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Engaging the Outright Owner-Occupier (Rotarian) towards a Net Zero future - attitudes, motivations, barriers and misconceptions of energy efficiency retrofit.

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Submitted in partial fulfilment of the requirements for the award of: Doctor of Philosophy of DeMontfort University August 2023

Abstract

To meet the UK's legally binding obligations for Net Zero, deep and universal cuts to domestic housing stock emissions are required. Whilst certain sectors are regulated for, the owner-occupier market remains free to act as they will. Owner-occupiers make up 64.3% of all tenures and 54.1% of those are owned-outright. They are the largest single sector of UK housing and whom this work is focused upon. Diverse housing stock combined with a disengaged and on-average older owner-occupier leaves this market struggling to achieve traction. This work aims to identify a better way to engage and subsequently motivate this group by greater understanding of their motivations and barriers and how Governance Entities (policy makers), Delivery Entities (SMEs) support them, the Decision-Making Entity (outright owner-occupier). The work was carried out with the participation of members of East Midlands Rotary Clubs due to their close demographic match to the government data of a typical outright owner-occupier. The work was completed following a mixed method inductive research technique. This allowed the owner-occupiers' practical experiences, beliefs, drivers, barriers and concerns for the future to be investigated.

Key research findings show that only 23% of those surveyed felt they had the practical ability to enact a new energy efficiency project in their home. Secondly, 56% were disinclined to act due to belief of limited financial returns and no other benefits being perceived. Age was a factor in decision-making on payback time and the results indicate that key changes to decision-making processes occurred through ageing, meaning the average owner-occupier is much less likely to be able to make good affective decisions that involved perceived risk. This directly affects purchasing decisions around new technologies such as air source heat pumps. Finally, contrary to government opinion on who typically makes spending decisions (males), two thirds of energy efficiency upgrade decisions are either made jointly (63.3%) as a male and female couple, around one in ten (11.4%) by solely by women and only a quarter (25.3%) solely by men.

The research found that neither the government nor Small to Medium Enterprises (SMEs) were trusted messengers and the issue of getting value for money using an SME loomed large in the home-owner's mind. In conclusion there is real opportunity to achieve significant carbon reduction in this area; government needs to motivate people with personal benefits, unlock long-term suitable finance packages, treat outright owner-occupiers as an age-specific group and find suitable trusted messengers they will engage with whilst also seeking to support SMEs in this area.

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Glossary of Terms

COM-B - The COM-B model of behaviour is widely used to identify what needs to change for a behaviour change intervention to be effective. It identifies three factors that need to be present in a person for any subsequent **B**ehaviour to occur: **C**apability, **O**pportunity and **M**otivation (Michie et al, 2015). It is part of the larger Behaviour Change Wheel (Michie et al, 2011), that provides a framework for the creation of behavioural change theories.

Decarbonisation - Decarbonisation can be defined as the process of reducing greenhouse gas emissions that result from activities such as producing electricity, heating homes or transport (ONS, 2021).

Decision-Making Entities - These are specifically defined as the person/s in a dwelling that authorise spending on energy efficiency measures. Whilst the Office for National Statistics (ONS, 2023) uses Household Reference Person (HRP) as a shorthand for the characteristics representative of the person representative of the household, specific care needs to be made to ensure that the HRP (as defined by the ONS) is not conflated with the decision maker/s who authorises spending as this will likely affect marketing and engagement.

Delivery Entities - These are defined as the chosen delivery arm of the current Governance Entities aka Small to Medium Enterprises (SMEs) with sub-250 employees. Practically, however, 78.8% of all businesses in the construction sector have no staff and are listed as micro-SME and 21% have less than 49 employees – totalling 98.8% of the labour force (BEIS, 2022).

Energy Efficiency - For this thesis, this means achieving a reduction in the day-to-day energy usage of a domestic dwelling compared to a pre-retrofit or renovation scenario. Energy efficiency is often measured and scaled using RdSAP surveying software (BRE Group, 2022), the UK Government's aim is to produce a desired Energy Performance Certificate (EPC) rating of C or higher for all dwellings by 2035.

Governance Entities - These are defined as those bodies who create, disseminate and potentially enforce policy and regulation affecting the supply and delivery of energy

efficiency retrofit measures to the domestic marketplace, for example Parliament, Building Regulations and local and regional planning offices.

HRP (Household Reference Person) - For the purposes of this work this may be considered the equivalent of an owner-occupier who “is the ‘householder’, in whose name the accommodation is owned and who is responsible for the accommodation” as defined in the English Housing Survey 2021-22 Headline Report (DLUHC, 2022). In “Families and household statistics explained”, the Office for National Statistics goes on to further define that “when publishing ad hoc analyses, we are interested in the characteristics of the household reference person as a representative of the household.” (ONS, 2023). A key characteristic is that on average they are retired and have an average age close to 70 years old. HRP is therefore a shorthand code for a representative responsible person.

Just Transition - An economic and political transition towards a future, more-sustainable, vision that is often within a regionally defined area. It has a particular focus on people and communities with key considerations being the maintaining of (or retraining for) employment, increasing local prosperity, redressing of past harms (and removal of future harms) and will include the promotion of a healthy environment.

Latent coding - In Thematic Analysis meaning can be coded at two different levels and latent codes “focus on a deeper, more *implicit* or conceptual level of meaning, sometimes quite abstracted from the obvious content of the data” (Braun & Clarke, 2022)

Net zero - Net zero refers to the greenhouse gas emissions being zero overall, where any emissions produced are counter-balanced by removal of greenhouse gases from the atmosphere. The term is often used as shorthand for the UK Government’s long-term aim of the reduction of net greenhouse gas emissions in the UK by 2050. This target can be achieved by a combination of deep reductions in emissions across the UK and emission removal through other methods for example, by afforestation or using carbon capture and storage technologies (ONS, 2021).

Neuro-Economics - “…a new highly promising approach to understanding the neurobiology of decision-making and how it affects cognitive social interactions between humans and societies/economies.” (Glimcher et al., 2009)

Neutralisation Theory (techniques) - There are five neutralization techniques: denial of responsibility, appeal to higher loyalties, condemning the condemners, denial of injury,

and denial of victim (Neumann and Mehlkop, 2023). Neutralisation Theory relates to individuals employing one of the five listed strategies to help remove cognitive dissonance felt when they know that their personal actions go against widely accepted norms, laws or values. Through this, they thereby justify (to themselves) why they may continue with their chosen actions without guilt or harm to their self-image (Sykes and Matza, 2017).

Nudge - A “nudge” is essentially a means of encouraging or guiding behaviour often by changing a default choice, but without mandating or instructing, and ideally without the need for heavy handed financial incentives of sanctions…a key element is that it avoids shutting down choices, unlike a law or formal requirement (Halpern, 2023).

Pareto Principle - “The Pareto principle can be applied to quality improvement, as the majority of problems (80%) are produced by a few key causes (20%)” (Cambridge Dictionary, 2023a). For the purposes of this work, it is considered important to address the “vital few” that affect the majority.

Personas - are archetypal users who embody the goals and aspirations of real users in an easy-to-assimilate and personable form (Haines and Mitchell, 2014). A further definition is that “Personas are fictitious, specific, concrete representations of target users…Personas put a face on the user—a memorable, engaging, and actionable image that serves as a design target. They convey information about users to your product team in ways that other artifacts cannot” (Adlin and Pruitt, 2010).

Persona Modelling - This is the process of creating and adopting a persona-based approach to understand the specific drivers and appropriate range of policy responses for each persona (for this thesis, in relation to the challenges of energy renovation). “Tailoring strategies to suit different personas will considerably enhance the diffusion of policy goals for low-energy retrofit and also allow business and technology developers to target an appropriate user” (Haines & Mitchell, 2014)

SME - The UK definition of SME is generally a small or medium-sized enterprise with fewer than 250 employees. They make up 99.9 per cent of the nation’s business population and 96 per cent of the UK’s businesses have fewer than 10 employees (BEIS, 2021b).

Semantic coding - In Thematic Analysis meaning can be coded at two different levels and “semantic codes capture explicitly-expressed meaning; they often stay close to the language of the participants or the overt meaning of data” (Braun & Clarke, 2022)

Sustainability Transition - Fundamental, transformative cross cutting change within society addressing how citizens live their lives, to ensure that society can exist in a more sustainable manner. Often focused more on policy, systems and operational delivery towards agreed targets.

The Green Book – The Green Book is guidance issued by HM Treasury on how to appraise policies, programmes and projects. It also provides guidance on the design and use of monitoring and evaluation before, during and after implementation. Green Book guidance applies to all proposals that concern public spending, taxation, changes to regulations, and changes to the use of existing public assets and resources (HM Treasury, 2022).

Value-action gap – This is where “strongly held pre-environmental values frequently fail to translate into green purchasing actions or other pro-environmental behaviours. This green gap between what consumers say and do is arguably one of the greatest challenges for marketers, public policy makers and non-profit organisations working to promote the United Nations sustainable development goals, particularly concerning consumption and production.” (Essiz et al., 2022)

Publications and conferences

Rowlatt, J., Reeves, A., Brown, N. and Morton, A. (2021). “Owner-occupier Engagement. The missing piece of the puzzle – how do we encourage them to engage in Energy Efficiency upgrades?” *European Council for an Energy Efficient Economy Summer Study Conference. Virtual (due to Covid-19) 07th-11th June 2021.* Online presentation.

Rowlatt, J., Reeves, A., Brown, N. and Morton, A. (2022). “Bow-Tie tool: a framework to analyse information flows and engagement for energy efficiency policy.” *Energy Research and Social Science 3rd International Conference, Renold Building Manchester, UK. 20th-23rd June 2022.* Poster presentation at conference.

Rowlatt J., Reeves, A., Brown, N. and Morton, A. (2022). “Engaging the owner-occupier towards a Net Zero future via a persona modelling framework.” *American Council for an Energy Efficient Economy – Behaviour, Energy and Climate Change, Capital Hilton, Washington DC, USA. 13th-16th November 2022.* Poster presentation at conference

Chapter 1: Introduction

This chapter introduces the research and its motivation (1.1), the need for the research (1.2) and discusses the government definition of an owner-occupier (1.3). This is followed by introducing the aims, objectives and methods (1.4) and summarising the thesis layout (1.5).

1.1 General background and motivation

1.1.1 Background

To meet the UK's legally binding obligations to combat climate change, deep and universal cuts to domestic housing stock emissions are required (IPCC, 2022). Whilst certain sectors are regulated for, such as private rentals and social housing, the owner-occupier market remains free to act as they will, as demonstrated in the Heat in Buildings Strategy (BEIS, 2021). Diverse housing stock data (DLUHC, 2022) combined with a disengaged and older owner-occupier (Ibid.; MHCLG 2020), leaves this market struggling to achieve traction (Löckenhoff, 2017). Owner-occupiers make up 64.3% of all tenures, of which 54.1% of those are owned-outright with no mortgage (DLUHC, Annex 1.1, 2022) who have an average tenure length of 24.5 years. With only 2.3% of all owner-occupiers moving property a year there is low stock turnover and consequent low drive to upgrade housing stock triggered upon moving home (DLUHC, 2022). However, with long predicted tenures, owned-outright households are more inclined to consider major home improvements if they can see the benefit from them (Freund et al., 2012; Mather et al., 2012) as they are the most likely to stay long enough to enjoy them.

This thesis therefore aims to develop a base of evidence to help identify ways to better engage, empower and support this large and vital group to reduce the carbon emissions of their homes. To provide an evidence base for this, the research used quantitative and qualitative social research methods to investigate the practical experiences, beliefs and concerns for the future of the relevant homeowners.

1.1.2 Motivation

In general terms the primary drivers for this research are the almost universally accepted problem of anthropogenic climate change (Lynas et al., 2021) and the need to reduce carbon emissions as set out in the Kyoto Protocol (UNFCCC, 1998) and later ratified further by the Paris Accords (UNFCCC, 2015). In the UK the Committee on Climate

Change (CCC) has been acting as an impartial advisor to the government, and its Sixth Carbon Budget (CCC, 2020) report echoes that of the IPCC Sixth Assessment Report (IPCC, 2022) but focuses on the UK. The CCC report highlights that the UK's intended progress towards set carbon budgets (Shepheard, 2019; IPCC, 2022), that were previously agreed for a measured transition to Net Zero, is not happening.

More specifically, this work focuses on retrofit to Net Zero for the built environment and particularly owner-occupied domestic dwellings in England. Specifically, to achieve this the government would need to support the increase in uptake of retrofit works by owner-occupiers to reduce the emissions of these buildings. These retrofit works would build towards England's Net Zero targets through the installation of measures such as insulation to the building fabric, increasing the efficiency of existing heating systems, moving towards low/no carbon (or all-electric) heating systems such as heat pumps and the generation of clean energy on site by use of Photo Voltaics for example. This would align existing properties with the aims of the Future Homes Standards Approved Document L (MCHLG, 2019, pg. 20).

Prior to Covid-19, the residential sector was "estimated to have been responsible for around 15% of UK greenhouse gas emissions in 2018" (BEIS, 2020a). However, with a shift in working patterns this has now risen to 19.9% in 2021-22 as shown in Figure 1.1. As such whilst there has been a long period of varying energy efficiency schemes - following the significant and far reaching "Home Truths" report (Boardman, 2007) that provided a key conceptual roadmap to reduce UK housing emissions by 80% for 2050 – the low hanging fruit was taken early, supported by a drop in the carbon intensity of electricity (Evans, 2021) and in the last decade progress has stalled (BEIS, 2022).

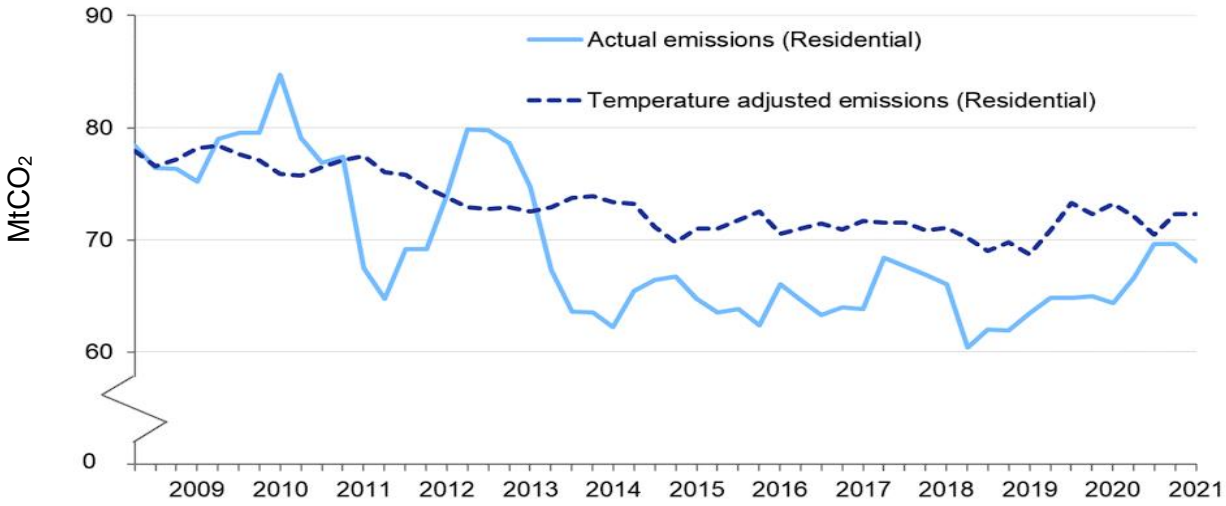

Figure 1.1 2009 to 2021 Residential property greenhouse gas emissions trend (BEIS, 2022)

Overall, the urgency to act before potential environmental tipping points (IPCC, 2022) are passed, combined with clear evidence that the world is struggling to address this pressing sector generates a need for this research to establish why progress with retrofit of owner-occupied UK homes is not progressing fast enough.

1.2 Need for research

“Don't be anxious or concerned as to results. Results will follow just as surely as day follows night. Have faith in this planting until the evidence is manifest to you that it is so. Your confidence in this procedure will pay great rewards. You wait but a little while in the consciousness of the thing desired; then suddenly, and when you least expect it, the thing felt becomes your expression.” (Goddard & Horowitz, 2022)

The above quotation, whilst originally religious in intent may also be used as a current metaphor for the 2010-2024 government’s beliefs in their chosen delivery model for the Net Zero Transition (Crown, 2021), particularly when it comes to owner-occupied housing and specifically those which are owned outright. This appears to be an ongoing theme of belief within governance that policy uptake by general society will spontaneously occur if they just create a policy (PAC, 2021). This notion is repeated throughout the research and as such it is put forward here as an underlying worldview that drives the engagement and delivery platform ideology of current policy creation.

Over the last decade there have been various energy efficiency retrofit schemes with varying levels of success. Some focus on insulation such as the Energy Company Obligation (ECO) (Ofgem, 2022) and others on clean energy such as the Feed in Tariff (FiT) (OFGEM, 2021). In some cases, they have had reasonable success towards their stated aim in the early days of launch. However, recent schemes that have focused on the owner-occupier and particularly the decarbonisation of heat have been challenging in terms of engagement, delivery, timescales and success rates. Two recent examples are the Green Homes Grant (GHG) (BEIS, 2020d) described by the Chair of the Public Accounts Committee as “a slam dunk fail” (PAC, 2021) and the current Boiler Upgrade Scheme (BUS) (OFGEM, 2021) which is the direct replacement to the Renewable Heat Incentive (RHI) (Ibid.). With a stated target of 90,000 vouchers over a maximum period of three years issued to homeowners this latter scheme has to-date paid out 6497 vouchers for Air Source Heat Pump (ASHP) installations in 8 months since launch (Ash, 2023). At present it appears the scheme will miss its target by over 50%, which highlights a

significant lack of engagement in terms of its target audience. This lack of engagement particularly matters as there is a stated aim for 600,000 installations a year to be happening by 2028 under the Heat in Buildings Strategy (BEIS, 2021).

Recent BEIS (2022) data shown in Figure 1.2 on the likelihood of the householders installing an ASHP when they next need to change, demonstrates that at present (Autumn 2022 data) only 17% of the people surveyed say they may be inclined to do so even if they have the capability to do so at the time.

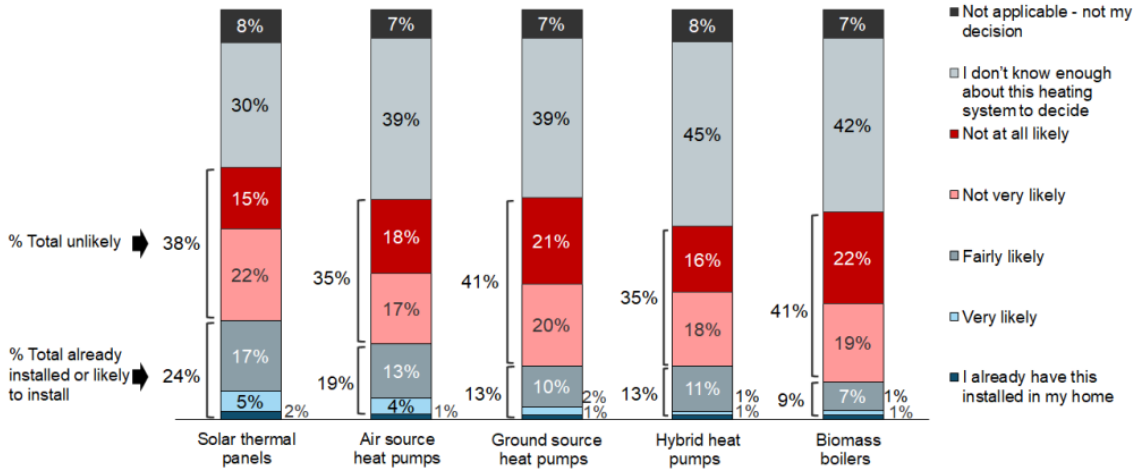

Figure 1.2 BEIS Public attitudes tracker of householders' likelihood to adopt renewable technologies (BEIS, 2022f)

This research addresses the causes of the gap in engagement between what the government wants (or hopes will happen) and that which the householders says that they care about and will act upon. It will include a holistic top to bottom approach looking at the required structural and engagement elements that are desired by the householders and what barriers may still exist. This is in line with, and builds upon, concurrent research papers which have also recently been published such as "MISSION ZERO - Independent Review of Net Zero" (Skidmore, 2023) and "In our hands: behaviour change for climate and environmental goals" (House of Lords, 2023a).

1.3 Jargon and the Household Reference Person (HRP)

For clarity it is vital to understand the abbreviation HRP (Household Reference Person) which is used throughout the thesis. For the purposes of this work this may be considered the equivalent of an owner-occupier who "is the 'householder', in whose name the accommodation is owned and who is responsible for the accommodation" (ONS, 2023).

For the sake of clarity, Governance Entities (including their structures and agencies) may range widely in scale and location with great complexity with consequent effects. The

Public Administration and Constitutional Affairs Committee (2022) note the following on the current arrangements:

"(1) The current governance structures [entities] in England are far too complex, with 333 local authorities split between two-tier (county and district) and unitary authorities, with some areas (9,000–10,000) having additional town and parish councils. Some areas are also now covered by an intermediate level of government such as a combined authority or the Greater London Authority. In addition to this, there are also national bodies and agencies that intersect with service delivery at the various levels.

(2) The complexity of the governance arrangements in England has created a patchwork structure that is a confusing and opaque system that people simply do not understand. It is not clear to people where decisions are made, where accountability lies, and, consequently, how policies and services can be adapted to the needs of local areas and local people."

Whilst the definition of the HRP may be correct in their terms as defined by the ONS, they also assume that this person is the decision maker for the property (DLUHC, 2022; DLUHC, 2023). Whilst this may be true in some cases it is vital to ensure that the HRP - if defined as the decision maker - is correctly identified.

Before moving into the main body of the literature review some thought should be given to language. Jargon can be a good thing in the right situation – ie. when used by people within the same milieu. It saves time and energy and provides accuracy with a shared contextualised meaning or phenomenon and the thesis shall return to this point further in section 2.2.4 when considering trust. This area of language, meaning and jargon is particularly important because the HRP is a very good definition of a gestalt compared to a phenomenon. A phenomenon is a fact or situation that is observed to exist or happen whereas a gestalt is an organised whole that is perceived as more than the sum of its parts. A gestalt is also considered to be singular but as a multiplicity of events or parts creating a singular construct or event that creates a synergistic output. It highlights the fact that an HRP, being human and existing in a complex physical, social, psychological, financial, structural and legal paradigm that often has complex shifting parts, cannot easily have predicted responses based on analysis of any one (or combination of other) parts (Bauer, 2023). As such, defining a person as a HRP (singular event) rather misses all the complexities and potential variances of the outputs that a person can have when

considered as a gestalt. Therefore, a human being defined as an HRP, may be considered greater than the sum of its parts, in much the same way that a Persona (Adlin & Pruitt, 2010) is a fleshing out of a brief sketch that is created by a character definition.

As such, this messy concept can potentially mean different things to different people depending on the lens through which it is considered. It is likely that outside of usage as technical jargon no one uses the term HRP when talking about the owner-occupier of domestic English housing. Therefore, it would be ideal if there was clear recognition that what a politician speaks about in the press is understood to be (for example) the same as the Planning Officer, who decides on a retrofit application, that is trying to follow the rules set out in a policy created by an economist, acting on a briefing from a statistician... If this was indeed accepted as being the case, then if the ultimate end aim is to engage the HRP to act, then humanising them and recognising the complexity and potential for emergent properties to be created by synergies throughout the whole process may be of benefit (as traditional jargon is not accurate enough nor suitably engaging for those for whom it is not traditional praxis) (EERE, 2012).

Furthermore, even within the scientific community for whom a “traditional format thesis” may hold sway, research has shown the “negative effect of jargon on the success of a paper [or thesis]”, meaning that “scientists might want to restrict jargon use to sections of the paper where its use is unavoidable” (Martínez A & Mammola S, 2021). This is because if put off by too much jargon in the initial skimming of the paper due to a lack of understanding then the reading researcher has less than a 10% chance of choosing to read the paper in full (Ibid.). In addition to this, with the rise of internet searching for reference works, when the title or abstract has higher levels of jargon it reduces the retrievability of the paper when using a search engine (Ibid.). This then reduces the reach and impact of the work. This thesis is cognizant of this and has tried, insofar as possible, to use “normal language” whilst still holding an academic tone as may be desired for a thesis.

Usage of clear, universally used, personae of varying HRP would provide a benefit as this is more human and relatable (EERE, 2012) as people are a complex gestalt and at present each department, by nature, tends to focus on the parts of the HRP character that relate to their own work rather than consideration of the Persona as a rounded whole. If done, whilst more complicated to initially arrange, this may help them to better empathise with, and craft policies for, these groups. This work seeks to foreground the issues around language, engagement and personas, however, for the purposes of this work the thesis

will continue to use the language chosen by the relevant governmental departments as they are used.

Unless otherwise stated this work concentrates on the outright owner-occupier of domestic property in England defined as a HRP by the English Housing Survey (MHCLG, 2021). “End-user”, “owner-occupier” and “HRP” are used interchangeably throughout this work depending on source materials used and hold the same intended meaning.

It was identified early in the research that there were three relevant stakeholder groups - Governance, Delivery and Homeowners (HRPs), each having varying levels of agency, autonomy and ability to effect practical change. They are broadly described as “Governance Entities” i.e., policymakers and the regulatory bodies that may support them. “Delivery Entities” i.e., the small to medium enterprises (SMEs) that make up the bulk of the delivery capability of the UK from an installation perspective. “Decision-Making Entities (HRPs)” i.e., outright owner-occupiers of English homes but specifically the decision-makers within those homes as related to energy efficiency. Please see Glossary of Terms for more detail as needed.

1.4 Aim and objectives

The general aim of this research is stated as:

Identify the views, beliefs and experiences of outright owner-occupiers (HRP) that influence household retrofit decision-making.

For clarity, this means looking at the whole delivery system from creation to delivery of policy, but with a key focus on ensuring that what is offered both supports and empowers the HRP in a way that they feel motivated to act. This is in direct contrast to the principle of “build it and he will come” (Kinsella, 2014) that appears to be the present engagement mantra followed by government (PAC, 2021), which as noted in the introductory quote, appears to have been religiously followed by the recent incumbent party. As defined in this thesis, it is meant that policies (and potential funding schemes) have been created and then engagement left to naturally occur, either stimulated by the delivery agents or through the HRP initiating engagement for their own reasons when varying schemes may be active.

The aim above is broken down into specific objectives designed to highlight and build upon investigation into varying aspects of the complex paradigm that presently exists. Through their varying lenses the Objectives relate to:

- the status quo of domestic energy efficiency retrofit (such as ownership, tenure and technical requirements towards England's Net Zero target)
- what the present socio-institutional infrastructure is and how this is delivered (i.e. governance entities, perception of the HRP, decision-making processes, timelines, chosen delivery agents and the end user experience)
- HRP age and their particular decision-making process, the effects of time on policy making
- investigation of what current research may recommend that would result in better engagement and outcomes to overcome any identified barriers

The objectives then use a mixed-method research strategy to gather new data to challenge the present policy design and engagement strategy. The objectives are:

1. *Focussing on English housing, to scope and identify the domestic energy efficiency policy landscape.*

2. *Analyse and evaluate the direct engagement experience of Owner-occupiers via the present delivery structure.*

3. *Analyse the alignment of current engagement policy for HRPs and consider this via the lenses of the three major stakeholders – Governance Entities (Policy makers), Delivery Entities (Small to Medium Enterprises – SME) as a delivery arm and Decision-Making Entities - the HRP (Owner-occupier) as the recipient of the policy framework.*

Through successful completion of this research this thesis seeks to provide an original contribution to knowledge that will assist both governance, local authorities and Non-Governmental Organisations (NGOs), in supporting the HRP to transition towards a Net Zero future in a timely manner that allows targets to be met.

The aim and objectives were addressed using both quantitative and qualitative analysis of data collected over a year from members of the East Midlands (District 1070) Rotary Club.

1.5 Thesis layout

This research is split into a further six sections which follow a clear structure. The sub-structures evidenced in the literature review will be present again in the results chapters and discussion to give a logical progression to the work and demonstrate the iterative, pragmatic and inductive process undertaken. The following chapters are:

Chapter 2 Literature review – making the argument

This chapter has five main sections:

- The first reviews the present status quo in terms UK energy efficiency and seeks to clarify what the current situation bodes in terms of meeting targets towards the UK's Net Zero aspirations.
- The second looks look at the whole energy efficiency system as a socio-institutional structure and investigates challenges to an engaging end user experience that empowers change.
- The third section examines the influence of age and the passage of time on HRP decision-making
- The fourth section examines behaviour change frameworks and their relevance for retrofit.
- The fifth and final section explores previous research into retrofit motivations.

Chapter 3 Methodology

This chapter provides detail on the chosen research methodology, the reasoning behind this strategy, a description of the analytical process undertaken and comment on ethical issues. It is split into a general methodology then a bespoke one for both the survey and the interview sections.

Chapter 4 Quantitative results and analysis

This chapter includes presentation and analysis of the results of the survey data and insights gained from the process. This includes analysis of the capability, opportunity and motivation of respondents to undertake retrofit, which led to the follow-on qualitative interviews.

Chapter 5 – Qualitative results and analysis

This includes presentation of the analysed results of the interview data and insights gained from the process.

Chapter 6 – Discussion

This chapter discusses the findings in relation to prior literature, structured according to the stakeholder entities under examination (governance, delivery and decision-making). Recommendations emerging from the research are also explored.

Chapter 7 Conclusion

This chapter summarises the research findings, presents the contribution to knowledge made and discusses strengths and weaknesses of the research. Implications for stakeholders and practical application potentials are highlighted and a conclusion made.

These chapters are followed by the references and any appendices such as charts, graphs and data that enhance the work.

Chapter 2: Literature review

This section discusses literature relating to the areas of research that informed this study. It is broken into five separate parts: energy efficiency retrofit; energy efficiency retrofit as a socio-institutional structure; age, decision-making and time; behaviour change and energy efficiency retrofit; and renovation motivations – what does previous research tell us? Whilst they are individually discrete, they build towards creating a structured argument that change is needed by the current policy/delivery system.

The literature review addresses three distinct areas within this process; policy creation, delivery and how end-users engage with the processes. These are viewed against the backdrop of the key stakeholders that work within the system. At all times the thesis will consider the interplay between the stakeholders when considering domestic energy efficiency upgrade as a paradigm. Please note some universal issues will arise repeatedly but via different lenses.

2.1 Energy efficiency retrofit

This section reviews recommended energy efficiency measures, the present status quo in terms of housing stock, tenure and policy relating to thereof and seek to understand what the current situation bodes in terms of meeting targets towards the UK's Net Zero aspirations.

2.1.1 Recommended energy efficiency measures

Before looking at the housing status quo it is useful to consider what potential measures may be applicable to the housing stock to deeply reduce emissions. The "Home Truths" report (Boardman, 2007) is recognised as a key report in outlining a strategic approach to low-carbon retrofit of UK housing stock. It provides detailed breakdowns into varying aspects of the policy landscape, failures and recommendations for addressing these. In terms of technologies, Boardman recommends the traditional areas of insulation, better windows, more efficient heating systems, installing solar thermal and Photo Voltaic (PV) panels and better lighting. However, the report goes further to provide an illustrative insight into what an "80% house" (one that has 80% lower emissions than those in 1990) is in terms of householder usage habitus and the technologies or retrofits that have occurred to the house (Boardman, 2007, pg. 103). It was used as a reference material for the incumbent government's research when developing the polices that it later introduced (Energy and Climate Change Committee, 2008).

Another influential concept in terms of the technical measures required is the 'whole home' or 'whole house' approach, as exemplified by Energiesprong (Energiesprong UK Ltd, 2023), which is based on the fabric-first approach (Institute for Sustainability, 2012). The measures installed include “Super-efficient thermal wrap with renewable generation, storage and heating”, in practice providing loft and wall insulation, low-carbon heating systems such as an ASHP and hot water cylinder, solar Photo Voltaics and battery storage. In larger modular systems, this includes heat networks with Ground Source Heat Pumps (GSHPs) as exemplified in the 2017 retrofit in Nottingham (Energiesprong Ltd, 2023).

Progress with retrofit across the UK has been slow, with latest figures from 2023 showing that there remain millions of properties that have yet to benefit from retrofit measures. At the end of December 2022 (DESNZ, 2023):

- *14.8 million properties had cavity wall insulation (71 per cent of potential properties)*
- *17.0 million had loft insulation (67 per cent of properties with a loft)*
- *805,000 had solid wall insulation (9 per cent of properties with solid walls).*

ECO (Ofgem, 2022) stands for the Energy Company Obligation which is a government energy efficiency scheme in Great Britain designed to tackle fuel poverty and help reduce carbon emissions. ECO included sub-schemes such as: Carbon Emissions Reduction Obligation (CERO), Carbon Saving Community Obligation (CSCO), Home Heating Cost Reduction Obligation (HHCRO) and Affordable Warmth (AW). The schemes ran from ECO1 to ECO4 with the ECO Help to Heat (ECO HTH) covering AW, CERO and CSCO for an interim period until the redesign and launch of a new scheme (ECO3) after the funding closure of ECO2. However, as shown in Figure 2.1 there has been a significant shift in typology and volume of measures installed over the years from 2013 to 2022, with those offering the least lifetime carbon savings shown in Figure 2.2.

Whilst this increase in retrofit work to improve the efficiency of existing gas heating systems helps to reduce emissions, it is still not fundamentally shifting the fuel source towards low-carbon options as would be the case with ASHPs. To provide comparison, between Jan 2015 and Dec 2022 there were 113,125 registered ASHP installations (MCS, 2023) into the circa 24 million UK dwellings. Whilst this has improved marginally with an “estimated 55,000 ‘hydronic’ heat pumps – those that connect to a water-based central heating system” being sold in the UK in 2021, by comparison “around 1.6 - 1.7m gas

boilers are currently sold each year." (DESNZ, 2023). These figures include commercial heating systems as well as domestic.

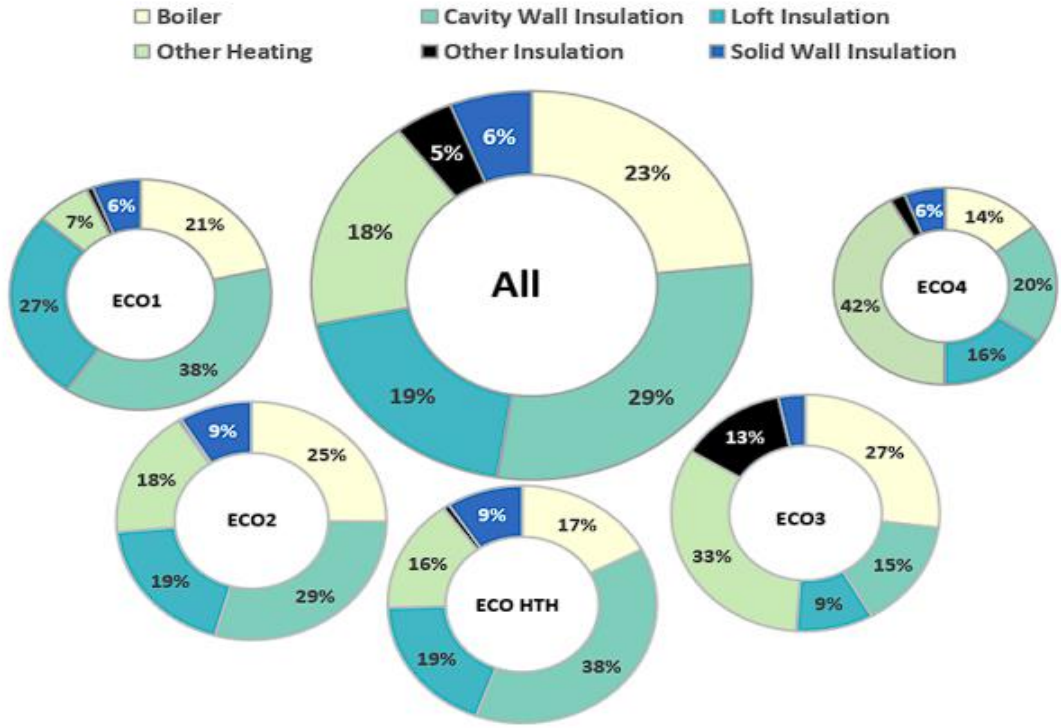

Figure 2.1 ECO measures installed by type, and phase and overall (DESNZ, 2023e)

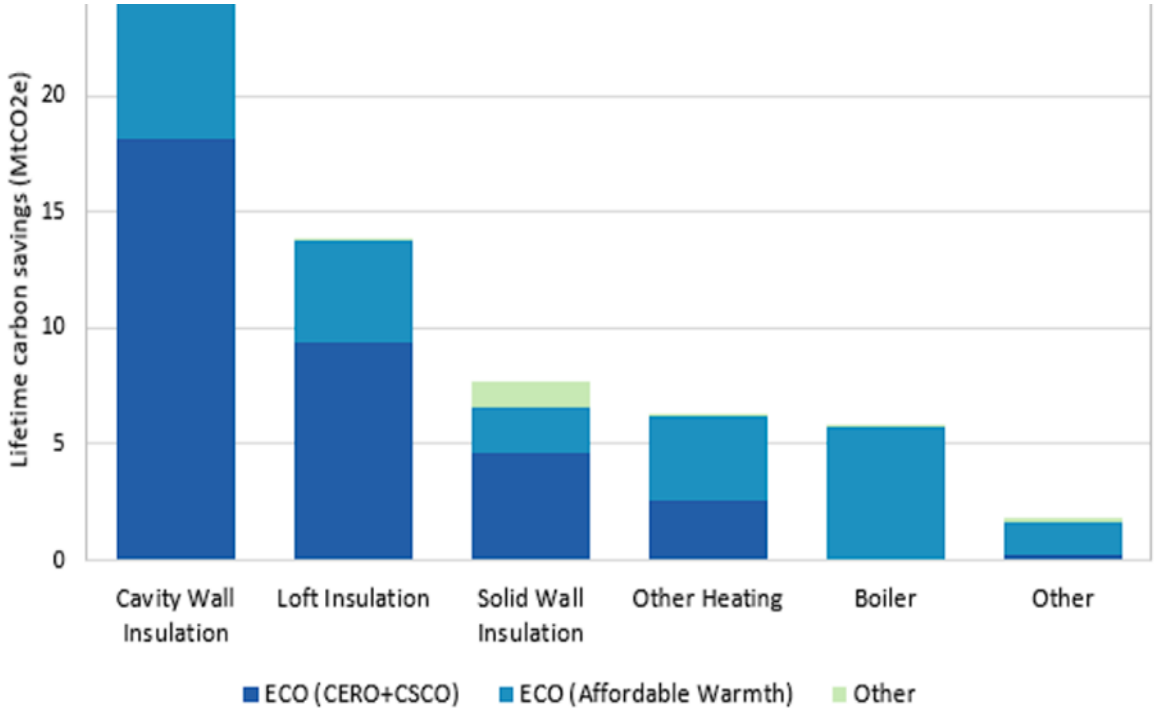

Figure 2.2 Estimated lifetime carbon savings by measure and scheme, from Jan 2013 to March 2022 (DESNZ, 2023)

This thesis is not specifically including domestic appliances as part of energy efficiency retrofit, and whilst recommending highly efficient products, this is considered as a standard principle not directly addressed hereafter. Instead, this thesis investigates the

technology structures in the home and end user decision-making and usage habits. When looking specifically at retrofit measures that are generally recommended to reduce a property's in-use carbon footprint, there are no silver bullets that provide a one-size fits all answer (Long et al., 2014; Qureshi, 2021). With the range of UK housing stock, regional variance, localised weather impacts compounded with the mix of tenures and HRP demographics there is a rich and diverse tapestry of factors at play.

Whilst this thesis makes no direct mention to desired insulation standards, energy efficient retrofit, as understood by the thesis, refers to the heat loss perimeter being improved to current building standards for modern homes as best as is practical – specifically for cavity walls and lofts. This is stated as a default requirement to receive a grant issued by the Boiler Upgrade Scheme (OFGEM, 2021). For hard-to-treat and solid wall properties, whilst more challenging, in most cases a technical route to achieving this exists to assist in the reduction of carbon emissions.

A key priority for policy makers is the electrification of heat - with around 23.7% of all UK emissions being from heating buildings (BEIS, 2021g). For domestic housing they recommend ASHPs or a heat network as the preferred choices and further research into hydrogen ready boilers as a slim possibility. Beyond this, there are other technical solutions such as far-infrared heating panels as well as modern storage heaters that have "black box controls" being suggested in the mix that can be combined with time-of-use (ToU) tariffs to support a more flexible grid supply.

In terms of renewable energy, more modern solar Photo Voltaic (PV) and superior modern (post-2022) Battery Energy Storage Systems (BESS) are enabled with arbitrage technology systems built in to make the most of time-of-use (ToU) tariffs such as Octopus Flux, Agile and Outgoing Octopus (Octopus Energy, 2023).

A house could have a mix of technologies rather than just one, ideally designed as a synergistic system. For example, an ASHP could be combined with a hot water cylinder, far-infrared heating and a PV & BESS system if there was not space for a standard ASHP monobloc outside (planning restrictions prevent this in many cases due to noise constraints and property borders), as is the case in many small terraced Victorian properties. This would allow greater utility of renewables when they are produced, lower investment in grid infrastructure and transmission costs, and limit any production curtailment required, as well as maximising value to the end user in terms of their energy bills.

This, along with increasing solar to 70GW of installed capacity by 2035 (BEIS, 2021e) should provide more homes with the ability to be zero carbon and net-zero bill properties, in line with a new trial being tested by Octopus Energy (Boulton, 2022). Ultimately though, the best technology should be reducing demand via passive options such as improved insulation, increased technological energy efficiency and behavioural change towards lower energy usage, although the latter could offer quite a challenge, especially to high-use homes (Cass et al., 2023).

The above methods of lowering demand, generating more clean energy, and the need to support the HRP towards Net Zero are well understood.

2.1.2 Houses (dwellings) or homes?

There are many and varied property types, family variations and tenure styles within English housing (DLUHC, 2022). However, this does not capture the complexity of the home as compared to that of a physical house or varied dwelling. In terms of language to be used throughout the thesis it is important to note that all dwelling types, as can be seen in Table 2-1, are under consideration in terms of energy efficiency upgrade,.

Table 2-1 English Housing Survey stock profile % (DLUHC, Annex 1.1, 2022)

	private sector		
	owner occupied	private rented	all private sector
dwelling age			
pre-1919	20.4	31.1	22.8
1919-44	16.4	13.4	15.7
1945-64	16.3	11.9	15.3
1965-80	19.2	14.6	18.2
1981-90	7.0	5.4	6.6
1991-2002	9.2	9.8	9.3
2002 onwards	11.5	13.9	12.0
dwelling type			
end terrace	9.2	10.6	9.5
mid terrace	18.4	22.4	19.3
small terraced house	7.5	12.6	8.6
medium/large terraced house	19.6	19.5	19.6
all terraced houses	27.1	32.1	28.2
semi-detached house	28.7	15.1	25.7

detached house	25.7	4.0	21.0
bungalow	7.6	4.6	6.9
converted flat	2.1	13.7	4.6
purpose built flat, low rise	7.5	25.2	11.4
purpose built flat, high rise	1.4	5.3	2.2
floor area			
less than 50 m^2	3.4	17.9	6.6
50 to 69 m^2	14.1	32.1	18.1
70 to 89 m^2	25.8	27.4	26.1
90 to 109 m^2	19.0	12.5	17.6
110 or more m^2	37.7	10.1	31.6
type of area			
city centre	3.1	10.3	4.7
other urban centre	18.3	32.1	21.3
suburban residential	58.4	46.9	55.9
rural residential	12.4	4.6	10.7
village centre	4.9	3.6	4.6
rural	3.0	2.4	2.9

Within the UK Government, the Department for Levelling Up, Housing and Communities (DLUHC) conflates together varied types of stock such as bungalows, flats, houses, high-rise etc under the term “house” (though when disaggregating the types of properties they term them as dwellings). Taking them into account as a leading authority for official terminology and the broad usage of the word “house” in many and varied reports (such as the extract shown in Figure 2.3) being directly quoted, this thesis uses the common inclusive term (“house”), whilst not seeking to specifically exclude any type of property from consideration. This thesis may still vary in specific areas such as when discussing architecture, building services and planning (fields in which the term dwelling is often preferred), but for the sake of simplicity unless otherwise defined or used in a specific quote, the term house is used as a catch-all for a domestic residence.

There is a long history of research into the definition and meanings of “home” (Sixsmith, 1986) and an increasing rise in understanding that it is not just a construction of bricks and mortar (for example) but rather a spatio-temporal construct that has a multidimensional aspect depending on the lens through which it is considered (Mallett, 2004). Whilst these definitions and associated research are often more concerned with the non-structural aspect of the home and more to do with the social, psychological, anthropological and geographical aspects and meanings (Ellsworth-Krebs et al., 2015),

they are still rooted in the structure of the home as a physical object that bounds the interaction to a location and structure.

It is important to note that this area of research, whilst bounded by the structures of the dwelling, has had a long-standing problem in that the traditionally technical terminology removes attention from the fact that people are at the heart of the decision-making process. Furthermore, stereotyping a house as a single-family detached dwelling in a snapshot of time does not fully conceptualise the sheer variation of household types in society nor of the home as a social and financial construct moving through time being adapted over and over as each occupant personalises the property to their unique requirements (Despres, 1991). It is also often overlooked that the home also steers the habitus of practice that householders engage with by the very nature of its construction (Bourdieu, 2010). As such, any future plans to drive energy-efficiency retrofit should indicatively have the ability to be more personalised and engage emotional drivers to meet individual needs and both support and work with the existing behaviours and attitudes of individuals rather than a one-size-fits-all approach (Long et al., 2014). Ideally retrofit approaches should allow adaption to occur over time as needs change and structures allow.

This work aims to clearly separate the lens through which the house (or home) is considered and discussed. Ellsworth-Krebs et al. (2015) defined the challenge as “Ontological priority given to the ‘home’ results in scholarship which considers both social and physical aspects that shape demand. Conversely, research prioritising the ‘house’ is dominated by techno-economic thinking, and overlooks critical social considerations”. This research crosses boundaries and looks at both areas of the concept of a house/home as a gestalt (BRE Group, 2022). However, whilst the house and the home are two different things, they are still a connected system and one influences the other, as indicated in Practice Theory (Bourdieu, 2010). This conceptualisation of house/home will be used in the thesis to inform and critique current and potential policy drivers for home retrofit.

2.1.3 Housing status quo

UK housing stock consists of many and varied types of dwellings and tenures, with a key feature being that there is a large proportion of it that is old (Victorian in era) and that may be considered hard to treat from an insulation perspective.

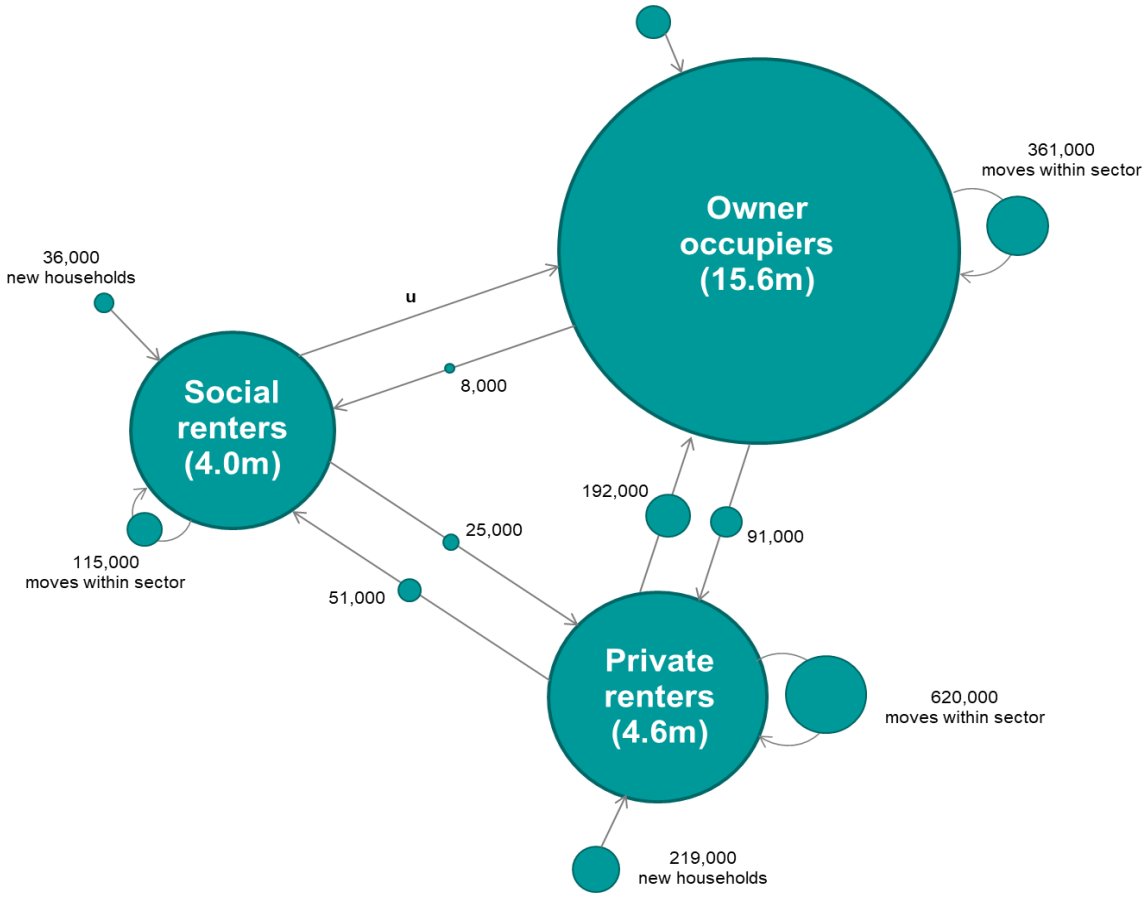

Figure 2.3 Annual household moves by tenure, 2021-22 EHS Headline Report figure 1.10 (DLUHC, 2022)

The numbers and arrows in Figure 2.3 indicate households' movements within each sector in the 12 months before interview. The values in the 'tenure' circles indicate the total number of households by tenure for 2021-22.

As shown in Table 2-2, 53.1% of UK housing stock is pre 1964 with over a third being pre-war, indicating lower thermal energy efficiency. 54.4% of properties are detached or semi-detached indicating a larger heat loss perimeter and therefore a larger heating load than others. 37.7% of homes have a floor area over 110m^2 indicating that they are most likely detached or possibly larger semi-detached houses or bungalows - again these would have a greater heating load requirement due to the large heat loss perimeter and likely be of an older construction (perhaps Edwardian). Finally, suburban residential zones make up 58.4% of all housing and, because homes are spaced apart, localised heat networks and infrastructures would have significantly higher installation costs than for terraced or high-rise neighbourhoods.

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converted flat	2.1	13.7	4.6
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70 to 89 m^2	25.8	27.4	26.1
90 to 109 m^2	19.0	12.5	17.6
110 or more m^2	37.7	10.1	31.6
type of area			
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other urban centre	18.3	32.1	21.3
suburban residential	58.4	46.9	55.9
rural residential	12.4	4.6	10.7
village centre	4.9	3.6	4.6
rural	3.0	2.4	2.9

With new builds only being manufactured at the rate of 139,200 per annum since 2010 (Patemen, 2022) they are not considered to be significant to addressing the scale of the carbon emission reduction challenge as compared to retrofit of existing properties.

As Table 2-3 shows, 99.5% of all occupied houses or bungalows have a private plot and control what happens with that site. Owner-occupiers, who have an average tenure length of 24.5 years, make up 64.3% of all tenures, of which 54.1% of those are owned-outright with no mortgage (DLUHC, Annex 1.1, 2022).

Table 2-3 Dwellings plot type data by tenure type (DLUHC, Annex 1.2, 2022)

occupied dwellings

	Private plot	**Shared plot only**	**No private plot or shared plot**	**all dwellings**
				thousands of dwellings
dwelling type				
house or bungalow	18,246	66	32	18,344
Flat	1,062	3,089	1,245	5,396
tenure				
owner occupied	14,109	987	359	15,455
private rented	2,724	1,014	587	4,325
social rented	2,476	1,154	331	3,961

2.1.4 Housing and Energy Performance Certificates (EPC)

An EPC (Crown, 2013) is a legally valid report done using dedicated surveying software being completed by a trained and certified surveyor (BRE Group, 2022) and which reports the energy efficiency of a property, its fabric and in-use performance. The present EPC system came into force on the 9th of January 2013. Survey data is combined, producing a value between 1-100 that has colour coded banding - A (green) to G (red) - evidencing likely property energy efficiency and providing potential efficiency upgrades for the owner to consider (Elmhurst Energy, 2022b). The data is presented in two halves, the fabric of the property itself as one and the “in-use” performance that would include services such as heating, lighting, hot water etc.

The average EPC rating for British dwellings has improved from 45 in 1996 to 66 in 2021 but has plateaued in recent years (DLUHC, 2022). This increase was “largely driven by improvements in the prevalence of the most common energy efficiency measures across

the stock, particularly insulating cavity walls, boiler upgrades from standard to condensing combi and full double glazing" (Ibid.) The government published a report on building towards net zero (BEIS, 2019, page 14) stating that there had been:

"a steep decline in renovation rates over recent years. This can be explained in part by a decrease in the availability of "low-hanging fruit", with the remaining potential for energy efficiency interventions becoming more expensive, but also by a drastic cut in public funding for energy efficiency"

EPCs are used in policy as catalysts to retrofit. For example, EPC improvements are used for the Private Rental Sector to define minimum energy efficiency standards required to rent out a property (BEIS, 2020b). EPC assessments are also used in conjunction with schemes such as the Boiler Upgrade Grant and ECO4 (Ash, 2023). Evidence from industry has suggested that EPC ratings were not initially fit for purpose (Entwistle, 2022), leading to a consultation called "Energy Performance Certificates for Buildings – Action Plan" (BEIS, 2020c) with an update being rolled out in June 2022. The present system can now assumedly be believed as being fit for purpose by the government for meeting the challenges of Net Zero.

Elmhurst Energy is a main accreditor for the EPC industry, and it notes a key systemic challenge built-in which skews the results and so affecting the intended consumer responses desired by the government (Elmhurst Energy, 2022). This is that the rating achieved, and subsequent products recommended, are based on cost factors relating to the type of fuel sources used. "Currently if the property uses main gas, it will score higher on the energy efficiency rating than a property which uses electricity. This is due to mains gas being cheaper per p/kWh than electricity." (BEIS, 2020). As such, an ASHP is not a standard recommended upgrade for a gas boiler within the list of improvements provided.

There is value in noting the aforementioned discrepancy created using an "average household" for the predicted in-use performance versus actual usage. Variance may exist as well as a performance gap which often occurs between theoretical modelling, averaged predicted consumption and real-life usage (Few et al., 2023) and this can occur due to any comfort taking.

The present Standard Assessment Procedure (SAP) 10.2, Table 12 (BRE Group, 2022) has gas listed as 3.64p per kWh and 0.210 $kgCO_2e/kWh$ with single rate electricity as 16.49p per kWh and 0.136 $kgCO_2e/kWh$ showing a lag in current data. Furthermore, this

still does not consider unique regional supply data which are provided daily by National Grid Energy System Operator and accessed via the Carbon Intensity API (Lyndon Ruff, 2023) which showed that in 2022 the East Midlands region's average carbon intensity was 0.293 kgCO2e/kWh for electricity, not 0.136 $kgCO_2e/kWh$ for the national average. Hence any decision-making that is based on a regional area may lead to skewed choices if this local data is not considered. The data has been accessible daily for some years now and it is questionable as to why daily update does not occur in order to provide accuracy on a regional basis.

These discrepancies clearly mean that both the financial and the predicted environmental impacts suggested in the current EPC system may be inaccurate and do not fully encourage a transition to a low-carbon heating source. This challenge is further exacerbated by gas also being considered the better cost value option for the property in use within the EPC calculations (Entwistle, 2022).

A complimentary system to support and enhance the EPC is the Domestic Operational Rating (DOR) (Lomas et al., 2019). This "generates metrics that indicate the absolute and relative energy demands, greenhouse gas emissions and energy costs of homes" allowing a more nuanced in-use understanding of a property, performance, carbon footprint and running costs. With the increasing roll out of smart meters with half-hourly data available this could provide the real-world data that has to-date been missing from any decision-making models employed by the HRP or SME when considering energy efficiency upgrades. The benefit of this is highlighted by the fact that many new technologies can use time-of-use tariffs to enhance their financial value and carbon saving potentials, in addition to addressing grid capacity concerns.

Whilst Table 2-1 shows that there exist many and varied houses that might benefit from an individualised approach, it is possible to also gain insight from understanding what many consider a typical home (including policy makers), which may affect the policy ranges they support.

An averaged UK outright-owned dwelling is considered by DLUHC (2022) as a semi-detached 3-bedroom property of between 70-109m^2 that has an EPC rating of D or worse and whose occupant(s) are over 65 years old (62.8% of all outright-owned dwellings have retirement age HRP) (Ibid.), have lived there for almost 25 years and are beholden to no-one in terms of property rights nor access to. They have an average income of £30,850 p.a.; however, if you were to exclude the top banding, constituting 15.3% of the data, then

this drops significantly to £23,081 p.a. (MHCLG, 2020). This evidences the disparity of income available to the wealthier households compared to others.

Whilst using averaged numbers can give a simple metric for policy makers or statisticians to analyse a group with, the sheer breadth of factors related to an exemplar HRP decision-making paradigm makes a single number redundant (Lee et al., 2013). The average is just that, an average, as any standardised distribution curve would show. In this data set, as shown in Table 2-1, the semi-detached house form constitutes only 28.7% of properties and by definition, 3-bedroom ones are a subset of this. As such whilst being most prevalent, they cannot be representative of all. This may recommend greater importance placed on either refining this into varying averages for different sub-sectioned personae rather than consideration as an all-inclusive HRP, or research into how it is possible to remove the use of averages in modelling altogether when engaging with the residential sector. This approach would be stronger as the needs, wants and desire of householders are personal and their emotive responses to any policy will be based on these.

2.1.5 Retrofit policies

Table 2-4 provides a summary of key relevant policies, white papers and regulations that relate to the housing market in the UK with breakdown by type, numbers of properties and targets and followed by comment on progress towards these.

Table 2-4 Current relevant energy efficiency policy paradigm affecting the HRP

	New build	**Retrofit existing**			
Aim	Targeted emission rate	EPC band C by 2035 where practical, cost-effective and affordable			
Sector	Private and Social	PRS	Social/L.A.	Owned	
Policy/Paper	Future Homes Standard (Crown, 2023)	MEES (BEIS, 2020) Private Rental Sector	Energy White Paper (BEIS, 2019)	Heat in Buildings Strategy (BEIS, 2021)	
Tenure type	All homes Circa 140,000 p.a.	All homes 4,325,000	All homes 3,961,000	Mortgaged 7,146,000	**Outright owned** **8,415,000**
Current targets and regulations	30% emission drop from previous standards to 2025 – Part L	C for 2025 New tenants	C for 2030 if in Fuel Poverty	C for 2030 *voluntary by lenders	**Discretionary**
Stretch targets	75/80% drop from previous (FHS) from 2025 onwards	C for 2028 Existing tenants	C for 2035	Possible future regulations if required	**None**

When comparing the disenfranchised private renter to the HRP, a private renter is more likely to live in a Hard-to-Treat home, that does not meet the Decent Homes Standard,

than a social tenant or the HRP (DESNZ, 2023). Currently governance has regulations applied to landlords (MEES) (Ibid.), yet at the same time has policies and incentives that only encourage the wealthier and more empowered private owner to act without any regulation. This is an issue, as the HRP may be more disengaged, as they may perceive they are in a comfortable situation already and do not wish to change and therefore potentially need greater encouragement and support.

To hit retrofit targets via replacement of all old housing stock by new-build (even if practical and desired, assuming no population growth and so no additional stock needs) would take 169 years with an average of 139,200 built per annum since 2010 (Patemen, 2022). Achieving a C-rated retrofit target in 2035 would require current rates of renovation increasing nine-fold compared with average trends since 2010. In 2021, 463,300 measures were installed via ECO, Green Deal, Green Homes Grant and LAD Flex against a built housing stock of 23,847,000 (BEIS, 2022). At present, the country is far behind stated delivery rates required to reach statutory targets and is historically challenged to know the data concerning costs and savings (Environmental Audit Committee, 2020) with insulation upgrade rates being 95% less than in 2012 (BEIS, 2019) and current policy gaps meaning that one third of UK housing stock has no requirement to upgrade their energy efficiency, as seen in Table 2-4.

