workers and installers to give tailored, accessible and appropriate advice
- Ensuring that data security and privacy statements adhere to data protection regulation(s)
- Mitigating the risks of miscommunication or mis-selling in a growing market

# Looking to the future

## What comes next?

### Alpha

- Testing our framework with stakeholders and users
- Developing a 'tool' to make the framework more useable
- Identifying potential mitigating actions for barriers
- Co-designing possible solution concepts

### Beta

- Further development of our solution concepts, through meaningful inclusion, to prototype technology-based or service solutions to the adoption of smart home systems

### Other Projects

- Apply the framework to future, and pre-existing, projects in this area, including the NGN Customer Energy Village related projects (NIA funded)
- Identify opportunities to work with a range of stakeholders to help progress their goals



**Thank you**  
**Any questions?**

# Contact details

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