Figure 2.4 provides a visual representation of the delivery paradigm as discussed so far and pertaining engagement flow with the red lines indicating barriers and a key beneath to the categories. Whilst the figure shows barriers to the HRP from both the SME market side and the agencies designed to support them, they are not fully blocked – there are gaps that still allows them to partially connect. The challenging politics of mandating people to change their own homes may go some way to explaining the regulatory gap in Table 2-4 above shown under the “outright owned” section.

Initially when looking at Figure 2.4 below it appears to be an interaction between government, delivery partners and the end-user HRP. However, characterising the retrofit scenario as an interaction between householder and SMEs that is then contextualised by a legislative and funding environment (i.e., governance) provides a simple way to consider this system.

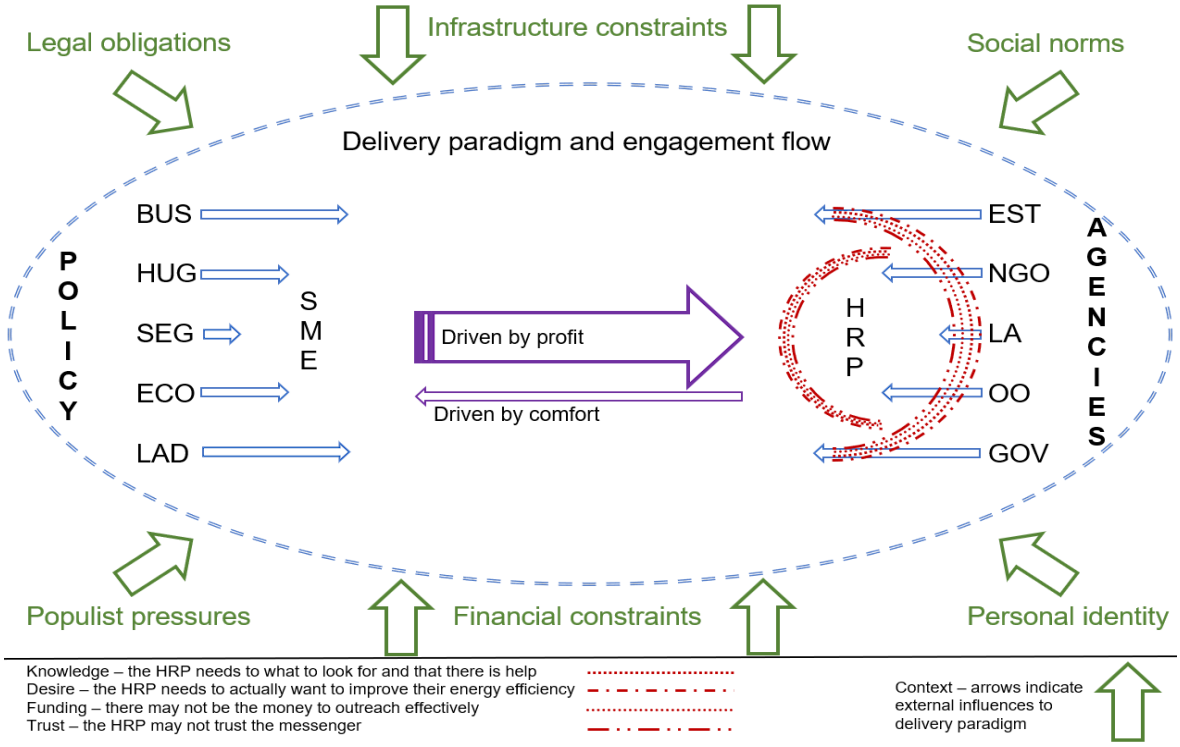

Figure 2.4 Representation of information flows, barriers and pressures

BUS – Boiler Upgrade Scheme
HUG – Home Upgrade Grant
SEG – Smart Export Guarantee
ECO – Energy Company Obligation
LAD – Local Authority Delivery scheme
EST – Energy Saving Trust
NGO – Non-Governmental Organisation
LA – Local Authority
OO – Other Owner-Occupiers
GOV – Central Government.

The whole construct has multiple external drivers (indicative not exhaustive) as indicated by the green arrows on the periphery. Whereby acting as a gestalt there may be emergent properties which due to emotional aspects and influences on the HRP side may cause stochastic outcomes with the present level of understanding. One key area this thesis focusses on is the HRP being surrounded by barriers both between themselves and the SME (chosen delivery arm of governance) and the other supporting entities providing data to support their decision-making. Recognition is given to the idea that without an empowered HRP feeling both a sense of agency and a desire to change (Bandura, 1977), policy engagement and consequent delivery may struggle without regulation requiring the HRP to engage.

2.1.6 Previous policies and their success

Before examining the previous decade of policy landscape, there is value in recognising the current governance paradigm – one of “Shared Values” (Porter & Kramer, 2011) and

to ask why this was chosen. The “Shared Values” model (applied to retrofit) promotes the concept that if governance sets a clear policy landscape supporting the homeowner in retrofit, then businesses will find the best route to market through finding “Shared Values” solutions supported by and benefitting all stakeholders i.e. a “win-win scenario”.

Current and previous policy measures to address domestic energy efficiency retrofit can be viewed through the Shared Values lens, considering if this paradigm could lead to successful delivery. These include the Energy Company Obligation (ECO) 2 or 3, the Green Deal and the Green Homes Grant (BEIS, 2020d).

The Energy Company Obligation (Ibid.) has been the most successful scheme to-date in terms of retrofit measures installed as it has been the longest running. However, as previously noted, in terms of meeting the desired targets for installed insulation measures, such as cavity wall or loft insulation, a woeful lag exists to target (Environmental Audit Committee, 2021). A key cause for this outcome is simple, the SME retrofit installer companies have picked the low hanging fruit, and now it is harder to both find and then gain funding for installations at a rate that allows an easy and healthy profit (BEIS, 2019). Therefore, they have shifted their targets to maximise margins and profits away from demand reduction to elsewhere such as replacing broken gas boilers (25% of all ECO3 measures installed) and other heating measures such as thermostatic radiator valves (31% of all measures installed under ECO3) (BEIS, 2022). By doing this, they are technically still able to exploit the funding available but it does not necessarily create large drops in carbon emissions in the longer term compared to improving insulation, as was the original policy intent. Instead, it potentially locks the homes into a cycle of future fossil fuel usage with continued high energy load demands from an inefficient heat loss perimeter.

Another challenge comes from the withdrawal of more universally applicable scheme elements such as the Carbon Emissions Reduction Obligation (CERO) (Ofgem, 2022) and the more focused (in geographical terms) but universal schemes such as Carbon Saving Community Obligation (CSCO) (Ibid.). What remains is accessible to such a small amount of the population that SMEs have a harder time accessing these potential customers. As such, even though for the end user the desired product is primarily delivered free of charge, the SMEs may not be able to find them nor potentially be willing to try harder (if it is no longer as profitable). Essentially this paradigm acts as a built-in engagement brake.

These policies can be contrasted with the more HRP-focused policy areas, such as the Green Deal (DECCb, 2012) and Green Homes Grant (BEIS, 2020d). Whilst there were many and clear administration issues around the schemes (PAC, 2021), the key difference was that there was very little uptake achieved, and the total measures delivered were significantly lower (DESNZ, 2023). The DESNZ data reports just under 46,000 Green Deal and Green Homes Grant installations compared to around 3.6 million measures into 2.5 million homes under ECO. This naturally raised questions around the preferred policy choice and delivery mechanisms of primarily fully subsidised retrofit measures (ECO) versus partially supported measures (GHG) or loans (GD) as echoed in the recent critical National Audit Office (2021) review of the Green Homes Grant. With ECO having always had a focus on low income, hard to treat, fuel poor or benefit-recipient homes, the question of equity and engagement was key – why should owner-occupiers engage in something they may not clearly see the benefits of, when others may be receiving measures for free, yet they had to pay partially or fully?

Good examples which contrast to the Green Deal are the Feed in Tariff (FiT) (OFGEM, 2021) and the Renewable Heat Incentive (RHI) (DECC, 2015) schemes which previously ran in the UK. In the Grean Deal, the HRP was expected to borrow the money at a relatively high variable interest rate and then pay back the cost over term from savings made due to the measures financed. Interest rates started at 6.98% and ranged up to 10.3% (Which?, 2022), although with current bank rates (May 2023) that would be indicatively circa 11.98% to 15.3% if started now. With the FiT and RHI, the HRP was expected to pay for the measures from their own funds. However, there was an agreed rate of return for them based on expected production of clean energy produced – either electrical or heat. These return rates were, certainly in the case of FiT, very generous at first and then later reduced for new applicants. The principle, however, remained the same – a clear reward for investment and unlocking private funds. This approach clearly worked, particularly for solar, with those able to afford the investment being financially motivated, as the product was effectively sold as a financial product by the installation industry. Between April 2010 - 2019, 1,014,576 MCS registered PV installations qualified for a FiT payment (MCS, 2023) and between Jan 2015 and Dec 2022, 113,125 registered ASHP installations qualified for an RHI payment.

A recent report commissioned by BEIS identified capital expenditure as a key challenge (Basis Social, 2021). Thus, whilst clearly there existed an appetite for the technology (particularly solar), only some could afford the outlay, even if their home was eminently suitable. As such, there exist learning opportunities for the government in combining the

two funding principles of the Green Deal and the FiT. For example, a low interest scheme that was accessible and provided a clear financial reward for installing the measure could be offered, rather than just covering the cost of an investment plus interest accrued. Further research into finding the 'sweet spot' of both, such as the correct funding method combined with the value of the correct financial motivator, may well be required. This is particularly an issue as currently no government supported marketing exists in terms of lifestyle benefits or *perezhivanie*, a concept that refers to the householder's emotional and cognitive experience, as defined by Bobrova and Papchristos (2023). Financial benefits are really the only other alternative being presently supported for promotion by governance entities.

The uptake figures of recent schemes therefore show significantly higher uptake where the HRP feels a direct financial benefit –. This split in numbers may be construed that leaving the definition and marketing of potential benefits to the SME sector without a clear understanding on the HRP side of what non-logical and non-financial benefits exist could well be considered a blind spot in the current engagement policy.

Many previous policies, particularly in the owner-occupier sector, have clearly failed to deliver. Questions therefore arise around why schemes have been rolled out and allowed to continue with very poor uptake. For example, a report into the failure of the Green Homes Grant scheme stated that this was a rushed policy roll out that was not thought through properly, nor conforming to best practice (e.g. following Green Book (HM Treasury, 2022) guidance) before release (PAC, 2021). The average GHG voucher was costed at £6,606 but with £1,063 going to the external administrator company (BEIS & National Audit Office, 2021) and a profit margin for SMEs delivering the service, the actual value of delivered material products would likely cost around half that of the voucher (Crown, 2016). This situation highlights that the delivery approach linked to the 'Shared Values' philosophy can be criticised for offering poor value for public money when combined with SMEs's desire to maximise profit through voucher-based grant funds.

Another key issue to consider for schemes to promote carbon reduction retrofit is the need to have a just and equitable transition. The International Labour Organisation (2015) state that "a just transition means understanding that some individuals and groups are already marginalised or have lower capacities to absorb new shocks; any strategy should protect or buffer these groups by ensuring adequate social protection measures are in place". This contrasts with those that argue that "nothing justifies postponing… the decarbonisation imperative" (Atteridge and Stambo, 2020).

The issue of equity, or perceived equity, is potentially a significant issue when viewed from the perspective of the HRP, including considering if and how they are empowered or even enforced to take action. At present the issues of justice and equity are not normally referenced by His Majesty's Government when it comes to the Net Zero Transition unless also talking about fuel poverty. An example of this may be found in the recent report for the Committee on Fuel Poverty by The Centre for Sustainable Energy (2024) which collates several research papers on the subject. However, outside of this area when specifically considering the HRP under research, there is a dearth of research and engagement relating to these issues and this demographic.

2.1.7 Present policies targeting the HRP

At present (March 2023) if a HRP searched online for energy grants for their home then the "Help to Heat" webpage (DESNZ, 2022) is a likely landing site for a comprehensive list of current schemes. Table 2-5 offers a summary guide of key factors per scheme from a householder perspective.

As shown, from the HRP perspective this does not mean that they necessarily qualify for some of the schemes as most have benefits-testing and target fuel-poor homes. How inclusive is this list for the average HRP? The latest fuel poverty detailed tables recording the Low-Income Low Energy Efficiency indicator (DESNZ, 2023, Table 19) shows that of the 24.35M UK homes the outright-owner HRP in fuel poverty makes up only 2.4% of the housing stock. Specifically, only 7.6% of all outright-owners were fuel poor at the time of the data collection (DESNZ, 2023), updated on the 28th February 2023. As such they face exclusion from most schemes and are also unlikely to qualify for ECO as most will not be on the appropriate pension credit benefit.

Table 2-5 Summary of present policies relevant to the HRP

Scheme name	Help offered	Targeting	Eligibility criteria
Boiler Upgrade Scheme[1]	£5/6000 towards total cost if criteria are met.	Owner Occupied, private rentals, some self-builds. NOT social housing.	Must replace fossil fuel or electric heating systems, has an EPC if not a self-build. Insulation recommendations in the EPC are met.

LAD[2] – Local Authority Delivery Schemes – on gas	Variable depending on Local Authority priorities.	Low-income households heated by gas.	Variable – many are benefits based and have the LILEE[3] criteria applied.
Home Upgrade Grant – off gas	Variable depending on Local Authority priorities.	Low-income households off gas.	Variable – many are benefits based and have the LILEE criteria applied.
Social Housing Decarbonisation Fund[4]	Variable but aimed at maximum value for EPC rating achieved.	Social Housing below C rated EPC.	Dependent upon where the Social Housing owner wishes to deploy.
Energy Company Obligation (ECO)[5]	Insulation work or help with repairing a boiler, other heating upgrades e.g., thermostatic radiator valves.	Benefits driven and are Owner-Occupiers or in private rental properties.	In receipt of certain benefits & if an owned property must have EPC D or lower, if a rental must be EPC E or lower.

(OFGEM, 2021) Boiler Upgrade Scheme: Installer guidance v1.0

[2] (DESNZ, 2022) Sustainable Warmth Competition - successful local authorities

[3] (DESNZ, 2023) Fuel Poverty Methodology Handbook (LILEE)

[4] (DESNZ, 2022) Fuel poverty detailed tables 2023 (2022 data)

[5] (OFGEM, 2022) Energy Company Obligation (ECO) schemes

The only scheme with guaranteed access is the Boiler Upgrade Scheme whereby, if suitable, they may pay between £9,000 to £15,000 on average to upgrade to an ASHP. As noted previously, their EPC may not actually recommend this for them. By doing so they may qualify for £5000 grant towards these costs; ground source can receive £6,000 but the prohibitive cost and physical unsuitability for this system in most homes makes it a very unlikely technology. Comparatively 11,328 domestic GSHPs were installed between 2015 and 2022 inclusive compared with 97,560 ASHPs over the same period (MCS, 2023). This contrasts with the 1,700,000 gas boilers installed in the UK in 2018 alone (BEIS, 2022), equating to 13,600,000 fossil fuel systems compared to 108,888 heat

pumps over the same period. This means that less than 1% of all heating systems installed were “clean”, indicatively demonstrating a lack of attraction to the average HRP.

The mortgaged sector of homeowners is also relevant for this thesis, as they eventually will become the outright owner HRP under research. Presently there are no more specific policies nor regulations relating to them around energy efficiency other than those listed above, though it is important to note there is still further discussion and research occurring in the green finance sector (DESNZ, 2023). The Heat in Buildings Strategy (BEIS, 2021g) has proposed setting “voluntary improvement targets” to achieve an average of a band C EPC across their loan books by 2030. However, the BEIS (2021) consultation on energy efficiency and lending, when considering current strategies, stated:

“It is acknowledged that individually, and in the absence of either regulation or extensive provision of funding, the aforementioned options are unlikely to significantly improve the energy performance of our existing housing stock at the rate required.”

This nods to the concept of “qui custodiet ipsos custodes?” (colloquially known as “Who will watch the watchmen?”) as many previous self-regulating schemes have had dubious prior success when financial interests are involved. Banks are unfortunately not viewed necessarily as upstanding pillars of the community by some, with only 22% of people believing that the leaders of banks would tell them the truth (YouGov, 2023), and as such the consultation goes on to sensibly define an option to move to mandatory targets with regulatory enforcement via financial incentives – specifically penalties linked to the cost of lost carbon savings (BEIS, 2021).

How the roll out may occur to incentivise the mortgagee has yet to become clear as large-scale deployment of green loans encouraging energy efficiency has not occurred to-date and they are not necessarily cost-effective for the mortgagee. Money Savings Expert (Sproson, 2023) states “we've found very few green mortgage deals offered by high-street lenders that can't be substantially beaten in interest rate by normal, non-green mortgage deals on the wider market.” Since one of the key purposes of a mortgage is to defray the cost of borrowing (Maxwell, 2023) by typically offering the best possible rate for the applicant (from their perspective), this may indicate that they may not be so attractive as the government desires. Also, there may be an element of greenwashing occurring (in that these are not genuine offers, and the customer is paying for their own incentive) potentially confirming that government may be right to consider the option of punitive penalties as a backstop.

As previously noted, there is a strong link between age and home ownership, with outright owners being older. This also has a link to Conservative voting patterns (McDonnell & Curtis, 2019; Conservative Party, 2022) and home ownership (Barton, 2020) with outright owner-occupiers being primary voting stock for the current government. One way to look at the whole system may be to consider that policy makers have elaborately designed the current transition pathway to avoid upsetting this important voting bloc as exemplified in the language used in the Heat and Buildings Strategy (BEIS, 2021d) concerning the HRP:

"…in order to reach Net Zero in a cost-effective consumer-friendly way… No-one will be forced to remove their existing boilers… This would be in line with the natural replacement cycle".

Instead, by requiring younger mortgage applicants to shoulder the load of improving the housing stock they avoid upsetting their core voting bloc whilst still meeting current targets by 2050. This is mainly due to the average age of the HRP being 69 years old; most of them will have died before this time arrives with median age at death being 82.6 years for men and 86.1 for women and the mode being 86.8 and 89.3 respectively (Buxton, 2021). As such, the property will most likely have been passed to family members who will mostly sell rather than move in (Brown, 2021; MFSUK, 2023). Whilst theoretically, society could wait for a younger generation to inherit the properties and notionally still meet the 2050 deadline, this may take time to reduce emissions that it would be preferable not to waste since a typical HRP statistically has circa another 17 years to live (Buxton, 2021).

Ultimately, when all added together this leaves approximately a third of UK housing stock stranded with no incentive or support for taking personal action, nor requirement or push to act on energy efficiency in a timeframe which supports the meeting of the UK's Nationally Defined Contribution targets (BEIS, 2022). In 2021, a House of Lords report (Dray, 2021) commented that the government is "not on track to meet its targets outlined by the fourth and fifth carbon budgets… The committee said that the Government will have to "introduce more challenging measures" if the UK is to meet future carbon budgets and the net zero target for 2050." The initial key challenge for the retrofit industry and housing stock is the lack of seeding of the industrial requirements to meet the transition targets. If companies cannot see the demand, why should they tool up, create supply chains and train people to meet it when this all incurs cost, reduces profit and provides no current return?

2.1.8 Ten years of progress in domestic clean heat policy – an example

The February 2012 call for evidence launched by the Energy Efficiency Deployment Office, a subsidiary of the Department of Energy and Climate Change (Sartin, 2012) had its results published in the official Energy Efficiency Strategy (DECC, 2012a), which sought to highlight the opportunities and barriers, with the key desired benefits being:

- *Boosting growth and creating jobs in the UK's economy.*
- *Saving households and businesses money on fuel bills.*
- *Creating a more sustainable and secure energy system.*
- *Delivering cost effectively against the UK's climate change goals.*
- *Reducing energy imports.*

The four key barriers at the time were stated as being:

- ***Embryonic markets** – In the absence of a developed market there is relatively little expertise on either the demand or supply side for investing in energy efficiency. This constrains the developing of financial products to support the energy efficiency market and leads to high retail costs.*
- ***Information** - The current lack or absence of clear and trusted data means many individuals do not prioritise energy efficiency investments.*
- ***Misaligned financial incentives** - On a societal level, wider benefits such as a secure energy supply and cleaner air are often not felt (by those making energy efficiency investments and) as a result, the decision to invest is based only on the benefits directly received. Therefore, investing into energy efficiency is not deemed as urgent. Furthermore, landlords are less likely to invest unless they will realise the benefits in monetary terms.*
- ***Undervaluing energy efficiency** - The lack of salience of energy efficiency increases the impact of hassle costs and behavioural barriers.*

Showing a lack of progress, in 2017 – five whole years later - the same government put out another call for evidence addressing effectively the same thing, entitled "Building a Market for Energy Efficiency" (BEIS, 2019a). The stated barriers still unaddressed mirrored those that the Energy Efficiency Deployment Office (created within DECC in 2012) previously reviewed. There was also strong similarity to the recently failed scheme the Green Homes Grant (PAC, 2021) and the resulting feedback of systemic barriers that had yet to be overcome. Now a decade later, the same government still seeks to gain the same benefits and address the same challenges, as may be recognised by the recent creation of the Department for Energy Security and Net Zero (DESNZ, 2022).

A metric of the success of 10 years of policy making may be seen in how well they have achieved the stated desire of improving “embryonic markets”, identified as a key barrier identified in 2012. As almost a decade later the Green Homes Grant was specifically launched post-Covid to further stimulate the market and support even more installations of green products (e.g. the desired target of ASHPs for 2028 is 600,00 installations per year). So, what progress has been made?

When considering the number of MCS registered domestic ASHP installers in England, between 2012 and 2023, licensed to install and access funding for clients (initially the RHI and later the GHG £5000 voucher and now the Boiler Upgrade Scheme (BUS)) it is possible to see the efficacy of a decade of industry support by the present regime (MCS, 2023).

- *In 2012 there were 1,000 MCS licensed installers.*
- *By 2022 there were 1,169 MCS licensed installers.*

This net creation of circa 15 new licensed installation companies per year on average (who may have already been in the industry but just not MCS licensed) suggests the industry is not feeling supported by policy in meeting future targets. Since the Heat in Buildings Strategy’s (BEIS, 2021) launch and the GHG evolving into the BUS between 2022-23 (and its planned expansion to 2028), licensed installer levels have increased to 1258 – a further 89 – which whilst an improvement is still not enough to meet the desired installation targets. This may be summarised as the consequence of a systemic failure of impactful engagement of householders and SMEs over the previous decade.

2.2 Energy efficiency retrofit as a socio-institutional structure

When considering energy efficiency delivery as a complex socio-institutional system one of the key challenges is how to hold such a large, dynamic, and complicated structure in mind yet be able to view the interacting parts uniquely, as a whole system, and potentially as a gestalt. At present there exist challenges to both developing and subsequent review of policy, and later delivery and engagement as an integrated system (Skidmore, 2023). This section examines this system, identifying key areas that the stakeholders interact and work within, and potential outcomes for energy efficiency retrofit.

2.2.1 Energy efficiency policy paradigm

To display the system as a whole, Figure 2.5 provides a simplified example of the three main stakeholder groups, their communication milieus and illustrative examples of their primary drivers and barriers (bounded rationalities). This shows the distinct social groups, their individual communication groups and limited feedback to research/policy makers when a call for evidence goes out. The sense of the HRP being two steps removed from the researchers and policy makers is intentional. The HRP feedback to the SME does exist but only informally, in the sense that the salesperson should be listening to the needs of their client (if only to find their purchasing motivation). All three groups are addressed within this section.

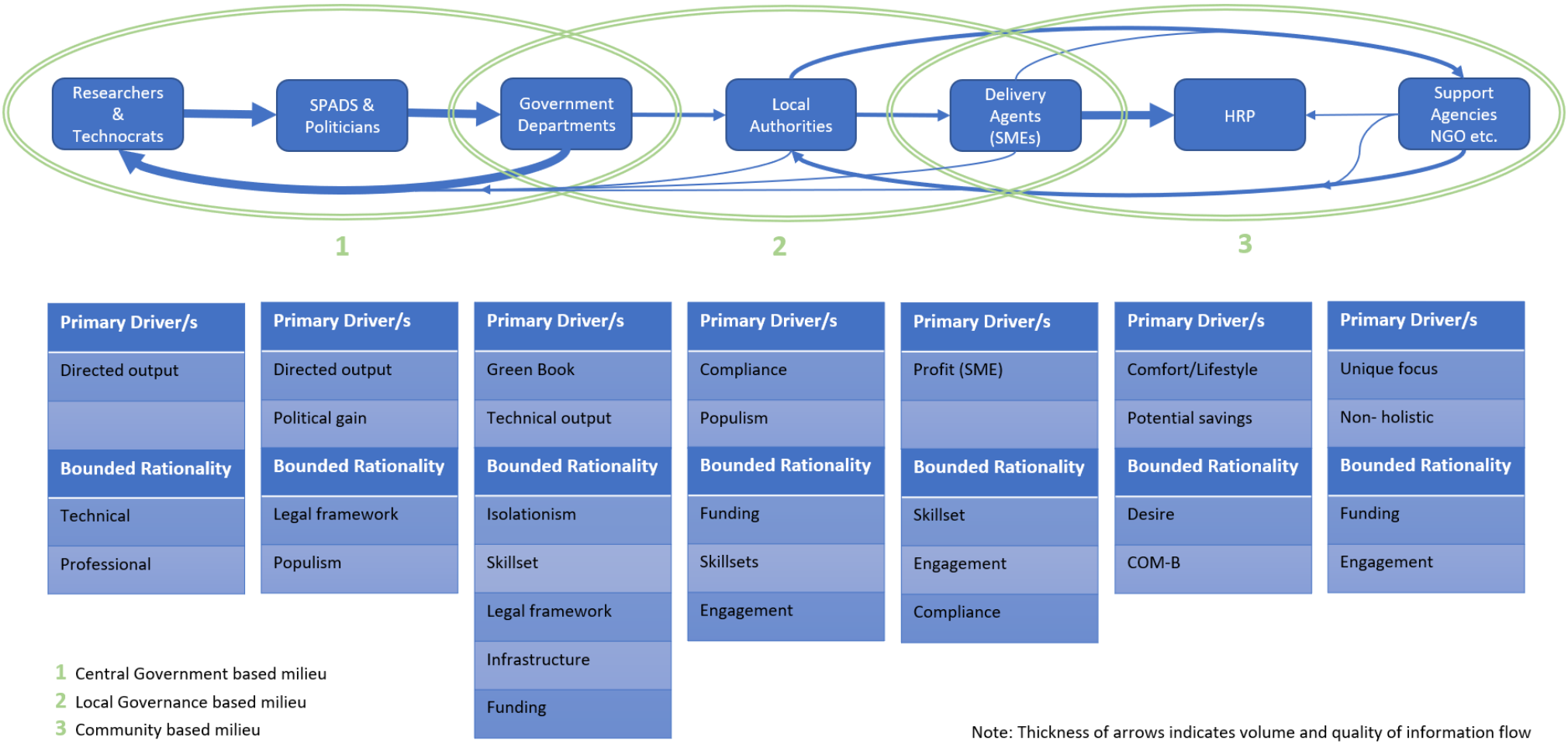

Figure 2.5 Example of policy making social paradigm and drivers

2.2.2 Recent policy making history

Creating a shared vision of a desired future paradigm is critical for allowing a policy to be fully supported by decision-makers (politicians) in relevant departments during both its development and later any ongoing reviews (Ssennyonjo et al., 2022). For the UK this may mean that the Department of Business, Energy and industrial Strategy (BEIS), the Department for Levelling Up, Housing and Communities (DLUHC), the Office for Budget Responsibility (OBR), National Audit Office (NAO), National Infrastructure Commission (NIC), Environmental Audit Committee (EAC) and the Treasury (to name a few) all need to work together at the same time towards an agreed desirable future. This is before the policy goes through multiple stages of review via the House of Commons and then Lords prior to being potentially passed (House of Lords, 2023). Due to this lengthy initial process many policies and associated infrastructure roll outs can take longer than a parliamentary term to enact and evaluate which would increase the chance of a change of minister or even government in this time.

A clearly communicated vision is particularly important as neither the politicians who make the policies, nor the homeowners who are expected to buy into the policy, normally have any granular technical engineering background nor understanding thereof and require support (Stanley, 2023). This can create inter and intra-departmental engagement gaps through incomplete or unreceived briefings within the government itself, and in delivery to targeted end users. The delivery agents (SMEs) are then being left with a challenge to translate potentially fractured policy guidelines into a desirable product wanted by the homeowners but which still meets their own commercial needs and desires. This may be exemplified by DLUHC who control planning (placing restrictions on where an air source heat pump (ASHP) may be installed) but BEIS wanting them as the default retrofit product to replace gas boilers (DLUHC, 2023; BEIS, 2021). In the past there have existed challenges with relevant departments turning up together to scheduled meetings (Environmental Audit Committee, 2021); however, BEIS later took a co-ordinating role across the whole of government to ensure key stakeholders are now represented at official levels in a cross-government strategic implementation group which then feeds into Cabinet committees (BEIS, 2021). The challenge to communication is often further compounded by the rapid shuffling of staff within roles often delaying any progress (BEIS, 2021).

A fractured and disjointed policy creation landscape creates challenges for companies in planning and future investment in training – which is an issue when combined with the relatively small size of the average construction sector SME. The uncertainty, when combined with the rapid rollout and rescindment of energy efficiency schemes targeted at the HRP, as shown in Table 2-6, refers not only to future funding schemes and projects but also existing ones that have been launched which have potentially not run long enough for supply chains and installers to invest in the delivery structure to support them. This very turbulent policy landscape has existed for a decade now and at present there does not seem to be any sign of this changing.

Table 2-6 terminated energy efficiency support schemes

Owner Occupied targeted schemes:			
Name	Measures installed	Period	Status
Green Deal	9,999 live plans	Jan 2013 – 2015	Scrapped
GDHIF	25,487 vouchers paid	June 2014 – June 2015	Scrapped
GHG	39,000 vouchers issued	Oct 2020 – March 2021	Scrapped
RHI	85,492 to date	April 2014 – April 2022	Due to be scrapped*
FiT	994,562 domestic installs	April 2010 – April 2019	Scrapped.

The longer-term pattern of policy failure suggests systemic problems with the policy process affecting HRP buy-in and the subsequent roll-out and uptake of the programs (Committee of Public Accounts, 2021; Environmental Audit Committee, 2021; BEIS and National Audit Office, 2021).

2.2.3 Optimism bias and policy failure

A relevant factor linked to failures of energy efficiency policy may be optimism bias. This phenomenon may vary depending on whether viewed from a personal or from a policy making lens. Personal examples may be “the tendency to overestimate the likelihood of favourable future outcomes and underestimate the likelihood of unfavourable future outcomes” (Bracha & Brown, 2012), or “a cognitive predisposition found with most people to judge future events in a more positive light than is warranted by actual experience” (Flyvbjerg, 2007). It originated from Kahneman & Tversky (1979), within which first comment was made of the “planning fallacy” which was described as “a systematic fallacy in planning and decision-making under which people underestimate the costs, completion times, and risks of planned actions, whereas they overestimate the benefits of the same

actions". This is noted to occur even in the knowledge of experience of having done the same (or similar) task before (Flyvbjerg, 2007). Importantly, in terms of policy creation, this may help explain why poorly thought-out policies are recommended in the first place, compounded with some forecasters and planners "deliberately and strategically overestimating benefits and underestimating costs to increase the likelihood that it is their projects, and not those of their competition, that gain approval and funding" (Ibid.).

Knowledge of, and the effects due to, optimism bias has meant that The Green Book (HM Treasury, 2022) includes the bias as a factor in all costing and timeline plans for national infrastructure projects. The problem, as noted, is not that policymakers do not know of it, rather that The Green Book does not allow for it in terms of end user engagement with policies by citizens. It is mentioned only twice in the whole document with a focus on the methodology of the policy creation process. A key example of how The Green Book actively misses the issue of irrationality in policy engagement is in the glossary of "widely used words as they are used in The Green Book" which defines "A Policy is a statement of intent that is implemented through a procedure or a protocol and a deliberate system of principles to guide decisions and achieve **rational outcomes**". Furthermore, that during the policy development process, when establishing a Longlist of choices before the whittling down process that "Longlist appraisal must be based on **evidence** and **rational assumptions** with **objective support**" (HM Treasury, 2022).

This phrase makes it clear that at this stage of policy development no allowances are made for the messy, complicated, irrational and dynamic motivations of the policy end users. Whilst hard to model, if this were included, it could provide much needed data at this stage. The omission excludes these variables being allowed for in any chosen future outcome if following The Green Book.

Another reason policy makers consider engagement less at the start concerns any infrastructure plans' roll out design; this is often via corporate tender or an agency such as Highways, and both are considered an internal/external client, which removes the engagement problem for the policy maker as they sit one step back up from the delivery process. The point was addressed in Table 2-4 (Energy efficiency policy making paradigm) which showed the perceived disconnect between social milieus. Therefore, as most policy is made using economic forecasting it may be reasonable to assume application of standard Rational Choice economic utility theory (Green, 2002) by the economists making the forecasts. Through this, they assume the decision-makers (in the delivery businesses) are all acting rationally for maximum utility in economic terms – be it

in terms of cost, return on investment (ROI), or some specified social utility benefit they are contracted to provide – and so will their ultimate clients, the HRP.

However, when the end user is an HRP, and not a rational 'Econ' (Thaler, 2016) as a person maximising utility in decision-making), there is a gap in the policy planning and delivery process leading to unexpected outcomes in areas such as predicted scheme uptake by the end user; the reason for this is that they are Humans not Econs (ibid). As such, pertaining to policy creation and roll-out they need to be viewed from multiple angles, as theoretical rational economic maximisers, as irrational individuals, and as community members acting in a social and cultural context (Vergragt & Brown, 2012). From a behavioural economics viewpoint, dramatically different and emergent end results may occur if the persona response (Human) is not also modelled into the system rather than just the simpler character (Econ) (Kahneman, 2012). It may be understandable that traditional economists and civil servants who specialise in infrastructure may not include the dizzying array of personal emotional motivators (both good and bad), nor the scale of their impact, which will affect the HRPs choices. This is despite the fact that with behavioural economics, "science has finally discovered that …in the economy of the brain, emotion is the currency" (Robinson, 2013).

2.2.4 Language, trust and engagement

Specialised language or jargon is the condensation of information occurring within teams (Yasuoka, 2015) and is a key item to consider for this thesis. By its very definition this jargon can exclude people from full understanding and appropriate usage of the information in a report without prior specialist knowledge in the area or if the jargon created by others had poor communication.

This is as true of Ministers as of the HRP; if the language used is not appropriately targeted and meanings explained, then a risk exists for unintended consequences. Ministers, however, could access support as they desire (Stanley, 2023) often with up to twelve or more staff assisting them and briefing them. Simple, unified language that can provide a publicly shared vision may well be a required policy outcome for HRP buy-in (Skidmore, 2023), but this may potentially be left to the SME delivery agent under the Shared Values Model (Porter & Kramer, 2011). However, SMEs do not have Ministerial resources to fall back on for explanation either of the data set itself, how to enact the policy best under current regulatory guidelines, nor how to best market it. Language, meanings, and discourse matter. In delivery terms this may result in what is perceived as the low hanging fruit being picked first by the SME for best profit, missing the harder to

engage sections of the market. A decade of policy change and stop-start energy schemes (Public Accounts Committee, 2021, pg. 5), may explain why the view exists within SMEs to get what they can, whilst they can, as they may not trust policy and the marketplace it influences to be stable for the long term.

Trust is important both for the HRP and the SME; where they place their trust and how much of it, has significant impacts on buy-in and likelihood to act, affecting whether they feel a sense of agency. When considering trust as a concept, having the right messenger has been understood as holding value by marketing departments worldwide whether for healthcare in the recent Covid crisis (NatCen Social Research, 2021; Shen et al., 2023) or for energy retrofit schemes such as the Green Deal (Gillich et al., 2016). Important government policy announcements and public engagement may benefit from being more aware of this consideration. A YouGov poll conducted for Sky News during the recent COVID crisis has shown clear examples that citizens trust independent scientists and not-for profit delivery agents rather than politicians or mainstream media that may have political, financial or other vested interests (Coates, 2020).

In the UK, the government is generally not a trusted messenger by the electorate (NatCen Social Research, 2021) with on average only 1 in 5 people trusting politicians to put national interests above their own, whereas Prof. Chris Whitty or Sir David Attenborough are good examples of independent experts trusted to engage the public. The relevance for energy efficiency is highlighted by a recent report (Environment and Climate Change Committee, 2023) which stated that “people will not make choices to support the achievement of climate and environmental goals unless we are engaged effectively, understand the rationale for actions, and policies enable these to happen”. This may suggest further research into whether this principle of trusted messengers for engagement would continue over into the area of energy efficiency.

Ideally future research may well be linked to a more bespoke user-led design process compared to previous methods which were often third-party solutions delivered by certain approved SMEs that people are offered to either accept or decline – however, one size does not fit all (Long et al., 2014; Qureshi, 2021). A user-led design process could contribute to an endowment effect, a sense of control and personalisation of preferred (needed) support for individually desired outcomes. Without this, due to the profile of the HRP, this may suggest the creation of a public awareness campaign like the 1970-75 road safety information films “Clunk Click, Every Trip” (Department for the Environment, 1971) and the Green Cross Code (National Road Safety Committee, 1975) but created within

(for example) the “MINDSPACE” Framework of behavioural science principles (Smith et al., 2022). These may well look to promote the benefits of improved domestic energy efficiency such as comfort, perezhivanie (Bobrova & Papchristos, 2023), improved health prognoses (Galvin & Sunikka-Blank, 2017), or longer lifespan (Braubach et al., 2011), in addition to the more traditional marketing areas of potential financial benefits.

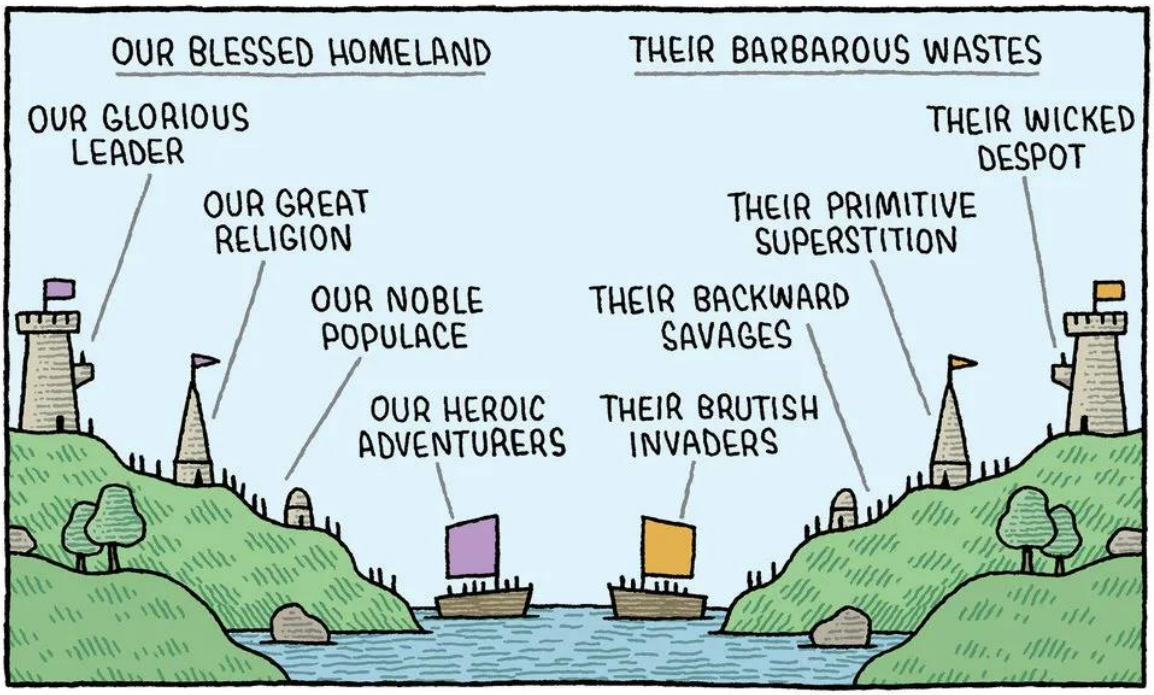

Figure 2.6 Our Blessed Homeland (Gauld, 2015)

Relevant issues for engagement are trust, tribalism (“them and us” thinking, e.g., Apple™ phone products or Android™, illustrated in Figure 2.6), communities of practice and communication (Goulding et al., 2013; Winch, 2020; Greenberg, 2014).

Figure 2.7 summarises key aspects of the discussion so far and visualises the current delivery paradigm, including the need for a ‘Trust Bridge’ to bridge the gap between SME and HRP.

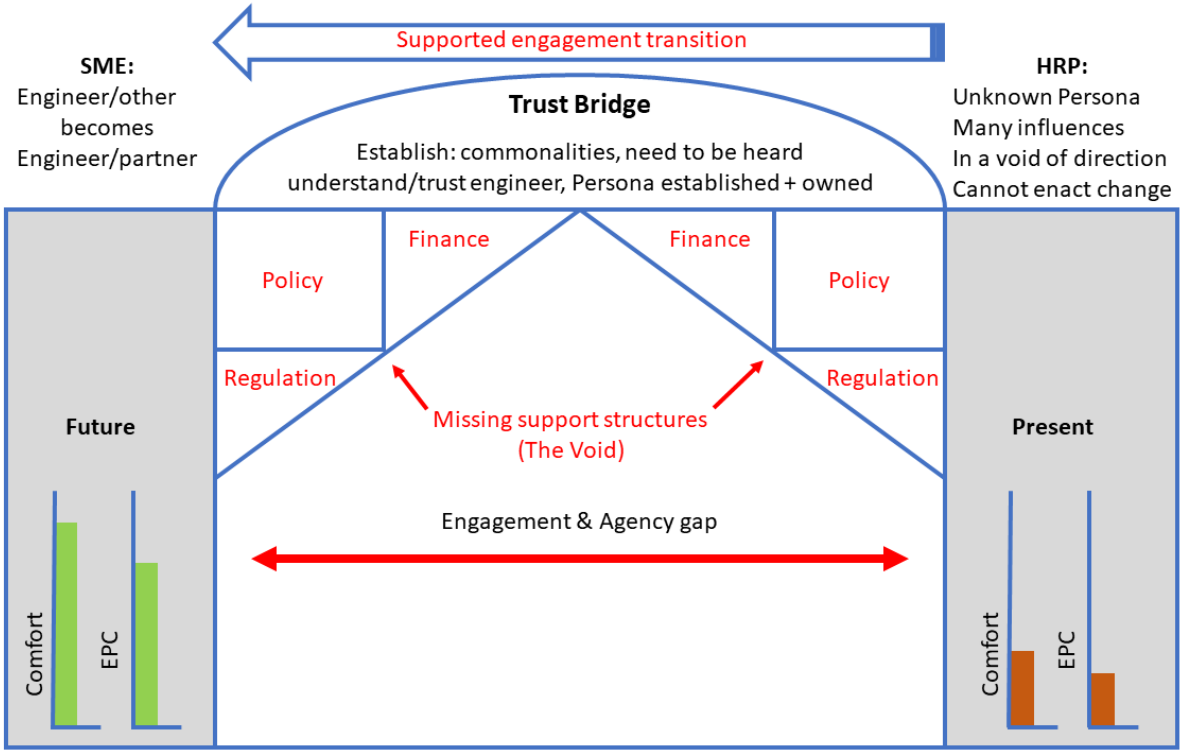

Figure 2.7 Visualisation of the required mechanism to bring together the HRP and the SME - "The Trust Bridge Picture"

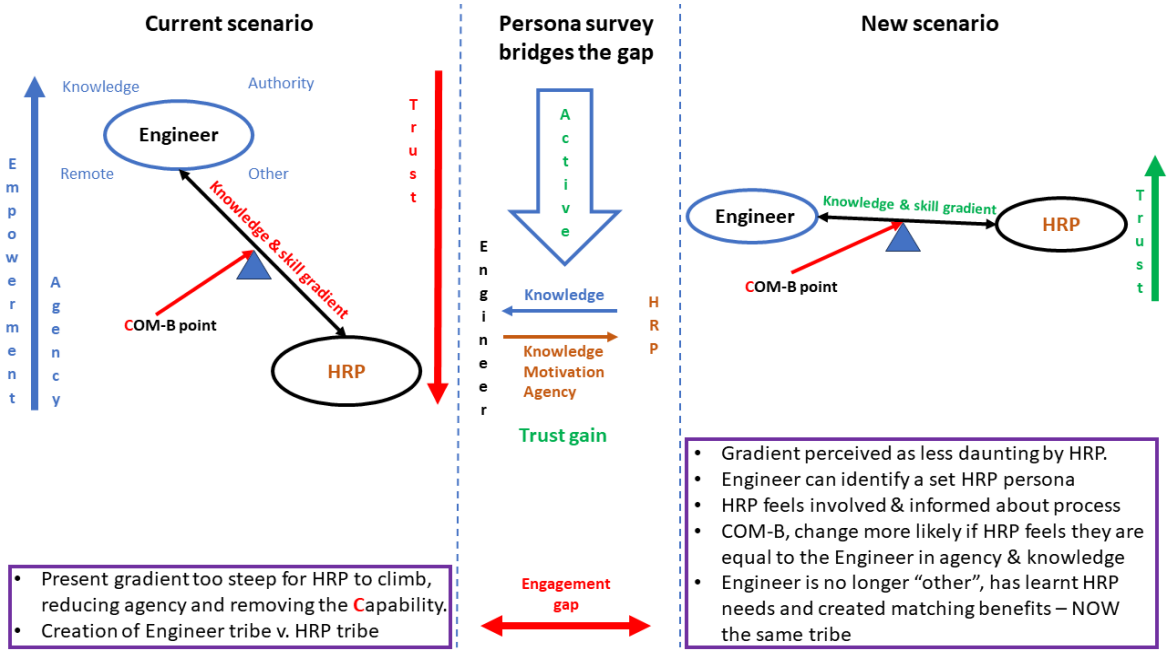

Figure 2.8 Persona Survey Engagement Tool

The HRP sits on the other side of the "Engagement Gap" to the 'Engineer' (ideally, they are a qualified engineer, however they are as likely to be a salesperson that the customer thinks are an engineer) who has all the answers but limited trusted access to the HRP. One of the primary concerns for the HRP exists around access to good information which

is both trusted and received in a way that is suitable for them. Figure 2.8 visualises what barriers may exist based on the preceding discussion, using the concepts of agency, who has what knowledge and how hard it is for the end user to gain the required information. The situation is represented as an imbalanced seesaw on a gradient in terms of time, effort, educational access and ability helping to highlight the current knowledge-engagement gap. The image uses the behaviour change wheel framework and the concepts of capability, opportunity and motivation (Michie et al., 2015) helping to explain the current situation whereby the lack of trust weighs down the owner-occupier and significant power being held by the engineer (often perceived as remote or other), thereby reducing the owner-occupier's capability to act, particularly through a perceived lack of agency.

"Trust is defined as believing that a person(s) or organisation(s) can be relied upon to accomplish objectives because they are competent and possess values and intentions that are consistent with their own" (Greenberg, 2014). This highlights the value of empathy and connection between a provider and the HRP before a decision is made to move forward with a project. The perceived knowledge gradient is often considered too steep for the HRP to effectively gather all the information needed to feel empowered and have a sense of agency to act.

To achieve this, a key consideration, as exemplified in Figures 2.7 and 2.8, is to attempt to understand the end user's paradigm when facing the process of energy efficiency retrofit work. Figure 2.9 illustrates what the current nested model may look like within the current policy landscape for owner-occupiers. This image makes a first step towards consideration of what is required to bridge perceived gaps more easily – Personas, Pressures, Policy (Priorities may be a fourth– potentially sitting between Persona and Pressures). As seen, there are no clear pathways to engagement with Policy, which leaves the Owner-occupier trapped in a void of inaction in many cases, as they have no way to know the best engineering solution, the most trusted advocate for accessing the best solution nor indeed whether it is value for money – creating the knowledge gradient for them to climb to achieve any sense of trust or self-efficacy.

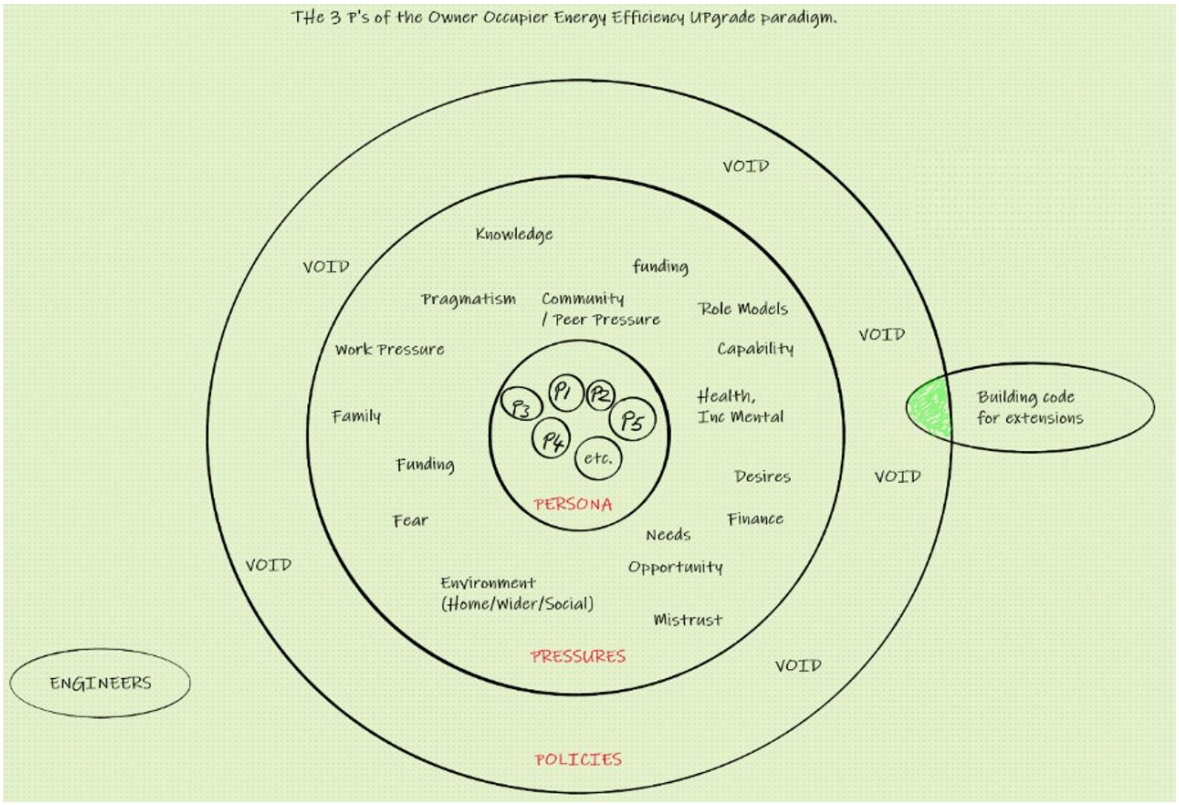

Figure 2.9 The "3 P's" nested model of the influences on the HRP decision-making

Only in certain limited areas does the UK Building Code give clear minimum standards to be achieved as some guidance. In this image the "Engineers" sit clearly outside the accessible paradigm that the owner-occupier works within, as due to the Shared Values delivery model chosen by the government, the engineer is effectively behind a paywall of a private company and in many cases a Salesperson (who is often not an engineer) is their contact point.

The Salesperson sells what he/she knows, can sell and earns income from, so for the client, the proposals in terms of product, funding etc. are limited by a cognitive bias called "What You See Is All There Is" (Kahneman, 2012), which states when presented with information confirming your mental model of what you expect, you do not query whether data may be missing or if there are other suitable choices. This then feeds to the "availability heuristic" as the Salesman has controlled the offering and if clever, they leverage heuristics linked to systemic cognitive biases used by the HRP (Baddeley, 2017; Kahneman, 2012; Thaler & Sunstein, 2009; Tversky & Kahneman, 1978; Caballero & Ploner, 2022).

Within a suggested sales journey there exist, from a behavioural intervention's perspective, some interesting questions around ethics, energy justice, the use of nudges

(via offered choice architecture and defaults) and offering educational and empowering "boosts" to the HRP instead of (or in addition to) nudging. This matters due to the preferred status quo bias of the HRP concerning energy and environmental behaviour that is demonstrated "irrespective of the information they are provided with" (Caballero & Ploner, 2022). The increase in cognitive load and its impairment effect on subsequent function leads to sub-optimal decision-making which may identify this group as vulnerable (Ibid.) Furthermore, this situation can result in a large value-action gap being displayed, where a value-action gap occurs when "strongly held pre-environmental values frequently fail to translate into green purchasing actions or other pro-environmental behaviours." (Essiz et al., 2022).

This may bring into question what is better for the HRP – nudging or boosting – and if they are nudged by controlling defaults and choice architectures then as researchers (or they as salespeople) it is important to consider ethics and justice. From a policy perspective, given that the UK government has declared a 'climate emergency', pragmatism might trump ethics – but should policy makers still ensure the HRP decision-maker is informed, empowered and has agency to choose rationally with knowledge of nudges or boosts? Researching this area holds value moving forward, as vulnerable individuals under cognitive load may have heightened sensitivity to nudges rather than boosts (Caballero & Ploner, 2022), although a boost may be the more desirable choice ethically.

Persona modelling has been mentioned here as an approach to influence engagement design. This is illustrated below through three examples of its potential application:

- *The creation of a 'superhero' role model learning story motivating and supporting the HRP to engage in an energy efficient upgrade. Where the protagonist is seen as an aspirational person who overcomes challenge to achieve their desired outcome via learning new skills and the application of same. If the story is produced from personal data provided by the HRP from a short online survey (for example) along with larger data sources being integrated such as EPC (and importantly, the HRP* ***does not know*** *that this story is effectively being self-created using algorithms) but the choice architecture of products/services recommended are outside of their control – this is an example of a nudge.*
- *If the HRP is assisted and empowered to understand the issues better, then supported to engage in* ***knowing*** *active persona modelling of their own situation (potentially through the proxy of familial created personae (Cherry et al., 2022)), with use of decision-making tools to consider best personal options - this may be*

considered a boost. But the complexity of this task takes more effort by the HRP and may require multiple attempts to be effective over time. Pragmatic issues around functional cognitive ability and resources may apply here and potentially the lack of both may mean that a third, more blended way, becomes desirable to follow the Pareto Principle of getting the best results for the most people at least effort.

- *The third way may be that of the first example with the **unknowing** creation of a personalised inspiring role model story but which links to practical empowerment tools that may include a local council show home, an energy efficiency support trainer/engineer, funding resources, accredited installers and social peer examples who have already led the way in their neighbourhood. Thereby allowing them to **knowingly** create and empower their own agency if they wish to put in more effort, supported by boosting schemes run by the Local Authority.*

The question remains as to whether this "third way", if acceptable, is potentially more applicable to the HRP as a group if it aligns with their cognitive competency (or potential lack of which may define them as vulnerable) and preferred level of engagement.
The act of creating a "Trust Bridge" and the shared understanding of a situation (particularly by those not looking to profit from them) creates a sense of trust, and trust can support agency to act. However, at present it is questionable whether the SME has the capability and resources to do this even if they desired to (and are perceived as trustworthy).

2.2.5 Defining and engaging the HRP

The English Housing Survey (EHS) is a longstanding, annual, national survey of people's housing circumstances, dwelling status, and energy efficiency of said housing in England being first run in 1967 (DLUHC, 2022). The term Household Reference Person (HRP) is used within the EHS as a shorthand definition for the person who is representative of the household. They are understood to be "'the householder', in whose name the accommodation is owned and who is responsible for the accommodation" (DLUHC, 2022). Clearly therefore, it is important to understand demographically who is the Owner-Occupier (HRP) as defined by the EHS 2019-20 Home ownership Report (MCHLG, 2020), which states:

- *The average age of outright owner HRPs was 68 years old and rising*
- *The gender split recorded is 63.1% male*
- *Owner occupied households had predominantly white HRPs (90%)*

- *Many owner-occupiers identified as Christian (57%).*
- *Outright owners were more likely to be retired (61%)*
- *Likely household composition was couple with no children (45%) followed by one person households (34%)*
- *In total, about 4.7 million (31%) owner occupied households contained someone who had a long-term illness or disability…More outright owners (39%) than mortgagors (21%). The prevalence amongst owner-occupiers increased with age, from 11,000 (11%) households aged 16-24 to 1.4 million (52%) households aged 75 or over who account for 32% of all outright owners*
- *Older homeowners were less likely to have a home rated band C or above*
- *The HRP was either very or fairly satisfied with their accommodation (95%)*

The last 10 years has seen an increase in the number and proportion of outright owners, which is partly explained by the "population ageing, with large numbers of 'baby boomers' reaching retirement age, paying off their mortgages and moving into outright ownership." (DLUHC, 2022). In 2011-12, 76% of those over 65 were owner-occupiers; by 2021-22, this increased to 79%. However, whilst more older people own their home outright, their health declines - both males and females are considered to have some ill health by the ages of 63.1 and 63.8 years respectively (White, 2022). This may well have implications for the targeting and uptake of energy efficiency policies and how they should be marketed – to be beneficial to lifestyle rather than just financially.

There are potential effects created by the choice architecture of the HRP definition where traditionally the male was considered by the ONS as the head of the household until the HRP definition changed in 2001 (Sharfman and Cobb, 2022). Financially, men traditionally earnt more over a career due to childbirth and care requirements, even if the female earnt more before pregnancy. A House of Commons Briefing (Francis-Devine, 2020) shows that this disparity has improved over time, however, earnings are markedly different in the post-40 range with the gap being 3-5 times larger. Social care duties for older relatives and time spent out of the marketplace for childcare "could affect earnings when a person returns to work" (Ibid.) as often women may return to work in part-time roles or in lower paid positions (Andrew et al., 2021). As such gaining a mortgage has been financially easier for men rather than women, even if household income is shared as a couple. This will skew the data set of the defined decision-maker towards men even though traditionally women are often considered the head of the household in terms of day to day running and decision-making. A recent survey of Starling Bank customers who were also householders, (N=512 male/female couples), shows more women than men take sole

responsibility for household budgeting (38% female vs 22% of males) and for large expenditure items they are made equally with their partners at 67% for both men and women (Parker, 2020). When interpreting this data, it is important to note the average age of a Starling Bank customer is around 37 years old, approximately half that of the HRP (Starling Bank, 2020) and more traditional gendered decision-making roles may not still apply within this age group. If not, this could have profound effects on the accuracy of policy targeting if the gender of the decision-maker is not correctly defined and understood by policy makers.

The last three points noted about the HRP definition may be particularly significant to their relationship with energy efficiency upgrades when considered through the lens of the inner circle of the Behaviour Change Wheel framework (Michie et al, 2015), which highlights Capability, Opportunity and Motivation as key influences on Behaviour.

- *They potentially have low Capability due to health and low resilience to disruption.*
- *They may not understand the Opportunity due to the steepness and complexity of the knowledge gradient required to retrofit older and inefficient homes.*
- *They may have low Motivation as they likely grew up and lived in a low efficiency home and to them this is a norm.*

The impact of these potential factors is likely to be exacerbated by the continuing improvement in the UK's healthcare and lifespan as the population ages.
With this understanding and having established this detailed demographic data set, the thesis can now review how the government attempts to make it useful to assist policy design using Acorn™ modelling to create useful personae to support policy creation.

Whitehall uses Acorn™ software in varying offices and scenarios, for example house pricing and consumer categorisation and they "consider the data of sufficient statistical quality for the purpose it is being used" (HM Land Registry, 2020). "Acorn™ is a segmentation tool which categorises the UK's population into demographic types and consumer characteristics. Acorn™ segments households, postcodes and neighbourhoods into 6 categories, 18 groups and 62 types (CACI, 2023). The Acorn™ knowledge sheet 4 (CACI, 2021) provides an interactive tool to allow research into sample data sets such as house cost, percentage breakdown in ownership and likelihood of an ACORN™ group to be in that category. The Acorn™ user guide (CACI, 2014) gives more nuanced definitions of those people in each category. This gives greater context to them as people rather than sketching simpler demographic data as in the EHS – providing them with a more relatable persona that could be recognised as a person not just a data set.

For the purposes of this work, it is important to understand the breakdown of the HRP (CACI, 2021) and into which group and category they most likely sit as shown in Table 2-7, and an example of how that is perceived by the policy maker using the Acorn™ tool (Figure 2.10).

Table 2-7 Analysis of (N=1851) owner-occupiers (defined as HRP by EHS and ONS) by Acorn™ group and category (CACI, 2021)

UK Base Housing stock		Categy 1 - Affluent Achievers			Category 2 Rising Prosperity		Category 3 Comfortable Communities					Category 4 - Financially Stretched				Category 5 - Urban Adversity		
		Lavish Lifestyles	Executive Wealth	Mature Money	Citiy Sophisticates	Career Climbers	Countryside Communities	Successful Suburbs	Steady Neighbourhoo	Comfortable Seniors	Starting Out	Student Life	Modest Means	Striving Families	Poorer Pensioners	Young Hardship	Struggling Estates	Difficult Circumstances
Owned Outright	1851	169	163	178	79	75	159	133	142	196	99	41	110	90	64	75	45	33
% of total owned	100.00%	9.13%	8.81%	9.62%	4.27%	4.05%	8.59%	7.19%	7.67%	10.59%	5.35%	2.22%	5.94%	4.86%	3.46%	4.05%	2.43%	1.78%
% per category			**27.55%**		**8.32%**				**39.38%**				**16.48%**				**8.27%**	
Valued up to 100k	11.80%	1	2	13	2	20	41	16	25	46	35	85	192	158	284	316	167	369
Valued 100k-150k	14.30%	1	9	35	6	55	87	48	95	113	97	116	204	165	200	194	129	171
Valued 150k-250k	26.20%	3	41	96	20	103	131	114	142	162	154	123	126	119	99	96	74	79
Valued 250k-500k	32.40%	27	136	153	89	139	119	150	119	99	113	102	43	74	33	28	98	32
Valued 500k-750k	9.10%	189	272	147	285	130	77	110	76	33	48	62	12	22	11	7	88	8
Valued 750k-1m	3.10%	550	339	109	478	118	53	61	25	15	19	43	5	9	7	3	57	4
Valued 1m+	3.10%	1801	263	62	762	76	27	23	5	7	6	29	2	4	4	2	33	2

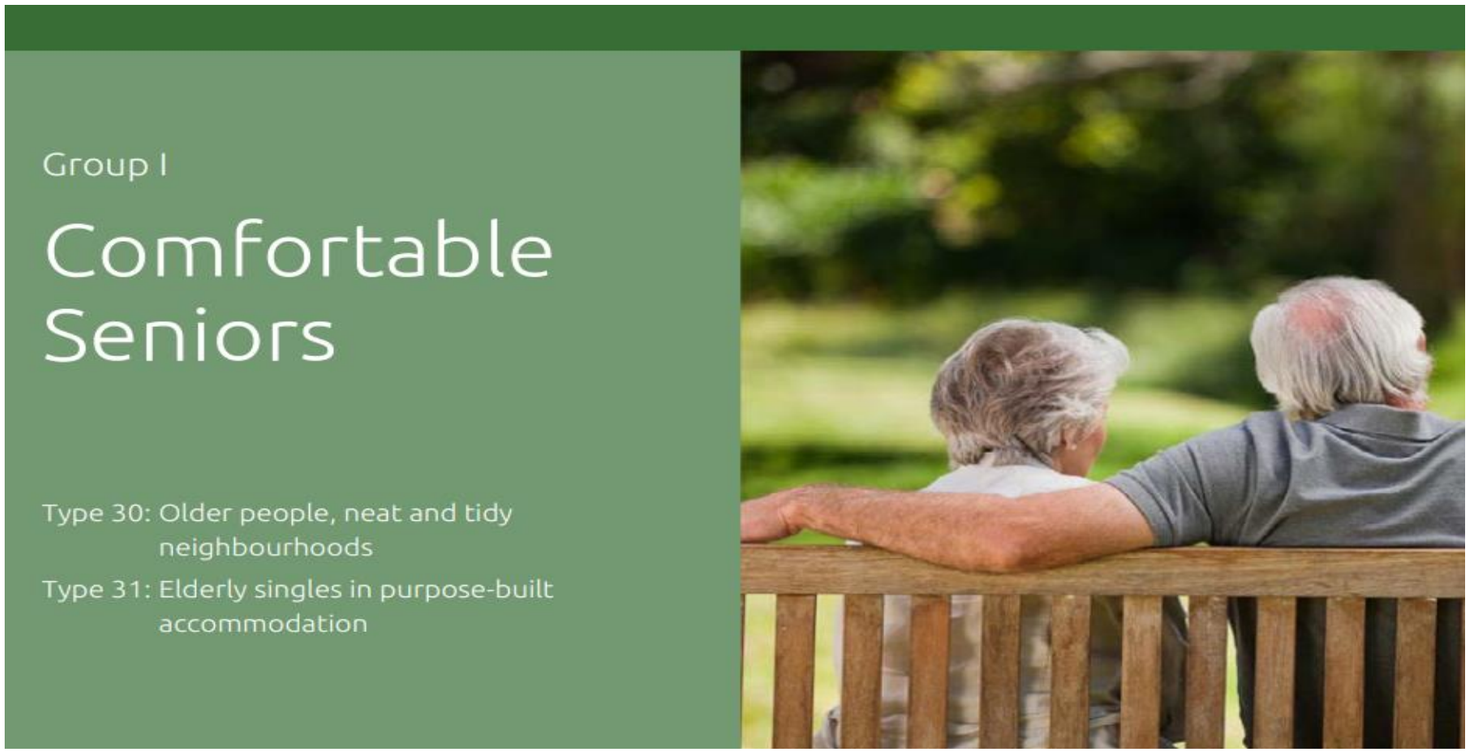

Figure 2.10 Excerpts from the Acorn™ guide contextualising what the largest category of HRP is viewed as (CACI, 2014)

"Flats… downsizing… pension income… low outgoings… some health problems… sedate leisure activities… theatre, art and similar cultural activities…"

"Semi-detached bungalows… older residents… a range of investments… only require basic mobile services… Daily Mail, Daily Mirror, and Daily Express… gardening, wildlife, travel, arts and crafts…"

As seen in Table 2-7 the largest category of homeowners is Comfortable Communities, and the subset Comfortable Seniors (Figure 2.10) is the largest group. However, the Affluent Achiever group with its Lavish Lifestyles, Executive Wealth and Mature Money categories runs a very close second and the two groups between them make up 67% of all homeowners. This is in line with the findings of the EHS data set on home ownership, satisfaction and wealth bandings, and matches the broad age definition of the HRP as being older (average of 69 years) (DLUHC, 2022).

The implicit theory of change in the UK Heat in Buildings Strategy (BEIS, 2021) is that householders should be allowed to make a change as and when it suits them. Building upon discussion so far, this would suggest that the dominant HRP, being less likely to switch to any new utility provider or technology, and also less likely to go online for research purposes, nor to ask others for their experiences, will also rarely use social media and therefore many government social engagement campaigns may pass them by. As such, this could greatly diminish the likelihood that they will voluntarily take positive action on energy efficiency even if they felt capability, opportunity and motivation as considered in the Behaviour Change Wheel framework (Michie et al, 2011).

Casterline & Palloni (2001) posit that a more granular and personally targeted approach is required to make diffusion models useful and this would require “theorising about social structures, about the positions that individuals occupy in them, about individual decision-making processes that accompany adoption of a behaviour, and about the constraints these individuals face.” Furthermore, that rather than competing with other more fundamental theories of prior structural factors such as those highlighted by the Behaviour Change Wheel, diffusion models can be a layer on top of these. Whilst diffusion models can work without the structural needs being addressed first, they may ideally work better once they have been. When comparing diffusion models to economic theories, the latter is often based on rational actors making optimal decisions which is very much against the general theme of behavioural economics (Thaler, 2016).

2.2.6 Small to Medium Enterprises (Delivery Entities)

Small to medium-sized enterprises (SMEs) account for 99.9% of the private businesses (approximately 5.5 million), three fifths of employment and around half of turnover in the UK private sector (BEIS, 2022). Of these, 2.7 million private sector businesses are registered for VAT or PAYE which is 49% of the estimated total population (FSB, 2023). Of all the businesses in the UK private sector, 56% are sole traders, and 51% of all business do not turn over more than £85,000 annually as they do not pay VAT (Crown,

2022) nor employ anyone if registered as a company and not a sole trader. Furthermore, the spread of SMEs is not even across the country, with some areas potentially lacking the delivery capacity that may be demanded by a transition to Net Zero, as exemplified with London having twice the number of SMEs to that of the North East (BEIS, 2022). With reference to the construction industry (which includes energy efficiency retrofit), this sector accounted for 17% by volume of all businesses, but only 8% of employment and turnover. Many construction workers are self-employed, which increases the number of enterprises, but not the number employed in the sector (Hutton, 2022).

Importantly, 78.8% of all businesses in the construction sector have no staff and are listed as a micro-SME and 21% have less than 49 employees – totalling 98.8% of the sector labour force (BEIS, 2022). As a comparison, in the EU up to 95% of construction, architecture, and civil engineering firms are micro-enterprises or small and medium-sized enterprise (SMEs). Initiatives in EU countries on energy efficiency are viewed as having significant potential to create jobs in this sector (European Commission, 2023).

From the perspective of the HRP, whilst Non-Governmental Organisations (NGOs) may be conflated with SMEs as a source of information or assistance, they are fundamentally different in terms of their funding platform, profit-making, motivation and ownership. They often have individual areas of focus – for example “An environmental NGO is an organisation that is non-governmental and non-profit making and engaged with an environmental problem or problems” (Potter, 2003) and can receive funding from charitable donations, governments, The National Lottery™, for-profit companies, individual gifts and are not normally looking to fund their work from income derived in a standard commercial way (UK Parliament, 2021). Given the minimal role of NGOs in delivery of energy efficiency retrofit, this section focuses solely on profit-making SMEs as they are the key chosen partner of government to deliver the Net Zero Transition in practical terms.

Clearly the concept of profit and its relationship to service delivery cannot be ignored as this will be fundamental to the experience and motivations of all stakeholders. As discussed above, the SME profit motive linked to delivery of schemes such as the recent Green Homes Grant led to increased householder costs and less efficient use of public funds. Lewis (2023) highlights this issue more clearly in terms of the mindset of the self-employed (aka Micro-SME in the construction industry) - when discussing the challenges of self-employment and new businesses it promoted the following advice: “You need a minimum viable product… you want to spend as little as humanly possible getting a

product out… the biggest takeaway I have learned is that every time you say to yourself "no, no, no, that is definitely the minimum", ask again because possibly if I had asked that question to more people at the time it would have taken me less time to find actual minimum" (Lewis, 2023). Given the 'social good' purpose of household energy efficiency, this suggests potential philosophical incompatibility or tension with harnessing market forces and the profit motive of SMEs for delivery.

2.3 Age, decision-making and time

The section is broken into three parts looking at the issue of age and its influences. The areas to be investigated are:

- *Whether the HRP is currently defined as an age-specific group, treated appropriately by policy makers (or SMEs) and the effect this may have.*
- *Does the HRP's decision-making process require dedicated awareness of, and allowance for, in terms of policy creation.*
- *What consequence the passage of time has in relation to the HRP as a large older demographic group in relation to policy creation for, and uptake by, them.*

2.3.1 Age

In recent years imaging technology such as MRI and other medical scientific breakthroughs have occurred and naturally therefore almost all previous behavioural and psychological theories had to be developed in a quantitative void from a medical perspective. These new technological breakthroughs created a new field called "neuro-economics" (Glimcher et al., 2009) that is defined as:

"…a new highly promising approach to understanding the neurobiology of decision-making and how it affects cognitive social interactions between humans and societies/economies."

The highly respected researcher Daniel Kahneman has noted that:

"One of the happy surprises of neuroeconomics is the frequent finding of impressive correlations between psychological measures and measures of brain activity." (Kahneman, 2009).

Currently the government does not appear to have a defined team working on neuro-economics. There is certainly research in government about the “how” aspect of managing older people as a population, such as housing needs (LGA, 2022) and, of course, health (NIHR, 2023; Sharp et al., 2020) with work being done around inclusive service access (Liljas et al., 2017). However, the apparent lack of research into the mechanism of this older population’s understanding process around, reception of, and actual engagement likelihood with, more generalised policies is a clear concern - this may well lead to adverse outcomes for this group compared to those for younger, more digitally competent and engaged members of the populace.

An important precedent has been set in this area already with the Scottish Judiciary (Scottish Sentencing Council, 2021) passing new age-related sentencing guidelines defining anyone under the age of 25 as being “not fully developed and may not have attained full maturity”. As a result, they:

- *Are generally less able to exercise good judgement when making decisions.*
- *May be less able to think about what could happen because of their actions.*
- *May take more risks, making any crimes committed before a certain age as “being different from that of an older person” (Scottish Sentencing Council, 2021).*

Therefore, it is of value to consider the concept of the mirror image, in that conceivably a similar blanket policy may need to be applied to older community members also, and that they may benefit from targeted support.

2.3.2 Decision-making in older populations

Lee et al (2013) provide a good example of the complex nature of the system any retrofit decision is made within, as shown in the recreation of the original image in Figure 2.11.

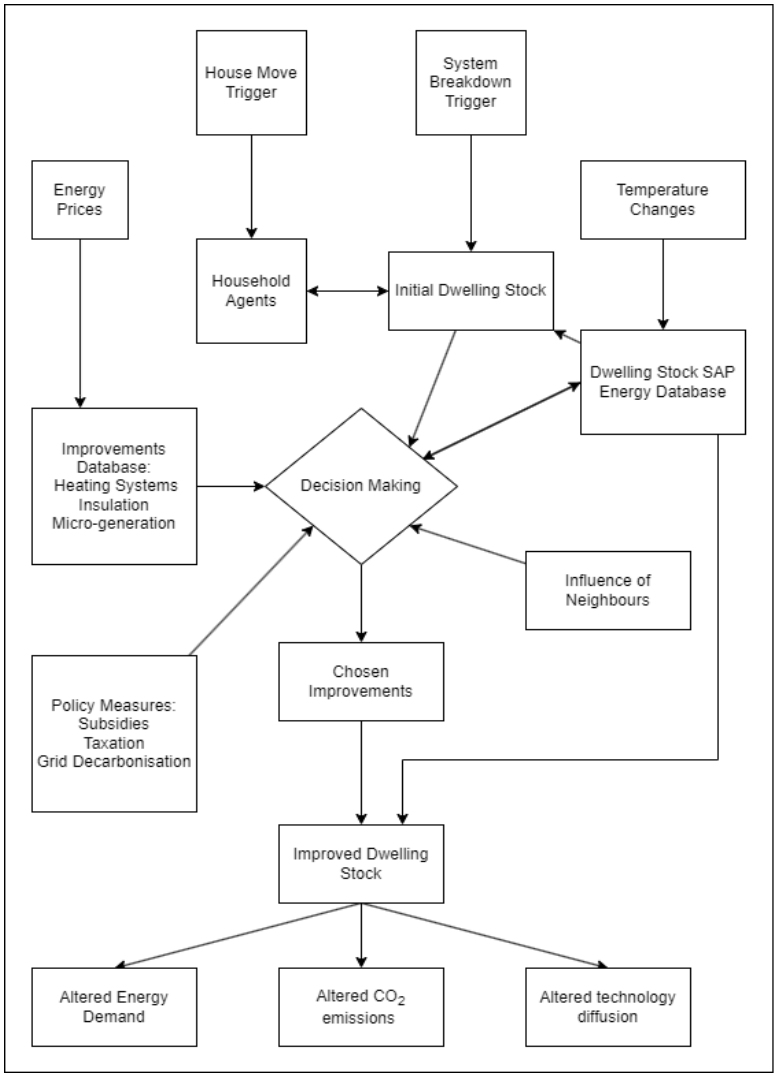

Figure 2.11 Recreation of Agent based decision framework (Lee et al, 2013)

As shown, there may be varying actors, triggers and influences for any decision taken which may affect what measure(s), if any, are installed at any given time. This issue is introduced at this point to clearly identify the fact that this may influence why the HRP, as an older person, may address one aspect of their home over others rather than treating it as a holistic whole to achieve greatest synergy and efficiency.

Older people display multiple behaviours differing to younger adults. A research review paper highlighted a complex mix of trends and behaviours (Löckenhoff, 2017), with key points being:

- Aversion to make decisions in the first place (Finucane et al., 2002; Chen et al., 2011; Lockenhoff et al., 2016)
- Research, when done, is less exhaustive than that of younger adults (Reed et al., 2013) with a preference to choose between fewer options
- Increase in likelihood to use heuristic shortcuts and to satisfice not optimise (Bruine de Bruin et al., 2016)
- Less willing to take risks than their younger counterparts and a tendency towards status quo bias (Mamerow et al., 2016; Mather et al., 2012; Pachur et al., 2017)
- Foreshortened life-span horizons and a later life characteristic more greatly valuing losses than gains focus older adults towards prevention strategies, preferring certainty over risk. (Freund et al., 2012; Mather et al., 2012)

Nowadays information is often accessed via online platforms, however, Heponiemi et al., (2022) state that “higher age, starting from around the age of 60 was associated with a lower likelihood of using online services…good digital competence was able to hinder the age-related decline in online services use, but only up to the age of around 80… older adults are at risk of digital exclusion…”. As such, this potential reduction of data upon which to base decisions may well be a compounding factor in skewing potential outcomes, especially if aging also affects that process.

Nevalainen et al. (2015) found that “Longitudinal assessments reveal stable performance levels until the 60s, followed by accelerating decline…64-68 is when average cognitive decline typically begins to be measurable”. Thus, in relation to this research, the identified age of cognitive decline is younger than the age of the typical HRP. The change in cognition, dopamine, brain structure and function are insidious and oft missed, creating a self-reinforcing feedback loop making it less likely that this change will be recognised by the HRP themselves.

MRI imaging shows that the Posterior Cingulate Cortex (PCC) thins, and functional connections reduce with age (Leech & Sharp, 2013), directly relating to cognitive impairment, reduced information processing speed, executive function loss and working memory performance issues. When directing attention externally, ageing is associated with a failure of the PCC to function as expected and this is strongly coupled with increases in cognitive load (Andrews-Hanna et al., 2007; Damoiseaux et al., 2007; Sambataro et al., 2010; Prakash et al., 2012; Spreng & Schacter, 2011). Therefore, the HRP may prefer to default back to heuristics and known positive memories of what works if faced with decision-making around a novel technology such as an ASHP. This may well compound challenges caused by the positivity effect which is defined as “a developmental shift in which a well-documented attentional bias that favours negative information - once presumed to be universal - becomes positive with age.” (Baumeister et al, 2001). This has a strong link to the statement that “older people are capable of processing negative information; yet, all things being equal, they do not” (Carstensen, 2021).

Hormonally, dopamine peaks as a teenager and then reduces. The link between risk taking, dopamine levels and youth, influences behavioural activation and heightened forms of appetite behaviour (including for risk). It has been described as a neuro-behavioural system that underlies incentive motivated behaviour (or its change) (Wahlstrom et al., 2010). A recent study showed “Participants became increasingly willing to take risks up to about age 35, at which point their aversion to losses grew.” (Guttman et

al., 2021). The lowering of dopamine reduces appetite for risks, rewards and the ability for recognising positive outcomes, which combines to produce what may be a significant disadvantage to this older generation to make good choices that are in their best interests (and in the case of domestic energy efficiency and ASHPs as an example, that of the UK and indeed the world).

A compounding physical and endocrinological process being at play may help explain recent research into egocentrism and snap (moral) judgements which can relate to the current response to the climate crisis. Research shows that egocentric evaluations are fast 'system 1' responses to stimuli (Kahneman, 2012) requiring only 250 milliseconds to occur (Van Berkum et al., 2009) and because they require no effort, they are the ideal default basis for judgements (including moral). This has influence on decisions based partly or fully upon them (Bocian et al., 2020). Due to this very speed people may strongly believe in the objectivity of their opinion or judgement exactly because it is automatic and unconscious (Epley & Caruso, 2004).

The more esoteric or remote the issue may seem, such as global heating (which may be viewed as being relating to the next generation), the less likely such issues are to impact on their decision-making process. This may explain what appears to be a large Value-Action Gap between stated motivated intents and what the HRP does in practice (Environment and Climate Change Committee, 2023). Clearly the combination of psychological defaults, the natural physiological decline in cognition and relevant hormonal levels (since they are default processes as humans age) needs consideration by policy makers. All policy and engagement relating to them and their day-to-day decision-making would benefit from being addressed via the lens of neuro-economics. A potential consequence of this may be to ask that if this is NOT done then does the government fall foul of its own Disability Act (Crown, 2015)? This is because it could be argued that the default of the HRP (with an average age of 69 years old) – in terms of capability to make affective forecasting and their skills thereof – is potentially disabled compared with younger (25-year-olds and upwards), healthy members of society.

2.3.3 Time

Figure 2.12 illustrates projected future growth in UK population. The blue lined area of 2020 data is overlaid by the forecast for 2079 indicating how top-heavy society is predicted to become (United Nations, 2023), though this is then predicted to stop with a continued decline to occur through to 2100. The large red area of extra older population demonstrates the increasing challenge being predicted as the population ages.

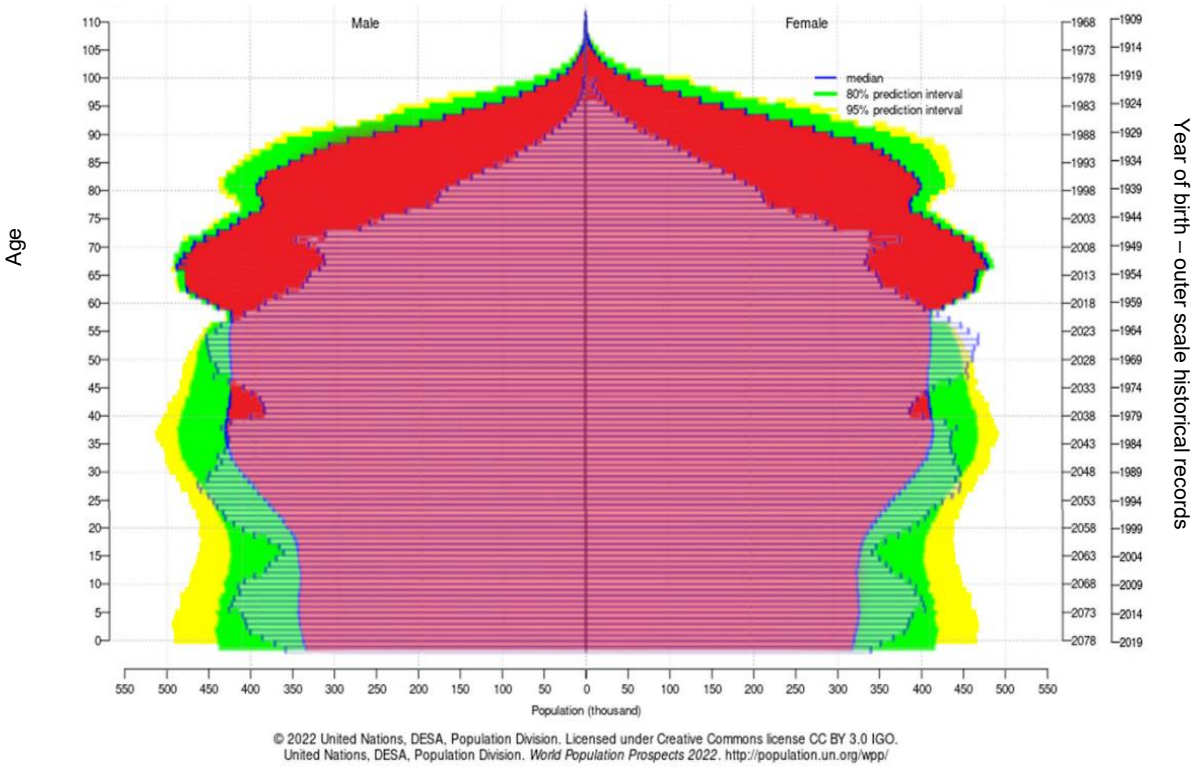

Figure 2.12 Predicted growth in aged UK population. Graphic created from United Nations population data.

If this trend does indeed carry on as forecast, the repercussions for society and policy making (particularly the power of the "grey vote") are significant. This increase in lifespan will have a societal effect that will include increased pension bills and a further wave of increased medical costs to the NHS likely through the late 2020s into the 2030s which will increase fiscal pressures on society (Hubner & Skidmore, 2003). At present the political impact of such a large voting population may be seen by the exceptionally generous "Triple-lock" on pensions (Anderson & Denham, 2023). Therefore, if society does not address the challenge of decision-making in an older generational group – in this case the HRP – then current consequences will continue to compound. Clearly, a new engagement model, building bridges and engaging the HRP in a salient and timely way, would be advised.

2.4 Behaviour change and energy efficiency retrofit

2.4.1 Overview of behavioural theories

A Theory of Change is considered key in planning any intervention and engagement roll out by most academics working in this field. It is project and study specific, explains the underlying rationale and supports the planning, implementation and assessment of the project against defined goals (Reinholz & Andrews, 2020). Such action-oriented theories are typically grounded in explanatory theories of human behaviour, such as those reviewed to develop the Behaviour Change Wheel (Michie et al, 2011).

To develop a theory of change indicates careful thought has been given to the system, cause and effects, and how the delivery to stakeholders contributes to achieving the desired long-term outcome. This section investigates theories of behaviour and behaviour change in a broad timeline - older to newer theories - noting how the latter build on the former rather than decrying or abrogating them.

Before considering any relevant Theories of Change, there is value in identifying the status quo in terms of traditional policy making around economics, purchasing behaviour and how the market meets these needs. Many policies are made or informed by economics, and Economists often hold great power, often considered so because of they can simplify complex paradigms of actors and motivations down to simple a utility theory, as per Green (2002):

“The choices made by buyers and sellers are the choices that best help them achieve their objectives, given all relevant factors that are beyond their control.”

Called Rational Choice Theory, the basic idea behind it is that people do their best under prevailing circumstances. The theory has a long history in print dating back to the 15th century, with the seminal Wealth of Nations (Smith, 1776) linking corporate self-interest to societal benefits without the concept of benevolence being involved (Oppenheimer, 2008). One of the key strengths is its broad utility; it acts as a normative and empirical theory of individual behaviour, a formalised logical structure serving as a basis for theorising around politics and economics and ties individual choices to preferences stating that choice is teleological and purposeful (Ibid.). Essentially the theory posits that researchers can look back and understand the drivers and purposes of a decision by the resulting choices made. However, being so broad it may struggle to capture granular complex systems and their influences, certainly in the areas of irrationality, heuristics, biases and

behavioural/neuro-economics – no awareness of which existed during the long period that Rational Choice Theory developed and became the received doctrine around decision-making and human/business relationships.

The theory has subsequently become the foil for cognitive theories of decision-making, which started developing in the mid-20th century. Within the area of socio-technical research into energy efficiency, Social Practice Theory (Bourdieu, 2010), which is defined as “dealing with relationship between the objective structures and the cognitive and motivating structures which they produce and which tend to reproduce them” effectively states that there is an interplay between the actors, their habitus and their world whereby the actors both shape and are shaped by their world. This evolving, self-adaptive and looping relationship between the HRP and the creation of home, via modification of house structure over time as needs change, is a constant backdrop against which all theories of change for energy efficiency retrofit must work and indeed accommodate if they seek success. As such the interplay between Social Practice Theory and Rational Choice Theory is certainly a complex area demanding greater research, though this is outside of the remit of this thesis. Some further relevant theories are examined, along with how they may relate to the current research and the HRP.

2.4.2 The Health Belief Model

Many behaviour change models have been promoted, often coming from specific areas of interest. Public health provides one of the earliest examples of this with The Health Belief Model (HBM) (Rosenstock, 1974) which was originally created in 1952. This work was specifically related to understanding why people did not adopt strategies to prevent diseases, nor screening tests for early detection of the same, and was later used for researching patient responses to symptoms and completing recommended treatments. The Health Behaviour Model states that the level of a person’s belief in the personal threat of an illness/disease, combined with their belief in the effectiveness of the recommended health behaviour or action, will predict their likelihood in adopting the desired behaviour (LaMorte, 2022). This mirrors well the concept of a warmer, more energy efficient home which affords a better experience of perezhivanie, improving one’s health prognoses and even lifespan in some cases – a health benefit arising from energy efficient retrofit which could be aspired to by the HRP. However, as discussed above the desired upgrades do not occur to the recommended levels, which mirrors the lack of uptake of recommended healthcare treatments or preventative behaviours which the HBM was designed around. The six constructs of the Health Belief Model are:

- *Perceived susceptibility - to risk of acquiring disease.*
- *Perceived severity - how serious is the disease.*
- *Perceived benefits - how effective are the threat reducing actions.*
- *Perceived barriers - weighing the effectiveness of the actions against barriers.*
- *Cue to action - the specific trigger to act.*
- *Self-efficacy - the confidence to successfully perform the required behaviour.*

These chart the varying stages of the decision-making process from the patient's perspective. The fundamental principles being:

- *It is assumed the patient wishes to avoid being ill, or alternatively to get better.*
- *The proposed enacted solution will cure or prevent the illness.*

The immediate problem relates to the individual perception or value and belief system of the patient as to the efficacy of any proposed treatment, which affects if they will engage and support its delivery. Many messy and complex systems work to produce attitudes, beliefs and worldviews, which does not bode well for producing a one-size-fits-all solution to be successfully enacted. Factors which limit the application for this study of the health belief model are external ones such as environmental or economic factors that pressure the HRP ('patient' in this case), preconceived ideas about access to suitable knowledge and whether positive social norms[1] of a considered act are widely prevalent in society. Furthermore, the assumption exists that personal health actions are the main driver in the patient's decision-making process, whereas other priorities may dominate (LaMorte, 2022).

Consideration of the health belief model is a good example of the key challenge facing the HRP when viewed from a policymaker's perspective. Effectively, the HRP does not necessarily perceive susceptibility to a worsened living condition caused by their home's energy efficiency if they are currently happy with it. As such everything thereafter (the further 5 points) become cognitive blind spots from their perspective. If someone does not recognise their relationship, then they would have no reason to engage. A cognitive blind spot relating to energy efficiency by the HRP will also influence any other behaviour change model considered for this group.

[1] For clarity of language within this thesis from herein a social norm is "Different from codified laws, social norms are unwritten codes of conduct that are socially negotiated and understood through social interaction" (Chung and Rimal, 2016).

2.4.3 The Theory of Planned Behaviour and Norm Activation Theory.

The Theory of Planned Behaviour has become both one of the most cited and influential models used to predict human social behaviour (Ajzen, 2011). It was designed to provide a framework to explain any behaviours over which people had the ability to exert control (specifically self). An important point was that attitude (from the perspective of how much an individual believes that the intended act will meet their desires) and subjective perception of social norms inform behavioural intent, which is then tempered by evaluation of the risk and rewards of doing the act (perceived behavioural control). Figure 2.13 illustrates the model.

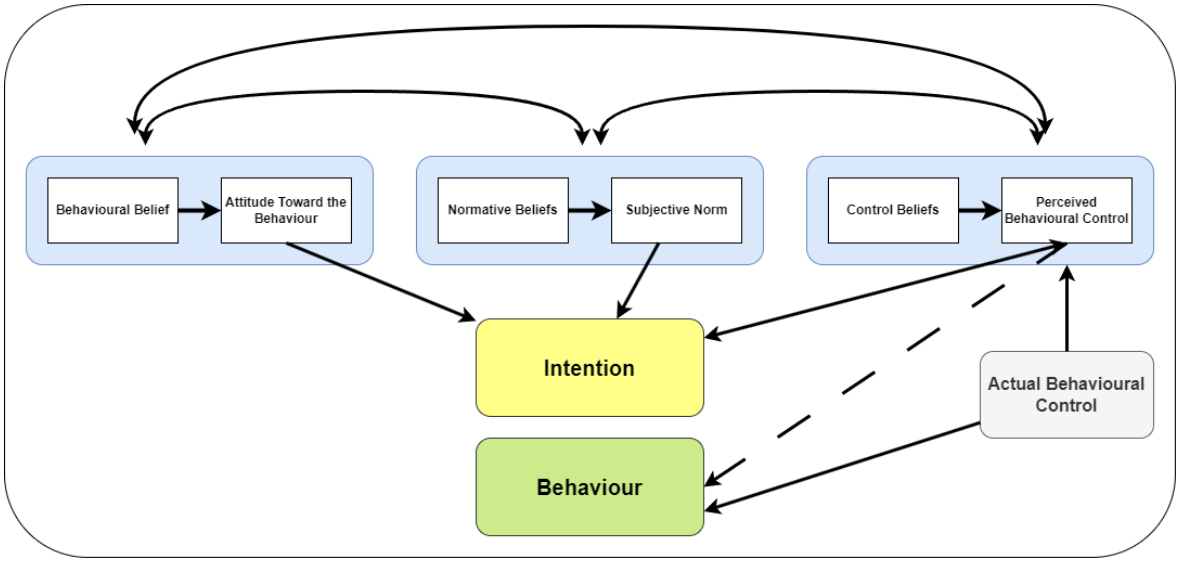

Figure 2.13 Theory of Planned Behaviour (Ajzen, 2011), image created by author

In the Theory of Planned Behaviour (TPB), unlike the Health Belief Model, understanding is given to the concept of normative influences of society. In the case of the HRP and energy efficiency the continued failure of delivery schemes indicates that desired levels of energy efficiency retrofit are not a social norm within the HRP milieu. This highlights a cognitive blind spot from the HRP's perspective, which may also be considered from a diffusion of innovation perspective.

It is then worth considering what happens if applying Norm Activation Theory (Schwartz, 1968), whereby "(a) someone is aware of the consequences of one's behavior for the welfare of others, and (b) one ascribes at least some responsibility for these consequences to oneself is added into the consideration". Research shows that adding this to the TPB leads to intent and behaviour being better explained (Harland et al., 1999). However, since increasing energy efficiency in the home is not in most cases an effective personal normative driver for the HRP defined in this thesis (as evidenced by the EPC

standards of UK housing (DLUHC, 2022) being low, ipso facto there is not a social norm of good energy efficiency being desirable), this would indicate that for energy efficiency retrofit, Norm Activation Theory does not pertain in most cases. This combination of no significant personal responsibility nor influencing social norms coalesces to, and likely supports, the HRP in feeling justified to keep the status quo and not engage in greater environmental activity surrounding retrofit acting as a neutralisation technique (Neumann and Mehlkop, 2023) towards any cognitive dissonance.

The Theory of Planned Behaviour does however provide a snapshot tool to consider the decision-making process as a single construct, although since homes are renovated (with any related retrofit work) over a long period of time it may not be suitable to analyse changing needs and drivers over such a long period. Setiawan et al., (2020) put forward an integrated Theory of Planned Behaviour with Norm Activation as more suitable for pro-environmental situations. Of note is that the original Theory of Planned Behaviour does not mention economic and other environmental influences upon the decision-making process that may exist, whereas the newer proposed joint Norm Activation one does, and these supporting structures may well be found vital.

2.4.4 Diffusion of Innovations Theory.

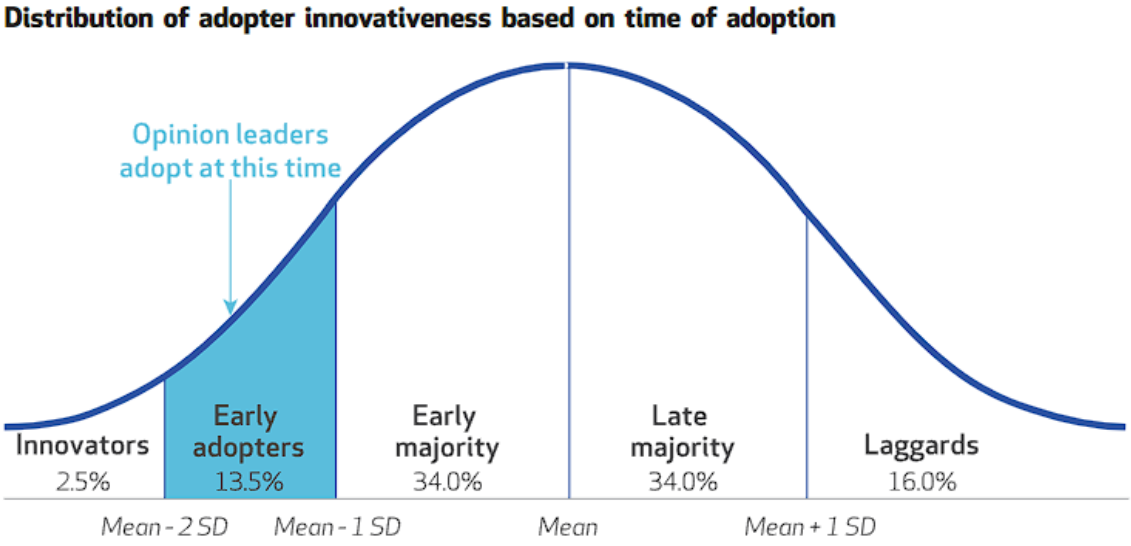

Figure 2.14 Diffusion curve of adopters for new technologies (Dearing & Cox, 2018) – figure permission granted

Diffusion is the process through which an innovation, defined as an idea perceived as new, spreads via certain communication channels over time among the members of a social system (Rogers, 2004). Figure 2.14 shows a commonly referenced example of the curve. The diffusion of innovation theory initially posited by E.M. Rogers in 1962 charts the concept that any new behaviour, idea or product has specific stages in its life cycle and its outreach into society is not equal to all members or groups at the same time. Generally

held belief related to the theory are that once the early adopter stage at circa 16% has been achieved, a “critical mass” momentum develops, and a threshold is achieved within statistical modelling leading to a “tipping point”. This term was defined as:

“…that the moment of critical mass, or threshold after being surpassed would result in exponential growth in development. For a tipping point to be reached, a percentage of the population has to be covered to trigger this explosive momentum” (Geng, 2020).

Often competing “ideas” or technologies may be considered by the HRP that meet the same needs and just because a new, and government-desired, innovation has been released does not mean it will diffuse into society as exemplified in Figure 2.15.

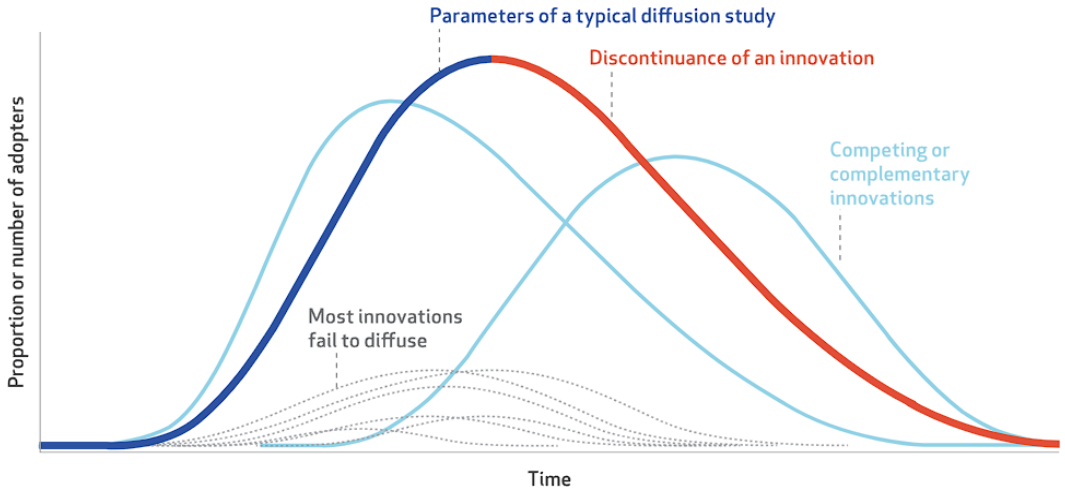

Figure 2.15 Diffusion curves of competing technologies (Dearing & Cox, 2018) – Figure permission granted

The dissemination of an idea or product is often wrongly conflated with its diffusion. SMEs being asked to roll out ASHPs via the GHG scheme is an example of SMEs being asked to successfully disseminate a product, whereas the actual delivery of only circa 6600 GHG vouchers was the diffusion result (Dearing and Cox, 2018). Dearing (2009), lists 10 specific mistakes in active dissemination of ideas (as opposed to innovations that diffuse naturally):

1. *We assume that evidence matters in the decision-making of potential adopters.*
2. *We substitute our perceptions for those of potential adopters.*
3. *We use intervention creators as intervention communicators.*
4. *We introduce interventions before they are ready.*
5. *We assume that information will influence decision-making.*
6. *We confuse authority with influence.*
7. *We allow the 1st to adopt (innovators) to self-select into our dissemination efforts.*
8. *We fail to distinguish among change agents, authority figures, opinion leaders, and innovation champions.*

9. *We selected demonstration sites on criteria of motivation and capacity.*
10. *We advocate single interventions as the solution to a problem.*

This matters because the key stages within diffusion theory that influence innovation adoption by the target audience are (LaMorte, 2022):

- *Relative advantage - is the innovation seen as being better?*
- *Compatibility - is the innovation compatible with existing values and experiences?*
- *Complexity - how difficult is the innovation to both understand and use?*
- *Trialability - can the innovation be trialled or experimented first before committing?*
- *Observability - does the innovation provide clear and tangible results?*

When considered from the viewpoint of HRP and energy efficiency, two things initially stand out. The first is consideration of the cognitive challenges for the HRP of receiving and processing new and potentially complex information; secondly, deciding from a risk-reward perspective if there is any relative advantage offers challenges. Furthermore, as one moves along the diffusion curve into the separate psychographic groupings of early adopter, early- then late- majority, and laggards there needs to be understanding of the specific motives of each subgroup and marketing to meet their needs. An example of re-marketing a reasonably standardised product would be Apple™ and the iPhone™, with minor adaptations on an annual basis seeking to meet the needs of their existing clientele, whilst pushing to meet the needs of the rest of the market that they are not currently engaging with. Effectively, as noted earlier, if the HRP has a cognitive blind spot they do not feel the need to improve energy efficiency and are content with their home at present, in addition to the fact since they have no awareness of potential benefits like health and perezhivanie (due to no marketing of these) then why would they engage?

As such, the diffusion of innovation theory offers a good framework to conceptualise the key stages of the marketing and delivery process required in the dissemination of an idea. However, it is not enough to suggest that if a 16% market share is achieved, then the creation of a critical mass will follow, and uptake will naturally occur. As a specific example, in the case of ASHPs vs gas boilers, within the current paradigm, boilers typically meet the HRP's need and the solution is cheaper, fully understood, and requires no effort beyond the norm to replace. Therefore, it is hard to see how, without influencing regulation of some sort, this desired diffusion of new technology will happen with the current dissemination technique as posited by the Heat in Buildings Strategy (BEIS, 2021) of letting people decide when and if to act.

One of the weaknesses of the diffusion model is that it does not consider the effect of a user-led participative approach to engaging with the uptake of the desired innovation; rather, it is a passive explainer of the process. With modern day social media and marketing the areas of social marketing and social norms may be quite relevant.

2.4.5 Social Norms Theory & Social Marketing Theory

Social Norms Theory describes the influence of individuals' perceptions of the attitudes and/or behaviour of peers and others (perceived social norms); this includes characterising situations in which individuals hold incorrect beliefs about societal social norms. (Berkowitz, 2004). In the case of the HRP this may mean that they hold strong internal values towards being pro-environmental and would like to take steps to change their home to reflect this, but they do not feel supported by society as they perceive that the trend is not in their favour. This phenomenon has been called "pluralistic ignorance" which can cause individuals to change their own behaviour to approximate the misperceived norm. This in turn can cause people to express or rationalise problem behaviour and inhibit or suppress 'healthy' behaviour. In the case of this work, it adds to the prior frameworks by helping to address the areas of environmental and social influences of peers on the behaviour change process. A potential implication of this perspective would be seeking to identify peer influence and educate the social milieu as the more effective communicator of change than the focus on educating the individual to change their beliefs (a "herd focus"), correcting the inaccurate views of the HRPs of others' intents and beliefs. This work is often done by what are now social media campaigns or via the web; previously via print, T.V. or radio. They follow a traditional process of scoping, message choice, "A B testing", delivery method analysis, volume of delivery and finally assessment of market penetration.

However, as noted by the Acorn™ classification system, the current HRP is not particularly digitally literate, certainly not in the use of phones and handheld devices to access information, nor do they proactively research options or are not as socially connected in digital terms as younger generations (CACI, 2021). Current social marketing approaches may struggle to reach the target audience with current preferred consumption methods for news by over 65s being predominantly TV terrestrial channels (e.g. BBC One 72%) compared to online channels such as news websites or applications (e.g. BBC website/app** 19%) (OFCOM, 2022).

One of the key barriers to applying the Social Norms Theory for the HRP would be that they are likely to challenge the new message. This would both be specifically due to the

misconceptions they hold, but particularly because the current paradigm they live in is both very acceptable (MHCLG, 2020) and because they already have suitable (although predominantly carbon-emitting) solutions to their needs (ONS, 2023). Therefore, a key role of inspiring trusted messengers would have come into play here that have both technical validity as well as emotional resonance for them, without any perceived negative agenda (which may be profit).

Research has shown (Rundle-Thiele et al., 2019) that producing social engagement strategies, including both the individual psychographic factors as well as the environmental and practicality issues around a subject, increases engagement in areas such as promoting active school travel for children. In their study, active travel rates rose from 10% when using the Theory of Planned Behaviour as a design model to 53.7% when these other factors were built in (Ibid.). This widening of considerations may be vital to addressing the UK's current HRP engagement challenge, as it both removes areas of blame or guilt around something being a personal responsibility by identifying the structural and historical supporting systems of the current paradigm that allowed it, but also by addressing them in a way that allows understanding of the environmental challenges facing them and allows a sense of agency to be developed. This effectively gives the HRP a trapdoor to exit the current situation from, as resistance to change is exacerbated if the subject feels trapped or guilty (thereby creating cognitive dissonance which can promote pushback) (Robinson, 2013).

If borne out in future energy efficiency engagement research, this could be a key consideration, as the change in behaviours in both cases is an active choice, not an enforced passive one by any external choice architecture. However, further research is recommended to understand the best way to communicate this to the target HRP considering how they access information and news. This posited cognitive blind spot as to the relevancy of energy efficiency to them means that unless marketing directly targets communication to them in a way they will access, understand and emotionally engage with (that is also based on prior experience), it is very likely to miss its audience.

2.4.6 Social Cognitive Theory & The Transtheoretical Model

Originally derived from Social Learning Theory in the 1960s (Bandura, 2001), Social Cognitive Theory was developed in 1986, and it analyses social diffusion of new styles of behaviour in terms of the psychosocial factors governing their uptake, and whether they are embraced, and the social networks through which they spread and are supported. Strong structural connectivity provides varied potential delivery paths; socio-cognitive

factors largely determine what diffuses through those paths. The theory posits that learning occurs in a social context with a dynamic and reciprocal interaction of the person, environment, and behaviour (LaMorte, 2022) echoing Bourdieu. A key issue is that the theory considers the persons own past experiences and how their memory factors into a future intent to change behaviour or make a choice, which is a fundamental issue due to the strong effect that memory has on the HRP and their decision-making process. The theory notes that there is a cycling and reinforcing influence of past choices on future expectations which in turn affects the choices made. Furthermore, the theory considers the capability to enact the new behaviour and a person's "self-efficacy" – how confident they are with their agency to be successful with the behaviour change, or in the case of new technologies, whether they will work as well as the existing technology.

The notion of a cyclic system, and potentials for building of feedback loops links to the Transtheoretical Model (often called Stages of Change) which has been a staple of change analysis in decision-making for many years (Freeman & Dolan, 2001). The theory posits that decision-making is a build up towards an intentional change rather than a snap one-off decision, with the view that people do not change behaviours quickly and decisively (LaMorte, 2022). Practically, it is more a model of process than a theory but since renovation of a property often occurs over many years with the average tenure of the HRP being 24.5 years (BEIS, 2021), this is appropriate. Whilst the model was originally more focussed on healthcare decision-making than some other models, due to the potential for emotional motivations around energy efficiency being strongly related to health, it may prove very apt. One of the key challenges foreseen for the HRP is that the decision to enact an energy efficiency measure potentially only happens upon trigger events such as hardware failure (e.g. boiler) or disruptions such as moving home or health events (e.g. becoming disabled). It may therefore be unlikely that they have had time to go through the relevant stages before the need to act arises. The five listed stages (Freeman & Dolan, 2001) are:

- *Pre-contemplation - i.e., not planning to act within the next six months.*
- *Contemplation - intended action within the next six months.*
- *Preparation - preparing to act within 30 days; changes are being made.*
- *Action - the change has occurred within the last six months.*
- *Maintenance - sustaining the behaviour change and intention to continue.*

To create and sustain the change event, a HRP must make a long-term effort to collect information, apply analysis, use intellectual processing power and perform evaluative and affective prediction skills to the likely change event or technology. If the HRP is not

already engaged due to a cognitive blind spot in this area, as they feel no need and are not educated as to the benefits of it, then it may be very unlikely that they will attempt to put in the long-term planning required to prepare for when a trigger event occurs at an unknown future time, or indeed, plan to change a system which works perfectly well for them as it is.

2.4.7 The COM-B model of behaviour change.

This model is a key one used by the Houses of Commons (Skidmore, 2023) and House of Lords (2023a) reports on behaviour change for climate and environmental goals. The model is defined as "a synthesis of other models by Michie et al. (2015) from University College London (UCL) and was referred to by several witnesses" (House of Lords, 2023a) indicating its current prevalence in the academic and policy making consciousness.

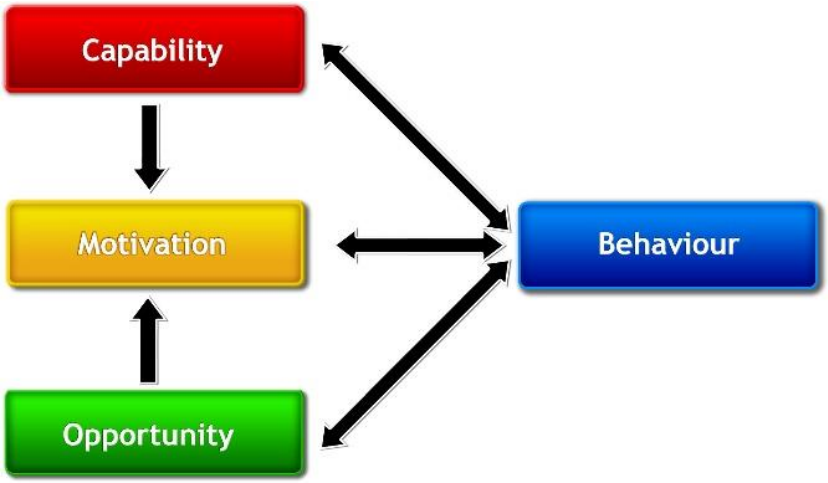

Figure 2.16 The COM-B system - a framework for understanding behaviour (Michie et al, 2011)

"For a new behaviour to arise, people generally need to have sufficient capability to enact the behaviour, which includes: the physical *capability* to do it, the means, the time and so on; the *opportunity* to do it—in other words, whether that choice is readily available to them, socially normative and so on; and the *motivation* to do it. Do they want to do it?"

The "COM-B model" as shown in Figure 2.16, arose from the behaviour change wheel (figure 2.17) which was created as a new framework to synthesise 19 pre-existing frameworks of behaviour change interventions and aimed to overcome the limitations that were identified in the original research paper (Michie et al, 2011). What it created was a wheel with the seven policy categories on the outside, the nine intervention typologies in the middle circle and the required conditions for change and their potential sources in the centre – the "COM" required for a Behaviour change to occur. This was subsequently referenced by the House of Lords report as the "COM-B system".

Right from the start, the Behaviour Change Wheel was intended to be “developed into a theory and evidence-based tool allowing a range of users to design and select interventions and policies according to an analysis of the nature of the behaviour, the mechanisms that need to be changed in order to bring about behaviour change, and the interventions and policies required to change those mechanisms.” (Michie et al, 2011).

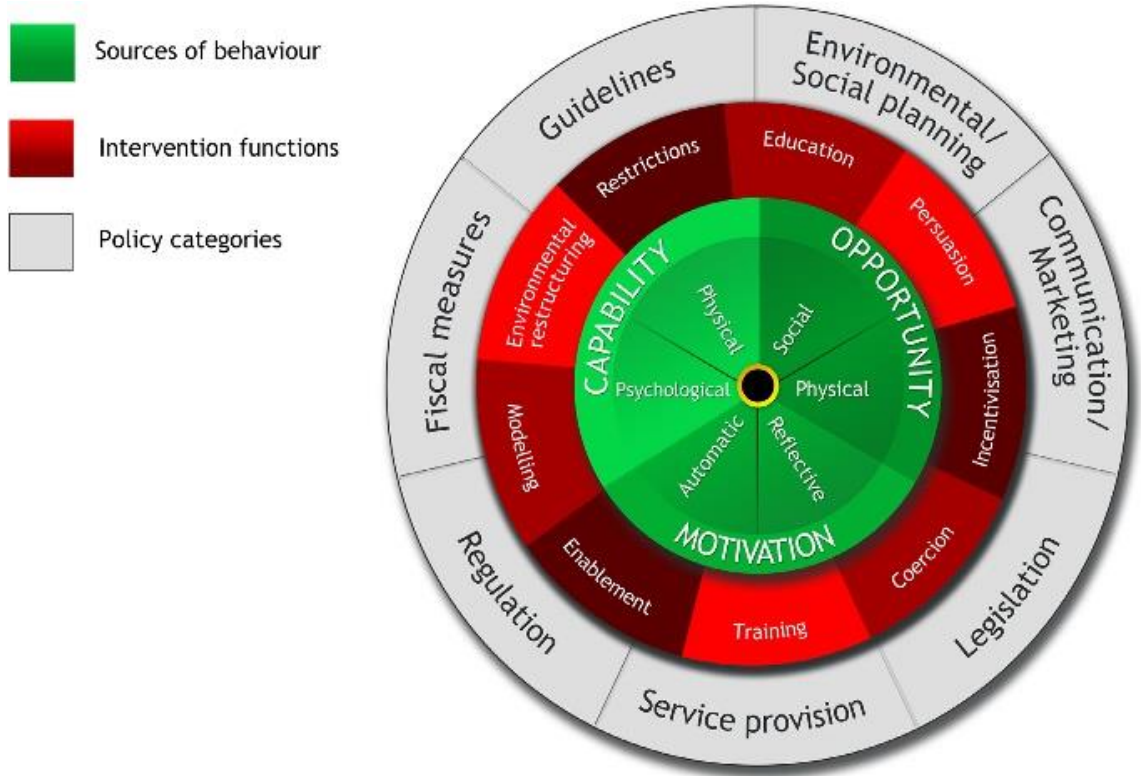

Figure 2.17 The Behaviour Change Wheel (Michie et al, 2011)

Via the analysis of a desired behaviour change, and the relevant resource typology available, it was now possible to identify interventions, policies and the areas of behaviour influences (COM) that may apply, all within one framework. This allows the practitioner to create the most practical and effective route to a behaviour change design whilst working within any bounded rationality informing the choices that were used in the wheel. Essentially COM-B allows change practitioners to view intended plans as a whole, aiding understanding and analysis for delivery.

The House of Lords report went on to also mention the Theory of Planned Behaviour as an adjunct to the COM-B system and that the two together provided both situational understanding of the HRP decision-making process as well as a wider understanding of social norms and environmental context and influences. This was because many of the behaviours desired to change are often considered habits and routines. They therefore respond to environmental and social factors, and as such, resist change even if the

individual has good intentions as they may be trying to push against the system in effect (House of Lords, 2023a). However, the report praises the “COM-B system” due to its ability to be deployed at multiple levels covering all stakeholders in a simple and understandable way.

A key application of the theory would be to analyse what percentage of a sample HRP group feels agency in all three areas of capability, opportunity and motivation. This could easily prove confusing, as an example being if HRPs were asked for agency in these areas separately the responses might come back as 50% positive in each area. This does not, however, mean that 50% feel agency in all three areas concurrently. Rather, under the COM-B model, without all areas being addressed and agency being felt by an individual HRP then the “B” of the behaviour change will not happen.

As an example, the British Psychological Society (BPS, 2022) stated in a recent poll that 73% of respondents either strongly or slightly agreed that climate change was a threat to humanity; however, (focusing more towards the UK’s HRP age grouping) only 13% of over 55’s felt their wellbeing or mental health has suffered due to climate change. Whilst some may consider these things to be very different – one with the main threat in the future, and one related to present times – the issue being raised here is that the current HRP, while noting an abstract and future risk, is not aware of the current risks to their health caused by the effects of climate change and the changes enforced on their living conditions.

This indicatively suggests that there will be a large Value-Action gap between any stated intentions to act and the end results due to a perceived lack of personal relevance. Once more this suggests motivations as an area of investigation for the thesis, as if the HRP does not see any personal risk to act against then the status quo bias would likely apply (Baddeley, 2017). Younger people hold greater awareness of both the risk and effects of climate change and therefore indicatively feel greater need to act (BPS, 2022). Consequently, even if the HRP recognises the risks, their own foreshortened time-horizons may mean they are less likely to take any remedial actions simply due to old age. When combined with the neuro-economics findings of neurological degradation and endocrinological changes affecting the HRP, this provides a “double whammy” in effect. They now may have both biological challenges as well as a clear preference to avoid processing anything seen as negative information (which poorly understood new technologies may suffer from being defined as) with a preference towards older, happier, memories being used in decision-making.

These factors combined my explain a negative compounding factor on whatever COM(-B) that they felt (i.e. a combination of adequate capability, opportunity and motivation) which may explain a higher Value-Action gap in terms of future behaviours, something this research can address.

Whilst the COM-B model and the Behaviour Change Wheel (Michie et al., 2015) offer clear simplicity and utility, when considered via the lens of the HRP and energy efficiency retrofit, no specific allowance is made for their age and the challenges listed above. Consideration must be allowed for COM-B having been put forward before neuro-economics being fully developed and these medical issues being identified. This also is due to its design as a universal tool rather than one focussed on the HRP group as a target audience for policy making. Although a policy can be analysed and responses categorised by the Behaviour Change Wheel it is the actual delivery of the behaviour change process into the target audience that is key. It must be delivered in such a way that the HRP can receive and process the information positively. After all, without regulation, if the end user either does not or cannot process the behaviour change intervention correctly and, in the end, does not wish to take up the offered policy, then said policy is ineffective.

2.4.8 Theoretical Frameworks via a delivery method

Les Robinson proposed in Changeology (2013) 6 key principles that are required to enact any proposed theory of change into the target group:

Start a buzz – following Social Norms Theory and Social Marketing Theory, whilst initially much communication occurs from a negative starting point, when people start to feel a sense of agency to tackle the challenging problem then the buzz becomes positive and focussed on the self. Making it personal matters for engagement – ideally supporting the HRP to feel that they are accessing the top rungs of the ladder of citizen participation (Arnstein, 1969).

Offer Hope – following Social Cognitive Theory and the Transtheoretical Model, this brings attention to the key areas of perceived self-efficacy and agency as without these and then the motivational feeling of hope, change is unlikely to appear. This may be particularly challenged for the HRP due to the strong effect of memory on their future decision-making. As such, finding what the core aspirations and motivators of the target audience are really matters, to allow them to tap into the story of their aspirational self

(either self-perceived or socially judged). These aspirations and motivators will exist, but previous policy work has not engaged them sufficiently – hence limited prior success.

Create an enabling environment – this can be related to all the theories of change or models mentioned to-date, as well as the wider debate about removing "sludge" (i.e. things that create a barrier, impediment or may slow down the process) and making things "Easy, Attractive, Social, Timely" (Halpern et al., 2023). The choice architecture provided really matters with making the "right thing" both the default and easiest action being ideal to foster effective change (Thaler & Sunstein, 2009).

Design a sticky solution – the story of design evolution (in any area) is often one of a cyclical nature, seeking iterative improvements over time and this follows the Social Cognitive Theory concept of future behaviour choices being influenced by past. This matters because when considering the retrofit Policy/SME/HRP as a system then the common phrase "All organisations are perfectly designed to get the results they get" (Jones, 2023) appears most apt. Therefore, a key priority to create lasting change would be having supporting structures to ensure that something is not just a one-off choice. Here a user-led design process, listening to needs, wants and barriers shows its strength allowing buy-in from the end user. This matters as when the "solution" meets varying social milieu it may need to adjust to meet individual niche needs in a continuing process as each may have their own risk/reward ratio to be met before change occurs. Or, in the case of Diffusion Theory, as the "solution" moves through society it must be re-focused and marketed appropriately to each audience e.g., late adopters will have different values and drivers to early adopters. This tailoring of the people and situations in the engagement change story will be a key part of making the "solution" permeate and stick throughout society in each diverse sector. Creation of a way to engage people on a more personal and emotive level should be an area of investigation as society moves ever onwards into large data, powerful computing and a connected world where the information, and ability to process it, on a near individual level is becoming possible.

The power of storytelling to engage people in more data heavy areas has been expressed as a challenge of promoting the "hero story" by policy makers, but historically society has not supported the "learning story" as a guide for the HRP to follow (Janda & Topouzi, 2015). The hero's "inner journey" represents and maps well to the behaviour change arc being proposed by any successful model that is employed. In this "Trumpian", post-truth world where "objective facts are less influential in shaping public opinion than appeals to emotion and personal belief" (Moezzi et al., 2017) a shift towards narratives and

storytelling has become more prevalent with a decline in satisfaction of technical, physical and economic explanations.

Expand people's comfort zones – fear of the unknown or new can result in anything from a mild disincentive to change through to being a crippling barrier. Social Norms Theory and Social Marketing Theory propose seeing behavioural changes or "solutions" becoming more commonplace as helping with this. Social networks may therefore be key to enabling this for the HRP defined in this thesis. They have digital challenges compared to younger counterparts and so potentially word of mouth or local community show-homes and resources may hold more value as suggested by Skidmore (2023) and backed up by McMichael & Shipworth (2013) who found that adoption of energy-efficiency measures could be increased by up to four times where personal contacts are used as information sources.

Find the right inviter – as discussed in the Social Norms Theory one of the key concerns is getting a trusted messenger (especially if the message challenges the status quo). As noted in Changeology (Robinson, 2013) the best inviters are "passionate, similar, respected, connected, powerless and believe in the [HRP's] ability to successfully enact the change". Potentially neither politicians nor the SME delivery agents are best suited for this role. But if not them, then whom? This is a question that this work seeks to address.

2.5 Renovation motivations – what does previous data tell us?

This section aims to review research evidence on energy efficiency retrofit motivations and influences, including evidence of what motivates those who do renovate their homes, focussing on research published in the last ten years (since 2012). This will offer insight to current thinking for domestic retrofit, seeking any emergent themes or disparate areas of research which may re-enforce the concept of complexity in the motivational area for the HRP. These findings will relate temporally to the policy maker as this small review concentrates post-financial crash (of 2008) and solely within governance by the Conservative Party. This means all policies and schemes, which were rolled out, terminated and replaced (and the recent research papers informing them) have happened within this more defined timeline and organisational/research/policy making system.

2.5.1 Did prior research output skew data for policymakers?

"The 'drivers and barriers' framing of the energy efficiency gap dominates both research and policy", stated Wilson et al. (2014), arguing that systemic limitations in the research have fuelled policy. This situation was created by the methodology and focus of the research itself, essentially caused by a bias and focus on financial variables and considerations of energy efficiency retrofits as events in their own right and the property being considered as a technical stand-alone system i.e., a house rather than a home. Wilson et al. break down the barriers to energy efficiency into three technical areas - Finance, Information and Decision-Making with subsections as appropriate, listing examples of policy or market solutions that are relevant to be applied.

They also note an "exclusion of amenity and other types of improvement…exclusion of emotional and social characteristics of homes, and households being considered as coherent decision-making units to the exclusion of dynamics and differentiated roles within the home" (Wilson et al., 2014) (i.e., there being potentially more than one decision-maker or opinion at play). In support, they produce a review of recent choice model research papers that gave citizens fixed choices to state what motivates them towards energy efficiency. The results of this demonstrated that the studies were skewing the results by a systematic tendency to emphasise financial influences on retrofit choices, mirroring the same skewed emphasis towards finances in the drivers and barriers framing the inquiry. When the participants selected what attributes they considered when making energy efficiency retrofits, the choices included 22 mentions of financial attributes, 9 information/decision-making attributes and only 5 classified under "all other attributes" of which only 1 was comfort (and that being air quality).

This may raise the query of whether policy-making researchers fell afoul of an availability cascade (Kuran & Sunstein, 1999) when it came to identifying suggested motivations to address. Seeking to fill some of the gaps, Wilson et al. stated that the "characteristics of both decision-makers and the decision contexts can potentially be influential". Via the lenses of theories of change, diffusion of innovation, social psychology and behavioural economics they noted that the scope of enquiry is much broader than those concentrating on the more financial aspects of the process noted. They then propose four broad categories of decision influences on energy efficiency:

- *Attributes of efficiency measures – technical, financial and experiential.*
- *Decisions about efficiency measures – Information and beliefs, incentives, installations, decision-making.*

- *Decision-maker – motivations, experience and skills, attitudes and beliefs, socio-demographics.*
- *Decision context – household metrics, home tenure, physical characteristics of house, salient trigger events.*

Trigger events such as moving home or breakdown of a boiler were also noted as instigating retrofit decisions.

Wilson et al. analysed the Green Deal against the categories above. Upfront costs and secondary areas (e.g. information, advice and quality contractors) were part of the scheme design, but there was little on non-financial influences (e.g. comfort, hassle, environmental awareness) or barriers to action (e.g. transactional costs, infrastructure availability, technical skills). This analysis suggests that there was little thought in the design of the 2012 Green Deal scheme given to the ages, genders, emotional drivers and beliefs of the decision-makers nor the contextual and societal boundaries that they operated within as Humans (not "Econs") in alignment with discussion in this chapter.

One of the larger UK industry research programs analysing householder retrofit motivations was CALEBRE (2008-2013) funded via Eon and Research Councils UK (Loveday & Vadodaria, 2013). The stated approach by CALEBRE was "to put householders' perspectives and their lifestyles at the heart of our thinking around the technical developments and investigations that we undertook – and that could ultimately lead to refurbishment solutions that appeal to consumers." Although principally focussing on hard-to-treat housing (mostly solid wall) they considered findings that were relevant to other property types.
The findings around householders' attitudes to refurbishment were:

- *Relating to motivation, timings and cost, the needs to repair and increase comfort are key drivers, not reducing energy demand – clearly there exists a pragmatic aspect of certain triggers i.e., repairs, however without that, emotive comfort becomes the main driver, not money nor lower energy use.*
- *Aesthetics and original features such as windows on older properties were cherished items – there was very little link to monetary returns nor energy efficiency here.*
- *Issues of trust in the professionals selected to carry out the work emerge as important, with unknown professionals routinely not being given work, whilst professionals were selected against affordability and cost of quote. The issues of*

trust, social recommendations and length of relationship with the professional under consideration were key drivers.

- *Following initial work at time of purchase, on-going upgrades are very piecemeal over time. This reflects the concept of a house in its role as a home moving through time configuring to meet the bounded rationalities and changing needs of its occupying family, including practical financial concerns as relevant.*
- *Householders are keen to maintain air flow, even if it loses heat and are often not prepared to lose the functionality of chimneys and ventilation to control humidity. Whilst this may show a bias by the sample being of older, (typically Victorian) houses, the lessons around habits and usage suggests that without strong and continued education, people are perhaps likely not to use something like a mechanical ventilation and heat recovery (MVHR) retrofit appropriately even if the home later became air-tight and insulated to reduce energy loads.*

Indicatively the three main recommendations made by this report around priorities, values and aspirations were a need for:

- *A better user experience led design process around retrofit that would educate both policy makers and SMEs to increase engagement.*
- *SMEs need to be upskilled to meet the surprising internal knowledge that householders held of their own homes.*
- *A re-design of refurbishment policies taking advantage of opportunities to engage householders on areas of interest, additionally addressing barriers to uptake as many of the projects already desired by householders have elements of energy efficiency within them to build upon.*

The findings broadly support the work of Wilson et al. (2014) by identifying policy gaps and potential levers in three further categories that reach far beyond providing simple financing plans or potential returns via energy efficiency as a motivation (as proposed by the Green Deal). Furthermore, framing future research primarily around drivers or barriers to stimulate energy efficiency retrofit was not leveraging what mattered to householders at a salient time. Rather, work moving forward should be seeking to identify personal (more emotional) motivational drivers that are often focused on comfort or maintenance rather than energy demand reduction and concomitant financial benefits. These findings starkly contrasted the nine studies carried out over the previous six years that were analysed by Wilson et al. (2014) which all listed upfront cost as a focal renovation issue.

Considering implications for this thesis, for each HRP, the specific trigger point in their ownership of the home may vary as the home evolves through time, and even though the

Green Deal was designed to provide suitable funding support this does not mean the HRP may wish to access it immediately. Considering that the average tenure length of an outright owned property in England is 24.5 years (DLUHC, Annex 1.1, 2022), this presents a challenge for schemes often only lasting anywhere between a few months to a few years. The combination of providing more personalised motivational support, a long-term funding model that would be in existence when wanted and a better and more salient SME skills sets, would conceivably engage more people to feel a sense of self-efficacy at the appropriate time to undertake retrofit improvements.

2.5.2 Persona-based approaches

One of the papers that evolved from the CALEBRE project was concerning “a persona-based approach to domestic retrofit” (Haines & Mitchell, 2014), noting the role of HRP aspiration as motivators for energy efficient retrofit. This represented a shift away from the promotion of technocratic needs-driven solutions, dominating industry to this point. The change towards a user-led design process which creates and codifies set personas for use by varying stakeholders increases the joint understanding of the wants and needs of the end user by the policy maker and delivery agents. This methodology, if deployed, could “enhance the diffusion of policy goals for low energy retrofit and also allow business and technology developers to target an appropriate user” (Ibid.).

ACORN™ was launched by CACI in 2013 (CACI, 2023) at the same time as CALEBRE was being completed and as noted previously, is used by the government to assist policy-making. However, there has been limited data to-date showing it being used explicitly and successfully for energy efficiency policy creation or engagement with delivery providers. This directly contrasts with the US Department of Energy, which is known to have done so for the last decade (EERE, 2012) with their EERE persona guide providing clear examples of varying external stakeholders (including the public) that they as a department should be supporting. Their analysis includes what stakeholders’ interests and barriers may be and examples of typical behaviours to provide context to the policy makers using the persona models.

Whilst UK policy making clearly supports the use of personas as evidenced in the Open Policy Making toolkit (Cabinet Office, 2016), and indeed OFGEM uses them for internal training and support of their professional stakeholders (Hippo Digital, 2020), it is the potential for engaging an end user and the SME delivery agent (and then their engagement with the HRP) that appears to be missing at this time. Again, potentially one of the key issues from an engagement perspective, both in terms of outreach and then

usage of personas, is the fact that over three quarters of all construction SMEs are micro-SMEs (BEIS, 2022), providing a significant challenge in both communications to, and internal skillsets within, these SMEs. As such, seeking a simple engagement platform that provides human connection and context which supports all stakeholders may be key for future engagement and successful delivery of policy. Combining both big data, and more individual datasets such as half-hour billing, EPC data and Domestic Operational Rating (if enacted) may enable the creation of more personalised personae like 'HADRIAN' (Marshall et al., 2015) that still support the technocratic data required from an engineering perspective for the SME to use, but also create a sense of endowment and recognition by the HRP.

2.5.3 Energy efficiency retrofit influences

There are possibly two distinct sides relating to this topic, one naturally being the end user's (HRP) motivation but the other may be those of the SME, which will be examined first. Practically, as noted in the inner wheel of the Behaviour Change Wheel (Michie et al, 2011) the categories for capability, opportunity and motivation will influence retrofit action by the HRP, and the same concepts can be applied to SMEs delivering retrofit. Research on this was done by Murtagh et al. (2021) with repair, maintenance and improvement industry SMEs to analyse their likelihood of offering and delivering increased energy efficiency outcomes in their normal work output using COM-B as a framework. The results found that whilst high levels of general engagement existed with the theoretical ideal of delivering retrofit improvements there were active de-motivators for the small micro-SME delivery agents. To incorporate this, the paper extended the COM-B model to COMD-B, including Demotivators as a counterweight stating that "negative motivations also exist, and these differ from the simple absence of positive motivations" (Ibid.). It highlights strong emotional motivators for the SMEs in the way they act and what they offer householders, including to ensure their own employees' incomes and jobs are secure, rather than offering the best benefit to the client. The final items recommended by the paper are not so dissimilar than those for engaging the HRP – greater understanding of what motivates day-to-day actions would point to many areas of targeting for policy, training standards and communication campaigns.

If this is the case then moving away from the SME and beyond the traditional challenges of capital expenditure, what can the HRP perspective around attitudes and behaviours contribute to help fill in the picture? Between 2007-2010 The Kirklees Warm Zone scheme provided a case study that provides "fuller understanding of the design, delivery, take-up and impact of domestic energy efficiency retrofit schemes" (Long et al., 2014). This

scheme offered full capital funding to residents to remove the barriers of cost for loft and cavity wall insulation, with low-energy lighting and carbon monoxide monitors also provided. With financial barriers and 'sludge' being removed at the start, the key distinguishing factor for this scheme was the delivery method – rather than piecemeal delivery by varying SMEs reacting to market needs, the scheme created its own market through outreach and education, being overseen by the Kirklees Borough Council as the trusted messenger doing initial engagement.

Of the 176,000 homes in the area, 165,686 were visited following a warm-up phase including posters and outreach engagement and 51,000 (29%) had retrofit measures undertaken. All homes had their door knocked a minimum of 3 times and of those engaged, 81% had their home assessed by trained personnel (ibid). Once all the installations had occurred in the area there was a crucial "mop-up" phase whereby those who initially declined were re-visited and re-invited to engage. This resulted in 28% of all installations being done by the diffusion 'laggards' (as per Rogers, 2004). Overall, the scheme was deemed to have cost £12.50/tCO_2 saved (assuming 50% of energy savings taken as increased thermal comfort) (Long et al., 2014), offering outstanding value for money.

Follow-up survey analysis of participants and non-participants found that key motivators included:

- *The scheme was free at the point of use - this empowered people without readily available capital, and enabled money-saving for lower-income groups.*
- *The ability to include the scheme with planned renovation work or as actions in response to trigger events (e.g., retirement) increased participation – the longer lead time, awareness campaign and delivery roll out made this more likely.*
- *Comfort and health improvement – this was mostly for lower-income participants, enabling higher temperatures and reducing mould/damp.*

The survey found that participants were more likely to have pro-environmental, energy-saving and environmental protection views, had higher levels of trust in their Local Authority and felt greater self-efficacy to find information, save energy and achieve a positive affective outcome. Self-efficacy is highlighted here, which links to decades of prior research on the topic. Schunk and Usher (2014) stated that "observing similar others succeed can raise observers' self-efficacy and motivation when they believe that if others can perform well, they can too.". The link between improved self-efficacy and increased likelihood of acting is noted by varying researchers spanning many decades (Rosenstock,

1974; Bandura, 1977; Freeman & Dolan, 2001; Robinson, 2013; LaMorte, 2022) and is included in recent government reports (PAC, 2021). This link would apply to energy efficiency upgrades when considered from a behavioural change perspective as much as it would to any other area of decision-making such as health or lifestyle changes.

The results in Kirklees may well suggest a positive re-enforcing loop for the householders who engaged, and whilst the research did not follow up, it posits the idea as probable. The project highlights the benefits of communication being both widespread in a chosen community, and also using personal targeting to provide personal relevance.

Kirklees is a multi-ethnic demographic with varying areas of deprivation (Kirklees Council, 2016), lower levels of pensioners than the average area (but this is growing fast) and a lower than national average income. This is not exactly representative of the HRP that is the focus of this research. Therefore, there is a need to review further initiatives and see if these motivations and barriers appear universal or what changes may be found.

Trotta (2018) indicates that in contrast to the Kirklees project, outright owners of homes (the HRP as defined in this thesis) were less likely to invest in energy efficiency retrofit measures than those with a mortgage and specifically less than those with older children living at home. Trotta suggests it may be because of lower risk aversion to debt by householders with mortgages which may increase likelihood of investment in the home (as the house is already a debt but also a growing asset), and an intention to potentially live in the property for longer than the average (older) HRP. This again reflects previous research into fore-shortened time horizons of the HRP discussed previously.

A recent report into UK rooftop solar showed the most likely considerers of solar were at an earlier life-stage with half under 35 years old (Basis Social, 2021), supporting research from Trotta (2018) stating that ‘younger’ mortgaged properties are more likely to renovate for energy efficiency. Their barriers and concerns fell into three categories:

- *Addressing risks.*
- *Financing and spreading out the costs.*
- *Ability to make financial gains from installation.*

This may indicate that the connection between any emotional or comfort benefit from solar is hard to derive and if the younger generation identify risk, cost and financial rewards as the barriers then, as previously shown, the HRP as defined in this thesis will likely struggle with these concerns to an even greater extent. They also find in support of a CALEBRE-

related paper (Haines et al., 2012), that the dwelling characteristics appear to have a greater influence on the actual likelihood of energy efficiency upgrades, more so than any socio-demographic characteristics; for example, having older properties with sash windows may mean that they are a ‘feature’ and desired to be kept. Also, the older pre-1990 properties are more likely to be upgraded as these were not built to modern building codes (with higher energy efficiency standards) meaning structure does indeed influence choice to some certain extent i.e., that these homes may already be “warm enough” or “cheap enough to run”.

Key recommendations from the Basis Social paper also follow those from Murtagh et al., (2021) by suggesting the targeting of specific groups instead of a one-size-fits-all approach which may help support those who were not intending to act compared to those who would free-ride funding when already intending action. They also recommend that a more detailed representation of the household characteristics should be included in the intervention design i.e., a modelled persona to aid targeting, ensure value for money and to increase uptake by those who would benefit the most. Finally, in support of the Kirklees example, recommendation is made of supporting Energy Service Companies (ESCOs) to find and create large-scale targeted activities in the residential sector to achieve greater economies of scale. This is because with the reduction of universal funding support targeted at the “able-to-pay” sector then under the current SME delivery paradigm it may become more important than ever for the SME market to be able to identify a business opportunity to invest in. However, one of the risks this may create is to exacerbate the systemic focus of SMEs on chasing a market by further marginalising those identified as less likely to invest in the first place – the older HRP under research.

2.5.4 Rebound effects and comfort-taking

Having highlighted some effective engagement approaches, it is important at this point to consider the impacts of ‘rebound effects’ and their impact on HRP engagement with retrofit. Rebound effects can be linked to the longstanding concept of ‘Jevons’ Paradox’ (Sorrell, 2009) and how this applies if the HRP does take up policy recommendations. These effects can reduce the expected savings from energy efficiency measures, meaning they can even backfire, although their impacts are rarely quantified.

For example, the Energy Saving Trust (2023) lists one value for the predicted energy efficiency savings of popular measures but the annually recorded National Energy Efficiency Data-Framework (NEED) report (BEIS, 2021c) will show the actual annual in-use reduction of energy post installation as being another (Table 2-8). These figures

would suggest that only 20.7% of the desired savings expected by HRP and the government are achieved for a cavity-walled property (and by proxy also the drop in carbon footprint).

Table 2-8 Predicted Energy Savings Trust ST savings v. lived reality

	Cavity Wall	Solid Wall	Loft Insulation	Condensing boiler + controls	Solar PV
EST*	£395	£540	£355	£305-540	£400
NEED savings %	8%	17%	3%	4%	10%
NEED savings £	£104.59	£222.26	£39.22	£52.29	£118.91
Variance	-£290.41	-£317.74	-£315.78	-£370.21 mean	-£281.09

The key driver for this is the rebound effect, or as the NEED report (BEIS, 2021) puts it "Comfort taking" which may combine with changes in behaviour over time as the HRP becomes more used to their new environment. Comfort taking (BEIS, 2021) can be defined as when a householder "runs their home to the level of comfort they always desired but could not either practically, or potentially affordably, achieve before the retrofit". This real world in-use result contrasts with the modelled data that the Energy Savings Trust use, which would be sourced from the BRE Domestic Energy Model (2012), which assumes a standard heat being achieved before and after installation not an adjustment of lifestyle after the installation.

For policymakers, this demonstrates that end users act as 'Humans' and not 'Econs', meaning they do not act solely for rational utility in areas related to expenditure (Thaler, 2016). As such whilst the policies are based on modelled engineering data sets, the in-use result has a human factor that may apply. The human factor is potentially showing that householders felt their homes were either under-heated (or underpowered) in the first place for the comfort levels that they required, and they could not structurally meet their needs without (for example) better insulation first. Or alternatively, their preferred lifestyle was perhaps out of their budget range and the savings now on offer allow them to afford to use more to meet their desired levels of comfort/enjoyment. This situation shows the strength of the concept of *perezhivanie* – that of the emotional and cognitive experience - on their in-use decision-making process. Either way, this may not be good news for policy makers, who will need to drastically increase the retrofit of UK homes if indicatively 79% of the expected benefits are "consumed" by the end user for comfort and lifestyle desires, thereby removing 79% of the predicted carbon savings.

The unexpected outcome of not achieving promised financial savings (even though self-caused) may promote dismay for HRPs, thereby reducing future engagement with similar

promoted schemes. Potentially this conflict may compound the challenges found with using EPCs for engagement. If the HRP perceives less benefit than expected by following a recommendation from an EPC, then they may feel less motivated to continue with further recommended upgrades. This matters because the EPC should be a used as a key information source for both SME and HRP for future planning. Ideally therefore, this should be a practical, useful and accurate tool that allows for real world in-use data to build on the more static BRE Domestic Energy Model (2012) to support engagement.

2.5.5 Decision-making and comfort-taking

Galvin & Sunikka-Blank (2017) conducted a review and summary of the previous decade of home retrofit policy research (2006-16) seeking to identify 10 key questions and answer them via the lens of sustainability, i.e., whatever occurred must benefit both people and the environment. In agreement with Haines et al. (2012), and Trotta (2018), they argued that in addition to reducing CO_2 emissions, preserving the cherished features of buildings was important, whilst also improving health for occupants. Linking these issues may well strongly motivate the HRP as defined in this thesis and help to overcome the initial financial demotivator. Galvin & Sunikka-Blank's work further goes on to support the CALEBRE summary (Loveday & Vadodaria, 2013), stating that most retrofit work is piecemeal over time and the order of retrofit varies, meaning diminishing returns occur for later projects which may limit the uptake of such works. This shows the conflict between ideally doing a deep retrofit to capture all possible savings in one holistic (and possibly overall cheaper) project compared to the desire to spread them out to increase uptake, which increases the risk of diminished CO_2 reduction. From a householder's perspective on retrofit, this begs the question of at what point is retrofit "good enough"? This will clearly vary by HRP and house structure, and as noted already there are many systemic barriers in the way from physical, mental, social, financial to name but some, but the evidence reviewed so far suggests that the sense of self-efficacy and the desire to do so for emotional reasons may be a key influence for the HRP as defined in this thesis.

Galvin and Sunikka-Blank also highlight an "almost complete failure to recognise the different roles and approaches of women and men in household consumption, retrofit planning, supply chains and research". The government-defined HRP is male as defined in the English Housing Survey 2021-22 Headline Report (DLUHC, 2022), and this research will seek to explore whether the government defined HRP is truly indicative of decision-making in retrofit projects.

Whilst Galvin & Sunikka-Blank also agree on the need for better and nuanced engagement they bring further questions around gender and socio-economic settings with recommending greater use of research from qualitative social science to “help us discover what households want, need, think, aspire to” (Ibid.) in retrofit terms. These are the more emotional drivers rather than the empirical and colder energy-based quantitative data driven “benefits” promoted at present. They may also help to explain the large amount of comfort-taking post retrofit discussed above. Previously introducing the ‘pre-bound’ effect (Sunikka-Blank & Galvin, 2012) they noted that using a buildings energy rating to predict savings “tends to overestimate savings, underestimate the payback time and possibly discourage cost-effective, incremental improvements”; this matters due to most retrofit improvements happening incrementally over time. They also note that “the potential fuel and CO_2 savings through non-technical measures such as occupant behaviour may well be far larger than is generally assumed in policies” and recommend better understanding of qualitative drivers and barriers to householder decision-making in direct support of the aim of this PhD; they further recommend that policy making needs to take this into account when forecasting (Galvin and Sunnika-Blank, 2017).

This adds to work from Tweed (2013) who (via literature review, case study of an actual property retrofit and interview with tenants) considered dwelling-retrofit socio-technical issues and explored “the application of conceptual and methodological tools from phenomenology and ecological psychology to investigate people's experience of and feelings about a retrofitted dwelling.”. They found that unexpected in-use behaviour by householders would often produce a performance gap. This implies that householders’ responses to refurbishment, and any change in affordances provided by the property, should be identified and mapped back into energy saving predictions. If done, this may lead to a savings probability range for use by policy makers ensuring realistic targets more likely enacted. This is echoed in other parts of the world such as Australia where research by Middha et al. (2022) recommends “regulations and strategies that rely on conventional understandings of home, homemaking and retrofit spaces are unlikely in themselves to result in low-carbon societies.”; social practice theory suggests that the HRP may find ways to retrofit non-standard spaces into (for example) “man-caves, garages and granny flats” (Ibid.) etc. but these may not perform within standard parameters after being retrofitted.

A good UK example may be the interplay between increasing insulation in a property to save energy and the risk of overheating during the summer. If designed and installed with poor ventilation and/or with low occupant training regarding managing their new environs,

a risk to comfort and health for the occupants occurs. This then potentially results in air-conditioning as an energy rebound, increasing both CO_2 emission and costs; using a model (or at least a heuristic) identifying overheating signatures of UK homes would likely be of great use to design-out this risk (Drury et al., 2021). This process should ideally be included in any planned refurbishment program if it is scheduled to occur over several years. Whilst this may be the ideal – planning and having an integrative approach for a whole home retrofit, even if done over several stages – it is not typically the case. The lack of sequential planning can reduce cumulative CO_2 savings for a mid-1930s semi from 54% to between 24-42% (Simpson et al., 2015), or even as noted above, cause topical net increases at varying times of the year. The consequences for the HRP regarding overall value for money of any deep retrofit if spaced over time could be significant.

2.5.6 Potential person-centred approaches

An approach currently being put forward to help householders better understand home energy retrofit decisions is the 'digital energy passport' (BRE, 2024). This is taking the concept of the Home Energy Model (Ibid.) that is being posited as a replacement for the EPC and expanding access to it to allow "the data on the certificates to be used in a more dynamic way to provide the information that homeowners and other energy users will need for them to take action to improve homes' energy performance."

Looking at existing engagement tools, the Department of Housing and Local Services (2022), provides a simple click-through process which pulls data from the EPC system and asks householders to answer 15 questions to check if the data in the EPC is correct (although it is questionable if the average HRP is likely to be able to provide all the answers). The tool then provides recommendations to add to an action plan for the home. The system is only designed for homeowners (not tenants) and the resulting report only provides financial cost/returns, with no mention of emotive or engaging benefits which the research discussed above has demonstrated as being of great value. This example highlights the longstanding focus on using promoted financial savings as being the motivator for the HRP.

In contrast, there is potential power in using personas and storytelling to engage people with retrofit planning. A good example of using personas to engage a community was provided by Cherry et al. (2022) with their study of future energy systems in Port Talbot, South Wales. The abstract's first line makes a key point:

“It is essential that any transition is shaped by what is socially acceptable/desirable at local levels, taking account of any existing vulnerabilities within the local community”.

In the case of the HRP under research, a considered vulnerability comes from age and neuro-economics being key factors shaping the decision-making process. Cherry et al. used an interactive persona-based approach to engage residents to explore future energy systems for Port Talbot; the act of the residents themselves knowingly creating the personas, which they then used to explore solutions in their known local environs was key to their effective engagement in the process. With HRPs, as defined in this thesis, relying more on memories and social connections to create personae and then mentalising affective outcomes to judge future decision against, this method may be key to increasing engagement. Cherry et al. note:

“By situating deliberation within a local context and grounding it in the emotional relationships that matter in residents' everyday lives, persona-based exploration provides a useful foundation upon which to conduct deliberation of complex socio-technical energy issues that can otherwise be presented and interpreted as quite abstract and technical visions of change.”

The removal of the need for learning of new technical complexities and comparison to existing memories helped bypass the stress-causing cognitive dissonance. This can thereby remove the challenge of both a thinning cortical cingulate and reduced dopamine efficacy whilst playing to the strengths of an aging mind. Whilst the study was not specifically looking at the ageing HRP as this thesis does, the ramifications are clear. The engagement with, and opening up to of, private stories fleshed out the personas they created and “…as characters were elaborated, they took on sympathetic traits of participants themselves, their friends or family members. Through this process persona characters became more rounded, resisting initial stereotyped descriptors.” (Cherry et al., 2022). The endowment process allows a more engaged reflection as they saw themselves and family in the personae, whereby the householder started to care about the outcome more, feeling it as now personal and not abstract, distant or other.

This practice may help drive the uptake of schemes designed to support retrofit. A key issue remains that these still require the householder to be motivated to carry out the improvements and ensuring that policies and technologies become appealing and acceptable to householders (Mallaband et al., 2013). Having Local Authorities, SMEs, support agencies and the HRP work together, with a mutual understanding that well-

designed and rolled out retrofit programs can be good for all, should be considered a desired baseline.

In this vein, the mPower Person-Centred Retrofit program run by Nottingham and Plymouth Councils (Jones, 2020) focussed on fuel poor homes and identifying those who slip through the cracks. The program aimed to benefit wider society through retrofit measures, improving physical and mental health, reducing social and medical costs, improving education and subsequent results for the local community. A key relevant part of this work is the use of 6 personas created based on user-led examples. Impacts of fuel poverty were overlaid onto personas and case studies before a solution was applied and the consequences and benefits of solutions included evidence and information. It was effective by being simple, engaging and presenting a story using photos and the householders' names. Whilst this study was focussed on fuel poor householders, the model could be considered useful for retrofit measures in general for the HRP considered in this research, facilitating greater buy-in.

2.6 Literature review - overall summary

The literature review has identified that the UK housing status quo is complex with the policy landscape not suitably engaging the HRP to take action to retrofit homes to reduce carbon emissions, nor requiring them to do so. Furthermore, the EPC system and recommendations made do not appear fit for purpose to meet the needs of transitioning to a low-carbon future, and England is not on target to do so at present within housing stock. Unfortunately, the delivery mechanism of choice - the SME - does not appear capable of supporting the level of retrofit desired due to historical stop-start policies. Even if they were, questions remain about the philosophical incompatibility of them to meet the needs due to an inherent need to extract profit and wealth whilst siloing best practice and skills. When the HRP does choose to engage and install retrofit measures then due to comfort taking, the financial and carbon savings are likely to be significantly lower than those suggested by EPCs.

There remain significant trust challenges between stakeholders and concerns exist regarding who are the HRP's trusted messengers. The HRP potentially forms a vulnerable group relating to their cognitive ability for decent affective decision-making with age being the main factor around neuroeconomics. Prior research into renovation drivers that informed early policy was skewed towards financial incentives but more recent research

shows greater emphasis on the emotive drivers for the HRP. However, government schemes and the EPC process fails to reflect this understanding. Although schemes such as the Kirklees Warm Zone scheme have demonstrated the value of localised, personalised, targeted and funded approaches to retrofit, this schemes sadly appears to be an anomaly rather than the norm.

Overall, prior research shows that homes are renovated as the need for improved habitability is recognised; this occurs within the bounded rationality of the HRP, and any retrofit happens piecemeal over time and in non-conventional orders. The HRP needs support to recognise personal, emotional and comfort benefits that may accrue to them, not just financial ones, if they were to improve energy efficiency as they renovate their home (or explicitly because of it). The use of trusted messengers, bounded locales, behavioural economics and behaviour change theories linked to personalised support would likely result in an improved level of engagement and consequent increases in installations if suitable funding platforms are available.

This understanding provides the platform for the present research which will address the issues raised in the literature review through analysis and evaluation of the direct engagement experience of owner-occupiers via the present delivery structure. It will then consider this via the lenses of the three major stakeholders – Governance Entities (Policy makers), Delivery Entities (Small to Medium Enterprises – SME) as a delivery arm and Decision-Making Entities - the HRP (owner-occupier) as the recipient of the policy framework.

Chapter 3: Methodology

This chapter discusses the methodology used in this study and is broken into four different parts: the overall research design; survey design; interview design; and finally, a chapter summary.

3.1 Overall research design

3.1.1 Research paradigm

The research took a pragmatic stance. Pragmatism involves research designs that incorporate operational decisions based on 'what will work best' in finding answers for the questions under investigation (University of Nottingham, 2024).

The research therefore seeks to use any method deemed suitable to help answer the research question and employs a mixed method technique following an inductive process seeking to use quantitative data to inform further qualitative research. This allows an interpretivist perspective to be used, seeking to understand any latent and contextual meanings which might influence the HRP when decision-making around the topic of energy efficiency upgrades to their homes. The perspective was specifically against a more traditional positivistic research paradigm of scientific research – to set, then test prior set hypotheses in a detached and impartial manner – although this is not to say that the data collection was not rigorous, valid, reliably replicable nor generally applicable (Denzin et al., 1994; Robson & McCartan, 2018).

The work follows the tenets of social-constructivism due to the inductive nature of its development and recognition that “people construct their own understanding and knowledge of the world, through experiencing things and reflecting on those experiences.” (Trochim, 2023), which places this as a sub-set of post-positivism (Creswell & Poth, 2018). However, this is more due to the results of the pragmatic philosophy employed in the research than any prior design. When considering where this sits within the traditional ontological (theories of reality) vs epistemological (theories of knowledge) perspectives, then due to the predicted importance of the HRP’s knowledge and beliefs this work leans more towards the social-constructivism epistemological stance (Robson & McCartan, 2018). It is worth noting that the distinction between ontology and epistemology is not always clear - varying paradigms are viewed by some authors as “ontologies, by others as epistemologies and others still as encompassing both at the same time” with people choosing to define either multiple or single qualitative paradigms and applying them as

they wish (or just a single paradigm with multiple “camps” sitting within) (Braun & Clarke, 2022).

3.1.2 Research approach and methods

A mixed method approach was selected using both quantitative and qualitative analysis. This involved direct demographic comparison of the HRP to government data sets to check the representativeness of research participants, followed by creation of a relevant online quantitative and qualitative survey. The relevant sections were subject to statistical analysis followed by thematic coding of any free text responses, thereby allowing informed selection of a specific sub-group for follow-on qualitative data collection. The methodology recommended itself as best to accommodate the diverse natures of both people and the buildings interacted with, but also the fluid financial and political backdrop that this work was conducted within. Key thought was given to allow the process to go where it led and to create data collection questions topically as the research moved forward due to this being by intent a flexibly iterative process.

In more detail, firstly, a 30-question online survey was completed by (N=281) research participants between 14th February 2022 and 30th June 2022 after earlier pilots were run. The participants had been demographically matched to the profile of the statistically averaged current HRP as defined by the English Housing Survey (DLUHC, 2022), and subsequently used by the government. This work included the use of Likert scales, open questions, free text boxes and direct closed questions to create a broad range of analytical options to investigate data and opinions in 4 distinct categories:

- *Their home and previous energy efficiency decision-making.*
- *Achieving Net Zero and government support.*
- *Beliefs surrounding energy efficiency in the home.*
- *Drivers and barriers surrounding energy efficiency upgrades.*

From these results, a selected group of survey respondents were chosen to follow up with more qualitative work through the medium of interview and Reflexive Thematic Analysis (Braun & Clarke, 2022) to allow greater context and insight. The interviews (N=11) took place between 17th of August 2022 and the 7th of October 2022 with the analysis occurring in the following two months.

The whole research study took place over the period of a year with the help of East Midlands (District 1070) Rotary Club and (N=281) of its members who were willing citizen scientists to be studied in their role as HRPs.

An unexpected external influence occurred with the invasion of Ukraine, on the 24th of February 2022, and the resulting energy crisis and large price rises for domestic heat and power happening after the survey response but before the interviews. This may well have resulted in different themes being of more relevance to the research participants in different parts of the process. To try to investigate this, a short MS Forms questionnaire investigating feelings about this subject was created before the interviews and completed by each candidate live at the start of the interview.

3.1.3 Researcher positionality

Researcher positionality was broadly viewed from three perspectives and how they come together (Darwin Holmes, 2020):

- *The location of personal positions on matters that influence the research*
- *Location of the researcher compared to other stakeholders within the research, such as the research participants, and how they may view the researcher*
- *Recognition that the research does not occur in a vacuum and that the research results will be influenced by both themselves and the methodology used*

I summarise my own positionality below for the case of this work. This discussion incorporates some mention of concepts from literature that have influenced my thinking:

I am a 51-year-old, white male atheist born and raised initially as aspiring working class in the East Midlands in England, diagnosed with Asperger's Syndrome and who had a poor early formal education experience. I have moved from a traditional right-wing upbringing to a more left-wing political stance as I have aged. My working life has been a series of jobs each providing some small improvement in skills and knowledge but predominantly working within product or service sales for the energy sector to the domestic HRP or landlord of private rented properties. I now hold an MSc in Energy & Sustainable Development and status as a Chartered Building Services Engineer which, from the HRP perspective, potentially provides more weight to my opinions when discussing retrofit.

My roles have almost always involved translating technical products or engineering solutions into accessible language to educate the HRP to facilitate a sense of agency allowing them to make a purchasing decision. As such I have mostly taken the role of "other" or "outsider" to this group in terms of knowledge and skillset but benefit by gaining inclusion and acceptance for my explanations to be accepted emotionally as well as intellectually. My philosophical and personal views about the role of capitalism and SME in the delivery of retrofit products (not the best suited mechanism available) strongly put me

on the side of the client not the company and this is often recognised by the HRP, helping me to bridge the tribal gaps between engineer/salesperson and the HRP client.

Following a pragmatic and inductive philosophy has helped me to establish sets of rules for least cost/best result for the client like the Pareto Principle.

“The lesson we should learn from the Pareto Principle is that some inputs are vital, while others are trivial” (MacIntyre, 2021). “The Pareto principle can be applied to quality improvement, as the majority of problems (80%) are produced by a few key causes (20%)” (Cambridge Dictionary, 2023a). For this work it is considered important to address the “vital few” that affect the majority. When working with clients this means agree common language, identify how they view success and seek to satisfice not optimise.

Translating this experience and habitus to research and this group of research participants (Rotarians) has been challenging as the research participants are from a traditionally higher social stratum of middle class (Cambridge Dictionary, 2023) people. My pre-existing perception of myself, them, and how they perceive (and act upon) their own status marks me emotionally as an outsider as I do not want to feel part of this social group nor judged to be one. However, as a member of the Rotary Club I am potentially perceived as an insider as I demonstrate socially stated shared values around the seven areas of focus that Rotary International publicly work towards (Rotary International, 2023):

- *Promote peace*
- *Fight disease*
- *Provide clean water, sanitation, and hygiene*
- *Save mothers and children*
- *Support education*
- *Grow local economies*
- *Protect the environment*

The Rotary Club is “a global network of 1.4 million neighbours, friends, leaders, and problem-solvers who see a world where people unite and take action to create lasting change – across the globe, in our communities, and in ourselves.” (Ibid.)

My personally held views around over-consumption, environmental and sustainable practices clash with my perception of how many (but not all) of them live their lives and the large value-action gaps I feel occur between often publicly held views and privately made choices. Whilst most people have traits within all three psychographic groupings

demonstrated in the Values Modes mapping system (Rose & Dade, 2007), my opinion puts this group predominantly within the "(Gold) Prospector" group but due to age they are now intersecting with the "(Brick) Settler" group.[2]

These views have likely influenced the research project by heightening my own awareness of potential influence and I have aimed to remain impartial and not to do so, particularly when I interacted directly with participants in interviews. The social constructivist paradigm of this research includes recognition that the researcher's own prior experiences and worldviews may influence the work. A key challenge in defining a research paradigm is the tension between constructivism and interpretivist epistemologies. There may, in fact, be a language difference between usage based on country of origin with some preferring one to the other. It may be described that interpretivism is a paradigm and constructivism is a theory.

For clarity, this thesis takes the view that a constructivist paradigm is the dominant one of the two as much of this work focuses on how the research participants construct their own reality through the interaction with others (albeit with interpretation of how they experience and interpret their reality). In particular, with understanding that the results of any interpretive analysis would be "…the product of [the researcher's] own worldview" (Mitchell, 2017), which will "both constrain and shape what the researcher attends to or overlooks, assumes and finds of interest during the course of undertaking research" (Huberman & Miles, 2009; Crowther & Lancaster, 2008). Due to the nature of an interpretivist perspective, it is inherent that for the qualitative data generated (unless it can be triangulated with other techniques), statements held true by research participants are

[2] To allow for greater understanding of the three psychographic groups the definitions of them are provided (Rose & Dade, 2007):

"**Settlers** are socially conservative, concerned with the local, known, identity, belonging, and prefer trusted channels and known behaviours. They are wary of change and espouse discipline, are acquiescent, keeping to the rules and wanting a lead from authority.

Prospectors want to acquire and display the symbols of success in everything they do. They want to make their lives better and be seen to succeed. They are a higher energy more fun seeking group. They are early adopters but not innovators, which involves social risk that they avoid.

Pioneers are society's scouts, testing and innovating, and always questioning. They are attracted not so much to signs of success but what is 'interesting' including 'issues'. Some of them are strongly ethical believing that to make the world a better place they must be better people. Others are more relaxed and holistic, and some are into 'doing their own thing'. They are most at ease with change and most global in outlook of all the groups."

only as “true” as believed, whether consciously known to be true by the HRP or not. However, this is not to reduce their importance if they are used as justification for future actions by the HRP themselves – effectively their narrative rather than the researcher’s knowledge leads the way (Guilfoyle, 2003). This statement, when linked to the natural filtration that occurs as a researcher stimulated by their own worldview, interests and desires (or any cognitive dissonance), will always influence the nature and tone of the researcher’s speaking position and what the researcher will find satisfying when seeking to answer their research question (Ibid.; Franklin & Blyton, 2011)**.** Whilst familiarisation occurs with the data sets over time during the initial analysis there will be an automatic preponderance towards the extremes – those facts or opinions most in tune with or out of alignment with the researcher’s own worldview and opinions.

3.1.4 Bias and influences – reduction of risks

Building upon the discussion of positionality above, it was recognised that bias and both internal and external influences on the researcher and the participants were going to be areas of focus. To attempt to combat bias, the following steps were undertaken:

- *A researcher identity memo was drawn up (in November 2020) seeking to identify any personal and historical biases that were being brought to the design process.*
- *The research philosophy was actively chosen to be inductive and pragmatic, seeking answers whereby no pre-conceived ideas were allowed to stand if challenged in the literature review process.*
- *Recognition was given to the challenge of self-selection of participants for pro-environmental behaviour and recognition of social credit or aspiration to be seen as a good person. This would mean that the more environmentally friendly members of the Rotary Club would dominate the response data set and thereby skew the results. To combat this, it was made clear that there would be no personal recognition nor data shared, and the survey questions were designed to be indirect and sectioned. This was to separate how people thought about pro-environmental behaviours and their actual actions and impacts (Koller et al., 2023) to mitigate this risk of bias through seeking recognition for actions or intent.*
- *The data was disaggregated by gender to allow clearer identification of motives, barriers rather than the just as an amalgamated whole due to the skewed positive ratio of men to women in Rotary.*
- *The interview participants were chosen on a first-come first-served basis using their unique survey ID code with no names to remove any potential choice bias.*

- *Questions were piloted to trial groups before full roll out. The interview questions were set and read out verbatim to each participant from PowerPoint™ slides to ensure they all received the same questions with limited influence from the interviewer. Also, the survey was designed to be taken without active research influence when being completed.*
- *When writing the thesis and during data analysis, Researcher Reflection was regularly used to capture context and influences to foreground any potential biases. This data was recorded separately to the thesis as it was not deemed appropriate to include in the text.*
- *For analysis of the results, intercoder reliability work was done with three independent researchers to help remove bias of interpretation that a single coder may bring.*
- *To further ensure that potential influence was minimised the researcher did not present to or educate Rotary Clubs on the environment or related areas as this would potentially skew the research results thereby.*

3.1.5 Ethical considerations

There were three key concerns to address from an ethical consideration perspective.

The first was anonymity for all parties who took part in the research, achieved by not including any personal details in the results. All results discuss the HRP or percentages of survey respondents to certain questions, for example. No free text box answers included any identifiable information, which even if publicly provided, would not identify an individual. All participants were told in advance that all data would be presented anonymously. As a result, people did not talk about themselves as ‘people’ but rather about their actions. With the interviews, whilst clearly the research records hold the personal details, again they are not used and no identifier beyond gender was assigned.

The second perspective was data security and to manage this, the records were saved behind passwords on protected online secure servers rather than in a physical or directly accessible location. The computer used to access them has its own security passwords and security software to prevent unauthorised access or potential for loss of passwords and future hacking thereof. The JISC™ online academic survey software used follows ISO 27001 security and information standards and is fully compliant with GDPR regulations.

The third perspective was around the area of emotional distress potentially caused to the participants, as the research area links to potentially strongly held views over things such as climate change. To combat the issue, the consent form stated that participants should feel no duress to complete the survey nor take part in interview; that all data would be held securely and destroyed at personal request and that direct access existed to talk about any topics of concern at any time. The consent form included contact details for this purpose with an invite to contact at any time, for any reason.

The doctoral research program was carried out in accordance with De Montfort University's ethics guide and approved by the University as a low-risk study.

3.2 Stage one - survey

3.2.1 Purpose and target audience

The survey aimed to address the second and third research objectives:

Analyse and evaluate the direct engagement experience of the owner-occupiers via the present delivery structure. By use of survey and interviews to research, record and analyse influences on the uptake of retrofit measures by owner-occupiers.

Use of real world (data-driven) results to analyse the alignment of current engagement policy for HRPs and consider this via the lenses of the three major stakeholders – Governance Entities (Policy makers), Delivery Entities (Small to Medium Enterprises – SME) as a delivery arm and Decision-Making Entities - the HRP (Owner-occupier) as the recipient of the policy framework.

An approach was adopted to capture the historical retrofit experiences of the HRP and the positives and negatives of this process via a secure online survey. The use of a semi-structured process of controlled questioning with curated answer options and free-text boxes would allow opinions to be expressed that could be both quantitative and contextualised at the same time.

The desired target audience was sought to reasonably match the more detailed government definition of the HRP provided by the Homeowners survey by EHS (MHCLG, 2020) whilst recognising the fact that very few of the respondents would exactly match the profile. Analysis of the demographic characteristics of participants would allow a robust

comparison to the EHS HRP definition for comparison to, and further analysis of, survey results provided. The only participant criterion was that they owned their home. This allowed as wide a net to be cast as possible, yet remaining true to the research aim of specifically targeting the largest group of English householders, the outright owner-occupiers.

As part of the planning to find appropriate research participants the issue of convenience sampling was foregrounded with consideration being given to the practicality and ease of access and likely motivations (i.e., that they were going to be neutral and representative of the desire towards energy efficiency). Planning also considered whether participants could be encouraged to be engaged enough to become involved at all and then allow a follow-up longitudinal study via a focus group. The author of this work is a member of Rotary Club and serves on the district Environment Committee and, having cleared GDPR queries with the District Secretary, was able to access data on the membership, consider the suitability of profiling and the topic relevancy with “The Environment” with this having just been declared a new focus for Rotary International. As such, the research sought to arrange access to the membership via the new District Governor at the time and a formal partnership was arranged with them that this research would receive their approval and that they would sponsor it as a personal project of the incoming Governor, as is traditionally their right.

Out of a total population of approximately 2000 active Rotarians in the district, the resulting survey participants (N=281), 79% male (n=222) and 21% (n=59) female, all were homeowners and self-defined as the HRP. This breakdown may be due in part to the fact that as an older group of homeowners, they would show bias in such a way. Also, since Rotary only started admitting women 31 years ago in response to an increase of female business leaders (Busting the Myths, 2021), this lag has resulted in an imbalance.

Figure 3.1 shows that the trends of age groups remain broadly the same over time, but the total number of memberships slowly declines. This may relate to the fact that the number of “unknowns” in Figure 3.1 is dropping the most as they may indicatively be the oldest group with many members being over 80 and potentially being less engaged or digitally literate to answer online surveys.

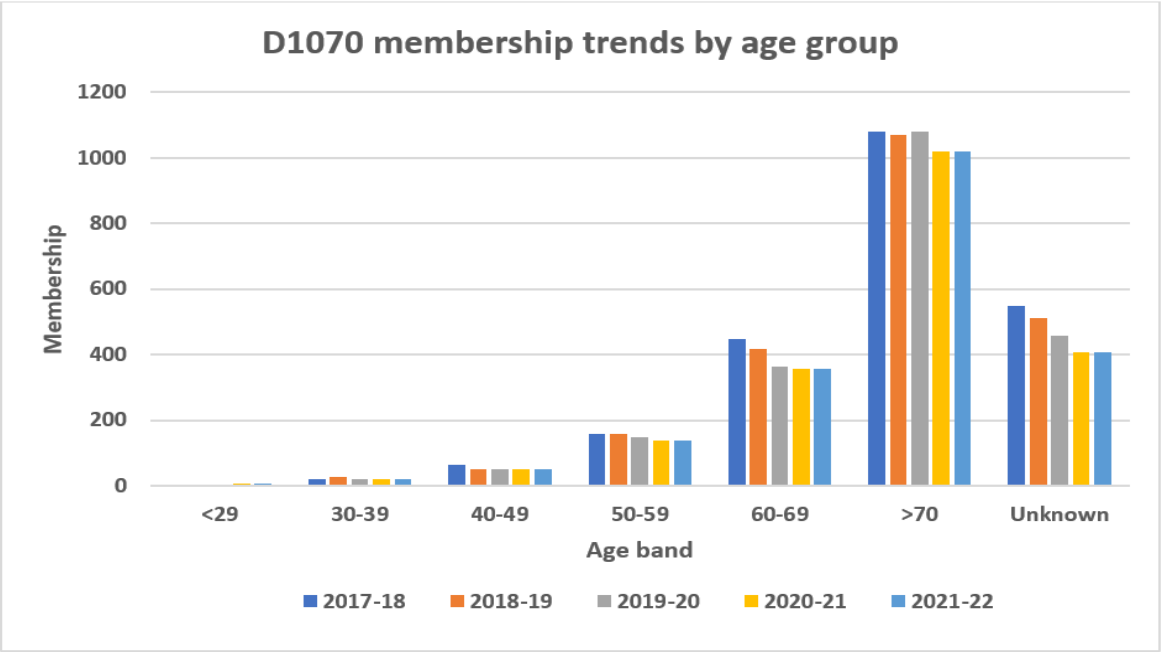

Figure 3.2 Age trends in Rotary

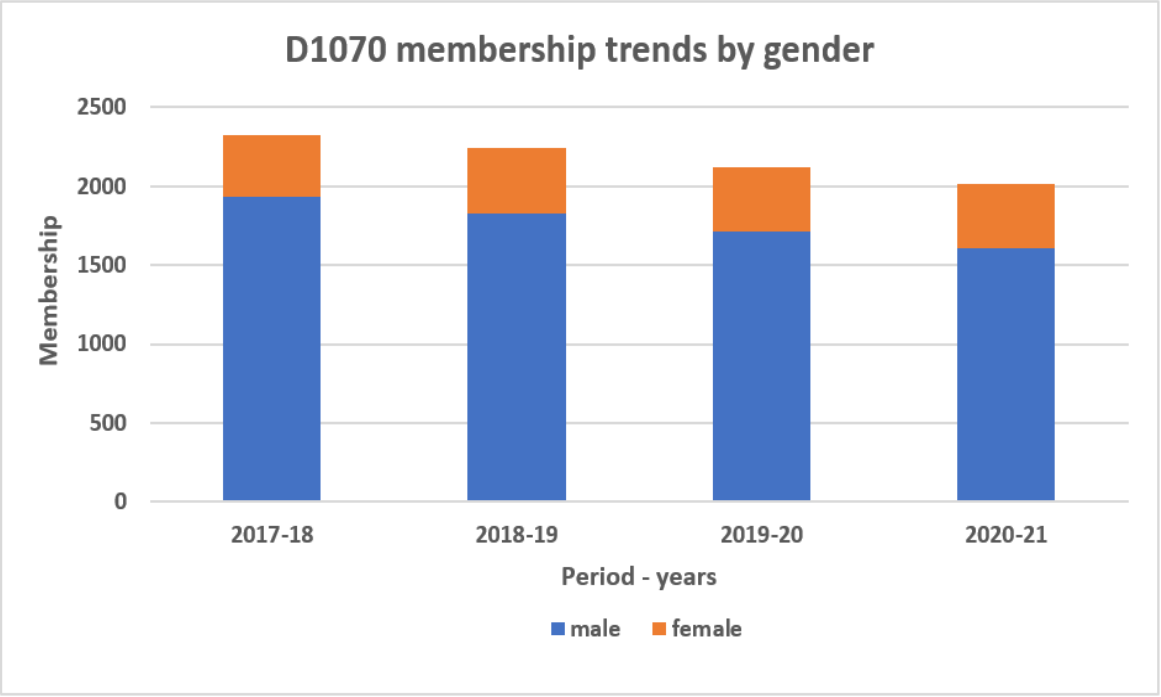

Figure 3.1 Gender trends in Rotary

3.2.2 Instrument design and process

The 30-question survey was created and distributed using JISC™ online software that provided both quantitative and qualitative data from (N=281) useful responses to validate or challenge the current policy creation process that was discovered in stage one of the research. The sample size was 281 after filtration of responses to remove (n=2)

intentionally spoilt surveys that either had impossible answers within, such as length of tenure being over 100 years or comments such as “Bah! Not answering silly questions”. The four main survey question sectors were on:

- *Home environment and previous energy efficiency decision-making*
- *Achieving Net Zero and government support*
- *Beliefs around home energy efficiency*
- *Drivers and barriers to action*

JISC™ online academic survey software was used as it followed ISO 27001 security and information standards and complied with GDPR regulations, with all data being stored remotely in the cloud on secure servers. The practical advantage of using dedicated software was the ability to create multiple iterations of the questionnaire and pilot test functionality before rolling it out, combined with the ease of data collation and export. The data was exported both as a PDF showing the questions, answers and simple statistical analysis but also as an Excel™ spreadsheet option. These two export options were important as this matched identically the method that the UK government chooses to publish its housing data and survey results – a summary PDF and then Excel™ data set. The Excel™ export data allowed detailed filtration tools that were suitable for analysis.

Several versions of the survey were trialled through the initial testing phase which ultimately led to two pilots being rolled out over the preceding 3 months prior to the main release. These pilots were run with (N=10) social contacts of both the author’s and other PhD researchers’ family and friends who were also homeowners and matched a similar age profile. These pilots were done with a view to understand what survey length was appropriate to gain as much useful information as a research participant was willing to provide in one sitting, whilst keeping both the time constraints and knowledge/effort requirements acceptable. The average answer time varied between 8 – 20 minutes with the average being circa 15 minutes.

The questions themselves were created targeting the four areas listed above and a table with their specific research aim was created, as shown in Appendix 1. This iterative process involved being reviewed by peers and the supervisory team before being rolled out in the pilot studies before full launch.

Within the survey software, Likert Scales, open and closed questions and free text box answers were used. There were 4 main sections with an introductory demographic questionnaire to help compare the survey respondent similarity to the EHS data -defined

HRP (MHCLG, 2020). To ensure this, the demographic questions used matched identically to those at the start of the English Housing Survey (Ibid.). This demographic matching method was used to remove the concern that the findings could be potentially doubtful or wrong due to participant relevance (Maxwell, 2013).

Likert scales, first introduced in 1932 to help measure attitudes (Willits et al., 2016), are a simple and pragmatic method of establishing (dis)agreement with a given statement to produce composite values that can index participants attitudes towards a particular topic. This was chosen as a useful and recognised technique to allow the posing of complex and nuanced questions with defined answers, thereby keeping the resulting responses within manageable and boundaries that would allow analysis. The use of closed questions could be used as springboards for follow up questions, identifying a sub-group of participants before delving into more detail. Finally, the free text boxes allowed for more nuanced and personal responses to those areas where context and opinion from the HRP perspective really mattered, and where emergent and novel views may be found. These results then allowed both quantitative analyses, some qualitative analysis and provided the launchpad towards follow-up qualitative data collection for further in-depth analysis. Participants would then be chosen from those whose responses indicated the most challenge to engage with energy efficiency retrofit.

After analysis of the survey data and write-up of results, thematic analysis was undertaken, seeking to identify themes and frequency via the use of latent and semantic codes:

Semantic coding - “semantic codes capture explicitly-expressed meaning; they often stay close to the language of the participants or the overt meaning of data” (Braun & Clarke, 2022)

Latent coding - “latent codes focus on a deeper, more *implicit* or conceptual level of meaning, sometimes quite abstracted from the obvious content of the data” (Braun & Clarke, 2022)

Whilst frequency of a code is not necessarily an indicator of its significance to the topic being coded, it was used to clarify how prevalent it was across Governance Entities, Delivery Entities and Decision-Making Entities. To aid analysis, the survey data collection was grouped by theme colour and expressed as a MindMap™ to highlight the greater focus on the drivers and barriers to action that the survey took (Appendix 2).

3.2.3 Survey delivery process

The delivery process of the survey held challenge even after engaging with the District Governor to create buy-in and a shared agreement of purpose. They were deemed an appropriate trusted messenger with authority to support and encourage participation.

Gatekeeping occurred by the District Secretary who was fundamentally averse to allowing an invitation email, with covering letter, to all members (approximately 2000). GDPR was the cited reason with non-relevancy being the specific point – i.e., that the individual Rotarians had not provided their email address to receive an email about a survey request. Privacy as a general principle holds merit, however, since the survey related to addressing climate change via energy efficiency, and the brand-new 7th area of focus for Rotary being "The Environment" it provided a "legitimate interest" within the terms of GDPR, as all Rotarians are supposed to recognise and work to address all areas of focus.

Interpreting the survey request as being in non-compliance with GDPR was a barrier to successful engagement. The resulting conversation flowed back and forth with the District Governor pointing out Rotary had just declared "The Environment" was a brand-new area of focus and all districts and clubs should pay attention to the crisis, and by being a Rotarian a survey about energy efficiency and environmental beliefs held relevance to both them and Rotary itself. Eventually a compromise agreement was made to cascade out the survey link with a cover letter to all the Club Presidents and their Secretaries to forward to their club members. Rather than knowing all 2000 members directly received an invite to participate, there were repeated reminders and calls put out to ensure the request cascaded through and people became aware they should respond. It is therefore unknown how many clubs forwarded the request to their members, however, circa 14% of the 2000 members responded.

3.2.4 Sample population comparison

Due to the EHS data being created and published in the form of an Excel™ spreadsheet, and to facilitate comparison of the two survey participant samples, an identical format and the same software was used as shown in Table 3-2. Firstly, as detailed more closely in section 3.2.1, when comparing the Rotary sample to demographic data on the 2000 Rotary members, the sample is broadly representative.

- *Gender comparison – 81/19% split of male to female*
- *Age comparison – 77% are aged 65 or over*

Next, looking at the Rotary sample compared to the EHS data, and comparing gender of the sample vs the EHS data, the proportion of female homeowners in the EHS data is slightly higher at approximately 40% compared to only 21% in the survey data, however, with women only representing around 1/5th of the membership of the district this is felt to be an limiting factor. Therefore, the correlation between owning the home and answering the survey as the main respondent would appear to track closely. Ideally, if replicated in the future the research would look to use a more balanced sample matching EHS data sets. The survey respondents averaged 70.5 years old compared to the EHS data (MHCLG, 2020) of 68.5. This was most likely due to the lag in MHCLG data, ageing population of the members within the Rotary district, and their lack of recruitment of younger members over the Covid lockdown period. In addition to older members who were no longer active remaining on the membership books but skewing the age range. The data on tenure length for those who own their homes outright (Table 3-1) indicated that it was almost identical to the national average for the home-owning HRP which is listed as being 24.5 years (DLUHC, Annex 1.1, 2022). Overall, when comparing the two samples together it is possible to note strong similarities in key areas that are associated with the EHS definition of an HRP (DLUHC, 2022). The key similarities observed are that:

Table 3-1 Tenure length analysis

Statistics

Tenure length - years

N	Valid	242
	Missing	0
Mean		24.64
Median		23.50
Mode		20[a]
Std. Deviation		14.969

a. Multiple modes exist. The smallest value is shown

- *Over 94% of those who owned their home outright were over 65 years old.*
- *The average tenure length was within 10% of each other at over 24 years*
- *They are predominantly of white ethnicity*
- *A majority are self-defining as being a Christian*
- *Over 85% of both groups state they are very, or fairly, happy with their dwelling*

This may be interpreted as a persona having the characteristics of being a retired, stable, typical traditional English person. These facts are considered broadly unsurprising as England is traditionally a white, Christian state with home ownership having been considered the norm for those born around or in the generation after World War II. Their upbringing during times of austerity leading to a make do and mend mentality which has most likely led to them being happy with modern accommodation compared to that of post-war Britain where they grew up and created formative memories. In terms of affecting the research results, this may skew the results in favour of not taking action to upgrade their home's efficiency simply because they feel they are in a relatively better off situation than when they grew up and so feel content in comparison.

Table 3-2 English Housing Survey v Rotarian survey participant's demographics, a comparison [3]

Demographic	Rotary results						EHS results (thousands)						Data source
Type of ownership?	Overall		Aged 65+				Overall		Aged 65+				
Owned	243	86.17%	204	94.44%			8324	53.56%	5136	94.14%			1
Mortgaged	39	13.83%	12	5.56%			7217	46.44%	320	5.86%			
Tenure length?	Overall		Aged 65+				Overall		Aged 65+				
Owned	24.71		25.84				22.4		--				1
Mortgaged	15.26		18.75				8.7		--				
Gender?	Overall		Owned		Mortgaged		Overall		Owned		Mortgaged		
Male	223	79.08%	197	81.07%	26	66.67%	9694	59.10%	4966	59.80%	4727	67.00%	2
Female	59	20.92%	46	18.93%	13	33.33%	5668	40.90%	3338	40.20%	2330	33.00%	
Ethnicity?	Overall		Owned		Mortgaged		Overall		Owned		Mortgaged		
Black	1	0.35%	1	0.41%	0	0.00%	107	0.65%	34	0.39%	74	0.93%	
Indian	2	0.71%	1	0.41%	1	2.56%	321	1.93%	101	1.17%	220	2.77%	
Pakistani or Bangladeshi	0	0.00%	0	0.00%	0	0.00%	208	1.25%	53	0.61%	155	1.95%	1
White	278	98.58%	240	98.77%	38	97.44%	14446	86.84%	7952	91.45%	6494	81.80%	
Other	0	0.00%	0	0.00%	0	0.00%	459	2.76%	184	2.12%	274	3.46%	
all ethnic minority	1	0.35%	1	0.41%	0	0.00%	1094	6.58%	372	4.28%	723	9.10%	
Age group?	Overall		Owned		Mortgaged		Overall		Owned		Mortgaged		
16-24	0	0.00%	0	0.00%	0	0.00%	111	0.71%	13	0.15%	98	1.36%	
25-34	1	0.35%	0	0.00%	0	0.00%	1745	11.23%	121	1.45%	1624	22.50%	
35-44	6	2.13%	2	0.82%	4	10.26%	2391	15.39%	278	3.34%	2113	29.28%	1
45-54	18	6.38%	6	2.47%	12	30.77%	2859	18.40%	789	9.48%	2070	28.69%	
55-64	42	14.89%	31	12.76%	11	28.21%	2979	19.17%	1988	23.88%	991	13.74%	
65 and over	216	76.60%	204	83.95%	12	30.77%	5455	35.10%	5136	61.70%	320	4.43%	

[3] 1 (DLUHC, 2021b) https://www.gov.uk/government/statistics/english-housing-survey-2020-to-2021-headline-report
2 (MHCLG, 2020) https://www.gov.uk/government/statistics/english-housing-survey-2019-to-2020-home-ownership
3 (DLUHC, 2021a) https://www.gov.uk/government/statistical-data-sets/attitudes-and-satisfaction

Retired?	Overall		Owned		Mortgaged		Overall		Owned		Mortgaged		
Yes	210	74.47%	203	83.54%	7	17.95%	5569	35.84%	5244	63.00%	325	4.50%	1
No	72	25.53%	40	16.46%	32	82.05%	9971	64.16%	3080	37.00%	6892	95.50%	
Religion?	Overall		Owned		Mortgaged		Overall		Owned		Mortgaged		
no religion	69	24.56%	54	22.22%	16	41.03%	5500	35.90%	2387	28.80%	3113	44.20%	
Christian	205	72.95%	185	76.13%	20	51.28%	8684	56.70%	5424	65.50%	3260	46.30%	
Buddhist	0	0.00%	0	0.00%	0	0.00%	55	0.40%	23	0.30%	31	0.40%	
Hindu	1	0.36%	1	0.41%	0	0.00%	277	1.80%	94	1.10%	183	2.60%	2
Jewish	2	0.71%	1	0.41%	1	2.56%	86	0.60%	51	0.60%	35	0.50%	
Muslim	0	0.00%	0	0.00%	0	0.00%	539	3.50%	199	2.40%	340	4.80%	
Sikh	0	0.00%	0	0.00%	0	0.00%	92	0.60%	34	0.40%	58	0.80%	
any other religion	4	1.42%	2	0.82%	2	5.13%	88	0.60%	66	0.80%	22	0.30%	
Occupancy type?	Overall		Owned		Mortgaged		Overall		Owned		Mortgaged		
Partner	213	75.80%	190	78.19%	24	61.54%	5123	32.96%	3348	40.23%	1774	24.58%	
Family	22	7.83%	14	5.76%	8	20.51%	4873	31.36%	1340	16.10%	3533	48.96%	1
Alone	46	16.37%	39	16.05%	7	17.95%	5181	33.34%	3449	41.44%	1732	24.00%	
Other	0	0.00%	0	0.00%	0	0.00%	364	2.34%	186	2.23%	177	2.45%	
Disability/illness?	Overall		Owned		Mortgaged		Overall		Owned		Mortgaged		
Yes	61	21.71%	55	22.63%	6	15.38%	4364	28.16%	3039	36.56%	1325	18.44%	1
No	220	78.29%	188	77.37%	33	84.62%	11133	71.84%	5274	63.44%	5859	81.56%	
Dwelling satisfaction?	Overall		Owned		Mortgaged		Overall		Owned		Mortgaged		
very satisfied	154	54.80%	143	58.85%	12	30.77%	4819	65.20%	2885	71.70%	1936	57.50%	
fairly satisfied	84	29.89%	64	26.34%	20	51.28%	2232	30.20%	998	24.80%	1232	36.60%	
neither satisfied or not	15	5.34%	12	4.94%	3	7.69%	163	2.20%	60	1.50%	101	3.00%	3
slightly dissatisfied	12	4.27%	9	3.70%	3	7.69%	133	1.80%	56	1.40%	77	2.30%	
very dissatisfied	16	5.69%	15	6.17%	1	2.56%	44	0.60%	24	0.60%	24	0.70%	

Where the two samples vary from each other by a wider range is in home ownership and gender, age as an owner, retirement status, occupancy type and disability status.

The key causes of this discrepancy most likely are the traditional recruitment profile for Rotary membership which was designed for management and above or professionals only. As a social construct if one was to broadly think of the heads of the households in 'The Archers' on Radio 4, as a traditional middle class nuclear family, it would be a fair representation of many traditional Rotary Club members within the district. As such, a bias exists towards male property ownership for example, but also a likely influence on the wealth or income of the Rotary members compared to national data. The higher net wealth is likely to influence why more are retired and older than the EHS data sample and why they may be (or perceive themselves to be) in better health and not disabled due to having led a less physical or damaging work life, with the ability to retire earlier with more money for a better lifestyle and lifespan.

The effect on the outcome of the research may be that more of the survey respondents state that they feel capability to act when they wish to, simply due to financial reserves, than the EHS sample would. Furthermore, a standard working life of management or professional competency may have increased their own sense of agency when considering future projects. As such if this research were to be repeated nationally with a broader range of income amongst the participants it may yield a lower level of self-defined capability.

3.2.5 Survey-specific risks

One of the key challenges foreseen was securing access to enough, and suitable, research participants eliciting the buy-in needed to complete a body of research that would potentially span many months if not over a year. This was specifically addressed by:

- *Targeting and engaging with the chosen Rotary Club district using their new District Governor as a trusted messenger to advocate on behalf of the work and elicit active engagement.*
- *Positioning the research under the umbrella of the new 7th area of focus as defined by Rotary International as that of "Environment".*
- *Active engagement with the participant pool with explanation of the project and pitching it as participatory research where their answers influence the next stages, and that results will be shared – thereby seeking to create endowment.*

- *Tapping into the group philosophy of engaging in social public service as a worldview held by members.*
- *Use of an openly accessible online survey tool that was left live for multiple months with repeated prompts to engage*.

Even with these there remained issues:

1) Access to survey respondents, as discussed above. Practically, it was not possible to reach out to the 40,000 Rotarians in the UK in an appropriate manner.
2) Diversity of survey respondents. Whilst the HRP definition is very clear, this research cannot match the gender split and would hold greater resilience if it had.
3) The number of participants for the survey was lower than desired, with more female representation preferable. If repeating this work these issues would be foregrounded to ensure greater parity occurred.
4) The education level and income bands of the respondents. Potentially, this relates to the very nature of Rotary as originally being for management personnel or professionals only, as a “by invite” club, a level of class distinction may occur.
5) Digital inclusion and access was an issue, as was predicted by the Governor and is often discussed within the Rotary Club. Older members are often not able to log in to online meetings nor even access and download information and attachments on emails – this may have affected who chose to answer the survey and engage.

However, this group matched the HRP definition very well and was accessible, reflecting the pragmatic aspect of the research. If repeating this research, the design would include representative levels of respondents from all income quintiles, although this may create challenges in terms of engagement.

3.2.6 Survey analysis

Before analysis, a MindMap listed all the survey questions and their quantifiable answers to aid the researcher’s visual access to the results (Appendix 2). The free text box answers were then thematically analysed, grouped and then put into a graphical form for numerical analysis and ease of use. These images were then added to the MindMap in appropriate areas to create a combined visual data set to aid the use of the Excel version. The quantitative results from the survey were then reviewed from the filtered lenses of Governance, Delivery and Decision-Making and how these three stakeholders cause challenges and hold back retrofit works on HRP properties. The identified areas were both individually noted then thematically grouped looking for systemic issues that were cross-sectoral for further analysis.

The excel output of the JISC™ survey had filters applied and pivot tables were created to analyse three key areas: that of money as a barrier, other known barriers and a group defined as unknown barriers. This last group was created through coding for barriers to upgrade due to ignorance on behalf of the HRP, that caused them to make decisions based on data that is either factually or potentially untrue. An example of this may be perceived cost-benefit analysis on their behalf, being unaware of any opportunity in their home or recognised self-ignorance about the topic. The pivot tables were looking at areas of age, gender, disability status, religion, and work status to provide some examples amongst many.

Key findings were also tested for statistical significance as detailed in 4.5.

Of particular interest were tests for age as being a negative factor both for capability, opportunity and motivation and how this may factor in when related to still having a mortgage. This was felt to be of interest due to the literature review work on neuroeconomics. Further testing was done to look at the self-defined gender of the survey respondent v. the stated gender of the decision maker. This was done seeking to identify any connection that may talk to the story of self and confidence in own opinions and action – specifically if this varied by gender.

This analysis set the stage for follow-on qualitative research, described below.

3.3 Stage two - interviews

3.3.1 From focus groups to interviews

The analysis from stage one was used to consider invitations to the originally planned follow-on focus groups with the intention to have two groups around the three topic areas of money and known/unknown barriers. These topics had been coded from the responses provided by the survey participants who expressed full Capability, Opportunity and Motivation but were still choosing not to upgrade their home’s energy efficiency. They had been coded then themed as such because this then allowed pivot tables to be produced as previously noted, subsequently providing guidance for where the qualitative work should focus.

However, there was no appetite for focus groups by the survey participants. Of 107 invites sent, initially only one person said they could even provide a short online meeting. Potentially this may have been due to the challenge of Covid-19 and a general reticence for public or on-line meetings at that time, and potentially the issue of being socially judged when being asked to talk in public about the research topics.

Consequently, interviews were used instead of focus groups, offering possible benefits and drawbacks. Having personal interviews may allow people freedom to discuss topics and present opinions that may be felt as more controversial. However, this may not result in many emergent properties arising for analysis due to limited discourse partners in a formal one-to-one interview structure as compared to a semi-structured chat with social peers.

3.3.2 Interviews: purpose and target audience

Stage two specifically targeted potential interview participants (n=66) identified from the analysis of free text box 5 from the stage one survey; participants who whilst stating they had Capability, Opportunity and Motivation to improve their home energy efficiency were not planning any Behaviour Change (Michie, Van Stralen and West, 2011). Those who self-selected as actively choosing not to engage in retrofit were likely to present neutralisation strategies (Neumann and Mehlkop, 2023) that may provide some points of interest for further analysis. Neutralisation strategies help remove cognitive dissonance felt when people know their personal actions go against widely accepted norms, laws or values. People using such strategies can thereby justify (to themselves) why they may continue with their chosen actions without feeling guilt.

To identify potential interview participants, a filter was applied to the original (n=107) survey respondents who had given permission for a follow up interview, asking if they felt they had full capability, opportunity and motivation, which resulted in (n=85) positive replies. Thematic analysis of the reasons why they did not intend to upgrade their properties resulted in three groups coded as financial/known/unknown barriers. These groups were then highlighted and cross checked/filtered by those with an email provided, owner-occupier status and an age group of 66-70 for closest demographic matching to the EHS HRP, and any duplicates were removed – this resulted in a pool of 66. Interview invites were sent out (N=66) seeking an equal representation of thee three barrier areas.

The delivery process for the interviews was relatively simple and involved splitting the (N=66) possible participants into genders, creating a bespoke cover letter and sending

interview requests to small blocks at a time over a fortnight to allow response time. The participants were chosen by simple order of their survey response code, and all were unknown personally to the researcher to prevent personal bias in any way. The emails were sent out in blocks of 10 for each of the coded barriers – i.e., 10 to financial/known/unknown each and the first respondents who accepted the invitations were accepted. Once the desired number of responses were achieved the email invitations were no longer sent out.

3.3.3 Instrument design and process

Semi-structured one-to-one interviews were conducted (see interview questions in Appendix 3) (N=11). The small amount of interview participants available limited the ability to balance the gender percentages between the interview stages, with (n=8) 72.7% being male and (n=3) 27.2% female.

Interviews were undertaken over MS Teams, recorded and automatically transcribed for later reflexive thematic analysis. Analysis aimed to identify motives from different perspectives, highlighting any emergent themes or patterns that may enhance understanding of the data from the survey results. Three different rounds of questions were created, piloted and reviewed before a final version established.

This final version was based around three broad areas of investigation as recommended by the survey analysis. These were:

- *What do you think are the financial benefits are of improving home Energy Efficiency, such as insulation, modern heating systems like air source heat pumps and power generation such as solar panels and batteries?*
- *Do you feel you know enough about the non-financial benefits of improved home energy efficiency, such as increased comfort, lifestyle, health outcomes and potentially lifespan?*
- *When considering our whole conversation, what things might be holding you back from doing Energy Efficiency upgrades in your own home if there are areas that you might be thinking about?*

Follow up questions elicited more detail in areas of interest such as trusted messenger status and engagement options. These were scripted within the presentation notes to ensure that each subject received the same questions, as shown in Appendices 3 and 4. From these starting points, the participant was allowed to explore their answers in their own way, and whilst this semi-structured process naturally focused the responses into the

three desired areas, the participants chose individual examples to provide context and meaning.

At the start of each interview, a brief MS Forms survey (Appendix 4) about the recent energy price rises was undertaken using Likert scale question to gather current opinion and to engage them actively in the process. The survey also asked questions that may have less personally emotive responses before moving to the interview itself. The results were then exported to an Excel spreadsheet.

To provide quantitative data regarding trusted messengers, once the interview was completed, the participants were directed to use a provided link to Padlet™. The site asked participants to rank in order their most trusted messengers from a list of potential options. To be specific, this asked whom they would trust when being advised on the topic of energy efficiency, and they were asked to rank a list of options from most to least trusted. This was included as it had emerged as an interesting area of research during the survey analysis.

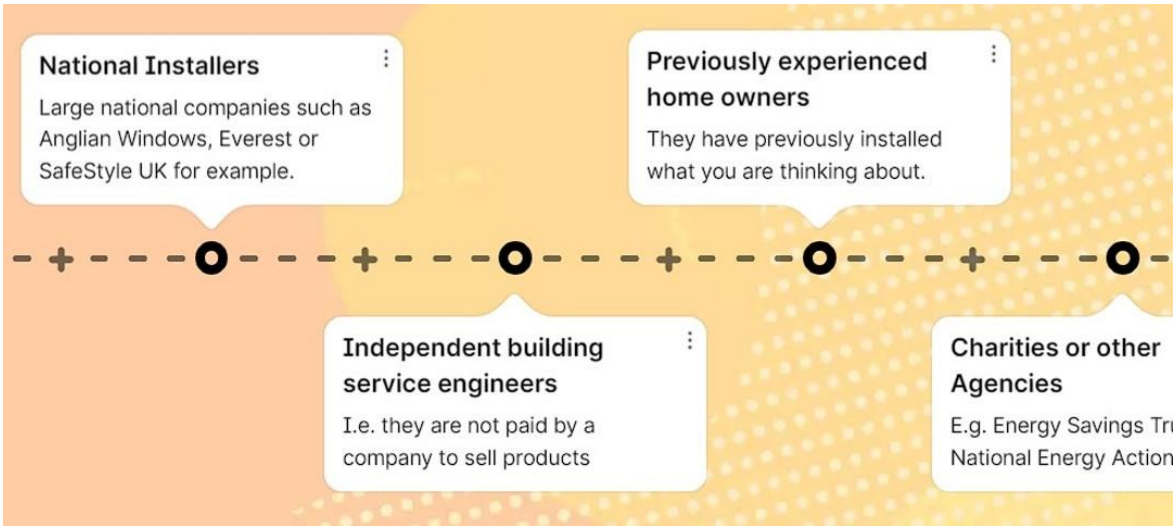

Figure 3.3 Padlet™ excerpt of trusted messengers question posed – zoomed in for accessibility

The messenger definitions exampled in Figure 3.3 portrayed a distinct identity for each to ensure there was no blurring or confusion between options.

The Padlet results were screen-grabbed and stored with individual participant files. Reflexive Thematic Analysis (TA) was specifically chosen as the most suitable method for the qualitative analysis of the interview data because of the complex nature of language and the nuances used by humans when expressing themselves. This approach gave the ability to identify semantic and latent meanings, grouping into themes and the consideration of context and the effect this may have on those themes.

Reflexivity “involves a disciplined practice of critically interrogating what we do, how and why we do it, and the impacts and influences of this on our research” (Braun & Clarke, 2022). For this research, awareness of the researcher’s own worldviews and opinions and their potential influence helped define the research, providing freedom to go where it will. Being very aware of trying to avoid applying personal bias as a researcher is part of what defines Reflexive Thematic Analysis as compared to other forms of thematic analysis. Continued reflection around avoiding bias (as evidenced by intercoder reliability work, repeat piloting surveys and interview questions and use of researcher reflection notes) was a constant throughout every phase of the work even in the most personal of times when emotional connection was strongly felt. However, a key aspect of Reflexive TA is to recognise the researcher skillset and subjectivity and use it as a resource to explore areas of greater knowledge to bring informed nuance and context to situations and analysis.

The general process of thematic analysis is well known and involves 6 traditional steps (Braun & Clarke, 2022, pg. 35)

- *Data familiarisation.*
- *Data coding.*
- *Initial theme generation.*
- *Theme development and review.*
- *Theme refining, defining and final naming.*
- *Writing up.*

The above steps did not vary when adding active and intentional reflection to the process. However, additional reflexivity recognised that a qualitative researcher may be considered the author of their own analytical story and “analysis happens at the intersection of the dataset, the context of the research, the researcher skill and locatedness” (Braun & Clarke, 2022). The willingness to recognise and then run with unexpected changes in focus and surprising emergent revelations were part of the journey; good qualitative research and intelligent, thoughtful reflection only added to this. Therefore, although attempts were made to avoid influencing of questions or interviews caused by researcher bias (to allow research participants to express their own views uninfluenced) recognition is made that the analysis and interpretation cannot be considered completely impartial or robotically accurate as it will be filtered by the contours of interest that drove the research in the first place.

Once thematically coded, extracts of the original interview transcriptions were provided to external PhD Doctoral Researchers to act as moderators along with the master code list

that had been created to validate the intercoder reliability of the results (O'Connor & Joffe, 2020). This was done to ensure some external control, validating that the themes being evolved from the list of created codes were robust. A good score of 0.825 was achieved which was considered adequate (Ibid.) as shown in Figure 3.4.

External coders						Agreed	Agreed with nuance	Disagree	Potential missed code	Other
1		Total codes	19			5	12	1	1	0
						26.32%	63.16%	5.26%	5.26%	0.00%
2		Total codes	21			4	12	3	2	0
						19.05%	57.14%	14.29%	9.52%	0.00%
Joint results		Total Codes	40			22.50%	60.00%	10.00%	7.50%	0.00%
		Agree - nuanced or not				82.50%				
		Disagree				10.00%				
		Potential additional code				7.50%				
		Other				0.00%				
Agreed with Nuance definition.		Agreed with nuance means that one or other of us has broken down a coding statement into multiple codes that the other has defined under a larger umbrella code - however, upon discussion we agreed that this is what had happened and the secondary code that the other had not included may be added or have been considered by the original coder in other circumstances and was not inappropriate.								

Figure 3.4 Intercoder reliability analysis excerpt

A wider validity threat to this interview work sits around generalisation from small numbers of research participants. A recommendation of repetition of the work with larger numbers and a better gender match is made, as although the intercoder analysis rating is good there is the possibility of other codes and themes occurring from larger sample groups.

3.4 Methodology summary

The research design, philosophy and methodologies have been described, with active components comprising of a broad policy-based literature review, an in-depth online survey questionnaire (N=281) and follow up one-to-one interviews (N=11). These were subjected to statistical and thematic analysis to provide a data rich construct focused on the targeting of stakeholders, how they interacted with information and their motivations, the governance and delivery entities milieu.

Chapter 4: Quantitative results - findings and analysis

This chapter presents the results of the quantitative survey (n=281). The chapter structure mirrors the survey structure, being initially split into 4 sections (4.1 to 4.4). Further statistical analysis of these findings are presented in 4.5 and the analysis of qualitative comments is presented in 4.6, prior to a chapter summary (4.7).

4.1 Home and previous energy efficiency decisions.

In this section and each first 4 sections, results are introduced through a MindMap image of the question layout, followed by a table showing the question number, question wording and its purpose. This is then followed by the quantitative question response data and some small explanatory text as needed if the prior provided information still requires it.

This survey section is asking questions around home, satisfaction with respondents' housing environment and living conditions and whether they have ever taken steps to improve them via the lens of energy efficiency. If steps had been taken, the survey asked in what manner and the general motivation for doing so. The use of a free text box allowed thematic analysis of retrospective desires. Figure 4.1shows the question structure and Table 4-1 shows the questions and their rationale.

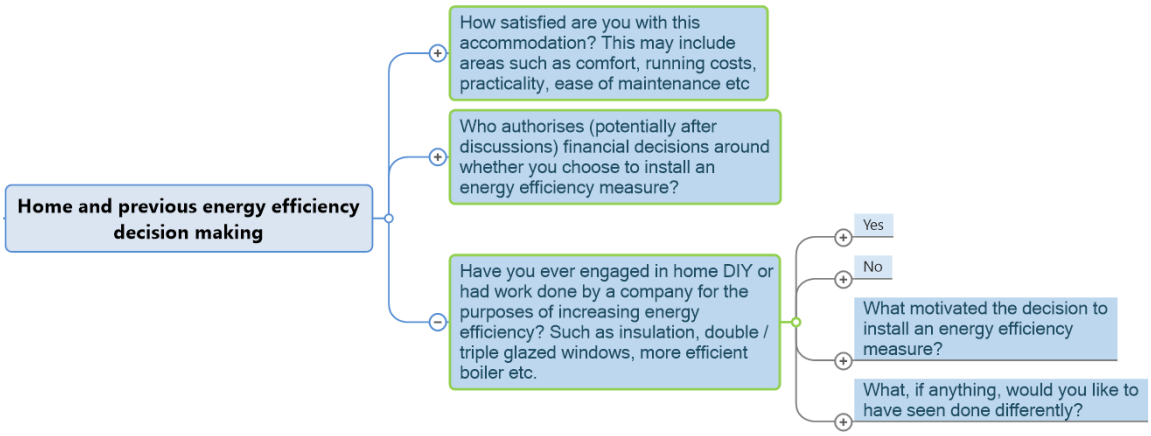

Figure 4.1 excerpt from survey Mind Map - Appendix 2

Table 4-1 survey section questions and intent

Your home and information regarding previous energy efficiency decisions.		
	Question	*Rationale*
10	How satisfied are you with this accommodation? This may include areas such as comfort, running costs, practicality, ease of maintenance etc.	Checks vs English Housing Survey results for owner-occupiers' emotions and is a good indicator of likelihood to improve Energy Efficiency or not.

11	Who authorises (potentially after discussions) financial decisions around whether you choose to install an energy efficiency measure?	Checks vs the government HRP statement around home ownership with the Household Reference Person making the decisions.
12	Have you ever engaged in home DIY or had work done by a company for the purposes of increasing energy efficiency? Such as insulation, double / triple glazed windows, more efficient boiler etc.	Experience check – the best indicators of future actions are those taken in the past not those stated/intended. Aligns with the theory of Value/Action Gap.
12a	If so, what was it?	Quantitative information and data of previous work undertaken – can show trends in preferences and information for further investigation as to why.
12b	What motivated the decision to install an energy efficiency measure?	Both quantitative and qualitative data collection around emotionally driven decision-making.
12c	What, if anything, would you like to have seen done differently?	Data to show if owner-occupiers were happy with the service provision and choices offered by SMEs in addition to larger systemic issues potentially being highlighted such as funding or payback/value concerns.

Table 4-2 Results for Home and Previous Energy Efficiency Decisions (Q10-Q12b)

Q10 – How satisfied are you with this accommodation? This may include areas such as comfort, running costs, practicality, ease of maintenance etc.				
Very	Fairly	Neutral	Slightly Dissatisfied	Very Dissatisfied
54.2%	29.7%	5.6%	4.5%	5.9%
Q11 – Who authorises (potentially after discussions) financial decisions around whether you choose to install an energy efficiency measure?				
Joint Decisions	You	Partner/other		
63.3%	34.3%	2.4%		
Q12 – Have you ever engaged in home DIY or had work done by a company for the purposes of increasing energy efficiency? Such as insulation, double / triple glazed windows, more efficient boiler etc.				
Yes	No			
88.1%	11.9%			
Q12a – If so, what was it/they?				
Loft Insulation	77.8%			
Double/Triple Glazing	66.7%			
Boiler upgrade	65.1%			
Cavity Wall Insulation	38.9%			
Draught excluders	29.0%			
Solar panels	20.2%			
External Wall Insulation	8.3%			
Solar gain	4.4%			
Creating shade	3.6%			
Ventilation	3.2%			
Air Source Heat Pump	1.6%			
Passive Cooling Design	0.0%			
Q12b – What motivated the decision to install an energy efficiency measure?				
Expected comfort	79.4%			
Expected financial benefits	79.4%			
Environmental and climate concerns	42.5%			
Lifestyle benefits	25.0%			
To help society be cleaner	13.1%			

The results for **Q12c ("What, if anything would you like to have seen done differently?")** are presented in Figure 4.2.

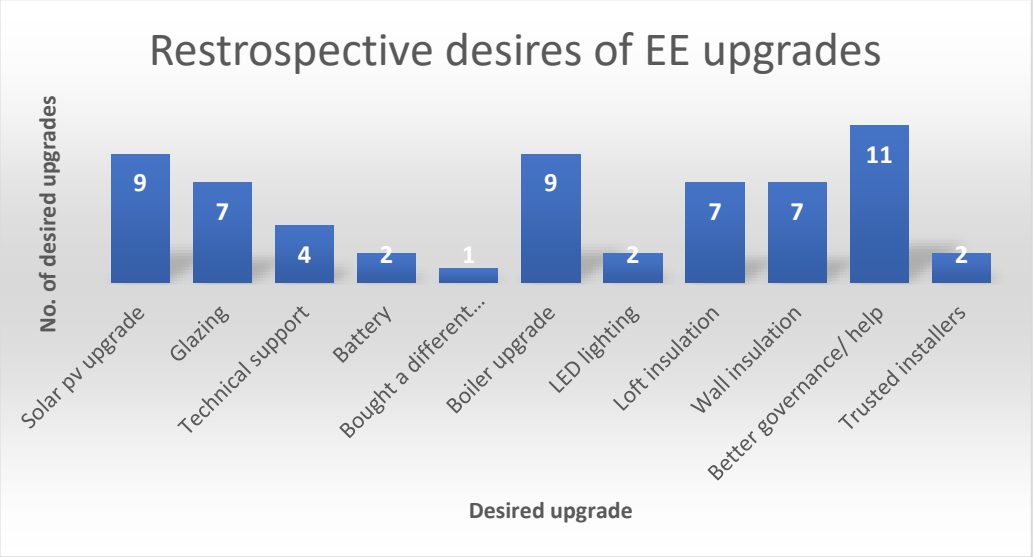

Figure 4.2 survey results of free text box Q12c

For Q12c there were originally 92 responses, of which 5 (5.4%) were deemed a null response and 26 (29.9%) of the result replied "nothing". For the purpose of analysis, these were left out from Figure 4.2 as it would bias the perception of the remaining results and was not the focus of the question in the first place.

Some key points from the results of these questions are:

- *The purchasing decision maker gender does not match the HRP*
- *The vast majority of participants have previously undertaken work for energy efficiency purposes*
- *They valued comfort and financial savings equally*

As for other sections in this chapter, these points are built upon and discussed further in chapter 6.

4.2 Achieving Net Zero & government support

This survey section is asking questions around government support for net zero actions by householders, again combining closed-option questions with a final free text box question which allowed thematic analysis. Figure 4.3 shows the question structure and Table 4-3 shows the questions and their rationale.

Figure 4.3 Excerpt from survey Mind Map - Appendix 2

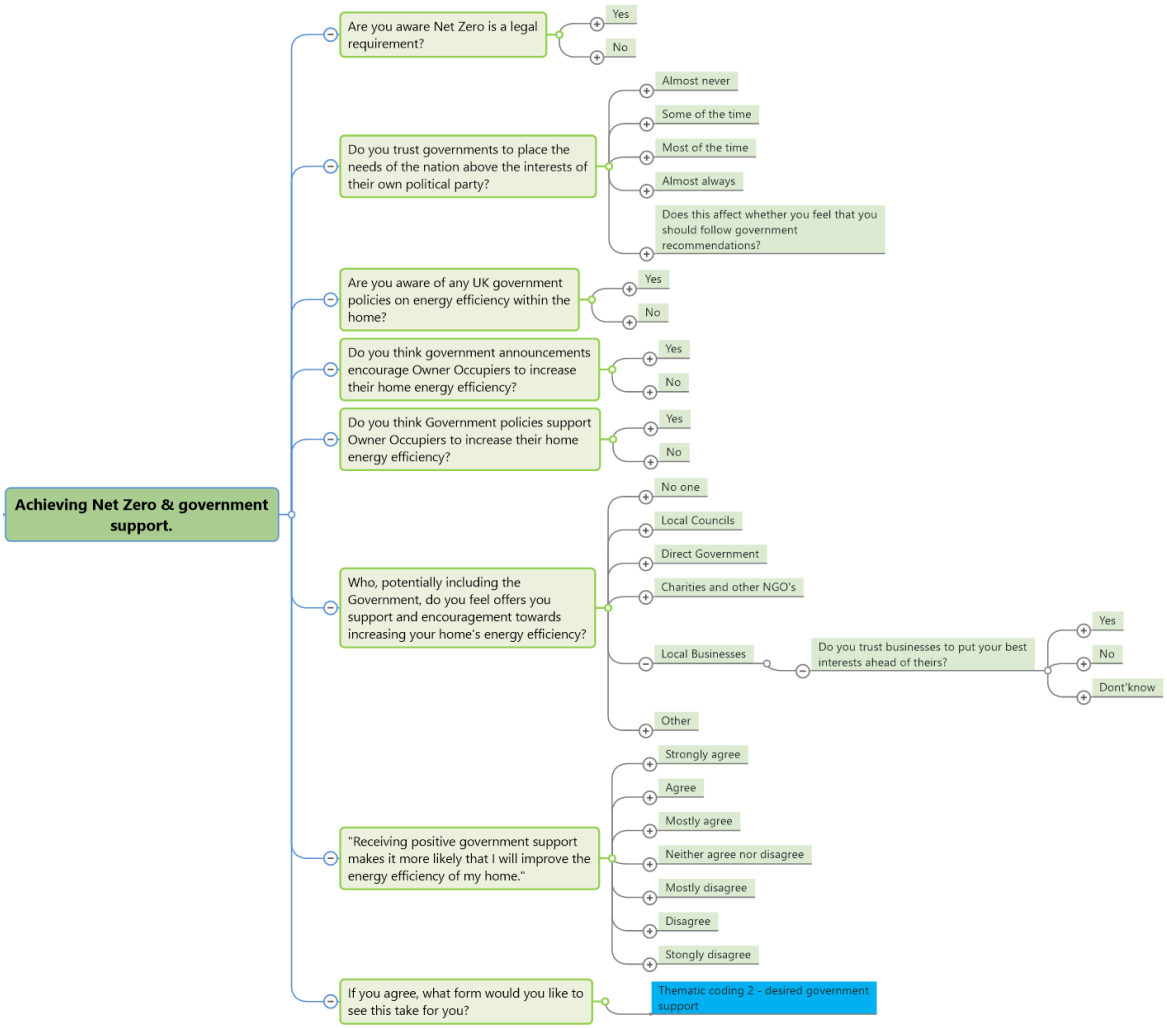

Table 4-3 survey section questions and intent

Knowledge of, and opinions around, government policy, trust and current engagement/delivery methods.		
	Question	*Rationale*
13	Are you aware that reaching Net Zero Emissions by 2050 is a legal requirement for the UK?	Knowledge and education check – how well is messaging reaching its intended target?
13a	How important do you feel this is?	Looking to see if there is a creation of a social norm as a default narrative. Following rule of law is a minimum requirement for any societal system change or regulation.
14	Do you trust governments to place the needs of the nation above the interests of their own political party?	Trust is a key issue as to whether people will take action on a subject when encouraged if no enforceable regulation exists. Is the government the correct messenger?
14a	Does this affect whether you feel that you should follow government recommendations?	Closed-response quantitative data to support previous question – provides supporting evidence of the need for a new (or potentially revised) engagement and marketing strategy.
15	Are you aware of any UK government policies on energy efficiency within the home?	Seeks to understand the market penetration of government engagement campaigns that might influence policy uptake.
16	Do you think government announcements encourage owner-	Closed-response quantitative data on how impactful the message is if received – does it

	occupiers to increase their home energy efficiency?	align with their values and create a motivational effect?
17	Do you think Government policies support owner-occupiers to increase their home energy efficiency?	Closed-response quantitative data on the buy in and belief they have in the support being offered, even if the message aligns with their belief structure and creates desire to take action.
18	Who, potentially including the Government, do you feel offers you support and encouragement towards increasing your home's energy efficiency?	Seeking to find opinions on who else both provides support and has effective messaging and engagement strategies (e.g. Local Authorities)
18a	Do you trust businesses to put your best interests ahead of theirs?	Closed-response quantitative data. Investigating perceptions of profit-motivation and philosophy – SME vs state service providers.
19	"Receiving positive government support makes it more likely that I will improve the energy efficiency of my home." Do you agree? – (Likert scale)	To find strength of support for positive case studies/information/communication as a narrative style of engagement rather than purely factual releases.
19a	If you agree, what form would you like to see this take for you?	Free text responses to gain qualitative data on desires and preferred communication methods. To find new emergent trends or confirm support for issues such as “Funding”.

Table 4-4 Results of Achieving Net Zero & Government Support (Q13-19)

Q13 – Are you aware that reaching Net Zero Emissions by 2050 is a legal requirement for the UK?						
Yes			No			
88.1%			11.9%			
Q13a – How important do you feel this is?						
Extremely	Very	Quite	Moderately	Slightly	Not very	Not at all
28.2%	30.2%	16.7%	12.3%	5.6%	3.6%	3.6%
Q14 – Do you trust governments to place the needs of the nation above the interests of their own political party?						
Almost never	Some of the time		Most of the time		Almost always	
54.2%	29.7%		5.6%		4.5%	
Q14a – Does this affect whether you feel that you should follow government recommendations?						
Yes			No			
60.8%			39.2%			
Q15 – Are you aware of any UK government policies on energy efficiency within the home?						
Yes			No			
65.4%			34.6%			
Q16 – Do you think government announcements encourage owner-occupiers to increase their home energy efficiency?						
Yes			No			
51.8%			48.26%			
Q17 – Do you think Government policies support owner-occupiers to increase their home energy efficiency?						
Yes			No			
27.4%			72.6%			
Q18 - Who, potentially including the Government, do you feel offers you support and encouragement towards increasing your home's energy efficiency?						
No one	Local Councils	Direct Government	Charities and NGO’s	Local businesses	Other	
44.2%	31.6%	29.5%	15.4%	12.6%	9.8%	
Q18a – Do you trust businesses to put your best interests ahead of theirs?						

Yes	No	Don't know
19.4%	41.7%	38.9%

Q19 – "Receiving positive government support makes it more likely that I will improve the energy efficiency of my home." Do you agree?						
Strongly agree	Agree	Mostly agree	Neutral	Mostly disagree	Disagree	Strongly disagree
28.2%	30.2%	16.7%	12.3%	5.6%	3.6%	3.6%

The results for **Q19a ("If you agree, what form would you like to see this take for you?")** are presented in Figure 4.4.

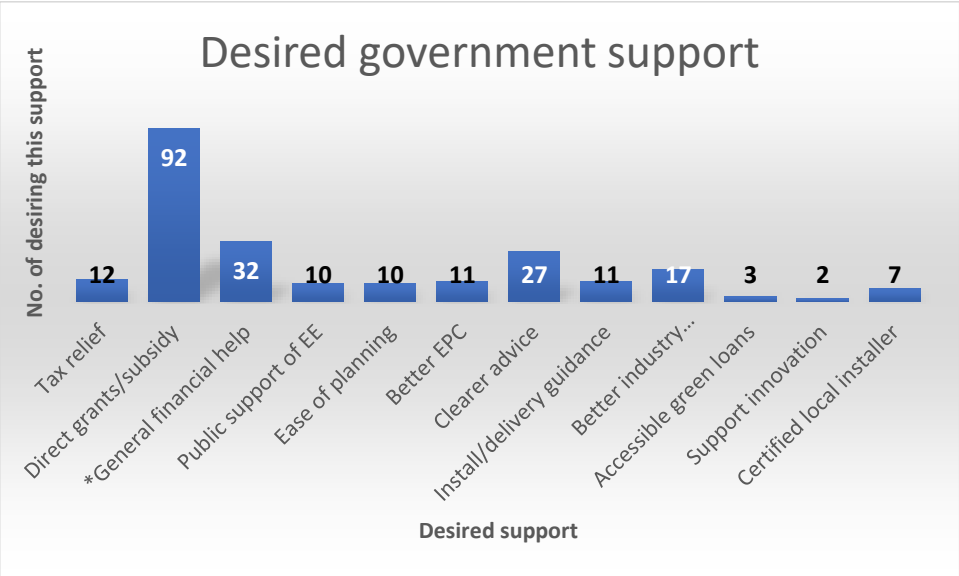

Figure 4.4 survey results of free text box 19a

For Q19a there were originally 244 responses, of which 10 (4.1%) were deemed a null response or inconclusive for coding purposes. This allowed the analysis to split out direct requests for grants from other financial options such as tax relief or other financial help. However, under "general financial help" some of the answers were very curtailed, in some cases being literally "financial help" but not providing any details of what form this may take. It is possible but unknown that most of these would fall under the category of "Direct grants/subsidy" if greater detail had been provided. This is investigated further in the qualitative work in section 5.

When considering all non-financial desired support as a sub-set, it is instructive to break it down into **C**apability, **O**pportunity and **M**otivation to make a **B**ehavioural change (Michie, Van Stralen and West, 2014) - as shown in Figure 4.5.

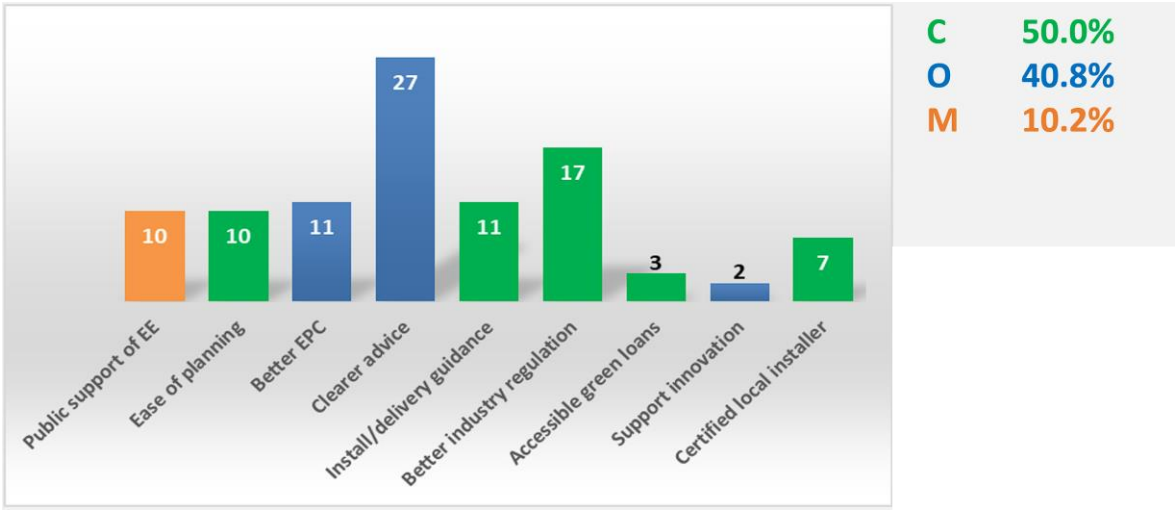

Figure 4.5 analysis of desired non-governmental support via a COM-B lens

In this figure, "Public support of EE (energy efficiency)" is considered as Motivational for the HRP because there is the opportunity for marketing to occur that provides positive role models or case studies for the HRP to follow. The common thread within the grouped blue bars is better information to help identify opportunities that may exist. The green Capability bars were grouped together with the common thread being enabler topics to facilitate action being taken. The order of the bars is that of natural occurrence when the data was coded and has no specific relevance.

The data shows that the HRPs surveyed do believe (or at least publicly state) that they feel **M**otivated to act and public support of energy efficiency is not as desired-for as help in comparison to areas of **C**apability or recognition of **O**pportunity for them. This is indicated by only 10.2% (n=10) of (N=98) asking for greater motivational support for energy efficiency. These results conflict with the answer to a previous survey question where 66.9% (n=188) of all respondents (N=281) stated that receiving what they perceived to be positive government support would make it more likely that they would improve the energy efficiency of their home.

Some key points from the results of these questions are:

- *Participants state high support for the need to achieve Net Zero for 2050.*
- *Trust in government is holding back the participants from taking action*
- *A perceived lack of general support is the most commonly stated feeling*
- *The majority of participants state they would feel more empowered if they received positive government support*
- *The most common desired support was financial followed by clearer advice.*

As for other sections in this chapter, these points are built upon and discussed further in chapter 6.

4.3 Beliefs and opinions

This survey section explores participants beliefs and views on the reasons to undertake energy efficiency retrofit. Figure 4.6 shows the question structure and Table 4-5 shows the questions and their rationale

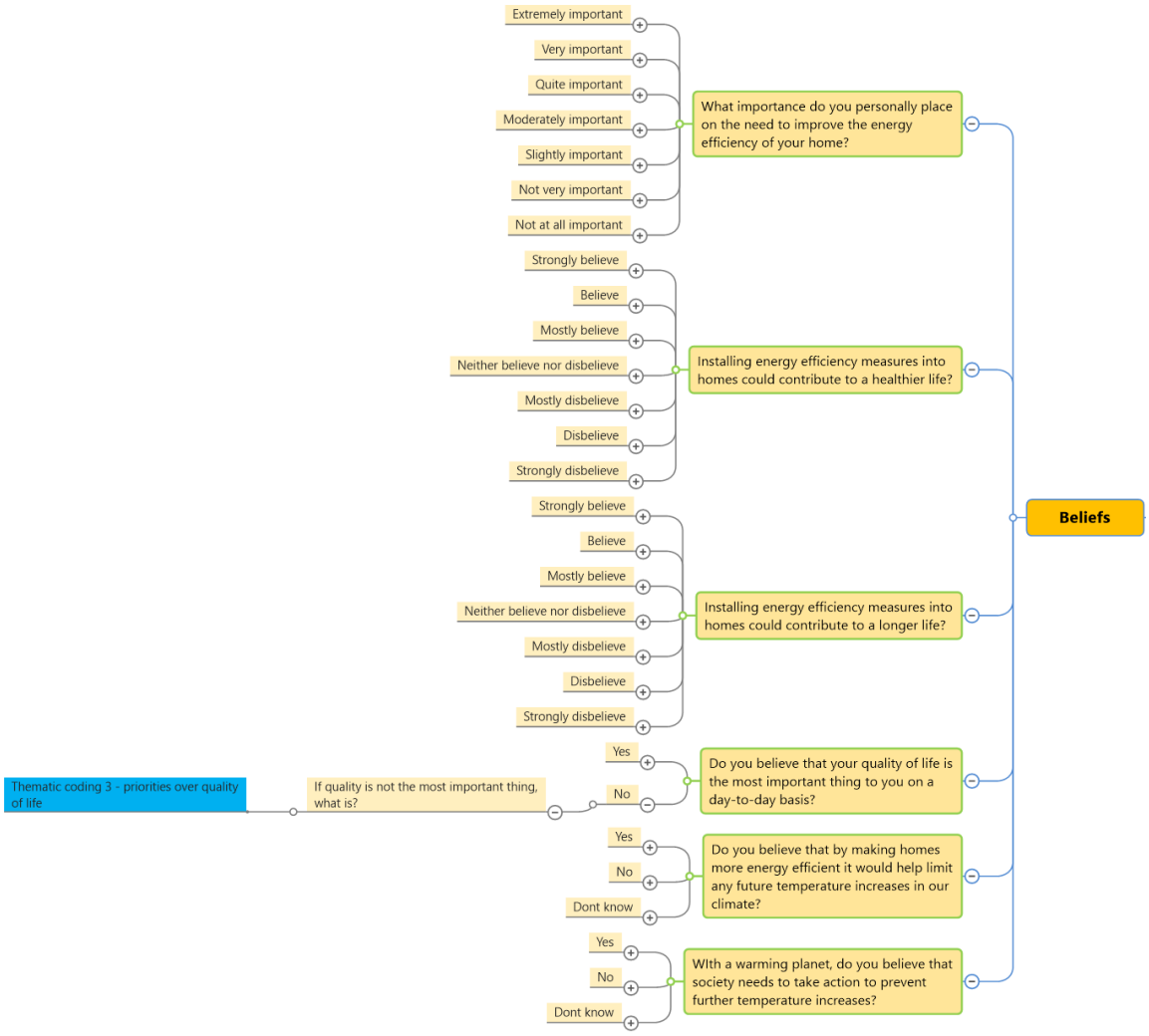

Figure 4.6 excerpt from survey Mind Map - Appendix 2

Table 4-5 survey section questions and intent

Beliefs & opinions – what you feel, why and your priorities.		
	Question	*Rationale*
20	With a warming planet, do you believe that society needs to take action to prevent further temperature increases? I.e., that there is a current climate crisis?	This sets a baseline data point for Value/Action gap analysis later in the research

21	Do you believe that by making homes more energy efficient it would help limit any future temperature increases in our climate?	Supports analysis of relationship between Energy Efficiency, home ownership and responsibility.
22	Do you believe that your quality of life is the most important thing to you on a day-to-day basis?	Exploring if quality of life is a significant underlying motivation for participants to increase energy efficiency.
22a	If quality is not the most important thing, what is?	Free text responses to gain qualitative data on desires. Seeking to find new emergent trends or confirm support for traditional issues such as health or money.
23	"Installing energy efficiency measures into homes could contribute to a longer life" - Is this something that you believe? (Likert scale)	Seeking understanding of participant awareness of benefits other than the standard financial message provided by government. Enables consideration of relevance of the perezhivanie concept.
24	"Installing energy efficiency measures into homes could contribute to a healthier life?" - Is this something that you believe? (Likert scale)	As above.
25	What importance do you personally place on the need to improve the energy efficiency of your home? (Likert scale)	Baseline for Value/Action gap analysis, complementing questions 21 & 22 (asked here so considered separately). Allows follow-on question of what measures they prefer to install if they feel it is important.

Table 4-6 Results of Beliefs and Opinions (Q20-22)

Q20 – With a warming planet, do you believe that society needs to take action to prevent further temperature increases? I.e., that there is a current climate crisis?		
Yes	No	Don't know
87.0%	6.7%	6.3%
Q21 – Do you believe that by making homes more energy efficient it would help limit any future temperature increases in our climate?		
Yes	No	Don't know
76.6%	12.6%	10.8%
Q22 – Do you believe that your quality of life is the most important thing to you on a day-to-day basis?		
Yes	No	No answer
76.6%	23.2%	0.2%

The results for **Q22a ("If quality is not the most important thing, what is?")** are presented in Figure 4.7.

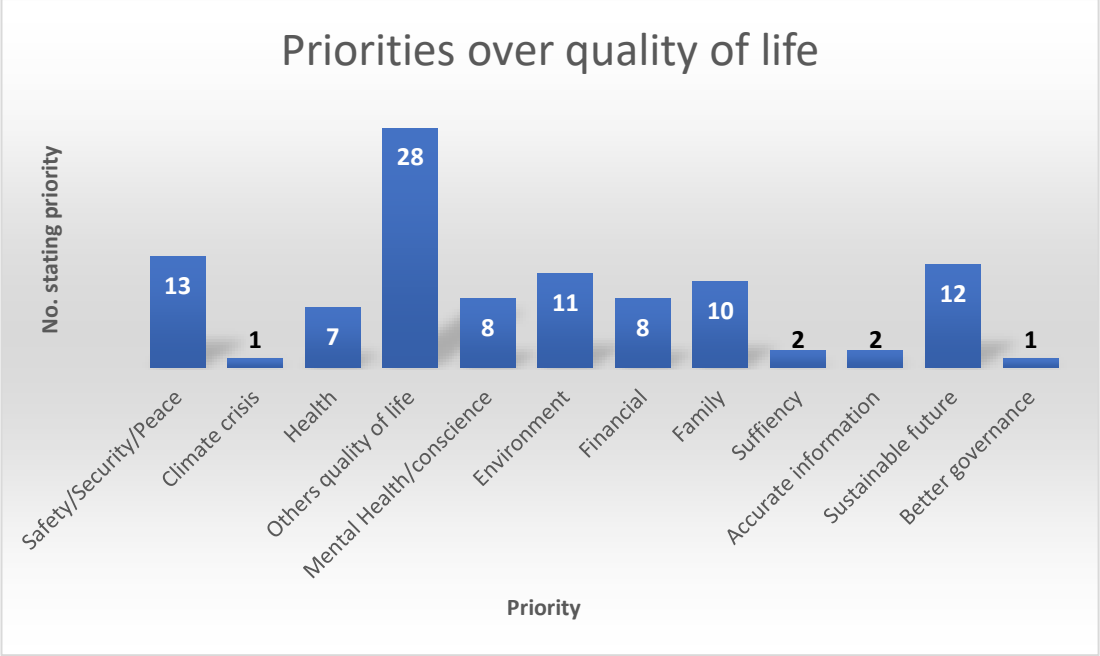

Figure 4.7 survey results of free text box 22a

For question 22a there were 76 responses which created 107 discrete coded comments; 4 of these were considered to be null responses and removed from the analysis (for example one interview participant voluntarily chose to respond and then put "N/A"). For clarity, 76 responses represents more than 23.4% of interview participants, which means that some who stated that their quality of life was their priority also decided to answer the follow up question relating to if it was not. This was interpreted as meaning that some interview participants reflected upon their initial response and wished to add other priorities that they find important.

Table 4-7 Results of Beliefs and Opinions (Q23-25)

Q23 – "Installing energy efficiency measures into homes could contribute to a longer life" - Is this something that you believe?						
Strongly believe	Believe	Mostly believe	Neutral	Mostly disbelieve	Disbelieve	Strongly disbelieve
5.9%	14.7%	17.1%	43.7%	9.1%	6.6%	2.8%
Q24 – "Installing energy efficiency measures into homes could contribute to a healthier life?" - Is this something that you believe?						
Strongly believe	Believe	Mostly believe	Neutral	Mostly disbelieve	Disbelieve	Strongly disbelieve
8.0%	18.5%	25.9%	33.6%	5.9%	6.3%	1.7%
Q25 – What importance do you personally place on the need to improve the energy efficiency of your home?						
Extremely important	Very important	Quite important	Moderately important	Slightly important	Not very important	Not at all important
9.8%	25.9%	32.2%	16.4%	9.8%	5.6%	0.3%

Questions 23 and 24 were asked in that specific order, as if they were reversed, there was a risk that considering health benefits immediately prior to lifespan would influence

participants to significantly increase their stated belief that the latter would be increased, as better health could increase lifespan.

Some key points from the results of these questions are:

- *Most participants state that increasing home energy efficiency would help address climate change*
- *However, most participants also stated that their quality of life was their most important daily concern*
- *There was a lack of marketing penetration concerning non-financial benefits to be accrued from improved energy efficiency*

As for other sections in this chapter, these points are built upon and discussed further in chapter 6.

4.4 Drivers & barriers - decision-making influences and practical implementation questions.

This survey section explores drivers and barriers influencing energy efficiency retrofit. Figure 4.8 shows the question structure and Table 4-8 shows the questions and their rationale

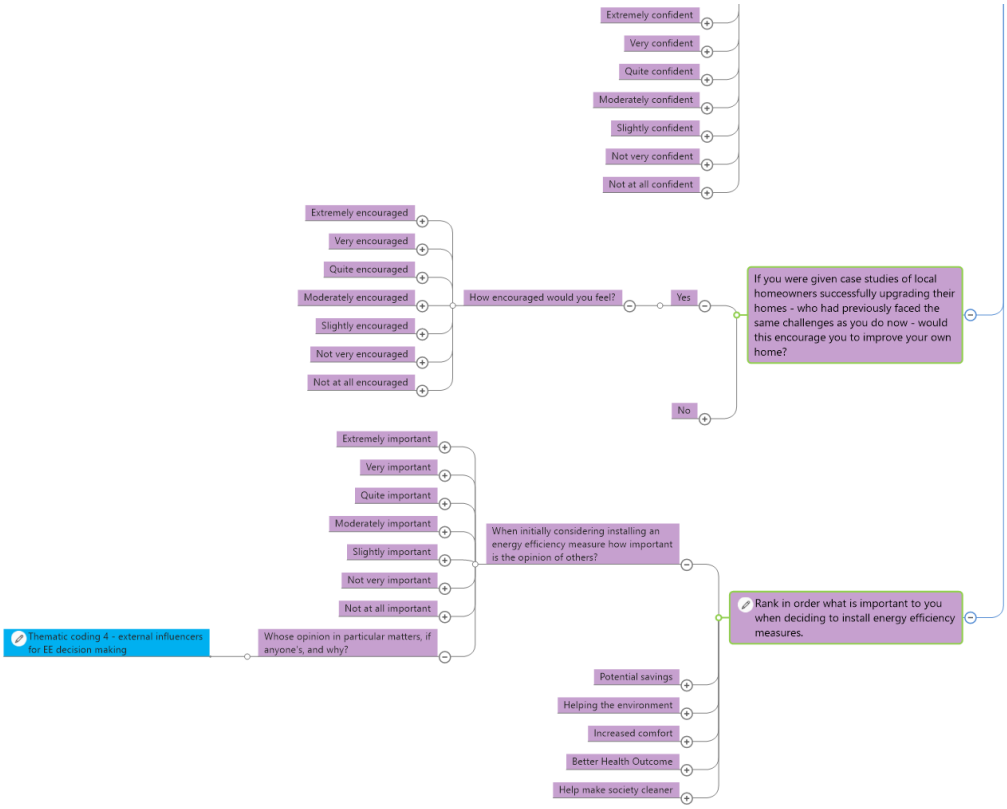

Figure 4.8 excerpt from survey Mind Map - Appendix 2

Table 4-8 survey section questions and intent

Decision-making influences and practical implementation questions.		
	Question	*Rationale*
26	Rank in order what is important to you when deciding to install energy efficiency measures?	Further information on the decision-making process and motivations driving the choices made.
26a	When initially considering installing an energy efficiency measure how important is the opinion of others?	Exploring social elements in the decision-making process.
26ai	Whose opinion in particular matters, if anyone's, and why?	Free text responses looking for data on who makes/influences decisions (beyond the HRP) and why.
27	If you were given case studies of local homeowners successfully upgrading their homes - who had previously faced the same challenges as you do now - would this encourage you to improve your own home?	Looking for specific support for the idea of a narrative factually-based engagement tool showing the hero/learning arc of demographically/geographically relatable owner-occupiers to support behaviour change.
27a	How encouraged would you feel? (Likert scale)	For quantitative data to apply to the positive answers for the previous question.
28	How confident are you that you have the capability necessary to plan and deliver a project to install an energy efficiency measure? (Likert scale)	Specifically checking against COM-B elements but also setting up follow-on question to barriers. Allows later sub-section analysis of statistics/demographics/barriers in further research.
28a	Please tick all that apply: What are the barriers to you feeling capable to take action?	Providing granular data for specific reasons why the negative sub-set from 28 do not act. Aids identification of opportunities to remove barriers.
29	Is your age influential on your likelihood of installing an energy	Seeking to understand if the current policy focus on financial incentives is misaligned or if non-

	efficiency measure, i.e., you may feel that you won't get value for money?	financial benefits would lead to more engagement.
29a	Would knowing that you might achieve additional benefits rather than just financial help remove that barrier? Such as increased comfort, lifestyle, health, lifespan and future provision for family?	Follow up to previous question that builds upon belief questions (22,23 & 24). Asked later as this is not a belief question but an influence question to identify data that can be used to establish support.
29ai	How much would this influence your decision to go ahead with an energy efficiency measure? (Likert scale)	Looking to establish weight of perceived influence on those who responded positively to question 29a.
30	Please tick all that apply: When thinking of your home and installing an energy efficiency measure in the future, do you feel that: (COM-B check).	This question literally asks if the respondents feel agency to respond positively to the three separate components of COM in the COM-B framework enables quantifying a percentage of participants who could take action to improve their energy efficiency. Can be extrapolated to larger society and facilitates creation of Value/Action Gap analysis.
30a	If you ticked all three boxes and an opportunity currently exists, why haven't you done so yet? Especially if it is to your benefit to do so?	Free text responses looking for more data to establish why, if (say, 53%) of respondents say they could take action, they have not to-date.

Table 4-9 Results of Beliefs and Opinions (Q26)

Q26 – Rank in order what is important to you when deciding to install energy efficiency measures?	
Potential savings	40.2%
Helping the environment	30.4%
Increased comfort	14.7%
Better Health outcome	10.8%
To help society be cleaner	3.8%

For question 26 it is important to consider the nuance that an earlier question had asked participants about previous energy efficiency measures undertaken. The tense of this question is present – when now considering energy efficiency. This is directly following a question on how much personal importance participants place on the need to improve the energy efficiency of their own home. 88.1% of the interview participants reported that they had already taken steps to improve their energy efficiency. Therefore, when considering the answers relating to this question, and indeed this whole section, it is important to have this fact foregrounded. This may explain why only 40.2% stated that potential savings are important to them now (down from 79.4% stated earlier), as they may have felt that they have achieved likely potential savings (or enough of them) in previous energy efficiency measures.

Table 4-10 Results of Beliefs and Opinions (Q26a)

Q26a – When initially considering installing an energy efficiency measure how important is the opinion of others?						
Extremely important	Very important	Quite important	Moderately important	Slightly important	Not very important	Not at all important
1.0%	9.4%	22.4%	16.4%	17.1%	17.5%	16.1%

The results for **Q26ai ("Whose opinion in particular matters, if anyone's, and why?")** are presented in Figure 4.9.

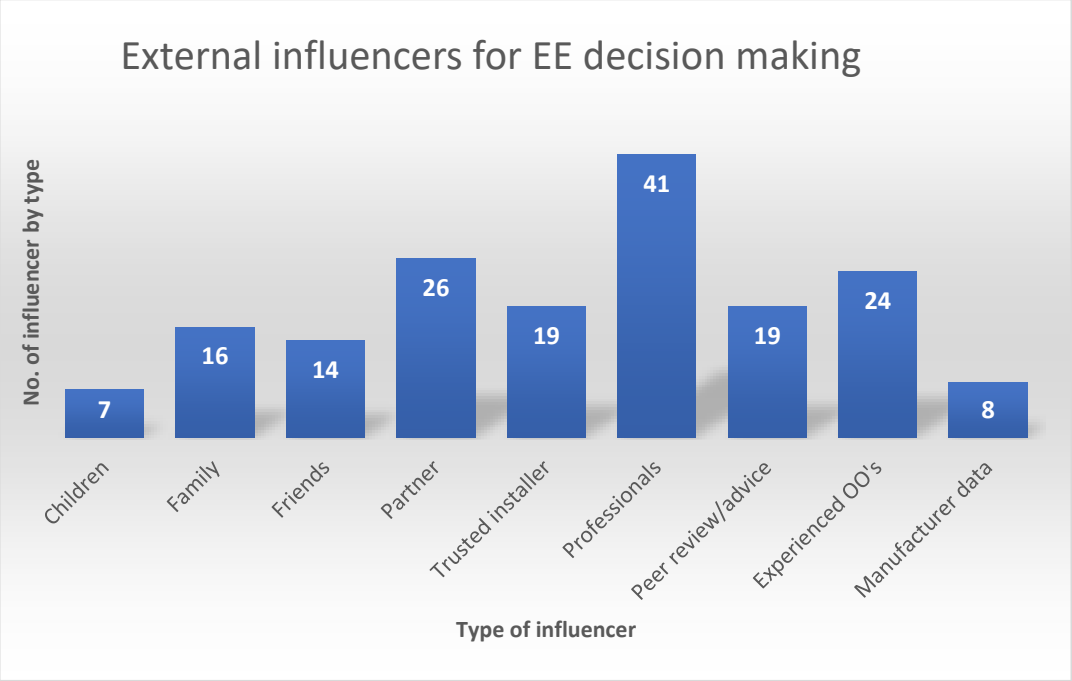

Figure 4.9 survey results of free text box 26ai

For question 26ai there were 209 coded responses of which 13 (6.2%) were considered to be null answers. These ranged from comments such as "what a waste of time for question 26" on one hand to "I have already achieved carbon neutral". Figure 4.9 also has the response of "own" removed from it as the interview participants were clearly requested to define external influences on their decision-making, whereas the coded responses for "own" included such comments as: "Others opinions don't matter", "I am internally referenced" with the most common one being simply "mine". This means that between the excluded "own" response and others deemed as null there are 35 (24.7%) responses whereby the interview participant chose not to answer the question yet wished to provide a response.

Table 4-11 Results of Beliefs and Opinions (Q27-28a)

Q27 – If you were given case studies of local homeowners successfully upgrading their homes - who had previously faced the same challenges as you do now - would this encourage you to improve your own home?						
Yes				No		
75.2%				24.8%		
Q27a – How encouraged would you feel?						
Extremely encouraged	Very encouraged	Quite encouraged	Moderately encouraged	Slightly encouraged	Not very encouraged	Not at all encouraged
4.2%	12.1%	44.4%	23.4%	15.4%	0.0%	0.5%
Q28 – How confident are you that you have the capability necessary to plan and deliver a project to install an energy efficiency measure?						
Extremely confident	Very confident	Quite confident	Moderately confident	Slightly confident	Not very confident	Not at all confident
9.4%	22.4%	22.7%	20.3%	9.4%	10.1%	5.6%

Q28a – Please tick all that apply: What are the barriers to you feeling capable to take action?	
Finding trusted installers	71.1%
Getting value for money	66.4%
Upfront cost	56.3%
Knowledge (lack of) of financial support	45.5%
Knowledge (lack of) of process	44.8%
Disruption (fear of)	27.1%
Not understanding new technology	25.6%
Access to finance (lack of)	15.5%
Digital skills	10.5%
Mobility/health	8.3%
Communication	6.5%
Other	4.0%
Isolation	2.9%

For question 28 it is important to note that these are self-assessed responses. There is therefore a risk of a lack of self-awareness; for example, digital skills may be self-assessed as a relatively low barrier, however, this may not come into greater salience until the time that a participant starts to consider a new technology (to them). For example, considering installing an ASHP could prompt awareness of the technical and administrative challenges around suitability for the property, decision-making and applying for a grant or planning permission, etc.

For the higher end of the list, there may be greater confidence in these answers being true. This is because they are likely a blend of fact, such as not being able to find a trusted installer, or concern such as getting value for money. Either way, both of these issues are "real" in the sense of being barriers to action from the perspective of the interview participant and salient at the time of answering the question.

Table 4-12 Results of Beliefs and Opinions (Q29-30)

Q29 – Is your age influential on your likelihood of installing an energy efficiency measure, i.e., you may feel that you won't get value for money?						
Extremely influential	Very influential	Quite influential	Moderately influential	Slightly influential	Not very influential	Not at all influential
4.5%	11.9%	27.6%	12.2%	14.0%	15.4%	14.3%
Q29a – Would knowing that you might achieve additional benefits rather than just financial help remove that barrier? Such as increased comfort, lifestyle, health, lifespan and future provision for family?						
Yes			No			
69.0%			31.0%			
Q29ai – How much would this influence your decision to go ahead with an energy efficiency measure?						
Extremely influential	Very influential	Quite influential	Moderately influential	Slightly influential	Not very influential	Not at all influential
4.1%	9.2%	34.4%	31.1%	17.4%	3.1%	0.5%
Q30 - Please tick all that apply. When thinking of your home and installing an energy efficiency measure in the future, do you feel that:						
Capability – I think I could either do it myself or organise the installation.		Opportunity – I could/can recognise and opportunity to do so.		Motivation – I feel that I would/do want to improve my energy efficiency.		
63.3%		54.2%		53.5%		

For question 30 only 23.5% (n=66) of respondents felt capability, opportunity and motivation at the same time. This is important as the participants would need all three concurrently in order to feel the agency to enact a behaviour change.

The results for **Q30a ("If you ticked all three boxes "COM" and an opportunity currently exists, why haven't you done so yet? Especially if it is to your benefit "B" to do so?")** are presented in Figure 4.10.

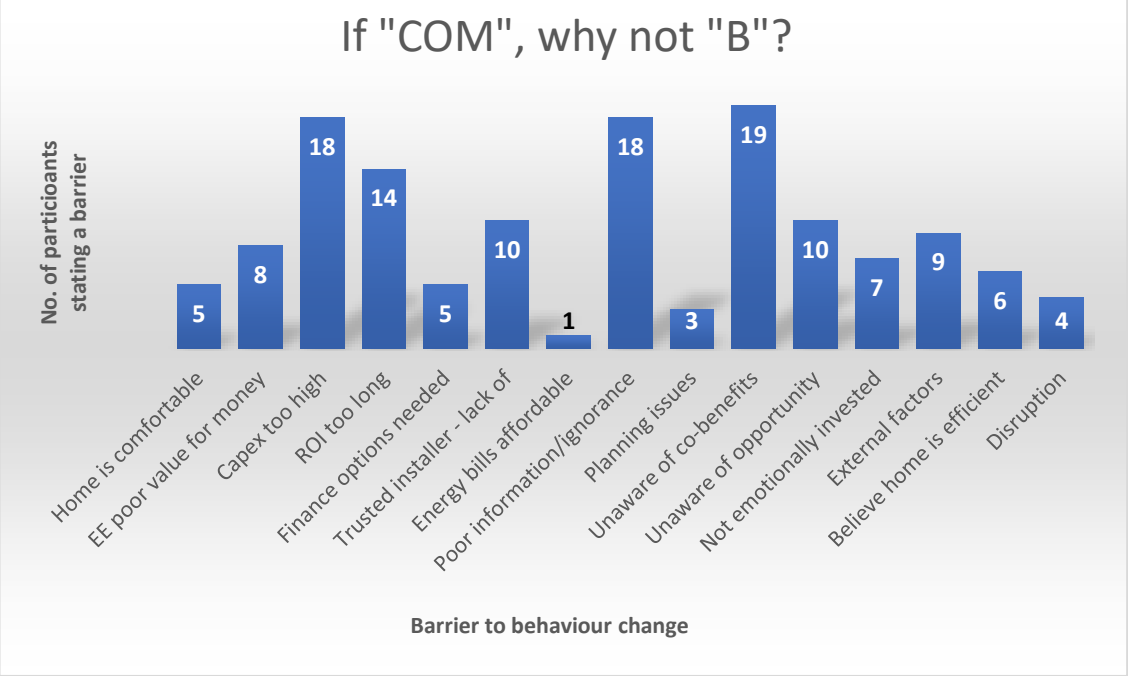

Figure 4.10 survey results of free text box 30a

For question 30a there were 145 coded responses of which 8 were considered to be null. These included responses ranging from "I have! I told you that earlier on Bah!" to "N/A" with the most common being along the theme of "I am actually doing some of these changes at the moment". Whilst this is positive, again it reflects the answer to 26ai whereby some interview participants chose not to answer the question yet wished to provide a response, although in this case it was only (n=8) 5.8% of participants.

Some key points from the results of these questions are:

- *The highest ranked external influencer on decision making was defined as a professional person – e.g., an engineer which outranked known and trusted installers by 2 to 1.*
- *Three quarters of participants said having real life case studies of local homeowners' success stories would encourage them to act.*
- *Finding a trusted installer was their number one barrier to taking action.*

- *Age is a significant negative influence on taking action, but this may be ameliorated by knowledge of non-financial benefits.*
- *Only 23.5% of participants felt Capability, Opportunity and Motivation concurrently when considering future energy efficiency upgrades.*
- *For those 23.5% who could take action their stated highest barrier to action was regarding ignorance of co-benefits and poor information.*

As for other sections in this chapter, these points are built upon and discussed further in chapter 6.

4.5 SPSS analysis of survey data

The analysis above identified a range of findings expressed through descriptive statistics. To identify the statistical significance of key findings, statistical tests were undertaken to explore the links between demographic factors (e.g. gender; age; tenure length) and key views expressed (e.g. perceived capability, opportunity and motivation to act).

A series of Chi-Square tests of independence were performed to examine the relation between differing variables. However, in some cases the results were deemed invalid due to more than 20% of the cells having an expected count of less than 5. To address this Fishers' exact test was used to provide a more accurate result. Upon re-running the tests, in some cases, there was insufficient memory available to compute a result. To allow for this, when using Fishers' it was calculated using the Monte Carlo method, assuming that having a confidence interval of 99% validates the work. A summary table (4-13) is shown below, followed by discussion and further detail on these findings.

Table 4-13 statistical analysis results summary

Variables	Chi-Square or Fishers	Statistically Significant	*p* value
Decision maker gender v Do they feel COM-B?	Fishers	No	.504
Who authorises spending decisions on energy efficiency v Do they feel COM-B?	Fishers	No	.984
Self-defined disability exists v Do they feel COM-B?	Chi-Square	No	.695
Tenure length in property v Do they feel COM-B?	Fishers	No	.105
Existence of mortgage v Age being a negative influence on likelihood to improve energy efficiency	Chi-Square	Yes	.003
Tenure length v Belief in energy efficiency to help limit global warming	Fishers	No	.513
Age by 5-year bandings v Belief that quality of life is the most important thing on a daily basis	Fishers	No	.610
Age by 5-year bandings v Do they feel COM-B?	Fishers	No	.249

Age by 5-year bandings v Do they feel COM-B? Filtered to under 55's	Fishers	No	.223
Age by 5-year bandings v Do they feel COM-B? Filtered to over 70's	Fishers	No	.112
Age by 5-year bandings v Age being a negative influence on likelihood to improve energy efficiency	Fishers	Yes	<.001
Self-defined gender v Stated gender of person who authorises spending on energy efficiency	Fishers	Yes	<.001

In this section the phrase "Do they feel COM-B?" means that they feel capability, opportunity and motivation at the same time, thereby enabling a sense of agency to enact a behaviour change (B).

One of the tests performed was a chi-square test of independence to examine the relation between the existence of a mortgage and of age being a negative influence on the likelihood of a participant to improve energy efficiency (i.e. likely because they feel they will not get value for money). A significant relationship was identified at, $X^2(2, N = 281) = 12.31$, $p = .003$ (see Table 4-14).

Table 4-14 age v existence of a mortgage as a negative influence on likelihood to improve energy efficiency

			Asymptotic Significance (2-sided)	Monte Carlo Sig. (2-sided)		
					99% Confidence Interval	
	Value	df		Significance	Lower Bound	Upper Bound
Pearson Chi-Square	12.313[a]	2	.002	.003[b]	.001	.004
Likelihood Ratio	18.143	2	<.001	<.001[b]	<.001	<.001
Fisher-Freeman-Halton Exact Test	14.828			<.001[b]	<.001	.002
Linear-by-Linear Association	12.075[c]	1	<.001	<.001[b]	<.001	.001
N of Valid Cases	281					

This shows a strong relationship between these two variables with the most probable link being that of increasing age correlating to not having a mortgage. Analysis of the age bandings used in SPSS indicates that the mean age of the survey respondents analysed, who own their house outright, is approximately 70.4 years old. This would raise the question of whether the mean age and mortgage status variables could be considered as relatively interchangeable in terms of variables acting as negative drivers when considered together with the concept of foreshortened time horizons and its effect on decision-making for the survey participants. The linkage is further explored by the next test that was run.

A Fishers exact test was performed to examine the relationship between 'age by 5-year bandings' and the 'age having a negative influence…' response examined above.). A significant relationship was identified at $p = <.001$ (see Table 4-15).

Table 4-15 Age v age as a negative influence on likelihood to improve energy efficiency

	Value	df	Asymptotic Significance (2-sided)	Monte Carlo Sig. (2-sided) Significance	99% Confidence Interval Lower Bound	99% Confidence Interval Upper Bound
Pearson Chi-Square	58.935[a]	16	<.001	<.001[b]	<.001	<.001
Likelihood Ratio	68.318	16	<.001	<.001[b]	<.001	<.001
Fisher-Freeman-Halton Exact Test	55.283			<.001[b]	<.001	<.001
Linear-by-Linear Association	42.392[c]	1	<.001	<.001[b]	<.001	<.001
N of Valid Cases	281					

Seeking to clarify this further, a Fishers exact test was performed to examine the relationship between age by 5-year bandings (filtered to over 70s) and feeling capability, opportunity and motivation concurrently towards enacting an energy efficiency upgrade in their own home. A relationship was identified at, p = .112 that whilst not considered to be statistically significant was deemed to be close enough that if the test were to be run again with a larger number of survey responses the results may become statistically significant. As such it was decided to show these results (see Table 4-16).

Table 4-16 age (filtered to over 70's) v Do they feel COM-B?

	Value	df	Asymptotic Significance (2-sided)	Monte Carlo Sig. (2-sided) Significance	99% Confidence Interval Lower Bound	99% Confidence Interval Upper Bound
Pearson Chi-Square	17.517[a]	12	.131	.128[b]	.119	.136
Likelihood Ratio	18.518	12	.101	.133[b]	.124	.142
Fisher-Freeman-Halton Exact Test	17.536			.112[b]	.104	.120
Linear-by-Linear Association	2.527[c]	1	.112	.113[b]	.105	.122
N of Valid Cases	163					

Whilst the results are not statistically significant at the 99% level, they are close. With the further consideration that the 'level of COM-B' felt by the survey participants is being self-defined there may exist a reasonable range of responses to the same questions. As such, with p = .112 this result should be considered relevant when viewed in the light of the previous test. That is, feeling fully capable, having a recognised opportunity and being motivated decreases with age. Running the same test for under-55s as a filtered group resulted in p = .249.

As a sense-check a Fishers exact test was performed to examine the relationship between tenure length and feeling that they had 'COM-B'. The relationship between these variables was quite high, p = .105 (see Table 4-17).

Table 4-17 tenure length v Do they feel COM-B?

	Value	df	Asymptotic Significance (2-sided)	Monte Carlo Sig. (2-sided)		
				Significance	99% Confidence Interval Lower Bound	99% Confidence Interval Upper Bound
Pearson Chi-Square	330.539[a]	324	.389	.387[b]	.374	.399
Likelihood Ratio	345.184	324	.200	.151[b]	.142	.161
Fisher-Freeman-Halton Exact Test	299.304			.105[b]	.097	.113
Linear-by-Linear Association	1.471[c]	1	.225	.230[b]	.219	.241
N of Valid Cases	281					

The reasoning behind this was that to have a higher tenure length, there should be a correlation to age bandings, which as seen were related to age and perceptions of COM-B. Again, whilst not statistically significant, since these are self-defined by the survey participants there may be a range for variation in the responses provided. In all, the age of the participant is the most likely factor in relation to feeling capable, feeling opportunity and motivated to act, with mortgage status being a proxy for age within this concept.

Whilst checking many relationships, as presented in the summary table at the start of the statistical review, only one other relationship produced a statistically significant result. A Fishers exact test was performed to examine the relationship between self-defined gender and who authorises spending decisions on energy efficiency upgrades. A significant relationship was identified at, p = <.001 (Table 4-18).

Table 4-18 self-defined gender v who authorises spending decisions on energy efficiency upgrades

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	23.235[a]	2	<.001	<.001		
Likelihood Ratio	20.709	2	<.001	<.001		
Fisher-Freeman-Halton Exact Test	20.766			<.001		
Linear-by-Linear Association	13.434[b]	1	<.001	<.001	<.001	.000
N of Valid Cases	281					

The results show that if the person defining the decision maker identifies as male then they are more likely to define themselves as the decision maker than a female does in the same situation. This could be a confidence issue, factual or just an assumption made by the participant; the upcoming interview analysis may provide greater clarity on this point.

The tests of independence which provided results that, whilst not statistically significant but were still quite high (i.e. greater than ≤ .150) were selected for reporting upon above, with the view that future research including more participants may clarify further these relationships. The remaining tests of independence that were not statistically significant nor close to significance (≤ .150) were not considered as worth reviewing further in this thesis. If this data had been created from thematic coding of qualitative data, then it would be worth reviewing for intercoder reliability, however, this did not apply for this survey data.

4.6 Thematic analysis of survey results

Codes were assigned across all three areas of review that are undertaken within this thesis – Governance Entities, Delivery Entities and Decision-Making Entities – with the focus being on identifying the barriers holding back energy efficiency retrofit. Each entity may view the same topic or issue through a different, more personalised, lens which is why the results in the columns below will vary across the different themes.
Within the three areas of review (Table 4-19) the data are shown by primary then secondary ('Main' then 'Sub') coded theme, vertically going from most to least used across all themes:

Table 4-19 thematic analysis of survey results - by entity

	Governance		**Delivery**		**Decision-Making**	
Theme	Main	Sub	Main	Sub	Main	Sub
Information & Education	6	4	6	3	6	5
Marketing & Behavioural Economics	2	7	2	2	4	8
Age & Lack of Appropriate Skillsets	1	0	4	5	4	5
Trust & Financial issues	3	1	2	4	4	0

As detailed in section 3.3.2 – Instrument design and process, Table 4-19 relates to the themes developed from codes created via thematic analysis. The 44 discrete coded comments identified were then condensed to 8 codes and ultimately 4 themes which were then cross-referenced by the stakeholder groups previously identified to aid analysis. It was found that when a statement was made it could have multiple codes that belong to different themes applicable within it. These were captured and then recorded with the

primary code in the statement being the main theme and any secondary or supporting codes being listed into secondary themes.

Table 4-20 examples of codes within themes

THEME	CODING EXAMPLE
INFORMATION & EDUCATION	Lack of information provided about a process or technology when trying to decide if an energy efficiency measure is appropriate
MARKETING & BEHAVIOURAL ECONOMICS	Lack of age-specific motivation provided to the HRP about co-benefits to be derived from an energy efficiency measure
AGE & LACK OF APPROPRIATE SKILLSETS	Challenges in digital competency in older members of the public that increase with age.
TRUST & FINANCIAL ISSUES	Lack of trust in politicians compromising their ability to act as trusted messengers in promotion of energy efficiency.

For clarity a discretely coded comment is defined as a response a survey participant stated about a topic which can stand in its own right as a partial or full sentence and conveys enough meaning to hold latent or semantic value for analysis via coding (Braun and Clarke, 2022). This is traditionally through the use of a defined reference subject (noun or pronoun) and then a verb, although many verbal sentences such as those in free text boxes can have compound subjects and, in some cases, can be challenging to code correctly, which highlights the value of the intercoder reliability analysis which was also undertaken.

Overall, this analysis highlighted that the coding shows Information and Education factors strongly within the main causes of barriers in all three Entities. The Decision-Making need for better information is being matched by the lack of provision for this by the Governance and Delivery Entities and one would appear the corollary of the other. It would realistically be unexpected to see the need in the Decision-Making without the matching lack of provision by the others. Naturally, good information and the education provided with it is a supporting factor in many of the other areas as can be seen by the broadly even split in the sub-theme column. When we look at the data, a latent analysis (which has a focus on a deeper, more *implicit* or conceptual level of meaning, sometimes quite abstracted from the obvious content of the data" (Braun & Clarke, 2022)), shows there is often an issue around information being appropriately presented.

This links directly to marketing and behavioural economics as a theme as clearly marketing and behavioural economics should both be based on good information to allow appropriate targeting of the intended audience. Of note is that upon initial viewing of Table 4-19 Marketing & Behavioural Economics are not seen as such a primary barrier for either

Governance nor Delivery Structures. This is because effectively, if neither Governance nor Delivery Structures are doing them properly in the first place it is hard to recognise and critique something that does not happen, beyond identifying the void. This is most likely why the Decision-Making column shows twice the value of barriers identified as they are showing the need that is not currently fulfilled in the other two Entities.

This leads directly on to the next area of Age & Appropriate Skillsets, where Governance shows very little evidence of a barrier, which makes sense as if Governance Structures are not actually marketing to the decision-maker then a lack of age appropriateness would not be an issue to flag. The Delivery Structures, however, do market to them and so this flags a larger number of barriers being recognised in this area. Much of this has to do with the lack of appropriate information being provided to the HRP that is tailored to meet their needs in an empowering and motivational way that is suitable for their age and social/economic situation. The data from the Decision-Making Entities highlights the areas where the products they are being marketed are not appropriate. This lack of age-appropriate services, marketing and information leads us to Trust and Financial issues.

The HRP as defined in this thesis is unlikely to have great future opportunities for income growth as the majority have retired and what they have is likely a fixed income or a set pot of money (DLUHC, 2022). If something is already owned, limited and cannot be replenished it becomes more valuable as behavioural economics and endowment theory shows us (Baddeley, 2017; Kahneman, 2012). Therefore, this HRP really must trust whomsoever is advising them that this energy efficiency measure will truly make their life better and enough to offset the fear of loss (Tversky & Kahneman, 1978), (of capital or monthly cashflow). Therefore, the issue of trusted messengers holds a disproportionate weighting compared to other areas. However, the latent sub-text that comes through more prevalently, and has been coded together into the top row themes of Information & Education, is lack of trusted information sources from trusted messengers to allow the HRP to make up their own mind. The SME Delivery Structure is fundamentally failing in these areas from their perspective. However, the HRP sees nowhere else to go as the Governance Structure specifically does not support them well (at all) in many areas that matter to them.

4.7 Survey results summary

The survey results mirrored the survey structure by presenting the data in 4 sections. The resulting information has been expressed in a clear and logical format to aid understanding. To provide further context and depth the free text box results were thematically analysed to capture useful information from the data. To check for statistical significance of findings, data was analysed via SPSS.

To provide a more cogent summary of the themes that resulted from the survey a thematic analysis was undertaken of the data. Table 4-19 provided this in a simple format, which was followed by short and interlinked prose-based analysis of the results to provide context of how these played out in relation to Governance, Delivery and Decision-Making Entities.

These survey results and collated information will be analysed and discussed in chapter 6 alongside qualitative interview findings from chapter 5.

Chapter 5: Qualitative results – findings and analysis

This qualitative results chapter is organised in eight sections: 5.1 looks at the interview participants, 5.2 provides analysis of the data then 5.3 to 5.8 present results according to six main themes identified in this thesis: financial, beliefs, value action gaps, age, trust and information; finally 5.9 has a chapter summary.

5.1 Interview participants

To add richness to the quantitative data collected for this research, follow-up interviews were utilised to collect qualitative data which could allow for a more in-depth understanding of the reasoning behind the interview participants' energy-related behaviours.

To allow for the interviews to be arranged, a selected subset of 107 survey participants were asked if they would be interested in taking part in a further interview when completing the survey. Table 5-1 highlights the range of demographic characteristics represented within the 107 survey participants.

Table 5-1 Demographics of participants contacted for follow-up interview

Ownership	88% owned outright and 12% mortgaged.
Tenure	From 3 to 49 years with a mean of 24.1 years.
Gender	88% male and 12% female.
Ethnicity	98% White, 1% Asian, 1% Mixed Ethnicity
Retired	77% retired and 23% working in some way.
Religion	71% Christian, 1% Hindu, 28% no religion.
Actively Religious?	28% no answer, 35% not actively religious, 37% actively religious.
Occupancy	18% live alone, 5% with family members, 77% with partner.
Disabled	71% not disabled, 29% disabled (self-defined)
Satisfaction with home	85% are very or fairly satisfied with their accommodation.

Age had a large spread and is presented in Figure 5.1 below; however, only those between 66-70 were invited to interview as they most closely match the HRP.

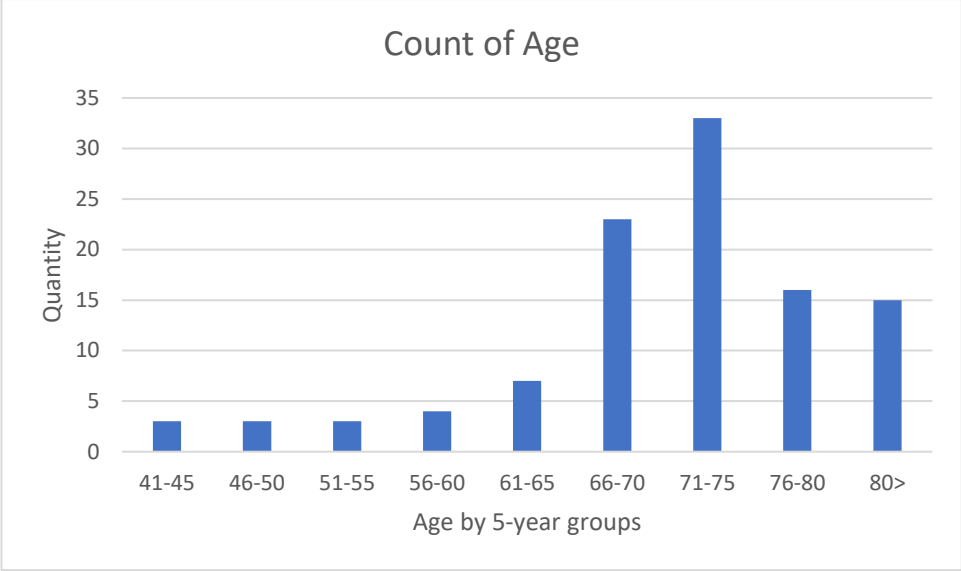

Figure 5.1 Age spread of potential interview participants

Three main areas of interest were identified in the initial coding of survey responses which were identified as being key areas to ensure the interview sample covered – finance barriers, known barriers and unknown barriers (where the participant does not know the reason for the barrier). This resulted in a split of the participants (n=107) as follows:

- *Finance barriers (n=40) 37%*
- *Known barriers (n=36) 34%*
- *Unknown barriers (n=31) 29%*

Initial analysis of the suitable participants for survey identified a limited number of females compared to male who had provided their email address. This meant that there were significantly fewer options for female representation. As a result, for the male engagement the first 6 participants in each of the three areas of interest were collated and grouped ready for an invite. Initial outreach was done of two invites per category selecting for email addresses that were unknown to the researcher seeking to avoid any bias or personal influence occurring. For the female invites there were only 6 email addresses available once filtration had occurred. Invites were sent out to all available. The results of this engagement were 11 participants (8 males and 3 females) agreeing to be interviewed.

Before moving on to discuss analysis, it is instructive to look at the available data of the energy efficiency for the interviewees' own 11 homes to see previous actions taken and to provide background context. The data may provide insight into any potential Value-Action gaps the interview participants are themselves displaying. Only six points of data exist, as those properties that have never had an EPC done have no data recorded against them.

As seen in Table 5-2, of the six properties that have had an EPC only one is a C rating (69+) or above, the rest do not meet desired retrofit targets of C if they are still as shown.

Table 5-2 available data and analysis on interview participants own EPCs

EPC Rating	E	D	D	E	B	D
Score	52	55	67	53	81	61
In date?	Yes	No	Yes	Yes	No	No

Has ever had an EPC?	6	55%	Yes
Has a current EPC?	3	27%	No
Average Historical Rating of sample data	D		
Average historical score of sample data	62		
Average active EPC of sample data	E		
Average active score of sample data	57		

If the EPC represents the current method of factual information outreach to the HRP about their property, then indicatively this is not penetrating the core market sector as only 27% (n=3) of interview participants (N=11) have a current EPC to look at.

5.2 Analysis

Following the methodology defined in section 3.3, thematic analysis of the 11 interviews resulted in a total of 529 separate coded exerts from the interview transcripts. A total of 8 distinct categories were identified from the coding - Information, Beliefs, Financial, Value Action, Age, Trust, Ignorance and Social Norms, as shown in Table 5-3. Examples of codes within each theme are shown in Table 5-4.

Table 5-3 theme summary table from coding of interview data

THEME	CHARACTERISTICS
FINANCIAL	Codes that fall under financial topics such as affordability, return on investment and capital expenditure, particularly relating to decision making.
BELIEFS	Codes that hold comments driven by world views, beliefs and values more so than any factual information.
VALUE ACTION	Codes that highlighted a clear Value Action Gap between what the interview participant said they may do (or believed in) and what they actually may do or did.
AGE	Codes that hold comments whereby age is a significant factor in decision making, what actions are considered and their capability
TRUST	Codes where trust is the significant factor in the statement made – whether positive or negative.
INFORMATION	Codes where information (often the lack of it) is the key factor in the opinion provided.
IGNORANCE	Codes where ignorance is either represented by the interview participant, or even clearly recognised by them, when relating to making decisions around energy efficiency.
SOCIAL NORMS	Codes where awareness is stated of the judgement of others on their own actions or the social interactions and behaviours of others.

Table 5-4 representative examples of coded comment within a theme

THEME	INTERVIEW EXAMPLE
FINANCIAL	Q: What is your motivation to doing these things? A: The only motivation is to save money.
BELIEFS	Q: What is holding you back from any energy efficiency upgrades? A: I'm most practical on the only thing that's holding me back is I don't actually see a need to do anything further. If I did, I think I would do it. I would find a way to do it.
VALUE ACTION	A: I don't think I've got enough insulation in the attic. I haven't got double glazing, I haven't got a terribly well fitting for door, etc.. Those sorts of things I am going to be addressing. Q: Is that because you just moved into the property a little while ago? A: No. Nine years. They're on the list...Voluminous now.
AGE	Q: What might hold you up from doing energy efficiency upgrades if there are areas you might be thinking about? A: I think I need to be 20 years younger.
TRUST	Q: Who is a trusted messenger to you? A: Sad that central government scores so low on the trustworthiness stakes here but it is the time we live in. Everybody's got an agenda, Uh, and their own particular snake oil that they're flogging
INFORMATION	Q: Is it yourself who pays for things? Or do you look for resources from elsewhere? A: No, I would pay for it, purely because I wouldn't even know where to look for resources elsewhere...
IGNORANCE	I think that our House is energy efficient, OK. I'm not sure whether there's a way to test whether it's energy efficient...
SOCIAL NORMS	Q: Would having public group meetings to discuss and explain things help people to engage better with energy efficiency upgrades? A: Someone might get some information that came out of the meeting, but a lot of people wouldn't ask the questions they would ask to the computer if they're in front of their peers and their neighbours and say, 'well, I don't wanna look stupid here. I wanna say the right thing'. And so I don't think it would suit as well as an individual one using, you know, an indeterminate sort of screen in front of you.

Table 5-5 shows how this coding was split across the sample and across the key themes identified of relevance.

Table 5-5 coding analysis by volume and then per theme by participant

Interview	Gender	Codes	Information	Beliefs	Financial	Value Action	Age	Trust	Ignorance	Soc. Norms
No.1	Male	36	3	8	4	9	4	4	3	1
No.2	Male	57	1	14	7	9	2	17	4	3
No. 3	Male	46	1	8	13	10	4	5	3	2
No.4	Male	66	2	11	6	23	8	4	7	5
No.5	Male	62	5	12	11	11	4	6	3	10
No.6	Female	30	3	3	6	12	1	1	3	1
No.7	Male	79	3	13	8	18	6	14	7	10
No.8	Female	31	2	6	8	5	0	6	3	1
No.9	Male	39	2	12	7	8	3	0	3	4
No.10	Male	28	1	5	6	6	1	2	6	1
No.11	Female	55	8	13	8	13	1	4	8	0
No. of responses		529	31	105	84	124	34	63	50	38
% of responses			5.9%	19.8%	15.9%	23.4%	6.4%	11.9%	9.5%	7.2%

These thirty codes were allocated to 6 master themes and two sub-themes for analysis. Of the original 8 themes in Table 20, Ignorance and Social Norms were considered sub-themes as indicated by their infrequency as primary statements. However, this is not to say that they are unimportant with links between Ignorance and Information certainly being logical.

For clarity, a discrete comment is defined as something that an interview participant stated about a topic under discussion that can stand in its own right as a partial or full sentence and conveys enough meaning to hold latent or semantic value for analysis via coding. This is traditionally through the use of a defined reference subject (noun or pronoun) and then a verb, although many verbal sentences can have compound subjects and, in some cases, can hold challenges to code correctly, which highlights the value of the intercoder reliability analysis which was also undertaken.

When making a statement, multiple codes could exist belonging to different themes. The process captured and then recorded these with the primary code in the statement being the main theme and any secondary or supporting codes being listed into secondary themes. Often the interview participants made an initial statement on the primary theme they were considering but then made further comments to justify their thinking which then became secondary codes/themes. A small amount (n=17) could be coded in two different themes and were attributed as so.

The resulting codes were then collated in numerical terms and displayed in Table 5-6. For example, Information and access – or lack of it – was only a primary theme twice, however, it was a secondary theme used to justify a primary coded comment seventeen times, potentially highlighting the strong but subliminal effect it has on the whole retrofit process from the HRP perspective.

Qualitative analysis does not traditionally display results in this numerical format as the data capture method creates challenges to rigidly replicate circumstances and the answers themselves are situational, subjective and personal, thereby making them hard to compare to others. Furthermore, from a reflective thematic analysis perspective "frequency and prevalence are not straightforward, nor is how important they might be analytically" (Braun and Clarke, 2022). However, the table is included to provide some information on the wider picture of showing how themes often supported each other or were referenced in the same statements. In the case of this research this may highlight the fact that prior government marketing of energy retrofit as a financial issue has gained traction in the HRP group as the "Financial" theme was the most common first theme being mentioned overall. Another reason for a numerical summary is that this identifies "Information" as the most prevalent theme, which could hold strong significance (and an area for possible later policy focus) due to this recording of its prevalence; if not done and presented in this way, it may not be so recognisable when qualitatively reviewing the interviews.

Table 5-6 has two columns of numbers – main and secondary. These indicate when the theme was mentioned as a primary concern or maybe as a secondary to back up a comment or in support of another.

Table 5-6 Summary of thematic analysis coding from interviews

Theme	Main	Secondary	Context or meaning
Financial	7	6	Financial topics including influence on decision-making
Beliefs	6	9	Driven by worldviews and beliefs more so than information
Value Action	6	1	A Value/Action gap between what they may say and may do
Age	3	3	A significant factor in decision-making, intent and capability
Trust	3	3	Trust is the significant factor - positive or negative
Information	2	17	Information (or lack of) is a factor in the opinion provided
Ignorance	2	6	Ignorance is present or recognised in the statement made
Social norms	1	3	Awareness of others' judgements or social interactions

A commonly used epistemology in qualitative research is Contextualism. Context can be key to understanding statements that otherwise are hard to locate or make sense of otherwise:

“While it retains a sense of truth, it emphasises the ambiguous, context contingent nature of language and meaning, the dependence on theory and interpretation for ‘data’ to have meaning and ‘make sense’ (Alvesson and Sköldberg, 2009).

The rest of this chapter follows this philosophy and seeks to provide some context where this can aid understanding. The next section looks at the top six themes with examples of coded comments to clarify the topic under discussion with reference back to survey results as relevant.

5.3 Financial theme

Of the original (N=84) coded responses from the (N=11) interview participants that are defined as financial the comments were split as follows:

- *38% (n=32) of (N=84) as awareness of financial drivers for energy efficiency upgrades*
- *31% (n=26) of (N=84) as payback concerns for any efficiency measures installed*
- *18% (n=15) of (N=84) as capital expenditure concerns as a barrier to upgrade*
- *11% (n=9) of (N=84) stating they had no financial capital expenditure barriers*
- *2% (n=2) of N=84) as concerns about future energy prices*

Whilst traditionally in Thematic Analysis less import is given to the frequency of topics compared to the latent or semantic meanings and the impact behind them, topic frequency within themes is included here to offer broader understanding of the results from the interview participants’ perspective. The data is shown at the start of each of the six areas under discussion.

82% (n=9) of (N=11) interviewees recognised that there could be financial influences around upgrading a home’s energy efficiency with an average of 3.5 comments per person to this effect. The main topics were an awareness of reduced running costs but also having an increased home value if it were very efficient. General comments were broadly positive; however, this does not mean they were presently motivated towards doing it.

For example, excerpts from interview participant 3, male:

Q: "Do you feel that overall, there are financial benefits of improving your home energy efficiency in general?"
A: "Yes."
Q: "what's your motivations to doing these things?
A: "The only motivation is to save money."
Q: "I think you said the fact that you believed that by installing measures in your home to improve your home energy efficiency, the resale value of your home might increase?"
A: "Yes. Yeah, it might make it easier to sell a house. And to say, I mean, if you got a, a better energy EPC, a higher one…if you ever get "A" an EPC at that level that might help because if I wanted to sell the house… And you would get a, a benefit of the increasing the energy efficiency of a house, yeah. Solar panels and the roof…if I were going to sell it on and say that's the benefit for the house. Might do it."

In this example, the interview participant recognises the potential financial benefits of upgrading his home but does not have a current imperative need as a trigger to action (e.g. as created by Minimum Energy Efficiency Standards for private rented homes) and therefore he may never do so. This is an undesirable situation for Governance Entities as if money is the main promoted motivator, and yet has no power over this person, then what redundancies exist in the engagement system for them? It is important to note the tone of voice used when saying "Might do it" was musing and very ambivalent, and whilst intellectually recognising the potentials, they felt in no way related to them in their present situation.

An example of this in action was displayed by Interview participant 8, female:

Q: "Do you feel insulation offers a benefit? "
A: "Yeah, I have proof. But I thought think it did. My house was definitely warmer."
Q: "And that potentially saved you money financially on your energy bills?"
A: "It would have done…whether it's psychological or not, I know not, but I really felt it helped keep my house warm."

These are anecdotal opinions being expressed here but the interviewee has never had an EPC done on their property (confirmed by search on the EPC register) and latently infers that they have not tracked any financial savings in their bills. A consequence of this is that if they do not have benchmark data to start any comparison with, it is hard to see how they can review choices and create an informed opinion of the best path forward, or once an action is taken, to conduct a review to see if it provides efficacy or a perceived value.

They do feel the comfort benefit of past measures and have then logically ascribed a likely financial benefit, but opinions and deduction are not proof when it comes to spending money especially if on new technologies with no prior experience. This is evidenced by their next comments around renewable technologies which were:

Interview participant 8, female:

Q: "What do you think of the financial benefits of improving home energy efficiency in these areas?"
A: "So, we're only going to by financial benefits here... So, I would say. Very low. Because it takes years to get your money back. So, I, as far as I know… Take solar panels. I think they look hideous on and from everything I've read it takes so long, as far as I'm aware, to see any benefits from it."
Q: "Things like modern heating systems such as air source heat pumps, do you have any opinion about those at all?"
A: "Looking at some prices of things, I'm not quite sure what benefits might be."

The interview participants are not suggesting they lack financial capability, rather a lack of motive in terms of value.

However, this is a complex landscape of motives and opinions and challenges exist in identifying a stated financial capability compared to desire for others to pay. The next few quotes start from a clear place of stated financial capability but no desire, through to a trigger event causing a reaction, a statement around value for money as a driver and finally to a request for a grant.

Interview participant 5, male:

"*…if I found my electricity and gas bills were going up such that I really can't afford this now I would spend a lot more money on making sure my house was really well insulated…I could do some more research into that, but I've got a round of golf this afternoon… Life's about living comfortably enough at the moment...there's nothing holding me back, really, other than it's not top of my list at the moment."*

Interview participant 3, male:

“And if the if the heating system broke down. Should we say then I would immediately put a new boiler in which hope would be more energy efficient.”

Interview participant 2, male:

“Because we got mains gas, using heat pumps doesn't really make any sense economically”

Interview participant 9, male:

“If there were grants, it would change my decision completely. I would certainly put in solar panels on my roof and probably think about changing the boiler to something that is significantly more energy efficient, like maybe a heat pump, I don't know.”

Whilst the sample is small (N=11), even amongst a low number these quotes demonstrate a broad range of opinions around finances. Participant 5 is of note as it clearly shows they can afford to not care from a financial impact view and are presently motivated towards their lifestyle choices. This statement may be latently interpreted as them not perceiving any lifestyle benefits promoting them to upgrade their home, suggesting a gap in present engagement strategies. Interview participant 3 highlights a practical trigger in action, yet does not even consider using a clean heat source; this may hold a latent interpretation that they just do not have the relevant information to mind that other suitable options exist, many of which are suitable for some form of grant funding. A combination of semantic and latent interpretation of the interview transcriptions from participants 2 and 9 shows examples of negativity around payback demonstrating poor knowledge and misconceptions of how long something takes to pay back.

Clearer examples of these in action with apparent anchoring heuristics are displayed here:

Interview participant 2, male:

“I think if you read about batteries at the moment that they are, they are seriously expensive... About 10 grand.”

Interview participant 10, male:
“If somebody said to me, we could put solar panels on your house for £1,000 or £20,000, I would have no idea whether it was a good investment or not.”

Interview participant 11, female:

“I looked at solar panels on an old property that we lived in and the price of those solar panels… it was gonna take about 24 years to repay.”

These comments highlight a lack of current knowledge on a topic, yet it is not hard to find current costs (for example on the Energy Savings Trust (2023) website), but for whatever personal reason, they have chosen not to find current price data before making a decision based upon a cost comparator. The average 6kWh domestic battery is circa £4.5k and the average 4kWp solar PV system is £5k or even less in some cases (installed in 2023). Their pricing perception may, however, relate to the last major trigger event in their personal timelines – retirement. This event is often related to drawing down of funds for renovation, following Practice Theory (Bourdieu, 2010) and the availability of capital for any desired works. If this was a decade ago, for example, this may be the last time they considered the relative cost and value of a product which may have significantly reduced in terms of cost and increased in efficiency over this term. Solar panels are a good example of this. But possible use of an anchoring heuristic relating to the last known data point means they may well be predicating future decisions on past knowledge which is simply out of date – thereby highlighting the value of receiving up to date and personalised information without the need to go and find it.

Age can often be referred to in part of a financial consideration – particularly its effect in relation to achieving a return on investment. Ten of the eleven participants provided comments that coded to age and the challenges it produced in relation to energy efficiency upgrades, with two brief examples highlight the areas of concern. An apparent anchoring heuristic effect is shown by participant 3 who is quoting a price for solar that is around 300% higher than today’s values (2023) and over 10 years out of date.

Interview participant 3. Male:

“And the question of solar…No, no, because in cost effective terms for me. Not anymore. If I did it, it would be about £12-14 thousand pounds and over. Should we say I'm 75 if I lasted till I was 90, then even then the £1000 a year, I don't think it would be cost effective.”

Interview participant 7, male:

“Yeah, you need to see a faster return on investment if you are older because you want it to start delivering positive economic benefit before they nail the lid down.”

It is important to remember all these interview participants were chosen due to them answering positively that they had full capability, opportunity and motivation to do a behaviour change towards energy efficiency but self-selected as choosing not to do so. However, as shown in Table 4-12, only 43.8% (n=123) of all respondents (N=281) stated that age would not affect their likelihood to consider a retrofit measure. There were five interview participants making clear semantic statements it does – 45.5% of the interview participants – but for brevity two were shown. This percentage tracks closely to that found in the survey results of 43.8%. The other six provided multiple statements around time and age which had latent meanings as part of them ie., their age was a negative influence on their likelihood to upgrade their home efficiency, resulting in five of the six of them coding directly to “age” as a theme. It may be that only five of the participants have the self-awareness to clearly state age as a barrier in financial terms (mostly around ROI) but it would appear to be a consistent theme amongst the participants, whether clearly stated or not.

For example:

Interview participant 4, male, provides a latent statement:

“Air source heat pumps… All I can see in that, and that includes solar panels and batteries, is a large expense. For a very, very low return over a very long period of time.”

Interview participant 5, male, provides a latent statement:

“I have limited resource because I'm on a pension. And seeing the way the government at the moment wrecked my pension [3.45pm, 03/10/2022], that's in stocks and shares and what and I need that to come back. All of these things have to be taken into consideration when I make a decision.”

In the above quote we are seeing the crossover into capital expenditure and age as a linked topic, with 7 out of 11 interview participants citing capital expenditure as an area of concern, if not specifically an outright barrier. Example relevant comments echoing this principle being:

Interview participant 7, male:

"…The most practical, or the only thing that's holding me back is I, I don't actually see a need to do anything further. If I did, I think I would do it. I would find a way to do it. I think if we're going to make any step changes like that, it would probably coincide with something like a tax rebate or a bonus coming through. Because I might as well do it now while I'm still earning and able to do these things, rather than try and do it later when I've stopped working and I'm on dwindling resources. So, it's a bit of a strike while the iron's hot kind of situation."

"And insulation? Well, yeah, the, the house has reasonable insulation, the loft is good… But last year's tax rebate went into ripping the garden up and sorting it out."

This again follows the thought process of the previous interview participant who feels a round of golf provides a better lifestyle choice due to no opposing data regarding quality-of-life upgrades being provided by energy efficiency retrofit. In this case, the participant prioritises relaying their lawn and making a more desirable outdoor environment for their wants and needs.

Evidence from the interviews also showed that whilst capital expenditure can be an outright barrier, there is also a more nuanced internal conversation happening by the interview participants when considering competing interests for capital, particularly in retirement. It might be that other factors such as a perceived lack of monthly spending power caused by potential repayment of loans, fixed incomes upon retirement and still having spare capital for future desires affects their thinking. This is shown by interview participant 11, female:

"I'd like to think there's some grants available somewhere… Maybe I'm being a bit ambitious, but at the end of the day, to get more energy efficient, there's got to be either a meeting halfway house with the consumer… I can think I could go to Australia rather than pay for solar panels on my house… Then it's a different lifestyle choice that you have got that free time in your life..."

These exemplified considerations may be the financial cause of reticence to act rather than any opposition to being more energy efficient. What is clear from the interview responses is that the theme of capital expenditure and cashflow holds relevance:

Interview participant 4, male:

"…even having said the finances could be there, it would be a fairly crippling outlay."

Interview participant 7, male:

"I think if we're going to make any step changes like that, it would probably coincide with something like a tax rebate or a bonus coming through."

When asking about barriers to energy efficiency upgrade, capital expenditure and the desire not to use their own money (latent analysis), was a clear and common response.

Q: What things might be holding you back from doing energy efficiency upgrades in your own home, if there are any areas you might be thinking about?

A: "And I come back to cost." (Interview participant 11, female)
A: "Cash flow. Obviously, like most people." (Interview participant 6, female)
A: "Depends on the capital cost of the project." (Interview participant 7, male)
A: "But there's a lot of money to be spent." (Interview participant4, male)
A: "I think with the air source heat pumps is the actual cost…" (Interview participant 11, female)
A: "Looking at some prices of things, I'm not quite sure what benefits might be." (Interview participant 8, female)
A: "So, for me, the balance is how much is it going to cost me to install. And how long would that take to pay back before I started to see the benefit?" (Interview participant 5, male)

5.4 Beliefs

"In Reflexive Thematic Analysis it is good interpretative practice to locate your data in their wider context. This acknowledges that the sense we make of the data is shaped by the contexts of its production, both immediate/local and wider." (Braun & Clarke, 2022 pg. 211)

Coding and analysing this section was challenging, as due to the complex nature of people, an interview participant may say one thing with belief about a topic then contradict themselves two minutes later when viewing the same topic through a different lens or context. They may appear to believe both statements without identifying a conflict. This highlights the challenges in thematic analysis surrounding interpretation and developing latent themes, as there may be conflicting data depending on the lens a subject is viewed through (Braun & Clarke, 2022). A good example of this issue is this, from the same interview:

Interview participant 5, male:

“I am a believer that we ought to start using more in the way of solar panels. Batteries, you know… and all modern houses should automatically now have solar panel system on the roof… All of these things should be in them.”

But also followed by:

“I can afford to pay the money for this so there's nothing holding me back, really, other than it's not top of my list at the moment, but if it became top of my list then I'd do something about it.”

When considering beliefs and their effects on action gaps, responsibility for payment is a key issue because in some cases, interview participants stated that the HRP should pay, then listened to themselves saying it, and then backtracked as they realised what they had said. One interpretation is that their first statement related to how they wished to be perceived as a responsible citizen being interviewed, and the second was as the person paying the bill. Regarding acting, they generally expressed a latent feeling there were many good reasons why something should be done, and that others should do so; however, this was combined with stating that they themselves had already done what they could and any more is unreasonable in their circumstance. This clearly aligns with the definition of a neutralisation technique (Neumann and Mehlkop, 2023), deployed to help reduce cognitive dissonance. These techniques were on display throughout the interviews, especially when participants were pushed on who has responsibility to pay for upgrades after they agreed that as the owner, they accrued benefits in terms of comfort, health and finance.

Overall for this theme, N=96 coded responses grouped under the theme “Beliefs”, were split as follows:

- *34% (n=33) of (N=96) Behavioural Economics is seen in action or used to justify choices*
- *24% (n=23) of (N=96) as belief in own security or belief in self*
- *17% (n=16) of (N=96) as belief that opportunity is not (would not be) recognised*
- *15% (n=14) of (N=96) as belief it is ok to externalise the responsibility or need for action*
- *8% (n=8) of (N=96) as general statements around values*
- *2% (n=2) of (N=96) as statements around emotions over benefits*

The whole area of decision-making, behavioural economics and motives strongly link to beliefs and perceptions of who the interview participants wish to be seen as (and how they see themselves) (Bocian et al., 2020). However, when comparing ideals against bounded rationalities (for example when being sold to or asked questions around who should pay) then personal gains come into play and who is judging them – “whether an action would be judged as right or wrong entirely depends on the social-relation context in which it occurs” (Ibid.) – will have an effect. As such Value Action Gaps may occur.

All 11 interview participants made multiple comments coded as involving beliefs with the average number made being 8.7 per person. All 11 interview participants also made multiple comments coded as involving Value Action Gaps with the average being 11.3 per person. Again, as previously noted, whilst the frequency is not necessarily indicative of the significance of a code it is instructive to demonstrate how universal the topic may be.

An overall norm was established (with the odd exception) where **o**pportunity for action was recognised, a **m**otivational benefit acknowledged, and financial **c**apability generally accepted. However, there was insufficient personal drive felt to commit to any **b**ehaviour change due to current levels of comfort and a desire not to use personal resources to pay for the works; this was combined with fear of loss in many cases as the perception of risk was off-putting and old age was potentially a limiting factor.

This above summary follows the principles of the COM-B Model and the linked Behaviour Change Wheel, as discussed previously. Analysing and coding interviews through the lens of COM-B usefully aligns interview with survey analysis and enables follow-on research to use the Behaviour Change Wheel to support suitable engagement

Building on the findings above around main topic of responsibility to act, nine of the eleven interview participants stated they would ideally seek external funding for future projects or directly discussed government grants within the interview, one felt it should be their choice

to pay or not and only one said it should be the homeowner. This is even though they have all self-selected to have Capability around finance and nine of the eleven had also stated belief in their own financial security.

Looking first at Behavioural Economics at play[4], differing outcomes can be seen from the same mutual experience in action.[5]

Interview participant 1, male:

"I negotiated an extremely good deal [on windows], so you know, I was, I was happy with it. It wasn't cheap. But on the other hand, they are excellent. And I got a deal that was significantly lower than their quotation."

Whereas a countering point of view about double-glazing companies is:

Interview participant 7, male:

"I think removing the incentive to lie with the facts is key here. Now the likes of Anglian Windows, you know I've done a litigation against these people. I know that there is a huge agenda here for kind of maximising the amount of money you receive and that comes with the possibility of poor service or corners cut."

The quote from interview participant 1 is an example of a successful sales technique in action whereby the original quote (for double glazing) was anchored high and a bargain was achieved by the interview participant. In reality, if the sale did not achieve the desired margin for the company, they would not have installed it. Once an HRP understands methods of behavioural economics that may be deployed by SMEs, trust may likely be damaged for future energy efficiency upgrades. The lack of either benchmarked cost comparisons or enforced regulation on sales techniques leaves the HRP vulnerable to a poor experience.

[4] Defined by Baddeley (2017) as "Behavioural Economics extends economic principles by allowing that our decisions are affected by social and psychological influences as well as a rational calculation of benefits and costs."

[5] Please note that some comments may be viewed through different lenses such as financial and behavioural economics and so may be seen in multiple sections of the thesis.

Another key area around decision-making would be that of fear of loss related to affective decision-making (particularly in an area of limited knowledge for an older person (Lockenhoff et al., 2016)). This matters because the fear of loss, and the aversion to this, has a stronger effect than any potential notional gains being considered by the interview participant, particularly if around a relatively inexperienced topic.

Examples of this “fear of loss” being at play in interview participants decision-making include:

Interview participant 2, male:

“If you're an early adopter, often it becomes, you realise a few years that you've got something slightly wrong in terms of that because if the battery becomes half price…”

This one statement is showing fear of loss, risk aversion and a potential lack of knowledge, when identifying as an early adopter, all at once.

In comparison it is possible that fear of loss can be a motivator depending on the context.

Interview participant 5, male:

Q: So, what was your motivation for changing it now then if the previous system was still working? [Boiler]
A: Umm, I think it's something that comes with age that you tend to think - I know from experience that things will go wrong. And the last thing we really wanted was to have the situation where the boiler breaks down at an inopportune moment, like Christmas Day or something, and you then need a new boiler because this one is now redundant and it's on a long lead in period because not many people make them [Johnson & Starley hot air system].

The recognition of age and capability, which when combined with potential fear of loss induced stress which combined to trigger a pre-emptive act (that of replacing the currently older but functional boiler). However, at no point is there proof that interview participant 5 considered connecting an air-to-air heat pump to his current ducting system rather than another gas boiler.

Returning to the issue of neutralisation techniques, interviews highlighted how a statement of beliefs (potentially held with all sincerity) can serve as a reason for or against a decision, even if factually incorrect:

Interview participant 4, male:

"UM, double glazing…it would still be a huge undertaking because it would destroy again [it is assumed this is referring to the fact that the old wooden window frames are plastered into the wall]…It would damage all of the decorations in all of the rooms…even if upgraded with decent looking windows it still doesn't really match the wooden windows that we've got, and I know there's wooden window double glazing."

As an example, interview participant 4 stated that they have recently re-decorated their hall/stairs… but did not change the window. They have lived in the house for 40 years and stated that they have redecorated several times throughout during this period, and as such could have timed work to easily replaced the windows in the rooms in the process without any additional disruption (suggesting they had the opportunity and capability to arrange retrofit works but lacked motivation). For context, the interview subject here is a retired GP and financially secure with a house that is council tax band G. His overall comments recognised that when they first moved in, they could not afford to replace the windows, however they have had ample opportunity to do so when they last decorated. This is a good example of a missed opportunity when renovating and potentially Prospect Theory being at work with the fear of loss being a barrier.

5.5 Value Action Gaps

This thesis defines a value action gap (Essiz et al., 2022) as being that between what the interview participant said they may do (or believed in) and what they actually do or did.

Relevant comments were made relating to Value Action Gaps, when the interview participants were asked "who pays and who benefits" (when relating to energy efficiency upgrades in their home). For clarity, this question was specifically asking who should pay for the upgrade and who benefits from the upgrade once done. Whilst earlier analysis on financial coding clearly highlighted the issues of capital expenditure and returns being related to age, there was less direct evidence that participants were unable to pay if an upgrade was desired. However, this did not stop people from asking for subsidy.

Therefore, participants' or desired public personas may conflict with personal desires, which may relate to the generation of value action gaps.

This section is split into four separate areas, as whilst they may all contribute to this effect, they do code discreetly to each other; however, it was common for all to be visible in one interview subject over the course of coding.

Of the original (N=124) coded responses defined as Value Action Gaps (where there is a difference between what participants may say and do) they were split as follows:

- *34 (27%) of (N=124) discuss the responsibility of who pays for upgrades*
- *20 (16%) of (N=124) are comments showing self-belief in own story - where they are confident they are correct contrary to actual personal actions already taken*
- *19 (15%) of (N=124) where opportunity for upgrade is recognised but no action taken*
- *17 (14%) of (N=124) as comfort is supposedly the key driver for action*
- *14 (11%) of (N=124) are specifically about seeking grants*
- *12 (10%) of (N=124) where emotions were clearly more important than financial drivers*
- *7 (6%) of (N=124) something they value more than Energy Efficiency is taking priority*
- *1 (1%) of (N=124) reticence over being identified and possibly called out over actions*

5.5.1 Externalisation

Eight of the eleven interview participants displayed clear externalisation of responsibility with neutralisation techniques; meaning they stated that somebody other than themselves should pay for energy efficiency upgrades but provided reasons justifying their choice to themselves. This stance on denial of responsibility aligns with Neumann and Mehlkop's (2023) definition of a perception of actors that "due to external forces they cannot influence, breaking a norm is not their responsibility". This foregrounds the challenges faced in creating buy-in for responsibility to pay (even if with cost-neutral long-term loans) if the HRP does not feel motivated to break the current social norm of inaction.

Examples of externalisation in action are:

Interview participant 1, male:

"I see no point in getting stressed about things that are outside my control."

Continuing the theme of external influences, as noted in the methodology, at the start of each interview a brief Microsoft™ Forms survey (Appendix 4) about the energy crisis was

undertaken by themselves using Likert scales to engage them actively in the interview process. They then uploaded it to be collected and reviewed later and it addressed areas that may have less personally emotive responses, that they are answering privately in a safe space, before moving to the interview itself. This data was then able to be used to provide context as needed to help interpret and code the data recorded.

Interview participant 1, when asked if they feel the importance of energy efficiency has changed since the energy price rises, ranked himself as zero out of 10 (on an internally defined scale) and only 1 out of 10 in terms of personally felt financial stress. For reference, zero is the lowest level of effect or impact and ten is the highest. The original statement made of not seeing a point in being stressed about things perceived as outside their control provides an opportunity to be interpreted as a semantic statement, however, when contextualised with the Microsoft™ Forms data, a latent interpretation of being more in control of any stress levels due to personal financial security may be made. As such this interview participant is choosing to socially justify their inaction as being due to something outside of their control, whereas in fact when selecting options on a Likert Scale they chose to define themselves as very much empowered.

The Microsoft™ Forms answers may potentially have been considered from a personal and safe, private perspective – not considered in the wider view of public opinion, whereas by proxy of being in an interview situation the answers are open to immediate public scrutiny by another person. This may well be what has resulted in an externalisation of responsibility and a neutralisation technique being employed – to reduce or remove social judgement and cognitive dissonance.

Interview participant 2, male:

“I think that's a huge difference for lots and lots of houses as people just have gotta start deciding where they're gonna cut back, aren't they?”

Interview participant 2, when previously asked via Microsoft™ Forms about whether they felt relaxed or stressed about the recent energy price rises, ranked themselves as zero out of 10 in terms of financial stress. In their comment, interview participant 2 is not specifically including themselves in the concept of worrying about energy efficiency and deciding where they must cut back (as one of the people) and it may be viewed as a viewed as a semantic statement but open to question. However, when contextualised by the Microsoft™ Forms data - that they themselves felt no personal impact due to the price

rises and energy crises - a latent interpretation is that they do not see it as their responsibility to cut back in expenditure (or increase energy efficiency to achieve the same results) as they feel no need. This combination of latent and sematic statement helps to build a clear picture of their feelings in the matter.

Interview participant 8, female:

"I'm not sure that they're really always targeting the right people because they seem to have forgotten the big businesses and things in this equation as far as I know. And some of them, for want of a stupid expression if you want, they need a good kicking, these big firms because they can do exactly what they want… a snippet, that's what I consider little people. Yes, of course we'll make difference, but I don't think we're the ones that will make an enormous difference."

Whether the argument is valid or not, a clear neutralisation technique and externalisation is being displayed here whereby someone else is being stated as more responsible than they are, which then lets them 'off the hook' in comparison. Contextually the tone of voice used by interview participant 8 was very matter of fact, slightly dismissive with a hint of regret - as if to say "it is none of my concern but there is nothing I can do anyway".

5.5.2 Who pays – Investment responsibility

As noted, nine of eleven interview participants all stated a desire for a grant or financial support being made available that is non-refundable. There were only two comments in all the coding that used the word "loan". One was in support of long-term low interest loans to empower and motivate the HRP:

Interview participant 10, male:

"…if they said, look, this is, this is gonna improve your lifestyle and health etcetera. There is a cost to it. We can give you a long-term interest free loan or whatever it is, something like that. I think would probably be the better way to do it, because OK, we could afford to do it but be a lot of people who probably couldn't afford to do it."

From this statement there is a latent interpretation that interview participant 10 is recognising that there is more that they could do with their own home, however, they do not perceive any direct benefit to their lifestyle for acting and acknowledge that they themselves would not require finance to provide agency. On the same theme, another

participant, below, said that they had previously borrowed money to install solar panels but would have also preferred a grant from the government instead of taking responsibility to pay themselves.

Interview participant 7, male:

“When we got the solar panels, we took a loan. Only on you know, the ordinary marketplace. I wasn't aware of any government grants available at the time. Uh, if there had been any, I would have, I would have gone for them.”

The comment by interview participant 7 is potentially as much about a financial decision rather than around energy efficiency, as solar PV has traditionally been marketed as an investment opportunity (whereby the return on investment from utilising solar energy outstrips the interest rates charged for the loan). As such, if any increase in property asset is discounted, and the HRP intends to stay in the home for longer than the payback period it made sense to borrow the money rather than access any potential personal savings. The fact that not one of the interview participants was actively suggesting a loan as the default architecture mechanism to fund energy efficiency upgrades demonstrates the scale of the challenge in this area. However, consideration must be given to the fact that as older people, likely on a pension, some may feel they would not be successful if applying for a loan at their age. All interview participants agreed that financial, comfort and health benefits accrued to the HRP (although some rightly also noted that the government would benefit from savings in future healthcare costs from better housing stock), but the idea of paying for those benefits themselves appears to be cognitively dissonant. Naturally there will also be some cross-over here into externalisation of responsibility as previously discussed.

Moving on to look directly at the question of investment responsibility, all were asked “Who do you feel should be responsible to pay for your energy efficiency upgrade costs and why?”, after it having just been confirmed with them that as the property owner, they “accrued benefits in terms of comfort, health and finance”. Whilst as noted most asked for grants, the rationalisation of this was often linked to reciprocity and the concept of fairness. Participants felt a need for a clear sense of equity; theoretically if this is funded from general taxation and the schemes were universal then they would still be paying for it themselves, but the perception of equity still mattered.

Interview participant 1, male:

“So, we bought a really old clapped-out Terrace cottage when we first got married and the government matched what we spent renovating it, pound for pound. So, you know, a bit like a matching grant…I think there's a role for government to play in terms of subsidies and encouraging people to do it.”

Interview participant 5, male:

“I think it's got to be a mixture. In my industry, civil engineering, we used to have contracts with our clients and the one phrase in there is fair and reasonable. And I'm a great believer in things being fair and reasonable, and therefore if some people can afford things that other people can't, then I think they should expect to pay more than the ones that can't. But it still be fair. It can't be unfair because you know you need to get people to do it willingly as opposed to, you know, saying you must do this; and I think that's what I would expect to do.”

Interview participant 11, female:

“Maybe I'm being a bit ambitious, but at the end of the day, to get more energy efficient, there's got to be a meeting halfway house with the consumer. OK, and the consumer to pay so much, you know towards it? So that 50/50 at the end of the day, that's another way around it. While we'll pay £1000, you pay £1000, but actually you can pay it together with your bills over, say, five years.”

There are clear statements interpreted as being semantic, asking for perceived equity and that society is all in this together. Interview participant 1 opines on the clear linkage of funding as a motivational lever; however interview participant 5 provides a more nuanced opinion that whilst those in fuel poverty may need more support those fully able to pay should not be treated in a way which feels unfair. Interview participant 11 provides a clear example of equity – 50/50 being their definition of fair, but with finance rolled in as a delivery scheme.

5.5.3 Story of self – confidence in own story contrary to past actions

“Story of self” is the concept of self-belief by the interview participants of their own story. A person confident in their own story of self is both aware of societal normative beliefs and is comfortable with their subjective norm and any social judgement they feel from their

behaviour or attitudes (using concepts as represented within the Theory of Planned Behaviour (Ajzen, 2011)).

Eight of the eleven interview participants made comments coded as “self-belief in own story” which is defined as “they are confident they are correct contrary to actual personal actions taken”. These are evidenced by analysis of public records that provide their home addresses, their publicly accessible EPCs for the properties they own and are responsible for the energy efficiency actions taken within. Examples of this include:

Interview participant 1, male:

“Clearly in the current economic climate, people should do as much as they possibly can do or can afford to do to make their homes as energy efficient as possible.”

Yet in direct opposition interview participant 1 states:

“When I'm buying a house… energy efficiency is not really high on my agenda.”

In relation to his own property, however, he believes that he either has done it or justifies why options are not relevant to him and so no more work is required:

“I'm in the fortunate position where I'm fully resilient…I wouldn't be very happy decorating the front roof with solar panels…that's not going to work here because all of my house is South facing, so if it was north facing and therefore the back of the house maybe I would consider it so there's an aesthetic question for me.”

Having a roof that is south facing is ideal for solar panels as they would produce approximately twice the output of north facing ones, yet interview participant 1 is happy to be confident in stating they are not appropriate for him. Furthermore,

“I remain to be convinced about modern heating systems like air source heat pumps...It has oil central heating… so that’s pretty efficient…the house is very warm, but I also have a log burner…So, from my point of view, as far as this house is concerned, it's not a lot more I can do.”

Whilst an oil central heating system may be effective it is not efficient in terms of energy costs to run compared to an ASHP. The fact that he also has a log burner (which are

relatively inefficient in energy terms) is irrelevant. From an energy efficiency viewpoint there is a lot that he could do. Yet the home is warm enough for his usage and so he states that the home is effectively energy efficient enough and feels no need to improve it. Therefore, in this case the motivation side of the COM-B model is removed, consequently causing them not to look for opportunities, and so their capability is irrelevant to them. It is important to note clear recognition the front of the house is extremely suitable for solar panels from a directional perspective but the interview participant states no financial motive. This thereby allows a competing aesthetic driver to take priority as the look of the front of their house relates in some way to providing a feeling of satisfaction, allowing them to comfortably state solar panels are literally “not going to work here”, contrary to fact.

Other examples of this theme of self-belief in own story removing the motivational aspect:

Interview participant 2, male:

“It’s good to save the planet. You know, we are all trying to be green aren't we?”

“So, I think we're doing what we can really, that makes sense with the current house that we have.”

These are positive statements that would both semantically and latently indicate that there exists an energy efficient property that the current owner has actively retrofitted to suitable standards. However, further statements clarify that this may not be the case and that interview participant 2 believes that they may not feel a motivational need, that they have already done appropriate work or that options are not relevant to him (effectively creating a narrative that satisfies themselves and abrogates them of responsibility) - hence no more work is required. Examples of comments from participant 2 that are either in direct contradiction to facts, or are statements of belief to justify actions include:

“I suppose we are fortunate enough that we can afford to pay for the increase (in energy costs due to the Ukrainian crisis).” [This is a statement of self-belief]

“So, we can't really do things like external insulation and then internal insulation, we've decided not to do because of the risk getting damp, there's lots of lime mortar.” [This is not true – there are suitable versions of both internal and external insulation.]

“Because we have mains gas using heat pumps doesn’t really make any sense economically.” [Using appropriate time-of-use Heat Pump tariffs with a correctly insulated home addresses this concern.]

“We can’t sort of fit solar panels because we are in a conservation area… and we wouldn’t do it anyway… our house isn’t listed but it would just look completely wrong.” [You can fit solar panels in a conservation area within permitted guidelines.]

The interview participant (2) went on to state that they did not feel that the energy efficiency benefits that have been mentioned would apply to their own home. Again, here participant 2 does not feel the motivational aspect of financial savings from improved energy efficiency due to personal financial resilience. There is likely a compounding effect that current outreach from Governance and Delivery Entities has not managed to penetrate, and as such they are not aware of breathable insulators using hemp (as the material) and lime mortar (as the finish over the top) which remove the risk of damp. It does raise the issue of needing good information and education to underpin decision-making as supported through the survey analysis. If the participant is not aware of alternatives it is perfectly fair they would believe their own narrative - they have done what they can if they wish to avoid the risk of damp. This perspective remains a challenge for the SME market, just in terms of engagement alone, even if they were a one-stop shop offering ranges of suitable solutions.

Participant 4 also demonstrated strong apparent confidence in their own narrative. An area of coding arose in their case out of the perception of risk to self, caused by own actions; it was perceived as being latent rather than semantic as the interview participant did not identify the risk even though professionally qualified as a General Medical Practitioner (GP), where they are trained and required to be aware in their day-to-day duty of care for others.

Participant 4, male:

“We have an open fire if we want it sort of thing so. Yeah. I don't think what we've been doing is unhealthy or has led to us being unhealthy.”

“We've been looking to move for 20 years, but we were also happily going actually, you know, why? Why are we? You know, the house is comfortable. We've done what we need

to do to it. We could have done a huge amount to insulate this house [loft]… It's still a draughty house, but it's not a damp house."

However, this does not mean that they do not desire the benefits of energy efficiency, as is latently suggested by a following statement around an imminent move to a new build home. The new home is a modern eco-house which costs £170,000 more to purchase than the sale value of than the one they are leaving.

Further questioning around the logic and motivation behind this move revealed that interview participant 4 believed their internal resilience to disruption is lower with increased age and whilst they recognised the benefits provided by a high efficiency home, they were not willing to undertake the effort in their existing property. The ease of being able to move to a more efficient home was part of the attraction compared to acting themselves. In terms of motivation then, this was a strong demotivator that had been holding them back more than the perceived benefits they may accrue. As such interview participant 4 clearly felt happier in telling themselves that they had done as much as they could (with no negative health consequences), rather than face the perceived disruption an energy efficiency upgrade may cause.

5.5.4 Social norms

Social norms, as defined by Chung and Rimal (2016), was identified as a sub-theme to Value Action Gaps, as there was often clear latent awareness of social judgement being made of them as people and homeowners (or even by them as people of others' actions), not just because of the interview (which was always likely to focus the interview participant's own awareness on social norms) but in more general anecdotal stories that they told. This was shown when, whilst answering interview questions they would often choose to contextualise their answers with examples from their past, since meanings were not semantically clear and they felt a need to elucidate their point further as the meanings were otherwise overly latent. This awareness, although often complicated, was often linked to when a Value Action Gap appeared, and this could occur when a social norm was identified but an individual belief in own story over-rode this and the interview participant then did whatever they felt appropriate from an ego-centric perspective. When coding for Social Norms the theme being used is consciously broad and defined as including: "Codes where awareness is stated of the judgement of others on their own actions or the social interactions and behaviours of others". This area includes all and any other statements around public engagement potentially linked to Persona Modelling techniques (exemplified in section 2.2.4).

Examples of consideration of social norms by interview participants are:

Interview participant 5, male:

Q: Who do you feel should be responsible to pay for the energy efficiency upgrade costs to the homes?

A: "…So if you could afford to do it. Then I think you should be willing to pay more than if you can't afford to do it. The downside to all of this is that the really wealthy can shield their money far better than the reasonably wealthy, and the ones who've got nothing sometimes can get everything. And again, that doesn't always seem…Make it fair and reasonable, and the more fair and reasonable it is, I think the more people that sign on to it. Yes."

Interview participant 5, whilst clearly recognising the bounded rationality of available capital for differing sectors of society, starts discussing the concept of being fair and semantically states a perceived social norm of inequity caused by wealth and power which they feel shields the most empowered from what they may consider a duty to do their fair share. Furthermore, they recognise the lack of equity as being a negative driver on others and states a desire for this group to show better leadership. This comment on the example of leadership by those considered to be powerful, and potentially societal leaders, may have interesting latent consequences if considered via the lens of psychographic groupings, value modes and diffusion theory.

Interview participant 7, male:

"I mean, I'm a solicitor. I don't do property transactions, but the property team is right outside my office door and I see what they see. And I see the stuff that matters to the clients who buy through them, and they are certainly much more switched on about energy efficiency in the world before… as compared with say five years ago 10 years ago."

Whilst the comment does not specifically talk to the impact of social norms on the interview participant, it highlights the impact of energy efficiency on property purchasing decisions currently being made and the shift over time. This particular comment foregrounds the latent issue of the ability and competence of SME staff to understand and

elucidate the energy efficiency features of a property and the benefits. If the clients are requesting this more often, then there is a potential for gap in support for SMEs to deliver the appropriate information in a relevant and desirable way.

Interview participant 4, male:

"When I've seen people living in houses and often being the government's guidelines or what they perceive to be the government guidelines, they're often very unhealthy. Because they lived in a hermetically sealed box, I think, peoples misunderstanding you live in this hermetically sealed box at some ludicrously high temperature, and then you go out and you, T-shirt and shorts and wonder, particularly with children, why they come back with a snotty nose..."

This is a very interesting example, clearly, interview participant 4 recognises an acceptable social norm of (noted to be uneducated from his perspective) tenants living in modern insulated homes not dressing appropriately/overheating their homes. From the context of this thesis this raises questions of post-occupancy survey, occupier education and a rebound (Sorrell, 2009) occurring in terms of energy usage because the home now can hold heat, as future research topics. However, focussing on social norms for now, the actions of the tenants that the interview participant describes is seen as illogical by them and resulting in negative outcomes from a GPs perspective. A question may be asked whether this is due to their own lived experience in a home not capable of being kept warm in the same way? As previously described the interview participant 4 is a GP and owns a large and draughty uninsulated Edwardian home. Where his normal practice is to put on gas heating and a coal fire to heat to own levels of comfort as needed (18^{o}C as a daytime temperature in winter) whilst living in a self-identified "draughty house", yet a semantic interpretation of comments would indicate that he believes his standards should apply to others in different circumstances. Social norms are influenced by a person's own worldview and in the case of domestic energy efficiency this will link back to practices of habitus as discussed in Practice Theory (Bourdieu, 2010). Therefore, mentalising another's perspective may be seen as challenging when it lies outside of one's own lived experiences, which again may support the concept of using Persona Modelling as an engagement tool to help bridge this cognitive gap.

Later in the interview participant 4 went on to state:

“Yeah, when I visited my father-in-law in a modern house, he wound the temperature up so high that the first thing my wife and I did when we walked in was to open as many windows as we could.”

This may be defined as clear egocentric behaviour in that the interview participant perceives their behaviour to be socially acceptable from his professional status as a GP – that this temperature level was not appropriate. Resulting in them confidently projecting beliefs onto others, to affect their father-in-law’s living habitus in an effort to amend it more towards their own. Again, this demonstrates an inability to mentalise the lived experience of others, as although his father-in-law is a generation older (likely in his 90’s and more sensitive to cold) interview participant 4 clearly felt it was in his right to cool his father-in-law’s house to his own standards as demonstrated by opening all the windows and letting out the heat his father-in-law had likely paid for. This recognition of acceptable social norms by interview participant 4 (that of modern a modern house being over-heated to his opinion) yet rejection of them as sublimated to his own needs or mental paradigm follows the literature reviews neuro-economics findings concerning the increasing import of self-opinions in decision-making as people age. It has strong implications on the area of social judgement of others and likelihood to uptake perceived changing social norms, as recognition of relevance would be a requirement for any future action and behaviour change.

5.6 Age

Age is a topic intertwined throughout all other areas as it is a state of being – the outright owner HRP is an age-defined group – and this has a systemic effect. By “age defined” this thesis refers to the EHS 2019-20 Home ownership report (MCHLG, 2020) which defines the owner-occupiers’ top identifying features being as having an average age of over 68 years old and rising, with over 61% also being retired and 90% being a white male. This thesis notes that whilst a specific HRP may be of working age, the outright owner HRP defined by EHS guidance is older and of retirement age as the norm. This is likely to have strong influence on all associated decision-making, both from external social forces and also from internal worldviews and personal competencies, in addition to likely effects on income and expenditure capabilities. As such the use of “age defined” reflects this and reminds the reader that on average this thesis talks of older (retired) people.

Interview participant 7, male:

"… anybody born since, say, 1990. They brought up in a world of mobile phones, tablets and laptop computers, and these are just normal tools. Awful lot of people in my generation are genuinely challenged by Items like that. So, it's the older you get I think, and particularly if people start to lose their edge, which sadly happens you know, that's when the friendly ear and a real human being could potentially deliver a better service than a machine."

This point is echoed by participant 3 (male) here:

"…take my Rotary Club as an example. I would say that 68% of the people are computer illiterate and they don't even…well, out of 20 people, eleven of them have not been on the district website for at least a year and a half. So, to get them to actually look at something it is somewhat difficult, it's just difficult…"

The quotes above all have a related theme of reduced interaction with digital services based on the age of the participant, generally scaling as they get older. The last quote would suggest that broad social communication on the topic of environmental action by Rotary may not be successfully achieved by digital means by Rotarians (who demographically equate closely to the HRP).

However, the most common thread concerning age within the results, previously noted regarding finances in 5.3, is simply the challenges of return on investment due to foreshortened time horizons. A related challenge highlighted above links to the theme of information, as problems with digital access will limit engagement with data which support affective decision-making on energy efficiency retrofit in an aging population.

5.7 Trust

Of the 48 responses that were coded as being trust-related, 35 were specifically to do with trusted messengers. The Padlet™ results showed a clear preference by the interview participants towards independent and professional sources of information (ideally not financially motivated) as shown in Table 5-7, the scale used is from 1-7, with 1 being most trusted and 7 being least.

Table 5-7 trusted messenger status, ranked most to least trusted (N=11) interviewed.

Independent building services engineers - not paid to sell a product.	1.8
Charities or NGO's - such as Energy Savings Trust or National Energy Action.	3.2
Previously experienced home owners – who have already had an installation.	3.2
Local companies - community-based installers and family businesses.	4.1
Local councils – a specialist department of trained advisors.	4.1
Central Government - Parliament, MPs and Whitehall sources.	5.4
National Installers - Large chain installers such as Anglian Windows etc.	6.0

Ten of eleven interview participants made comments that were coded as "Trust issues with messengers" (when a statement was made about receiving a message from a party that they did not trust). In alignment with the Padlet results, most comments highlighted lack of trust in either Governance or Delivery Entities.

Three main aspects of trust were identified:

- *General communication and clarity – 22% of codes*
- *Perceived self-interest of politicians/SME – 39% of codes*
- *Lack of expertise – 25% of codes*

The first may be exemplified by statements regarding trusted messenger status –

Interview participant 4 –

"It certainly isn't government, because I still think they give mixed messages or they don't give enough of a message. I debate that forever, really."

Interview participant 1 –

"I think there's plenty of examples where we shouldn't trust what the government tells us... I don't generally take what the government tells me at face value."

The first comment by interview participant 4 is a clear semantic statement relating to the quality of communication (i.e. clarity and consistency) and latently suggests this has been a historical trend; the second by interview participant 1 however, may be interpreted latently as within the same area, suggesting a need for government communication to be correct, apposite, salient and timely to have an effect, so that supporting actions promised are subsequently delivered.

Specifically considering this aspect (of perceived self-interest of politicians) there were numerous examples provided by the interview participants:

Interview participant 1 –

“I'm sceptical enough to believe that the government follows the science when it suits them, and then ignores the science when it doesn't suit them.”

Interview participant *3* –

“…it's government who have just buried the head in the sand because they're too interested in their own self. I'm sorry, but I just think they are incompetent.”

Interview participant *7* –

“As long as central government is as dishonest, unprincipled, as it currently is they've got to stay right on the right-hand end.” (Of the Padlet sliding scale i.e., least trusted messenger status.)

These quotes align with the Padlet™ findings above which show central government (Parliament, MPs and Whitehall sources) as being –least trusted, just behind national installer companies.

The third area – that of a perceived lack of expertise – is clearly highlighted by the following quotes:

Interview participant 8 (who for context, has spent many years in Local Authority government and working with enacting Central Government policy) –

“…my experience of government and things are that they don't always know what they're talking about… there's a lot of managing on the hoof there and you can see it in the government.”

Interview participant *5* –

“(the government) they have to rely on specialists in that area and I would rather listen to them and take my advice from them than I would from an MP.”

Moving on to trust in delivery entities, several participants highlighted issues around trust.

Interview participant 7, male:

“I think that any time you take something that should be a centralised resource for the country and give it over to people with a profit motive, you will not see improved service, reaping the benefits of competition, quite the opposite. You will see everything stripped to the bone to provide large sums of money, small class of people, shareholders and most importantly, the people at the top of the organisation.”

Interview participant 2, male:

“National installers will be on the furthest left (he meant the least trusted side in Padlet) *you can get them people, Anglian, Everest…Absolute, absolute bandits.”*

These two aforementioned quotes are quite clear and semantically interpreted as having strong negative markers for trust towards larger National Installers. For context, the tone of voice used by both interview participants was vehement and in one case clearly angry, potentially suggesting a bad personal experience either for themselves or for someone important to them. These comments agree with the Padlet™ data indicating that National Installers are the least trusted messengers for energy efficiency retrofit.

Other comments suggested lack of trust in businesses on energy efficiency in general:

Interview participant 1, male:

“I trust the energy providers? Probably not. I mean, they, you know, they're a business…”

Interview participant 4, male:

“I hesitate when you go to a commercial firm and say, how would you deal with this problem? I know I can get a number of quotes, you know, and I can look at catalogues and look at double glazing units and go well, I like that one, but not that one. But in the end, these are people who tend to make money out of me.”

Interview participant 3, male:

Q: Who do you think would be the right people to listen to?”

A: "I wouldn't go to a contractor."

Whilst the interview participants were not overly clear as to whom they would want to act as a trusted messenger they stated clearly whom they did not want – Government (politicians) or businesses (National installers being the least trusted but SMEs more widely).

5.8 Information (or lack of) and ignorance

Most of the coding around information was latent, suggesting that interview participants did not directly recognise information as an issue (information was coded as a primary factor in two areas but was a supporting factor in seventeen others).

Information and ignorance relate to participants' knowledge; within any community being researched a spectrum of knowledge exists and some will self-state they are knowledgeable, or potentially feel they know enough as is shown by interview participant 6 (female):

"Well, I think, you know a reasonable amount. I wouldn't say I know a lot. But I think I'm reasonably knowledgeable. It's much better to know as much as you can. I have no doubt whatsoever, there's still lots I could learn that I don't know already."

This quote shows a perceived need for better information to support themselves or others. A challenge here exists around whether a person reflecting on their own perceived knowledge has a benchmark to fact, and if particularly for retired individuals knowledge is current and apposite when considering potential challenges to learning, information access and decision-making as evidenced previously.
As a researcher reading the self-evaluated statement from participant 6, one cannot have confidence they have the required knowledge to support a particular choice.

The following quote again highlights the challenge around accessing good information, even though they recognise that they have an information gap in non-financial benefits of energy efficiency.

Interview participant 8, female:

“No, I don't feel I know enough about it (non-financial benefits), but I'm very aware that me being me, I probably am more inquisitive than your average person on a lot of things. So, you know, for me, I don't feel I know enough about these things. And I will try and make it my business to find out. But sometimes it's very difficult to find authentic information on some things I find.”

Whilst this is a clear and semantic statement, there may be latent interpretations regarding trusted messengers, accreditations of SMEs or other information sources and ease of access (likely digital) to these resources. The lack of this good information creates the risk of decisions being made from a perspective of ignorance compared to the desired state of being fully informed of all options and their ramifications.

Interview participant 11, female:

“We've got gas, central heating and I get asthma. So, you know, it's there a link there where you could have a better system in your property. So, there is definitely considerations there, but I would wanna know a lot more about it before I put my investment forward.”

Interview participant 11 again clearly notes a risk they have under consideration which may provide a motivator towards change; however, they identify their own perceived ignorance as the barrier to expenditure. There are no stated challenges to finding the information and it is latently interpreted that she has not tried yet due to the phrasing used. Indicatively therefore this recognised lack of information is a stronger barrier than the motivator of potentially improving their own health. Cross-checking against the survey, this participant had responded that quality of life on a day-to-day basis was the most important thing to them (along with 76.6% (n=215) of all (N=281) survey respondents.

Another interview participant again evidenced this example.

Interview participant 9, male:

A: “Umm, you'd be hard pressed to convince me on changing my life span. Because I don't see how energy efficiency can do that…Cleaner air clearly will improve everybody's health.”

Overall, some interview participants are aware of their own ignorance, although this did not mean that they then resolved this to go on to make good decisions, in part because information resourcing can be a challenge. It is noteworthy that all the comments that specifically stated a desire to find out more factual information before making better future decisions were female. None of the men specifically coded in this way; this tracks well with the preponderance of male comments in the “self-belief in own story”. This combination of self-belief combined with potential ignorance of data for decision-making (or an intentionally low desire to know more) is clearly a challenging issue, especially when neuro-economics is than overlaid with the issue of learning, understanding and making good affective decisions about future risks in novel areas of complex subjects.

When the interview transcripts were being analysed and coded the theme of ignorance was split into two discrete sections – “Ignorance in decision-making” (defined as making decisions based on poor/no information having 26 codes); and “Technical concerns/ignorance” (defined as stated financial barriers to action often through not understanding returns or product technicalities having 27 codes). The former can bleed over into the latter whereby ignorance in decision-making can have a consequence with respect to returns on investment or perceived capital expenditure costs, however, decision-making ignorance is not necessarily financial in nature. Technical concerns/ignorance is specifically about the actual suitability of a product for needs and the rejection of it then can cause a financial barrier to be created that did not have to be there. Some examples of this include:

Interview participant 1, male:

(Solar PV) *“I know that these things used to be subsidised but are not subsidised anymore and the cost the capital cost of installing them did not offer a particularly quick payback period. I've not investigated it myself, but one of my one of my neighbours knocked the house down and built a new eco house and he's got this stuff all over his roof…”*

Here, although he has a practical example right next door with an experienced owner-occupier to access, he is rejecting the idea even though he says he has not actually got a quote for his own home. When asked directly if his reason for rejecting solar and/or batteries was due to not knowing the cost/return benefits he replied that it was. This may point towards the issues of worldviews and values being important as the motivator to engage in the first place, as experienced owner-occupiers are stated as being the third most trusted source of information in the Padlet™ data. Participant 1 also stated that *“I*

*wouldn't be very happy decorating the front roof with solar panels…". w*hich may be interpreted latently that aesthetics and other values are over-riding a financial consideration of solar Photo Voltaics. This suggests that the role of information in supporting decision-making, whilst key in certain areas such as financial capacity for example, holds less sway when emotive areas of weighting are involved.

Interview participant 10, male:

"I think that our House is energy efficient, OK. I'm not sure whether there's a way to test whether it's energy efficient… I don't think energy efficiency information is out there and easy to access, I mean, let's be right if you want to buy, I don't know, a Range Rover or something like that, OK, there's lots of places where you can just look on the web and get an opinion. OK, I'm not sure you can do that about energy efficiency."

Latent interpreting of this remark brings together linked topics such as digital access to data, which potentially highlights the power of advertising from well-funded larger businesses and the lack of saliency of energy-efficiency as a concern (or opportunity driver) in their lives. Some more-technical areas may be more apparent to recognise. This is understandable and potentially more expected as unless the interview participant happens to be a technical specialist in an area, or have experience of having a product installed, then there may be no direct or prior access to suitable information. Even when experience does exist, then the passage of time and technical evolutions may make this out of date.

Interview participant 5, male:

"I used to be in the construction industry, so I know a certain amount of information about what happens and there's something called night time radiation, which if you don't actually block the heat, so the cold air from getting above where you've got hot air. You can get condensation which then can rot your rafters and all sorts of things. So, I've tried to steer clear of insulating the loft completely."

In fact, a correctly insulated loft that has appropriate eaves ventilation and which has been professionally installed, does not suffer from rotting rafters. This is commonly available information and has been a building standard over the last few decades.

Interview participant 3, male; [talking about a perceived risk of low-carbon heating]:

"…heating systems like air source heat pumps because of the cost of electricity. I have a concern about that and particularly if everybody went to ASHPs as should be say in 20 years' time when we haven't got any electricity and we've got a deficiency in electricity because of a lack of electricity."

Both a semantic and a latent coding exist within the remark. Semantically they are concerned about running costs and an increase of the same if all people went to electrical heating; furthermore, the grid will not be capable. Latent interpretation suggests a lack of knowledge about grid infrastructure increases being developed and rolled out by National Grid (2024) which, when coupled with time-of use tariffs and greater energy efficiency, may alleviate this concern.

5.9 Interview results summary

The interviews were semi-structured and so whilst certain topics were designed to arise, participants were allowed to contextualise their answers with anecdotes as they saw fit. This effectively led to two different types of answers being provided. The former were straight forward factual answers (although sometimes these were interpreted as what participants believed was the desired answer); these factual answers were often followed by more of a story to amplify and detail their meaning. This story often provided greater context with latent meanings inside drawn out through analysis.

The interview analysis has resulted in several clear themes emerging. The typical interview participant had a relatively poor level of up-to-date product knowledge that was badly informing their decision-making process. They often were making decisions based on limited knowledge. A lack of appropriate information was the most frequent code within the thematic analysis, which causes ignorance in decision-making. Challenges were highlighted in ease of access to the relevant information and a lack of perceived salience when considering energy efficiency upgrades.

Financial issues, capital expenditure and monthly cashflow mattered to the participants due to a fixed income and there is an apparent strong effect caused by knowledge of foreshortened time horizons. As such any perceived financial returns were typically not enough to encourage this older group to act. Their knowledge of and motivation towards potential personal benefits is not enough to overcome these challenges and they do not

recognise any currently accessible trusted messengers who they can routinely access for personalised and relevant information.

Overall, with the interview participants not feeling a financial driver or benefits from a potential energy efficiency upgrade, then with the vacuum of anything else to engage them, the status quo of inaction seems to remain

Chapter 6: Discussion

Following the literature review, engagement of the HRP was identified as the key fundamental challenge, with the issues they faced and their causes spread over three main influences (Governance Entities, Delivery Entities (SMEs) and Decision-Making Entities – see glossary). Building upon the results presented in chapters 4 and 5, this chapter discusses findings and links back to points identified in prior literature in relation to governance, delivery and decision-making entities (sections 6.1 to 6.3). The chapter then highlights some key areas of recommendations in relation to the topics discussed (6.4) prior to a brief summary (6.5).

6.1 Governance entities

6.1.1 Accuracy of HRP decision-maker profile - gender

The research survey data showed 63.3% energy of efficiency upgrade decisions are made jointly as a male and female couple, with 25.3% solely by men and 11.4% solely by women. This finding suggests the traditional definition of the HRP (ONS, 2023) (as the decision maker) being male is wrong. This highlights a useful future research recommendation to investigate the dynamics of decision-making within couples, as at present there is not any specific mention made in The Green Book (HM Treasury, 2022) to allow for appropriate marketing for the gender of the decision maker(s) in domestic retrofit policy, nor the influences this may have.

The presumption for the male is currently caused by recognition of income as the defining driver in the case of a joint mortgage title as discussed in detail in section 2.2.4. Incorrect targeting of the decision maker is likely to negatively affect end user engagement. It is important to note here that the data in this thesis may be slightly skewed due to the gender representation split in the sample – future repetition would be advised.

6.1.2 Accuracy of marketing for the HRP

Whilst 79.4% (n=223) of those surveyed (N=281) stated that their previous decisions to install an energy efficiency upgrade were motivated equally by expected financial benefits and comfort benefits, when separately asked about future motivators, 76.6% (n=215) of those surveyed (N=281), stated quality of life was now the most important thing to them on a day-to-day basis. The data was further supported at interview stage with the three women placing comfort as a greater motivator over potential financial benefits. This may indicate that non-financial benefits could have more influential weighting on their future

acts, and also that the targeting of these should potentially be more focused towards women (or as partners in joint decision-making), indicated by women being fundamentally important in the role of household decision-making as noted above. This is all in direct opposition to traditional UK policy planning and its incentive strategies.

6.1.3 Incentivisation to the HRP – an age-specific group

In the recent update to the Green Homes Finance Accelerator (DESNZ, 2023), there has been over £4M awarded to address challenges around supporting the HRP to upgrade their home's energy efficiency and specifically creating financial products to help meet their needs. This is in direct agreement with the research results showing that age and return on investment is a barrier to upgrade with 56.2% (n=158) of survey respondents (N=281) saying they were disinclined to upgrade the energy efficiency of their home - even if they stated that they felt full capability, opportunity and motivation to act. This appeared to be simply due to their age and perceived lack of return of investment within their lifetimes. This was despite 84.3% (n=237) of all respondents (N=281) placing a value statement of "quite, very, or extreme" importance on the need to improve the energy efficiency of their home."

This reticence to upgrade energy efficiency due to age, combined with the government statement that "…the public can prepare to decarbonise in a way that suits them…" (BEIS, 2021) means that current policies are not successfully targeting those who are the largest homeowner group in the UK. This is because the current trend of promotion via financial incentives may be better received by a younger group, as recognised by BEIS Public Attitudes Tracker for Heat and Energy in the Home (2022b) which states that 74% of householders aged between 25-55 would install solar PV compared to 53% of those aged 65 or over. Furthermore, 75.2% (n=211) of all survey respondents (N=281) from the results of this thesis stated that if given relatable energy efficiency upgrade case studies from local social networked HRPs they would be more encouraged to upgrade their home.

These results mirror the findings from neuro-economics, noting the import of social networks in decision-making being increased the older a person becomes (Löckenhoff, 2017; Peters et al., 2011; Hess et al., 2012). This is due to the reduced ability to make good affective forecasting and to recognise and manage risk in decision-making (Löckenhoff, 2017), especially in areas involving higher levels of intellectual research requirements. Having an accessible network of trusted messengers who have prior experiences would help to abrogate this issue by allowing them to see successful results and effectively place the responsibility for this research legwork on others. Analysis of the

survey results (i.e. external influencers for energy efficiency decision-making) showed that once we remove their partner as an influence as they could reasonably be called “internal” to the household, then previously experienced owner-occupiers are the second most influential source behind industry professionals. This result is backed up by the Padlet™ results in Table 5-7 which showed previously experienced owner-occupiers to be the joint second most trusted messengers.

6.1.4 Beliefs around health, lifespan and energy efficiency

76.6% (n=215) of all respondents (N=281) stated their quality of life is the most important thing to them daily, suggesting there should ideally be recognition by all 76.6% that a better environment has impact on both health prognoses and lifespan. However, only 52.4% (n=147) of all respondents (N=281) believed it could lead to a healthier life, and only 37.7% (n=106) of all respondents (N=281) believed that a more efficient home could lead to a longer lifespan. These results highlight failures to link environmental health with quality of life or lifespan for all of the 76.6% who deemed this a priority. This suggests a gap in government education (and the marketing of energy efficiency products) around health and the home environment. Research finds a clear burden of disease linked with environmental health and inadequate housing (Braubach et al., 2011), a risk of summertime excess deaths due to overheating (Drury et al., 2021) and additional areas such as poor air quality (in large part due to burning fossil fuels) being linked to 800,000 extra deaths a year in Europe (European Society of Cardiology, 2019).

The very running of a suitable campaign may also increase the 76.6% (n=215) of all respondents (N=281) who valued their quality of life as a priority by focusing the conversation on what really matters to them. When asked to rank what is important to them when deciding to install an energy efficiency measure, the highest answer with 40.2% (n=113) of all respondents (N=281), was potential savings. This indicates that government messaging is indeed getting through around energy efficiency in relation to financial savings; however, since almost all messaging in these areas has been around money and lower consumption benefits, participants were not connecting this with their desire for a better and longer life with energy efficiency. For some it may (also) mean that they consider having greater monthly disposable income – presumably because of operational expenditure savings after upgrade of energy efficiency – would produce a measurably better quality of life for them. Although it is possible that a household that would perceive an energy saving of (for example) £540 a year from solid wall insulation as being life changing, and so motivational, they may be challenged to find the £12k+ capital expenditure cost (Energy Saving Trust, 2023) to install it in the first place and the 22+ year

return on investment may also be a barrier to them. Even if motivated, their motivation may understandably lack if one considers adding 22+ years to the current average age of 69.5 for a HRP would take them 5 years past the modal age of death, and 9 years past the median for the EHS HRP in England. Recommending improved thermal comfort and quality of life as the result of energy efficiency retrofit might be a more engaging narrative if the financial returns are not motivational.

6.1.5 Market penetration of government messaging

Table 4-4 showed that whilst 65.4% (n=184) of all respondents (N=281) are aware of any policy relating to domestic energy efficiency, the number drops to 51.8% (n=146) when asked if they feel encouraged to act. This further reduces to only 27.4% (n=77) of all respondent's stated feeling supported to act, and yet 66.9% (n=188) of all respondents (N=281) previously stated that receiving what they perceived to be positive government support would make them more likely to improve the energy efficiency of their home.

This gap highlights the importance of the marketing penetration from the HRP's point of view – at present they state that they do not recognise a decent level of support which may therefore reduce their level of engagement with the topic. Addressing this could be a clear and simple policy lever that could be applied to this gap in terms of direct positive marketing.

6.1.6 Directly desired government support – financial

Asking the survey participants about directly desired governmental support resulted in many responses of direct requests for financial aid. These were split between asking for full capital expenditure payment through a less defined but presumably significant level of subsidy paid towards any work. This practical (or preferred/perceived) lack of spending power by the HRP being a barrier may be attributed back towards Governance because, whilst the HRP decides to spend money or not, this is a known barrier, as shown by the previous creation of The Green Deal (DECC, 2012b) to address this challenge.

At present the financial barrier (real or preferred/perceived from the HRP perspective) is systemically permitted to happen by choice. This requirement for people to contemplate risk, hardship, complexity and uncertainty in considering a possible investment into energy efficiency creates a barrier. Removing sludge and making things "Easy, Attractive, Social, Timely" (Halpern et al., 2023), such as having simple low/no cost choice of finance being available to them, is therefore recommended. The current status quo also specifically

works against perceived wisdom in neuro-economics around what sort of information is preferred, how the HRP would like to receive it and how they process it for use in decision-making (Finucane et al., 2002; Chen et al., 2011; Lockenhoff et al., 2016; Reed et al., 2013; Hess et al., 2012; Peters et al., 2011).

A solution would be to provide access to suitable, easy to access Green Finance as a default option. Funded research projects such as the “Green Lifetime Lending” project by Aviva (DESNZ, 2023), aim to address this challenge by removing the capital expenditure cost and deferring the repayment until after the tenure ends, with a specific focus on “how advice can be targeted to encourage suitable improvements, and how to tackle behavioural blockers currently inhibiting uptake.” Effectively, if one can address the link between value for money and other benefits that may be accrued then a major hurdle may be overcome for a significant volume of the populace. As can be seen by this funded project, the government already recognises that their governance structures currently do not support the HRP fully in this area, as they will have to allow and regulate for the provision of new and bespoke financial vehicles to resource this need. Financial levers are traditionally within the remit of government as may be exemplified by Labour’s proposed £28billion a year Green Finance package (The Labour Party, 2022).

6.1.7 Directly desired government support - non-financial

Amongst non-financial issues highlighted, information was a secondary theme in analysis of interviews 17 times, meaning that its importance should not be downplayed. It presented as more latent than semantic in its expression, for example where a survey response may state they do not know the installation cost of an item, yet they consider it too expensive (suggesting that lack of information is actually an issue).

These findings are in support of the COM-B based analysis of desired non-financial support from the survey, where the primary non-financial desires such as “clearer advice”, “better industry regulation” (around confidence of getting what is ordered), “Better EPC” and “Install/Delivery guidance” all have strong elements of information and communication. As such the use of plain language and providing engageable and instructive information should underpin these areas.

The call for better industry regulation, indicates challenges to participants around their perception of getting what they have paid for; that is, a product they feel meets their perceived needs, at reasonable value and longevity. If they were historically happy with

this then feasibly, they would find no need for better regulation. The data indicates a role for more obvious certification and training standards to alleviate concerns for the HRP.

When asked “What are the barriers to you feeling capable to take action?” the largest perceived barrier with 71.1% (n=200) of all respondents (N=281) was around finding trusted installers. Whilst it is understood that in a free-market economy the cost of products, services and the principle of value for money finds its own level, and as such may not be considered part of Governance Structures, creating the confidence in the chosen supply arm of policy is. TrustMark (BEIS, 2022d) is “the only Government endorsed quality scheme for work carried out in or around your home” and runs as a not-for-profit enterprise which aims to “provide a high level of assurance, certainty and protection to homeowners looking to have work done in and around their homes… so homeowners can be sure they’re making the right choice.” With 28.9% (n=81) of all respondents (N=281) feeling confident in their ability to find a trusted installer it appears this messaging has some way to go in terms of market penetration.

With TrustMark being a not-for-profit social enterprise rather than a scheme run by Whitehall, it may be there are challenges around funding and outreach which could be more supported by Governance Structures. Whilst all tradespeople carrying out energy efficiency upgrades must be TrustMark registered, the message of what this means to the HRP may have become lost, thereby losing the benefits that it brings in terms of confidence and peace of mind. If it appears to be just another accreditation that the HRP does not understand, then it is likely to be lost in the plethora of marketing that may be provided by a company as shown by figure 6.1.

Figure 6.1 - Common accreditations provided at the bottom of a quote

Looking more closely at the interview results, as noted in section 5.5.2, there was comment by interview participants to recognise a perceived lack of equity as being a negative driver (on the actions of others) and a desire for the wealthy to show better leadership. This finding can be considered via the lens of psychographic groupings, ‘value modes’ and diffusion theory (a focus which is supported by the thematic coding of interview participants which shows that beliefs and value actions are the most frequent primary codes after finances).

“Values Modes is defined by Rose and Dade (2007) as “a psychographic mapping system which looks at the values that underlie behaviour. Behaviour is generally a strong determinant of opinion. Therefore, the driver is values> behaviour> opinion. This is why one cannot drive behaviour with information based on surveying opinion. The Values Modes top line is a three-level segmentation into Settlers (security driven in Maslowian terms, ca 20% of UK national population), Prospectors (outer directed or esteem driven, ca 40%) and Pioneers (inner directed, ca 40%).”

Whilst the research participants for this thesis may not believe themselves to be “Prospectors”, it may not matter if an observer considers and treats them as such. The fact that they are perceived as being important enough to discuss and judge means that their behaviour (in the mind of the interview participant) affects that of the poorer sectors of society. From an engagement perspective, this raises questions about creating positive role models and social norms for society to copy, starting with those who may be more conscious of self-esteem and receiving positive social judgement. As a statement of change theory, it may simply be described as: “If an action is deemed to improve someone’s self-esteem and increase the positive judgement of others, then they are more likely to act.”

From a marketing and diffusion perspective (Rogers, 2004), Pioneers may be doing something new because of ethical reasons or because it is simply fun to play with. Prospectors will be doing it because it brings esteem from others or confirms self-esteem: it may be cool, fashionable or clever for example. In brand development terms, the Prospectors are the ‘early adopters’ following the Pioneer innovators. Once the other two groups have adopted a behaviour, the Security-driven group termed ‘Settlers’, may follow suit, but most likely not before (Rose and Dade, 2007). When considering the level of retrofit still to happen in the UK, it may be reasonable to believe that we still need to engage the early adopters in the market, which makes this concept of the wealthier Prospectors (as perceived by the interview participant) an important group to motivate in a way they may respond to. As noted previously, persona modelling with this group may assist engagement options.

6.2 Delivery entities (SMEs)

This next section focuses on how Delivery Entities (SMEs) cause challenges and hold back retrofit work. The survey data is discussed with this in mind with additional contextual support as needed from the interview data.

6.2.1 Siloing of products and solutions

The question of constructive collaboration and efficient system design is raised by the fact that whilst most of all survey respondents (N=281) have upgraded their loft insulation (77.8%, n=219), double glazed their windows (66.7%, n=187) and upgraded their boiler (65.1%, n=183) all of which address efficient thermal comfort, the area of draught exclusion is much less addressed (29.1%, n=82). A fundamental concept behind heating a property relates to retaining the heat for as long as possible; the more efficiently this is done then the less the energy load required over time.

The above results indicate that the individual product design surveyors (or salespeople) engaged by the HRP are not thinking holistically about energy efficiency or are choosing to silo their offerings (i.e. offering only what they wish to). If they were thinking and making holistic offers, then more homes would have achieved better draught exclusion to the heat loss perimeter or compartmentalisation of the home itself to reduce the running time of their boiler. This is of relevance due to thermostats commonly being installed in the hallway in most properties, which is defined as an uninhabited room with higher ventilation rates but a lower temperature than a living room (MCS, 2024). As such, it may well suffer from more draughts, or draughts that are seen as acceptable.

Draught exclusion, where done, was potentially offered by the window company as they also sell doors, with the work occurring when a door is installed. This should ideally, however, have also been offered as needed by the boiler company and the insulation company even without a door being installed. However, they might miss the opportunity as they are not standard products to their trade, even though it may impact the perceived efficiency of their own products and increase the energy consumption of the property. The survey participants who had previously improved energy efficiency listed seven different categories of retrospectively desired additional upgrades (e.g. solar PV or boiler upgrade). This clearly indicates that whatever the previous upgrade, opportunities still existed.

The data shows that only 29.9% (n=84) of all respondents (N=281) were happy with their past decisions and 54.0% (n=152) wished they had purchased other additional product upgrades (the balance mostly wishing for better governance help in areas such as

planning and some in finding trusted installers). This situation may again be either due to the SME not wishing to risk diluting their sales proposition by introducing something that may compete for their client's attention and money, or simply a lack of internal knowledge and skills around these useful and desirable products – further research could clarify this point. Long-standing grant funding arrangements focussed on the delivery of single or specified measures has also likely influenced this outcome. What is important is recognition that current Delivery Entities are generally not geared up to offer a holistic energy efficiency retrofit solution with a clear upgrade path so that the HRP may act when the relevant life stage triggers occur.

6.2.2 Perceived lack of support by, and trust in, SMEs

Respondents were asked questions around the principle of improving energy efficiency and perceived support and encouragement i.e., who offered it to them? 44.2% (n=124) of all respondents (N=281) felt that no one offered support and encouragement at all. For those who did, SMEs were the lowest group with only 12.6% (n=35) of all respondents (N=281) feeling that local businesses did "offer support and encouragement to increasing their home's energy efficiency". This does not bode well for uptake of retrofit measures if the preferred delivery arm of government policy is not felt to be supportive nor encouraging by the dominant sector of their target audience (privately-owned properties).

There are a couple of scenarios that might explain this low level of belief by the survey participants. The first is that energy efficiency when considered from the viewpoint of an SME sales journey is just not exciting for domestic customers, as evidenced by Loveday & Vadodaria (2013). Consequently, if energy efficiency is not perceived as exciting for the HRP, then potentially the SME market should promote comfort, lifestyle benefits and emotive buy-ins that the customer may desire to achieve a sale. From this perspective, even though the product may increase energy efficiency this is potentially seen by the HRP as a secondary benefit or even just a by-product. The survey results indicate that the participants may not recognise energy efficiency as a benefit and if so, may not perceive new encouragement towards it beyond what they had the last time they renovated. This prior encouragement over the last two decades is demonstrated by the fact that 93% of owner-occupied dwellings have a boiler with radiators (DLUHC, 2023) and that since 2004 these have been required to be more efficient condensing units and 83% of band D dwellings (the most common owner occupied) have double glazing (Ibid.).

A second scenario explaining the low level of belief by the survey participants surrounding SME support for energy efficiency upgrades, relates to the technical knowledge gap to be

bridged with the customer that may distract from the sales opportunity and profit wanted by the company. This is both a philosophical challenge and a practical one around siloing of products and knowledge, internal skills and neuro-economics. The company itself (or their representative) may not be overly versed in the property as a holistic energy system. [As noted previously, this could be alleviated by home having a “property passport”, contextualising energy efficiency measures in the home seen as a system (BRE, 2024).] Having a holistic perspective which is then presented to the HRP may introduce complexity and, from their perspective, unrelated extra information and work. To explain this to the HRP may well throw up enough information overload to risk the sale in the first place, as identified by Lockenhoff (2017). With the philosophical primary driver being to make a sale and profit, traditional business practice would recommend that anything which is not required to make the sale is removed from the process. However, doing so may have negative effects on the likelihood of the HRP acting, as the survey findings show 44.8% (n=126) of all respondents (N=281) stated that lack of knowledge was a barrier to feeling capable to act.

There is recognition by the research participants that the SME brings its own motives to the relationship and that these may not match those of the HRP. The SME may be offering a product that matches a desire expressed by the HRP, however, when considered whether a trusted messenger around energy efficiency, the HRP recognises that their motivations may differ. When asked “Do you trust businesses to put your best interests ahead of theirs?” only 19.4% (n=55) of all respondents (N=281) said that they did, the balance being split between either outright rejection of this statement or unsurety. If 80.6% (n=226) of all respondents (N=281) do not trust the SMEs, then this may help explain why they are not perceived as offering support and encouragement.

The Local Authority was perceived as the most actively supportive body offering encouragement, but they actually scored the same as SMEs when the interview participants were asked to rank a list of trusted messengers (see Table 5-7). This raises questions around the method of engagement used and who is being used as their messenger; whilst the Local Authority (Council) may be active in the promotion of energy efficiency, they may lack the internal validity of having professional independent staff who can be evidenced as such. Chartered Engineers, research scientists and other highly valued messengers (Coates, 2020) could be used, which contrasts to many outreach schemes such as ECO3 and 4 being rolled out through partnership with local energy firms and door-to-door canvassers.

The Local Authority may run the Green Homes Grant Local Authority Delivery scheme but a local energy firm delivers the service, as exampled by the Kirklees Warm Zone scheme (Long et al., 2014). The local SME delivery partner will then often sub-contract the engagement and sales process to self-employed door-to-door sales surveyors who have a letter of authority from the council to help engagement. As such the actual "face on the doorstep" which represents the council is still an SME with someone effectively selling them something even with a transaction cost of zero. Therefore, the ability to have the validity and trust that could be leveraged to the independent experts, who most importantly are often recognised as not having a vested financial interest, is lost through the delivery strategy employed of using an SME.

6.2.3 Who influences opinions on retrofit and products?

49.4% (n=139) of all respondents (N=281) stated they felt the opinion of others was moderately to extremely important when considering installing an energy efficiency upgrade to their home. 55.5% (n=156) of all respondents (N=281) chose to use the free text box to explain whose opinion mattered and why, with 10 different codes being created out of the data. Within these there were (N=196) useful coding responses covering a broad range, of which "Trusted Installer" was 9.1% (n=18) and "Professionals" 19.6% (n=38). There is potentially some overlap between these codes with latent interpretation of meanings suggesting that in some cases the respondents may indeed mean a professional employed by a trusted installer. However, when reviewed there was a clear difference in meaning between the two codes:

- *Professionals:* *"Expertise, qualified and independent"*
- *Trusted installer:* *"Expertise, experience and a known contact"*

Expertise was ranked most highly in both as an assumed required default, but independence and professionally qualified were the key variables that were not represented in the "Trusted Installer" data. This recognition of independence and professional competency may be due to the respondents reflecting on their experience that tradespeople, even if viewed as expert, only recommend what they sell and so do not compare options outside of this. With the HRP seeming to recognise this difference, and only 9.1% (n=18) of 196 responses identifying "Trusted Installers" as an important external influencer on future energy efficiency upgrade decisions, questions arise about who is supposed to support the HRP in terms of unbiased technical support on appropriate products, that meet their needs and increase energy efficiency.

The Local Authority does not fill this role as they are not product installers and likely do not hold the internal expertise around current marketplace products. The survey responses on this issue (from section 4.4) indicated that the majority of participants are seeking advice from unqualified and inexperienced sources such as their social milieu, previously experienced HRPs (which they may know) and family.

Whilst these groups can give anecdotal information, and the value of this is recognised by neuro-economics in older groups' decision-making, it may not be technical enough to meet the challenges of each unique household. As has been noted, England has a very large variance of housing stock; much is old and many homes have been adapted to family needs over the years, so there really is no "one-size-fits-all solution". As such, having SME Delivery Entities as the current primary source of technical and bespoke information to influence opinion does not work for achieving widespread energy efficiency retrofit, even though SMEs are most accessible to the HRP and have the relevant skillsets for the local conditions and variables in housing stock. This matters, since without salient and apposite information, suitable products, clearly stated potential benefits and synergies, the average HRP is likely not receiving good advice from their social network. Good advice is more likely to result from a site survey by a qualified and independent professional, without which opportunities and benefits may be missed.

6.2.4 Capability, opportunity, motivation - barriers to action

With the assumption the HRP does indeed decide they wish to upgrade their energy efficiency, and they feel they recognise the **O**pportunity, have the **C**apability to arrange this and are **M**otivated to do so, then what barriers related to the SME delivery structure do they face? Barriers are discussed below under one of these sections, avoiding repetition when (at times) some may be considered system-wide barriers and affect capability, opportunity and/or motivation depending on the lens through which viewed.

Capability – Question 28 of the survey used a Likert scale to ask about confidence in personal capability to plan and deliver an energy efficiency project as a pre-cursor to exploring barriers and 74.8% (n=210) of all respondents (N=281) stated they were moderately to extremely confident that they had capability. However, when later asked (question 30) directly about installing a measure in the future, only 63.3% (n=178) of all respondents (N=281) felt that they had the capability. This figure which is 11.5% lower may be indicating a reduction in those who are still happy to do a future DIY project, considering the HRP age group.

If as they age the survey respondents potentially rely more on a tradesperson, finding a trusted installer becomes more important. The results show that the largest barrier to action with 71.1%, (n=200) of survey respondents (N=281) was finding a trusted installer (Table 4-11). [For clarity, if a topic had received 100% it would mean that 100% of all survey respondents felt it was a barrier]. This can have a significant impact – reducing the 74.8% of participants who felt capable to act down to just 21.4% (n=60) who feel capable and do not have trust as a barrier to action (see calculation in Appendix 5).

With 66.4% (n=187) of all respondents (N=281), the second highest barrier to feeling capable of action was getting value for money (or the perception of), with capital expenditure coming in third at 56.3% (n=158). The results do not show the SME not actually providing value for money, but rather that the survey participants understand a key principle for the SME relates to making a profit from them and they most likely wish to know if a quote is fair before acting.

By using the SME as the primary delivery agent without an independent, certified and impartial cost comparison being available, the HRP has no practical way to make these risk calculations, nor is easily able to make comparisons between options or potentially even a reasoned binary yes/no to the project at all. The closest they may get is their social network or some online peer review sites, although these rarely talk money and value; or perhaps an internal dialogue is held of “do they wish to spend £XXX to achieve YYY?”. This is where behavioural economics and prospect theory really adds insight, as is supported by the Basis Social (2021) report for BEIS which stated that key areas to address to overcome barriers to solar uptake, from the HRP perspective, were “Risk mitigation, a guarantee scheme if something goes wrong and approved supplier listings”. If DESNZ were to follow these recommendations from its own report “all underpinned by clear and trusted information to demystify the process, and communications to counter myths and concerns” (Ibid.) then the HRP may feel greater capability to analyse value for money and to act. At present the SME industry does not effectively provide these things for its consumers and this may reflect in the research results demonstrating that the survey participants (N=281) consider SMEs to offer the least support and encouragement towards domestic energy efficiency upgrade from the options provided.

The current consultation to proposed changes to the Microgeneration Certification Scheme (MCS) notes that “consumers are, unsurprisingly, cautious about spending large sums on what are perceived as new or at least unfamiliar technologies to provide an

essential service to their home…their answers indicate that they need reassurance about going ahead with an installation" (MCS, 2023). Furthermore, they note:

"There is strong support for financial protections, over 80% of consumers requested it in our research, either in the form of an extended warranty, insurance, or guarantee. Customers mistakenly believe that the current provision of an Insurance Backed Guarantee (IBG) offers the financial protection that the name suggests." (MCS, 2023)

The MCS engaged with one IBG provider of a high-volume of policies and discovered that in 2022 "none were settled" (Ibid.). This inability for SME to effectively self-regulate nor promote confidence in their marketplace again clearly affects uptake of energy efficiency retrofit. Most other barriers identified in this research are around access to suitable support. Whilst it could be argued that to have a self-sustaining business model, an SME should provide information, education and access to finance as needed, again these highlighted issues may be related back to the pre-ponderance of micro-SMEs in construction and their limited ability to provide, or even know of, the desired support. As such having these duties fall to the SME as part of Delivery Entities is clearly a hindrance. As noted in research by the Centre for Local Economic Strategies (CLES, 2020), the use of anchor networks (large organisations that are rooted in a place and are invested in the development of local areas), Local Authorities and better central government support to carry these loads, would be of great use. This is both practical for delivery and also in terms of increasing consumer confidence and engagement if the right trusted messengers were to be used.

Opportunity – 54.2% (n=152) of all survey respondents (N=281) said that they can recognise an opportunity to install an energy efficiency measure in the future. Furthermore, 44.8% (n=126) of all survey respondents (N=281) stated they felt their lack of knowledge of process was a barrier to their capability, but this may also apply to their ability to recognise an opportunity, as if they do not know how something is done then they cannot necessarily know the opportunity exists or recognise it is suitable in their own circumstance. With 25.6% (n=72) of all respondents (N=281) also stating they do not understand new technology, there is a compounding factor of opportunities being missed. With SME education and outreach being limited due to the size of most SMEs in the construction sector being small (BEIS, 2022; Crown, 2022; Hutton, 2022), it is hard for them to create the ability for the HRP to recognise an opportunity. This exacerbates the challenge to climb the perceived knowledge gradient, to span the imagined "Trust Bridge"

concept (put forward in this thesis in chapter 2) to support a sense of empowerment and agency.

69.0% (n=194) of all survey respondents (N=281) stated that knowing they might achieve additional benefits beyond simply financial ones, such as increased comfort, lifestyle, health, lifespan and future provision for family would overcome the negative influence of their age. The perceived negative factor was that they may currently feel value for money would not be achieved within their lifetime, as without recognition that such an opportunity does exist, they cannot feel motivated towards it. Of the 69.0% (n=194) of all survey participants (N=281) who said the age barrier would be removed a sub-set of 79.0% (n=153) said that they would be moderately to extremely influenced to go ahead with the recognised energy efficiency measure once they recognised the benefits. Again, the current Delivery Entities arrangements hold this back as SMEs are, as noted, fundamentally not suited for the widescale educational and motivational engagement programme needed to achieve this without better external support.

Motivation (and engagement) –
The survey findings show that 75.2% (n=211) of all survey respondents (N=281) would be encouraged by case studies of local homeowners who have previously had successful installations. This could fall to the responsibility of the SME to get authority, ensure compliance with GDPR, create effective case studies and build a network of show homes of suitable products and archetypes to match with prospective clients… most SMEs – (many micro) are just not adequately resourced to achieve this. The creation and support of anchor networks linked to Local Authorities would be of great help here to carry the burden of motivation towards energy efficiency, potentially providing a list of local accredited installer firms.

By externalising the practical responsibility to promote and deliver energy efficiency to SMEs in England, central governance has effectively chosen a partner that is mostly without capability to creatively motivate and engage with the HRP. The deliberate use of behavioural and neuro-economics is beyond the knowledge, skillset or ability of most SMEs. The National Installers who could have greater capacity to use such frameworks to support decision making had (as shown in Table 5-7) the least trusted messenger status of all choices available to survey participants, which would likely negatively affect their levels of motivation when engagement does occur with them.

What consequences may all of this have? One outcome may be a lack of synergy in retrofit approaches and cascades of effects caused by the current Delivery Entities' interaction with the HRP. Cascades of effects refer to how a faulty first assumption or action may then affect how they choose to act in the future. This was reflected by the interview comments from the participants. For example, by a HRP not believing that better insulation is possible, the running cost of any potential heat pump would be increased, thereby making it more costly to run than staying on the current fossil fuel system. Furthermore, without the direct driver of increased electrical loads, any motive towards installing solar panels and a potential storage system is greatly reduced with less need recognised. Greater knowledge support around planning rules would support the survey participant who believed that solar panels were not permitted in a conservation area to understand that they can be installed, depending on their siting. However, this benefit of increasing householder's knowledge raises questions around responsibility for doing so. Should the SME find their route to market and, in this scenario, to evidence options to a potential client? Or due to the very speculative nature of this work should government take this lead as many SME are under-resourced in workforce, knowledge and skills, as noted in the literature review? This, when compounded with the survey and Padlet™ findings that the interview participants feel strong mistrust towards SMEs as messengers, foregrounds again how the challenges faced are very nuanced and latent in interpretation. Yet this may be one of the key challenges of engagement. If a trade body or a governance structure filled this gap in skills and education with effective professional and independent support, helping to bridge the perceived trust gap then the HRP would be able to perceive opportunity better, find the motivation to act and have the capability to engage with trusted SMEs.

Ultimately, if the HRP were proffered an integrated solution meeting their needs, which removed predicted risks and provided tailored, personalised, benefits then they may feel supported to see themselves as a person who now can take action.

6.3 Decision-Making entities (HRP)

For this section of work the scenario for decision-making is that of a typical HRP (ONS, 2023; MHCLG, 2020), which as seen through the literature review, EHS data set and survey results is constrained by their bounded rationality and experience of:

- *Previous incentive schemes being promoted on money saving terms (PAC, 2021)*
- *Old age is likely to be affecting their decision-making (Lockenhoff, 2017)*

- *Limited information sources or access to trusted messengers (Table 5-7)*
- *Required information often relating to technical product or service upgrades (Figure 4.5)*
- *Financial considerations around monthly cashflow and capital investments (Table 4-11)*
- *Practicalities of ageing affecting abilities to manage upgrades (Table 4-12)*
- *Limited practical desire to upgrade due to current comfort (Table 4-2)*

These points and other key issues emerging from the results are discussed below.

6.3.1 Financial issues

There is clear and prevalent note of capital expenditure as being a barrier to uptake, even in this potentially higher income demographic of professional or management grade retirees (Busting the Myths, 2021) who form the basis of Rotarian membership. A latent interpretation of what may be occurring is to posit that just because they may have a higher income or capital reserve, spending power is tempered by higher expenditures and lifestyle tastes. So, whilst their homes likely do not fall under LILEE definitions (meaning "low-income low energy efficiency" as per DESNZ (2023e)), there may be less flexibility to release capital than thought.

Energy efficiency for its own sake does not appear as a direct motivational driver, with interview participants recognising that, whilst mostly accepted as providing financial returns and increasing property values, these benefits alone are not enough to motivate further upgrades to their homes. There is clear recognition of age as a decision-making influence noted by interview participants (as predicted in section 2.3.1) that is placing a perceived value barrier. This compounds onto the lack of motivation likely caused by high satisfaction with the residence (as reported in the survey stage), whereby many of these interview participants have a tenure length of 20-40 years and they did not do the work even when younger and age did not factor (as is seen by their EPCs). There is a challenge around up to-date information, accurate costings and consideration of other non-financial benefits being included in their decision-making process rather than just capital expenditure.

If engagement on these factors was better resourced, coupled with options for green finance products, this may address many of the issues on finance. Although Rotarians are potentially wealthier than the average citizen, they are not above asking for a handout

when asked “who should pay?”. This clearly highlights the issue of equity as one to address in future scheme roll outs.

6.3.2 Trust

The literature review noted that MPs and Ministers were achieving a very low trust rating from the general public (NatCen Social Research, 2021). This thesis investigated trusted messenger status as a governance structure challenge and found that the survey respondents tracked very closely to the national average scores in their ratings, with 81.5% (n=229) of all respondents (N=281) giving a negative rating to the government compared to circa 84% (YouGov, 2020). Importantly, however, 60.8% (n=171) of survey responses (N=281) then stated that this had a knock-on effect to their likelihood of following government recommendations. To address the lack of trust in Government, then as a Theory of Change statement (Reinholz & Andrews, 2020; Robinson, 2013), the solution could be stated as:

“If we identify Trusted Messengers, generated by a trusted third-party investigation, who are then used to engage with the HRP around improving energy efficiency we will increase uptake of a suitable EE scheme when one is made available.”

OFGEM (Office of Gas and Electricity Markets – the regulatory body) could be an appropriate independent third-party body recognised by the HRP in this case.

This theory of change statement supports the concept of increased perception of risks and benefits being important to future actions, as discussed in The Health Belief Model (HBM) (Rosenstock, 1974). It highlights the value of distinguishing and then using trusted messengers and appropriate independent communicators (Dearing, 2009). Rundle-Thiele et al., (2019) noted that producing social engagement strategies including both the individual psychographic factors as well as the environmental and practicality issues around a subject, increases engagement.

With social norms moving towards a more environmental mindset, having well-communicated and suitable energy efficiency schemes will allow a ‘trapdoor’ (Robinson, 2013) out of an increasingly cognitively dissonant situation for the HRP. This would reduce pushback and aggression against the prevailing social norms that are desired by the government. A lack of trust in government matters because a strong interplay exists between trust and reciprocity, which is a key element in many co-operative and collaborative activities – including for political movements to succeed (Baddeley, 2017).

One of which could well be defined as the transition of our society to Net Zero. As noted in the literature review, using qualified non-governmental presenters such as independent scientific advisors (i.e., not politicians nor Ministers), would appear to be a reasonably simple way to improve public trust. This is mirrored by the recommendation of further research into this subject being recently made by the House of Lords (2023a), as this will affect both the belief in, and uptake of policy.

If the government is not a trusted messenger, consideration should be provided to how their preferred delivery partners (SMEs) are faring. It should be noted here that even when householders contract work through national installers (e.g. Eon for solar panels), they typically contract local SME sub-contractor to carry out work (e.g. Eon, 2024), with whom the HRP directly interacts. A challenge here is that whilst the HRP may engage more willingly with local SMEs, for whom interview participants gave a trust rating of 4.1/7 compared to 6/7 for national installers (with 1 being optimal), the smaller companies lack the resources, information, capacity and finances to support engagement for large scale transitions when compared to larger companies. Trust in SMEs was also undermined by concerns raised by around the topic of cost and profits.

This key question of value for money and perception of trust may hold strong sway in the future success of any sustainable transition if the HRP is not enforced to act. For example, a domestic solar PV system from Eon starts at £4995 for 6 panels (Eon, 2024) but it is very likely that the same installing SME sub-contractor for Eon could install the same system at a lower price, if Eon's mark-up was removed. Quotes from installers to demonstrate lower available installation costs could be very easy to obtain in a modern, digitally connected world; however as the literature and data from Rotarians in this thesis show, an older generation may struggle more with digital literacy and so be less able to find and then access better value options for themselves compared to what is presented to them directly by SMEs (Heponiemi et al, 2022).

From an engagement perspective, on the one side having brands the HRP recognises, such as Eon or EDF, offering installation services via their present billing accounts may offer ease of access via a known and (presumably) trusted contact. On the other hand, National Installers are the least trusted messengers identified in this research. With over a million UK homes already installed with solar PV, it is reasonably likely that if the HRP wanted to install solar panels they could find other owner-occupiers who have gone before them and ask their opinions instead. These prior experienced owner-occupiers score even

higher in trust than local SMEs with a score of 3.2/7 (with 1 being highest) and as such their opinion will hold more weight.

If it becomes widely known that the larger national companies are offering worse value for money by using a sub-contractor chain, this may compound the challenge of them being seen as a non-trusted messenger. Breaking that sub-contractor chain, with multiple companies and shareholders all wanting a profit, is a key challenge in the upcoming transition and would require changes in supply chains, engagement and governance structures to ensure greater uptake and better value for money.

6.3.3 Motivational beliefs

87.4% (n=246) of all survey respondents (N=281) stated that they felt becoming Net Zero for 2050 being a UK legal requirement was “moderately to extremely important”. In a subsequent question, 87.0% (n=244) of all respondents (N=281) agreed that society needs to take action to prevent further temperature rises. When asked if they believed that making homes more energy efficient would help limit any future temperature increases in the UK’s climate 76.6% (n=215) of all respondents (N=281) confirmed that they did. Finally, when asked if they personally felt a need to improve their home energy efficiency 84.3% (n=237) of all respondents (N=281) also stated that they felt it was “moderately to extremely important” to them.

This alignment of beliefs around governance, societal and personal need to effect change with stated confidence in the efficacy of energy efficiency retrofit might suggest there should be effective uptake of energy efficiency schemes. This is because all retrofit schemes have a promoted financial incentive element, and if householders were going to do the upgrade work anyway, then logic would commend to take advantage of them. As the thesis has already established, that is not the case.

As discussed in the literature review, beliefs and worldviews (more akin to system-1 thought processes) are likely to have a strong effect on behaviour and can exert as much, if not more, influence than any system-2 active cognitive decision[6] (Kahneman, 2012).

[6] “System 1 operates automatically and quickly, with little or no effort and no sense of voluntary control. System 2 allocates attention to the effortful mental activities that demand it, including complex computations. The operations of System 2 are often associated with the subjective experience of agency, choice, and concentration.” (Kahneman, 2012)

From a Governance perspective, allowing motivational beliefs and worldviews to influence the actions of free-agents, such as the HRP, may well be considered risky, as has been noted by Dame Marteau (Environment and Climate Change Committee, 2022), due to Value-Action gaps occurring (Essiz et al., 2022). Whilst the strength of the aforementioned "beliefs" in the importance of action towards climate change appear to be high, they are likely system-2 derived opinions of what is often perceived to be an impersonal issue, that whilst important and has strong social norms connected to it, has little perceived direct effect on the HRP in their day to day lives.

This is shown by the survey results regarding personal motivators around energy efficiency, that are at odds with the more impersonal beliefs just mentioned. For example, when asked if they believed that quality of life was their most important thing to them on a day-to-day basis 76.6% (n=215) of all respondents (N=281) replied that it was. When asked to use the free text box to explain what was important to them if not quality of life, the results showed only 1% (n=1) of 107 coded responses were "The Climate Crisis", 10.4% (n=11) were "The Environment" and 11.3% (n=12) were "The Future/Sustainability". If we broadly assumed the latent meaning and resulting intentions behind these three were the same – to act against climate change for the good of the planet – then the personal motivator (when triggered) still completely over-rode the more impersonal beliefs around action on climate change and energy efficiency. This was even though that was the theme under discussion, with the question design and order being purposeful so that there was a chain of logic being established whereby the theme in mind was about beliefs on actions that mattered to them.

This highlights the challenge for the survey participants - who are a proxy for the HRP in this thesis - to mentalise and internalise the more remote and informationally complicated belief structures around climate change and the effects on others around the world (even when prompted); they struggled to assign a moral, personal and social norm value to climate change beyond any personal effects on them and their quality of life. This highlights the challenge caused by not promoting energy efficiency upgrades in ways which promote personally desirable benefits. Clearly a Value Action gap (Essiz et al., 2022) occurs here.

The survey results showed 37.7% (n=106) of all respondents (N=281) believed improved energy efficiency could contribute to a longer life and, when asked separately, 52.4% (n=147) of all survey participants (N=281) also believed it would contribute to a healthier life. Leveraging these two primary desires with appropriate behavioural economic

marketing of energy efficiency would therefore be beneficial in addition to the traditional financial benefits. This change would better enable energy efficiency to compete against other more emotionally driven challenges that require less information to act upon.

6.3.4 Age and motivational beliefs

The recommendation of promoting personal benefits, which may be considered more as system-1 decisions, rather than financial (which are more system-2 decisions) links into the issue of age and decision-making. The potential for this is shown by the survey results where although 56.2% (n=158) of all respondents (N=281) said they were negatively influenced to act due to a perceived inability to get value for money during their lifetime, 69.0% (n=194) of all respondents (N=281) stated that knowing they might achieve additional benefits rather than just financial could help remove the barrier caused by age.

With 79% (n=153) of the sub-set of 194 (who would feel motivated) stating they would be “moderately to extremely” influenced by knowledge of other benefits such as increased comfort, health, lifespan, and future provision for family it would seem sensible to promote these as key benefits of energy efficiency upgrades. This confirmation is in support of the literature, which states that foreshortened time-horizons have a negative impact on decision-making (Freund et al., 2012; Mather et al., 2012). With reference to an ageing population (Hubner & Skidmore, 2003), there comes the concomitant challenge of not only keeping healthy but also functionally able to act from both a mentality aspect as well as a physical one.

The survey findings showed that participants were often not correlating improved quality of life with increased energy efficiency; they were not all convinced that improved energy efficiency would result in improved health prognosis or lifespan. One of the most well-known concepts in behavioural economics is “Prospect Theory: An analysis of decision under risk” (Tversky & Kahneman, 1978) which explains “systematic violations of the axioms of rationality in choices between gambles”. A key insight from prospect theory is that people valued loss roughly twice as much as that of gain; however, with many participants not linking potential losses of health, welfare and lifespan to improved energy efficiency then Prospect Theory would not apply, meaning a missed opportunity of these factors providing motivation.

As such, without education on these issues occurring and information being absorbed, if schemes continue to have blanket and non-personalised financial promotions, then without the HRP knowing even that a financial benefit has definitely been achieved then

future schemes are likely to miss the mark, as this person has no prior confirmed proof future upgrades would benefit them. This matters because they are more likely to reflect on prior positive experiences as drivers for future affective decision-making than younger counterparts (Carstensen, 2021). Use of the E.A.S.T framework (Halpern et al., 2023), to make a considered intervention to be easy, attractive, social and timely may well better support action by the HRP. For example, for interview participant 5, a technical solution retro-fitting a heat-pump to a ducted system could have suited this homeowner perfectly as a low-carbon heating approach as it was within their current lived experience and would require little effort to envision a positive outcome. As such this may be considered an example where behavioural economics, if used correctly, may nudge the owner-occupier towards a net zero future.

6.3.5 Age and ability

The EHS 2021 data set (DLUHC, 2022) shows that outright Owner-Occupiers (36.6%) are almost twice as likely to be disabled or have a chronic illness than those with a mortgage (18.4%). This is a significant influence, that rises with age, on the mindset of an HRP when it comes to affective planning processes, as without a health challenge to account for or manage, the level of risk being considered is greatly reduced. This matters because older people with a disability or chronic illness are likely to have poorer mental health, become pre-disposed to take fewer risks (Lockenhoff, 2017) as they do not wish their circumstance to get any worse, and they report a lower Health-Related Quality of Life (Megari, 2013).

The whole area of ageing and chronic diseases or disability is a complex issue, yet recognition in research of how ageing and ill-health can result in “psychological problems, difficulties in mobility, poor cognitive function, falls and incidents, wounds and injuries, undernutrition, and communication problems” (Maresova et al., 2019) is vital if it is to aid understanding of how it could affect decision-making. The survey results indicate that the average survey respondent self-selects as less likely than the 36.6% average to be chronically ill or disabled with only 22.6% (n=64) of all respondents (N=281) doing so. This approximate value of 40% below the norm may be due to cognitive dissonance felt in acknowledging the perception of self as being ill, or that they truly are healthier as Rotarians likely reside in higher income quintiles than the average as stated earlier and so live a healthier lifestyle in general and had a physically less demanding work life (or even a combination of all factors).

Regardless, the HRP with a chronic illness or disability will feel more challenges to acting than their younger self may have felt in the same decision-making situation in the past, even if they choose not to report it publicly as so. When considering new or additive technologies to their current house, this may indicate they are less likely to act. Feeling a sense of agency and confidence in their own information gathering, review of product, finding of trusted installers and own decision-making process matters, and it will affect their likelihood to act on an idea and this will change with age and health. The challenge may be exacerbated over time as HRPs with health issues rise to an average of 52% from the age of 75 or older (DLUHC,2020).

Another challenge related to aging and ability is digital competency and access to appropriate information. With the era of artificial intelligence (AI) coming in, there are programs such as “Bard by Google” (Google LLC, 2023) and “Co-pilot” from Microsoft™ (Microsoft LLC, 2024), where a person can simply ask their computer for help and get back detailed, personalised support. This could be done via enhanced accessibility such as verbally talking to the computer with speech recognition or simply typing an interrogator. The returning results are formatted in a conversational tone of language, yet are data driven. Undoubtedly there are others working towards a dynamic and engaging experience such as You.com (Socher, 2023) but the idea and interface methodology is seen as being user-friendly, such as by Forbes magazine recently commenting “Why enter a query and get back a long list of links (the current Google experience) if you could instead have a dynamic conversation with an AI agent in order to find what you are looking for?” (Toews, 2022). This sort of engagement tool is certainly one that may require further research to understand its potential impact on an ageing population.

Age also appears to impact upon the issue of trust discussed above. The survey results show that when asked about previous energy efficiency work that they had commissioned “What they would they have wanted to have seen done differently?”, when using a free-text box to reply only 2.3% (n=6) of all respondents (N=281) stated that they had a problem finding trusted installers. Whereas when later asked about possible future energy efficiency projects and “What are the barriers to you feeling capable to take action?”, 71.1% (n=200) of all respondents (N=281) stated that finding trusted installers was a barrier to future action. Whilst the two questions are not an exact mirror image of each other, the respondents had complete choice to raise any, or as many topics as they wished in the free text. Most respondents chose to answer with a single issue, presumably that which mattered most to them at the time. This stated current lack of ability to research, find and engage with SME that they perceive to be trusted was not enough of

an issue when they were younger for them to flag up in the free text box. With average tenure length being over 23 years, and many of the survey respondents being much longer, there may be significant life changes in affective issues such as work, health, retirement and cashflow affecting individuals in varying ways. The stable factors over time are they themselves and the property they live within, 63.3% (n=178) of all survey respondents (N=281) stated that (whatever their own variables) they still felt capable to arrange or DIY a future energy efficiency upgrade. If this is so, and yet installer trust as a barrier has risen from 2.3% to 71.1% then the single cross-cutting factor will be the variation in the survey respondents' age between the time when they last made a retrofit decision and now.

The complicated subject of trust (and feeling enough to support agency), or lack of in this case, reflects the literature review whereby older people are shown as less willing to take risks than their younger counterparts and have a tendency towards status quo bias (Mamerow et al., 2016; Mather et al., 2012; Pachur et al., 2017). Clearly, to take action in spending personal resources with a contractor, trust is required. Creation of this trust may require research to be done by the HRP and the recorded drop in trust of SMEs over time aligns with the literature which shows that research, when done by older people, is less exhaustive than that of younger adults (Reed et al., 2013) and has a preference to choose between fewer options. The cognitive load this learning causes results in an increase in likelihood to use heuristic shortcuts and to satisfice not optimise (Bruine de Bruin et al., 2016), resulting in an aversion to make decisions towards a new action in the first place (Finucane et al., 2002; Chen et al., 2011; Lockenhoff et al., 2016). In the case of this thesis, this is being expressed as the number one barrier to "feeling capable to take action".

Allowing for the above to be considered the norm, then the question here is to ask if the current paradigm, whereby the HRP is free and unregulated to make upgrade decisions or not as they see fit, is holding back retrofit progress?

Given this, how can we as a society, considering the HRP's age and ability, expect them to invest their own money into a product or service that (according to findings of this thesis): a quarter may not understand; rising to almost half not understanding how it is installed into their home; rising to two-thirds of whom who do not believe it will offer value for money (as they have been trained to measure financial returns as a metric of success); and even if they still felt comfortable to move forward almost three quarters feeling they are likely not to find a trusted installer to work with? This is especially

challenging when the survey results show that over four fifths of participants are already very, or fairly satisfied with their accommodation and therefore potentially lacking motivation. These issues are built upon further below in terms of recommendations from the thesis.

6.3.6 Information and ignorance

Whilst complex, the topic of information and ignorance is presented in the survey data as the joint second largest stated barrier to acting (with finance being the other) and was a common secondary theme (17 times) in the interview data. An example of this is from participant statements that energy efficiency upgrades have low financial returns which in many cases is not true, demonstrating poor working knowledge and research to base opinions on (Energy Saving Trust, 2023; MCS, 2023). Similarly, few interview participants demonstrated knowledge of home smart systems, integrated hardware choices or heat pumps, which could all play a key role in future energy efficient housing (Boulton, 2022; Octopus Energy, 2023). As a further example, interview participant 4 (a practising GP) appeared to be ignorant of the negative health impacts of cold homes and particulates from wood burning stoves as a relevant factor to inform their decision-making.

These levels of ignorance (in how they may personally relate) may have profound impacts as a person ages if they are acting as a barrier to action that may improve their quality of life, which was stated as the number one desire by most survey respondents. This issue highlights the importance of good information well communicated.

An example of poor information being that of interview participant 5 who held inaccurate beliefs about loft insulation causing damp, this highlights how the HRP will reflect on past experiences or out-of-date information to inform affective decision-making, as noted by Lockenhoff et al. (2016). Similarly, many of the interview participants made statements regarding energy efficiency representing poor value for money based on ed incorrect and outdated pricing data. This outcome is potentially due to anchoring at historical prices last seen years ago, lack of knowledge of present schemes such as the Boiler Upgrade Scheme (Ash, 2023) and current concern of payback before death (Mamerow et al., 2016; Mather et al., 2012; Pachur et al., 2017), or potentially all of the above.

To help address these issues, good and support information would benefit from being:

- *Factual – as veracity matters to householders.*
- *Accessible – using awareness of digital competency and other routes to market.*

- *Desirable – explaining benefits available rather than just technical features.*
- *Salient – personalised, ensuring relevancy to current lifestyle and age.*
- *Universal – made relevant at all stages where purchase or upgrades are considered.*
- *Promoted – using trusted messenger status when information delivery is concerned.*

In contrast, the interview participants flagged up the pervasive effects of poor-quality information, challenges of access and negative impacts on their decision-making process.

Finally, the relatively high confidence in actions and opinions of males, even when recognising a lack of good information, provides clear concerns. The gender split in thoughtful information gathering (with females being more likely to acknowledge a need for learning) supports the importance of recognition of the HRP decision maker as female, or in partnership with females, by policy makers and recommends them as a route in for providing better information support.

6.3.7 Beliefs, value-action gaps, norms and the story of self

Following the structure introduced in chapter 5.5 “Value Action Gaps” this section addresses four distinct areas:

- *Externalisation – denial of responsibility and neutralisation techniques*
- *Investment responsibility – who pays for any upgrades*
- *The story of self – confidence in own narrative contrary to past actions*
- *Social Norms – awareness of others, judging and being judged*

Externalisation was employed to describe why energy efficiency upgrades were the responsibility of others and often linked to the use of neutralisation techniques to defray the effects of recognised cognitive dissonance. This was a common theme in interviews, for both males and females. The more resilient the interview participant stated they were financially to energy price shocks, the more often they dismissed the issue as being irrelevant or another’s problem but not theirs. Such responses are examples of the “Condemning the condemners” neutalisation technique, whereby “blaming others makes it easier to neutralize one’s own misconduct and shifts the focus away from oneself to other norm violators” (Neumann and Mehlkop, 2023).

In practice people do not like to be judged badly by others so they will avoid behaviours which may cause social sanctions (Pryor et al., 2018), or if employing a neutralisation technique, they will deflect the responsibility they recognise onto others so the third party

will become the focus of ire by the judging (or sanctioning) social body or person. This allows the individual to externalise responsibility, reduce cognitive dissonance and potentially direct focus away from themselves. Whilst the deflection may be based on correct data regarding scale of personal impact, using a neutralisation technique means that there is no personal duty claimed or acknowledged.

This finding aligns with prior literature where externalisation and neutralisation techniques were identified when maintaining old housing features such as windows was put forward as a reason to not undertake retrofit (Haines et al., 2012), whereby old housing features such as windows are valued by the HRP and demonstrates neutralisation techniques (Neumann and Mehlkop, 2023) being used to remove the cognitive dissonance being caused by their (in)actions. Neutralisation techniques may indicate belief in something of value beyond energy efficiency, so it would be of benefit for policy makers to engage with the HRP on related issues when these techniques arise, as otherwise there is a risk of value action gaps occurring.

Regarding investment responsibility, there was clear recognition of personal capacity to act and to pay if needed but an overwhelming desire of, and direct requests for, grants to support any desired action. The issue of equity arose regularly as a justification for this, with common threads being a desire for 50/50 investment by public funding, even though recognition was made that they as the property owner and occupant would accrue the majority benefit. There appeared to be no desired one-size-fits-all solution beyond a grant but mention of long-term cost neutral loans was not dismissed altogether.
One of the key challenges moving forward will be the issue of perceived equity, particularly related to finance as spending capital reserves (where available) or reducing monthly cash flow are clearly not desirable for the HRP. The current research into Green Finance (BEIS, 2022e) has not yet produced a model that meets this need and remove this barrier to action for this significant population of property owners.

A third common theme identified related to value-action gaps was the ‘story of self’. This is defined as someone being “confident they are correct contrary to actual personal actions taken” and eight out of eleven interview participants having comments coding into this theme. Where this was present, there appeared to be very little link between actions taken and the personal narrative put forward in interviews, which often suggested strong support for or motivation toward energy efficiency retrofit. As an example, interview participant 4 (male) identified their home as draughty, described a failure to have done a lot to mitigate this, but still put forward that they had done what they need to regarding energy efficiency.

Through this phenomenon, householders may confabulate[7] stories to placate dissonance caused by their own inaction towards energy efficiency, as evidenced when being interviewed. There is perhaps a link here with today's so-called "post-truth era" where emotions or sheer will to believe hold more influence than facts (Lewandowsky et al., 2017), even facts regarding their own prior actions. The cascade effects that this phenomenon could have on uptake of energy efficiency measures cannot be downplayed enough.

Finally, social norms were a relevant issue in terms of value-action gaps. They were often referenced by interviewees in terms of equity, coupled with awareness of leadership and how social examples can creating behavioural trends. In some cases, technical comments around housing conditions and perceived norms were also made. Whilst these were noted and commented upon by interview participants, this does not mean they personally felt the need to conform. The personal drivers, needs, personal paradigm and world view of the interview participant appeared to be more influential than just the recognition of the existence of social norms. As interview findings suggested that the interview participants are all broadly judging themselves as good people, who have tried to conform to desired social norms, and have a personal narrative they follow that justifies why they should be seen as such. This issue provides a hint of how impactful a strong future marketing campaign (with delivery support) may have to be in influencing people to appear socially responsible around energy efficiency, as the facts would not alone appear enough at present. Public support campaigns that include a register and comparisons of properties in a street/area may well be worth considering for these interview participants who are clearly aware of social status and judgements.

6.3.8 Capability, opportunity, motivation - barriers to action

This section now returns to the subject of barriers to action where capability, opportunity and motivation is stated as felt, with the lens being the Decision-Making Entities.

Capability - Only 63.3% (n=178) of all survey respondents (N=281) felt they had the capability to arrange or DIY a future energy efficiency upgrade. If the survey sample is

[7] Confabulation occurs in response to "a problem that makes someone produce false memories about events, or the false memories themselves: Confabulation differs from lying in that the person is not consciously attempting to deceive." (Cambridge Dictionary, 2024)

representative of the “Comfortable Seniors” combined with “Lavish Lifestyles” segments as reported in the Acorn™ guide (CACI, 2014), who make up the largest single body of outright owner-occupiers in the UK, then this would indicate that over a third of all UK outright owner-occupied homeowners are potentially not willing to engage in finding out what they could do, nor what benefits it may bring them (even if someone told them any beyond financial). This represents over 3 million properties that are potentially not going to receive any upgrade (unless as an unintended consequence of maintenance) until the ownership may change and even then, if another typical HRP bought it to retire into, it may fall back into the same void of action. With the average tenure length being circa 24.5 years then this would put another 1 million homes into stasis until they were sold again around 2050, just based on self-perceived capability alone.

One area for future enhancement may exist around the principal of reciprocity, which has been described as “a social norm that dictates we reward the positive actions of others with equally positive behaviours. Similarly, negative actions are punished with negative behaviours” (Pilat & Krastev, 2024). This could be enacted by having a qualified surveyor do a full and comprehensive (beyond current EPC standards) energy efficiency survey which is passed to a holistic project management team to create a bespoke “digital passport” for the house. This would provide the full upgrade path, with funding options and independent hardware advice, with accredited workers in place and signposted. This could remove the barriers and sludge to create a better sense of agency, not just in those who feel capable but also in the 3 million homes that currently do not feel capable. Clearly there are conversations around who pays for this service, which may be from general taxation or perhaps stamp duty (HM Treasury, 2024) which is a central tax to government derived from the from the sale of properties. These levers are not beyond the ability of Government and Local Authorities to manage, and it is likely that the stimulus to the construction industry would create greater tax revenue through growth in economic activity and it would boost employment.

If it was assumed that the capability issue is resolved using reciprocity or another suitable measure as exemplified above, and 100% of HRP now feel agency (and assuming that motivation exists) a challenge still remains – how do you compare and contrast about something that you have never done before and are not trained in? This challenge is shown by the top two barriers from the survey in this research being finding trusted installers and getting value for money.

By allowing the HRP to attempt to answer these questions from a frequent basis of very low knowledge and experience (as indicated by survey and interview results), effectively being siloed to their social milieu (Reed et al., 2013), the learning gradient to climb for them may be too steep (Figure 2.8). From a practical perspective, the HRP is more likely to use a simple heuristic to make these decisions (Bruine de Bruin et al., 2016) if told who to trust (by a trusted impartial source) and there being a benchmarked and transparent pricing comparison that they can refer to (conceivably run by a Local Authority). Whilst this may never be perfect due to the complexity of housing stock needs, range of products on the market and the current use of SMEs as the delivery agents, if inexperienced and unqualified householders are to decide upon the viability of energy efficiency measures, then they should be supported appropriately. Whilst clearly this a role for governance to fill or address, the problem is caused by the Decision-Making Structure in place.

Opportunity – The survey results found that SME Delivery Structures are not well suited to educate the HRP appropriately to identify any extant opportunities, which may in part explain why only 54.2% (n=152) of all survey respondents (N=281) felt they can recognise an opportunity for energy efficiency retrofit in their own properties. With the average age of the HRP survey participant being 70, it is reasonable to assume some level of experience has been gained and 65.4% (n=184) of all survey respondents (N=281) had previously stated that they were aware of at least one government policy on home energy efficiency. However, since there is no regulatory requirement for them to reach out to be informed by the SME market or otherwise as to what opportunities may exist, this will result in lower levels of opportunities being recognised than may be available (and SMEs perceiving lower market demand).

Motivation and engagement - The research shows only 53.5% (n=150) of all respondents (N=281) felt motivated to improve their energy efficiency in the future. This was even though earlier questioning around theoretical motivation to address a heating planet by society received a positive response from 87.0% (n=244) of all respondents (N=281). Also, when asked if they believed that by making homes more energy efficient it would help limit any future temperature increases in the UK's climate 76.6% (n=215) of all respondents (N=281) confirmed that they did.

Motivation is a more nuanced area to investigate, which is characterised by subtle shades of meaning or expression, as it is very much more likely to be based upon feelings, emotions and desires rather than a decision made simply on the basis kWh of energy saved on a modelling spreadsheet. The areas of perception, risk analysis and biases such

as Prospect Theory (Tversky & Kahneman, 1978), all hold sway here. Following rational utility theory in standard economics (Green, 2022), the HRP should desire to live in the most efficient house possible with 100% of survey respondents ideally wanting to improve their efficiency; this wasn't the result found in the survey and in practice it is potentially incremental and additive barriers that are preventing this from happening. As previously noted, most participants felt that their house was already comfortable enough and were happy with their status quo, giving reduced motivation for change. As also noted, support of climate action and awareness that energy efficiency supports this did not translate into strong motivations to act personally.

The findings also highlighted several negative motivators. 27.1% (n=76) of all respondents (N=281) stated fear of disruption as a barrier to acting. Whilst some things such as internal wall insulation inherently cause disruption within the home, others such as solar PV remain pre-dominantly outside the house and normally only take one day to install. Therefore, possibly this is a perception issue more than a factual one, creating a barrier with all retrofit measures being lumped together in participants' mind. This conglomeration of perceptions rather than an awareness of specific facts likely exists due to the present status quo, with the HRP free to decide with if they feel motivated to act with often only poor information to hand that is primarily provided by small SMEs.

6.4 Towards Recommendations

Appendix 6 provides a brief one summary of the key research results found in the thesis. To provide practical benefit, a range of issues are explored below which identify recommendations emerging from this research.

6.4.1 Better information provision

To support the HRP age group (but also others in general) it is ideally recommended to follow the E.A.S.T. principles - that a designed intervention to create behaviour change in a target audience needs to be Easy, Attractive, Social or Timely to support agency and encourage action (Halpern, 2023). This links directly to marketing and behavioural economics as a theme (Baddeley, 2017; Kahneman, 2012; Thaler & Sunstein, 2009; Caballero & Ploner, 2022) as marketing they should be based on good information to allow appropriate targeting of the intended audience.

The thematic analysis of survey results (Table 4-19) did not identify issues related to Marketing & Behavioural Economics as a primary barrier for either Governance or Delivery Entities. This is because effectively, if neither Governance nor Delivery Entities are doing them properly in the first place it is hard to recognise and critique something that does not happen, beyond identifying the void. This is most perhaps why the Decision-Making column results here showed twice the value of barriers identified, indicating a need that is not currently fulfilled by the other two Entities. This further highlights the need for better information provision.

6.4.2 One-stop shop approach

The most likely real world example solution to the challenging mix of barriers discussed so far may be an evolution of the Irish One-Stop Energy Shop (Sustainable Energy Authority of Ireland, 2017), whereby all services can be bundled under one roof with trusted engineering support and appropriate Local Authority finance options. Marketing of benefits and co-benefits would be age appropriate as are all financial options and incentives, with a benchmark Local Authority installed system available as a backstop that offers a risk free, value for money, quality installation of the product or service considered. This would allow the SME to still find ways to offer value or co-benefits to the HRP as an approved installer within a one-stop shop, or separately by evidencing why a client should do business with them not the Local Authority installer. This approach may well improve delivered service and product levels as well as ensuring good value to the HRP (and taxpayer in terms of grants and loans).

Future research and practice could look at how this may work with the upcoming results from the Green Home Finance Accelerator (DESNZ, 2024) pilot phase, that is currently being run with 13 different projects across Great Britain and which includes varying delivery models and finance plans designed for the HRP and owner-occupied homes. This could be enhanced by the additional creation of local show homes of experienced HRPs who have already had the work done and are happy to act as social norm demonstrators, and to provide personal support to alleviate concerns with their installation stories and the benefits they have found.

6.4.3 Potential role of persona modelling

Persona modelling (Adlin & Pruitt, 2010), when discussed in the context of this thesis, is the process of creating and adopting a persona-based approach to understand the specific drivers and appropriate range of policy responses for each persona relating to the

challenges of energy renovation. Haines and Mitchell (2014) suggest that “Tailoring strategies to suit different personas will considerably enhance the diffusion of policy goals for low energy retrofit and also allow business and technology developers to target an appropriate user”.

The results of this thesis highlighted a lack of emotionally-engaging and tailored marketing and engagement as a barrier to retrofit motivation, supporting the potential role that persona modelling informed approaches could offer to the decision-making of normal owner-occupiers. Cherry et al. (2022) noted “persona-based exploration offers a means of grounding deliberation over potentially abstract and technical visions of change in the emotional relationships that matter in citizens in everyday lives”. That is, the creation of personae by the individual allows them to better frame and understand the issue being considered in terms that they relate to and can process better.

It is reasonable to believe that the advent of AI and interactive systems could be merged in the near future to create a more engaging way to support the HRP and provide better information in a more personable and engaging way, thereby supporting agency. A recommendation may be made that consideration of these technologies, and the above-mentioned social norms and techniques, should be used when considering how to educate people to accept energy efficiency upgrades.

6.4.4 Approved SMEs

Having effectively unregulated industries in the energy efficiency market is a problem, even for those that notionally already have codes of conduct such as the Renewable Energy Code of Conduct (RECC, 2024), around solar PV for example. This is hard to enforce as a Code, as any potential breach would likely happen in a private personal environment such as the HRP’s living room; furthermore, a client is not necessarily likely to have the needed technical knowledge to know what standards a business is supposed to adhere to.

Having a third-party Local Authority approved benchmarked product or service being specified with trusted recommended installers at the time of quotation is recommended to provide better support for the HRP and help to build industry trust (GMCA, 2024). This could be part of a package of governance oversight that is provided by the local authority for the benefit of both competent local SMEs and also the targeted HRP. There might be challenges around resources to administer this, such as finances and staffing within the Local Authority. However, a small surcharge per measure taken from installation costs

(such as sub £100), would be a relatively small amount for the HRP compared to the capital expenditure that is often in the many thousands of pounds sterling, but would allow the Local Authority to manage this in a cost-neutral manner. This type of approach is an area that deserves immediate review by any Local Authority that does not run its own installation teams.

6.4.5. Age and policy

The challenges created by the HRP (and survey participants) having an average age of circa 70 years old is possibly the most nuanced yet pervasive issue to be raised by this thesis. It affects everything from the perception of comfort by the HRP, to the likelihood to engage with present government retrofit schemes (in terms of motivation), ability to access salient and suitable data when needed and how the information should be provided to them in terms of marketing of benefits from an energy efficiency upgrade.

The findings from this thesis highlighted these issues, raising a range of questions to consider in order to improve engagement: Why market something in terms of return on investment and value for money if it does not payback within a persons expected lifespan? Why not offer lifestyle benefits from the same product as the primary incentive with the financial one being a secondary incentive? Why not market an appropriate finance scheme to support a HRP who may be capital rich in terms of equity yet who has limited disposable income? The survey participants, and indeed the wider HRP as reviewed within literature, are effectively calling out for support due to a recognised inability/motivation to resource appropriate information to educate themselves as needed, even if they felt the desire to act.

A strong case therefore exists for all future energy efficiency schemes targeted at this audience to be reviewed via the lens of behavioural economics and neuro-economics before launch. An outcome of this could be that independent support of the SME could be indicated with pre-written marketing or engagement methodologies for them to use and access for this core market. Aging is an inevitable fact of life; forecasts show that the average age of society is expected to increase through this century, and with this the challenge created will continue to exacerbate. Support and empowerment of this large and significant decision-making block of homeowners to find personal benefits from energy efficiency upgrades will be vital if England is to hit retrofit targets and by extension 2050 Net Zero targets.

There is precedence set by the Scottish Judiciary to treat young people differently when judging responsibility for their actions simply by dint of their age as caused by their neurological status (Scottish Sentencing Council (2021). An implication of this thesis is that it could be beneficial for the same review to be conducted into the older end of the population when considering competency and capability for affective decision-making around energy efficiency upgrades.

6.4.6 Trusted messengers

The issue of trust – and the lack of it by the HRP and survey participants – is a complicated subject. Depending on the lens being discussed, it can be considered from varying perspectives. However, the analysis presented in this thesis suggests that the lack of trust felt results from challenges with issues such as information, education, marketing, behavioural economics, age and a lack of appropriate skillsets. This means that some are causal factors (related to neuro-economics) and some are a problem by their lack of use, such as effective adoption of behavioural economics and marketing tailored to a targeted age group (70+ in this case) and effectively delivered.

Changeology (2013) by Les Robinson provides a good framework to follow for creating community change without proscribing specific techniques – if it works for the situation, then it works. The key is to know your target audience and their motivations (or barriers) and engage with them in a way which engenders trust and pushes boundaries to open opportunities. This literature review demonstrated that outreach over the previous 14 years of policy making has had limited success and new messengers and techniques are needed to meet the UK's domestic retrofit targets. Trusted messenger status will vary from community to community so there will be no one-size-fits-all solution, but the recognition of its importance and the attempt to provide one will matter. This will apply whether this is at a very local level in areas of high occupancy by specific ethnic origins or due to geographical bounded relationships, or indeed, in the wider sense that age is the underlying factor which will need to be accounted for. Whatever the case, trusted messenger status will be key to supporting good marketing targeted at the HRP group in question.

This will need to be supported by good information and education as noted earlier to support the HRP when they seek to engage with professional and independent engineers as solution designers for their considered upgrade. There are schemes run such as that promoted by the Greater Manchester Combined Authority (2024) "Your Home Better", which provide this clear and independent support for a set fee with no salesperson visit

and no obligation to complete any works specified. Your Home Better provides a range of options from specifying hardware for a bespoke job to a complete home survey and recommendation report if the HRP wants to know their options. They also then provide a link to trusted local installers who are accredited in the chosen work area that the client may ask for a quote. This would help to address the challenge of the 71.1% of survey participants who stated that finding a trusted installer was a barrier.

Following the Changeology principles (Robinson, 2013), to improve their likelihood of energy efficiency upgrades, a strong marketing campaign by trusted messengers is needed first to establish the norms and then to kickstart an engagement process with suitable trusted third-party, non-financially motivated professionals as noted. With this in progress there would need to be practical benefits that they can achieve that are supported by policy roll-out that will encourage them to act in their lifetimes. These may include financial products that defer the costs until after death, up-front financial incentives, clear and strong proof of non-financial incentives such as warmth, increased comfort and better lifestyles (for example) rather than theoretical energy reductions. This should be backed up with good local networks of prior installations that householders can visit and socially engage with, that have product ambassadors who have gone through the process already and can attest to the benefits achieved to give better real-life context to potential benefits.

6.4.7 Finance for retrofit

The challenge of finance is rightly recognised as the elephant in the room, with current Private Public Partnerships looking to unlock £3 of investment for every £1 spent by government, as in the new (in July 2024) Labour Government's recently announced Sovereign Wealth Fund, but this ratio potentially increases in the green sector.

From a financial perspective it may well be that the Green Homes Finance Accelerator (DESNZ, 2023) programme will hold the key when it publishes its results. Due to regional inequity in wealth and house values there is no surety the HRP can afford to pay for upgrades themselves, though this issue was not specifically flagged as a hard barrier by survey respondents.

Whilst recognising the personal benefits accrued from energy efficiency upgrades there was a clear desire for equity and fairness - if they (the survey participants) had to pay anything then someone else should also pay – no matter how financially resilient the individual person had stated themselves. Such beliefs are important, as personal beliefs

are often used as part of neutralisation techniques to remove cognitive dissonance felt when justifying value-action gaps in environmental behaviours. In the interview stage, beliefs were most stated as justification of statements made or motives perceived, rather than relevant facts, for taking personal responsibility around upgrading domestic energy efficiency. This may be expected when considering the established need for better information and appropriate education identified by this research.

Participants showed some interest in a range of forms of financial support, suggesting that there is no one-size-fits-all methodology of delivery scheme to offer financial help with retrofit. This could mean for example a specific value of match funding for certain measures or funds being used to support financing of loans to unlock private capital over time. Whatever it is, foregrounding the equity issue and perceived fairness from the HRP's perspective appears to be key; as such, creating a clear governance framework that includes relevant information and education to support the outreach of any future schemes is recommended to future policy makers.

6.5 Chapter Summary

This chapter has discussed findings and linked these to literature for the three areas of Governance Entities, Delivery Entities (SME) and Decision-Making Entities (HRP) with the key lens being that of engagement of the HRP and identifying recommendations to improve this.

It has found systemic challenges related to information gathering by the HRP, their ability to process it suitably and the effect this may have on their decision-making. The HRP is under-supported by Delivery Entities who in turn are not suitable supported by Governance Entities. There is a need for greater use of behavioural economics and bespoke marketing to engage the HRP and overcome their present reliance on out-of-date information that has an emotional attachment to them, or which re-enforces their sense of self, and can be used in neutralisation techniques. If the neuro-economic and age-related drivers of decision-making cannot be changed, then it would be wise to work with them both in terms of marketing and financial support. The futility of trying to hold back biological drivers with rational economic utility theory is akin to King Canute trying to hold back the incoming tide. Further recommendations have been made towards better information provision, a One Stop Shop local delivery approach, the use of Persona Modelling in engagement and better local governance of the SME Delivery Entities.

Chapter 7: Conclusion

This chapter presents the research findings in relation to the aims and objectives and key thematic areas identified, summarises the contributions to knowledge made and research strengths/weaknesses and discusses practical implications for Governance Entities, Delivery Entities (SMEs) and Decision-Making Entities (HRP). Finally, further research opportunities are discussed.

7.1 Addressing aim and objectives

This work had a stated aim of:

> *Investigate the Owner-occupier (Household Reference Person) experience of upgrading their homes' energy efficiency, how they interact with policy - their drivers, beliefs and barriers towards this goal.*

The objectives put forward to meet this aim were:

> ***Objective 1*** *- Focussing on English housing, to scope and identify the domestic energy efficiency policy landscape.*
>
> ***Objective 2*** *- Analyse and evaluate the direct engagement experience of the Owner-occupiers via the present delivery structure. By use of survey and interviews to research, record and analyse influences on the uptake of retrofit measures by Owner-occupiers.*
>
> ***Objective 3*** *- Use of real world (data-driven) results to analyse the alignment of current engagement policy for HRP's and consider this via the lenses of the three major stakeholders – Governance Entities (Policy makers), Delivery Entities (Small to Medium Enterprises – SME) as a delivery arm and Decision-Making Entities - the HRP (Owner-occupier) as the recipient of the policy framework.*

A brief overview of how each objective was met is summarised below, with a more-detailed thematically organised summary being put forward in 7.2.

7.1.1 Objective one: energy efficiency policy

The literature review started with mapping the current status quo in terms of housing stock, tenure, current efficiency levels and the EPC system to allow understanding of what the current policy system was being created for and the policy recipient paradigm. Then focus was placed onto the current policy landscape and any pertinent regulations and effort was made to understand how this, when applied to the focused-upon HRP decision maker, met their needs or left any identified gaps.

End-user engagement (lack of) was identified as the strongest barrier in the current policy landscape. The combination of this and the current policy landscape then naturally led to objective two – creating the mirror image analysis from the perspective of the HRP to the policy.

7.1.2 Objective two: engagement experience

To understand and position the engagement experience the whole process of energy-efficiency retrofit was reviewed as a socio-economic structure to identify the stakeholders and paradigm they operated within. Key systemic issues arose such as (mis)information, trust, the role of optimism bias and how it affected predicted policy uptake.

Empirical data collection and analysis with Rotary Club members was then undertaken to research and analyse influences on the uptake of retrofit measures by Owner-occupiers. An online survey (N=281) was followed-up with (N=11) qualitative interviews from selected survey participants. The research findings are summarised thematically in 7.2.

7.1.3 Objective three: analysis for three major stakeholders

The analysis of survey and interview data identified findings structured according to their relevance for three major stakeholders – Governance Entities (Policy makers), Delivery Entities (Small to Medium Enterprises – SMEs) and Decision-Making Entities - the HRP (Owner-occupier), which were discussed through these three lenses in chapter 6.

Empirical findings related to the three stakeholders are summarised within the thematic summary of results (7.2) and implications for the groups are put forward in 7.5.

7.2 Thematic summary of results

This section summarises the key research findings through four broad themes as noted by the thematic analysis of the survey results – Information & Education; Marketing & Behavioural Economics; Age & Lack of appropriate skillsets; and Trust & Financial issues.

7.2.1 Information and education

Thematic analysis of survey results showed information and education as the most prevalent theme over all three stakeholders. The key findings and discussion points are:

- *Whilst the most desired supports by the HRP are financial aid or green finance products, underlying this is a desire for clearer information and advice followed by better industry regulation to receive this.*
- *Energy upgrades are not typically done holistically nor for best synergy within the property as a whole due to the siloing of information and skills within the SMEs that do the work for the HRP.*
- *Energy efficiency may not be recognised as an achievable benefit of renovation (or considered as a motivator) and the survey respondents stated that receiving greater government support promoting this would make it more likely that they would increase their home energy efficiency.*
- *The HRP gender used by governance entities is incorrect if the purpose of the HRP is to define the decision maker for spending authority on domestic energy efficiency upgrades. That is, the government-defined HRP is male, whereas the survey results in this thesis (n=281) were that approximately two thirds of energy efficiency upgrade decisions are either made jointly (n=178) as a male and female couple, a quarter (n=71) solely by men and around one in ten (n=32) by solely by women. This has implications for appropriate targeted householder engagement approaches.*

It is reasonable to consider good information – accurate, reliable, accessible, salient and apposite – to be fundamental for use in informing and educating the HRP on the subject and benefits of energy efficiency upgrades for their homes. The responsibility for the provision of such does not rely on the HRP, nor does the duty of seeking it out and processing it in a way that would maximise their likelihood of enacting the discussed energy efficiency upgrade. This duty primarily belongs to the Governance Entities to put in place governance that supports the chosen Delivery Entities appropriately when they interface with their target audience. This is because in England most SMEs are not large enough nor well enough resourced to have the competency to deliver what is required effectively, nor are they philosophically motivated to do so. As such, this role falls back on

Governance Structures as the sole provider with the scale and reach to provide factual but appropriately delivered information to the HRP.

Whilst the survey and interview participants may feel that better engagement with supporting case studies would encourage them to act, this is not a role central government has chosen to undertake in the previous 14 years, with the devolution of responsibilities to either Local Authorities or the SME market being the norm. In this period of government austerity, where local authority budgets were continuously cut, and most SMEs not having the scale nor philosophical motivations to provide more holistic and bespoke information to their clients, there is not enough resource nor staffing to fill these requirements. As such at present the HRP does not on average perceive enough benefit to consider an energy efficiency upgrade compared to their status quo. As it stands England will not meet its Net Zero targets within the domestic retrofit sector.

“Please give me a grant” may understandably rank as the most desired government support being requested (or themes thereof), however, this is not a realistically viable scenario for central government in the current financial climate. Leveraging private capital – the HRP’s own or external investors – remains the most likely route to market at present. Therefore, better information, advice and industry regulation to help support this is the most practical, low cost, low regret action to take at present whilst awaiting on the results of the Green Home Finance Accelerator pilot phase. This is not the traditional role taken by the recent government and could require a re-shuffle of departments to effectively manage this, or to create a dedicated delivery body. If done correctly, with a suite of suitable outreach products/data/case studies/information that the SME can use, which has been produced by trusted sources, then energy efficiency upgrade roll out should accelerate. It is to be noted that the issue of age and neuro-economics will be relevant here and that information and education will have to be tailored to its audience appropriately. This leads directly to the issues of marketing and behavioural economics.

7.2.2 Marketing and behavioural economics

Key findings and discussion points related to this are:

- *Marketing and behavioural economics (often linked to beliefs) were a strong latent theme underpinning many areas.*
- *79.4% (n=223) of all survey participants (N=281) stated that their previous renovations were equally motivated by financial and comfort benefits; when later asked separately about future motivations 76.6% (n=215) of all survey participants*

(N=281) stated that their quality of life was most important. There exists a gap in marketing to non-financial benefits targeting quality of life, lifespan and health benefits.

- *Government policy marketing is not fully penetrating the HRP target audience, where there is a significant lack of felt motivation and it creates even lower feelings of support within the HRP.*

This research found that whilst financial motivations were identified by the survey participants (which may be no surprise due to the promotion of recent schemes being of a financial nature as previously noted) there are equal levels of motivation stated towards comfort derived from the measures. This is instructive for future marketing campaigns as quality of life for the survey respondents was now considered their primary driver on a day-to-day basis. In contrast, the financial returns aspect of such measures is diminished by foreshortened lifespans for elderly householders. This would indicate that a combined campaign focus looking at non-direct financial benefits (or delayed capital benefits for descendants) linked to better lifestyle, health and lifespan prognoses may be more attractive to the HRP owner-occupier market than previous financially motivated ones.

Given the research finding that beliefs and opinions are drivers for decision-making more than facts or known accurate information, marketing campaigns produced using targeted behavioural economic theories addressing the motivational beliefs (or perceived barriers stated), in addition to any financial benefits, will likely be more effective than the business-as-usual approach of focussing on financial benefits alone. However, they will have to address the challenges concerning targeting an older audience.

7.2.3 Age and lack of appropriate skillsets

A key characteristic of the HRP is their high average age (69 years old) and this affects:

- *Decision-making capabilities*
- *Digital inclusion and access*
- *Research capabilities*
- *Affective risk-taking ability*
- *Willingness to invest due to fore-shortened time horizons*

Only 23.5% (n=66) of all 281 of survey respondents stated that they felt they had full capability, opportunity and motivation to do a future retrofit project (see section 4.4). Age was also a self-identified significant disincentive to take future action for 56.2% (n=158) of all survey respondents (N=281). Over 56.2% (n=158) of all survey participants (N=281)

also stated that their age was a significant disincentive to them acting due to foreshortened time horizons when considering financial benefits.

Where age-related barriers are taken together, the percentage of HRP likely to act on energy efficiency in response to the current regime of promoting energy efficiency schemes via financial benefits drops to single digits (Appendix 5). Business as usual is not a viable option.

Even with enhanced outreach, potentially the HRP will still choose not to engage - no matter how focused, accurate, tailored and bespoke the marketing is. This may bring about the challenging scenario of regulation being the only effective route, but to win them over, would take the creation of significant levels of trust and the removal of key financial barriers in addition to bespoke marketing.

7.2.4 Trust and financial Issues

Key points from the research on trusted messengers are:

- *SMEs are not trusted delivery partners*
- *Government and politicians are not trusted as policy messengers*
- *Professionals are the most trusted messengers for SMEs with a key point being that they are not paid to sell a product*
- *Finding a trusted installer was a barrier for 71.1% (n=200) of all survey participants (N=281).*
- *When asked what government support they would like as the survey participants, 55.7% (n=157) of all survey respondents (N=281) asked for some form of direct or general financial support which was backed up by 81.8% (n=9) of interview participants (N=11) also requesting a grant or financial support*
- *Belief statements and the value-action gaps were clearly being evidenced in regard to the financial barriers put forward, including perceived unfairness in how financial support could be distributed to households.*

As noted in chapter 6, the above points highlight the importance of using trusted messengers to drive engagement and to develop financial support schemes that are perceived as fair by the HRP.

7.3 Research contributions, strengths and weaknesses

This section summarises the key contributions to knowledge, methodological contributions and summarises the recognised strengths and weaknesses of the research. This is separated into 3 distinct sections for clarity.

7.3.1 Knowledge contribution

The primary contribution to knowledge is the empirical evidence from research participants who closely match the Office for National Statistics Household Reference Person. This brings fresh data to integrate when addressing this complex paradigm in future research programmes.

The second is to recognise the outright owner-occupier HRP as an age-defined group with particular needs in a definable bounded rationality via the use of an inductive mixed-method research programme. This mirrors the Scottish Judiciary research findings O'Rourke, S. *et al.* (2020) showing social groups can benefit from being legally defined in terms of the consequences of their decision-making process and the biology which drives this.

Whilst the literature research around neuro-economics as a topic is not new, findings from the research results showed a significant shift towards risk aversion, the inability to affectively forecast good options and challenges to find trusted installers regarding energy efficiency by the research participants (in support of neuro-economics theory). This was unexpected at the start of the research, but these findings have changed the way the HRP is considered, specifically in terms of engagement, now this is known. Integrating this knowledge into future energy efficiency delivery scheme design and delivery will have a significant impact on the likelihood of the HRP to engage if they have no regulatory need to do so, as is the case at present such as through the Heat in Buildings Strategy (BEIS, 2021).

The third is identification of a clear gap in in Governance Entities' understanding around the clarity of gender and whom the decision maker/s is/are in the house - when it comes to energy efficiency upgrade spending – as it is not the HRP as presently defined. However, it is noted that further research needs to be done into the decision-making process within couples and multi-person households to understand the dynamics at play.

Whilst previous research has identified varying HRP personas they have not sited them within the energy efficiency retrofit paradigm as a framework that exists within the present stakeholder delivery platform and governance entity as a single system. This work contributes to filling the gap in knowledge around the need to engage a currently dis-enfranchised and purposefully overlooked large, politically active, body of house-owners who need support. Further, the results align with recent government funded research into Green Finance (BEIS, 2022e), the outcome of which will benefit from the research provided by this work when practical applications are brough to the market.

7.3.2 Methodological contribution

This thesis has applied a methodology for the investigation and identification of the HRP decision-making process, with both quantitative and qualitative data, using an iterative and inductive process map of one to inform the other, allowing recognition of a structured paradigm of stakeholders to be created. It thereby allowed better siting of their bounded rationalities within a complex political, practical and social structure whilst foregrounding their needs, limitations and desires.

This is the first time this methodology has been knowingly applied as a whole, rather than individual component parts being solely applied, to the area of HRP end-use decision-making for energy efficiency, and would allow a rich persona-driven construct of the lived-experience to be created; this would allow more nuanced empathy and consequent understanding to be achieved which will help with the design of user-led engagement methods for energy efficiency retrofit work in the future.

This methodology can be expanded upon to act as a springboard for future research into practical engagement strategies, potentially for example, using persona modelling techniques to increase personalisation for, and endowment into, energy efficiency retrofit for the newly understood HRP.

7.3.3 Research strengths and weaknesses

This research programme is considered successful, with significant areas of strength to endorse it as listed below.

Strengths:

- *The survey participants' demographic match is very close to the EHS HRP.*

- *Continued access to the same participants over a year's period due to Rotary membership allowed greater understanding of data and veracity of results.*
- *Multi-disciplinary methods of statistical, quantitative, qualitative and thematic analysis of all data sets, in all stages, provided thorough investigation opportunities, creating useful contextualised information.*
- *The work has a very logical flow process held throughout with strong awareness and mitigation of researcher influence and bias as a risk.*
- *A very broad range of research was covered to allow practical application into local and national policy work by both Delivery and Governance Entities.*
- *A large amount of future research recommendations have been put forward.*
- *The researcher's professional experience in energy efficiency retrofit and building services added insight and value to analysis and implications from the research.*

There are also lessons which may be learnt in some key areas that may wish to be reviewed and considered when undertaking similar or follow-on future research, listed below as relative weaknesses:

Weaknesses:

- *The plethora of data to analyse meant that for every question asked there were multiple examples of evidence, sets and sub-sets that could have been created and again analysed in their own right for more focused questions. Time constraints were a challenge and led to choices being made that by nature excluded some areas or examples of interest.*
- *Lower survey respondent numbers than desired due to challenges with an ageing research group and strong institutional gatekeeping at all levels in the Rotary district that was engaged with. The disjointed nature of Rotary as an organisation was a challenge with individuals holding sway over their own 'kingdom' being reluctant to distribute the survey. Having even stronger governance led roll out to all potential participants by a trusted messenger may have helped.*
- *There were lower interview numbers than ideal due to challenges with arranging Focus Groups, and the reduced timescales for interviews resulting from this.*
- *Data regarding income quintiles would have been preferred, as no data was captured due to the belief it would put the participants off from engaging; however clearly there was a dominance of wealthier and more comfortable individuals in the interview stage and so presumably in the survey stage. This would be very much likely due to the historic nature of Rotary recruitment. This is a systemic challenge caused by the choice of the research group being Rotary members.*

- *Having identified the impact of female decision-making around energy efficiency upgrades there was a lack of proportionate gender representation in the research participants. Whilst this may have tracked more accurately to the current government HRP from when the research started, this does not help since the results of the research have shown this average HRP to be incorrect.*
- *Potentially the property sizes (and ages) of these wealthier research participants may mean any works such as insulation are costing more than the national average etc. and so this research group may be less inclined to act as all their quote are high, which may have skewed their opinions.*
- *There are regional issues around property value divides in equity terms from north to south which have not been allowed for in this study and may affect future research around appropriate finance and loan structures for the HRP*

From a critical analysis perspective, the weaknesses listed built towards a thesis that may face challenges concerning its replicability and suitability of its results if repeated in a relatively poorer societal sector. For example, this might happen if replicated in “left behind neighbourhoods”, many of which are to be found in the North-East and a broad belt running coast to coast from Hull to Liverpool as shown by the All-Party Parliamentary Group (2023) research into the subject.

Ideally there should be a complete repeat of the survey and interview process done in other localities such as those listed and then comparison of findings to this thesis. This would allow analysis over a range of different property sizes, incomes (although this is an assumption, albeit considered reasonable) and potentially variances in capability, opportunity and motivation. Potentially this research could find the “lost middle” of owner-occupiers, who are not currently qualifying for support under any LILEE (low-income low energy efficiency) schemes such as ECO4, but also do not have the capital reserves nor borrowing power (potentially linked to lower value homes) to act even if they felt capability and motivation.

Ultimately, whilst recognising the weaknesses of the work, it is felt that having been carried out during Covid-19 it has been managed to an acceptable level. With the imposed isolation upon the researcher, supervision team and the participants having been a challenge to offering and receiving support, the learning processes and engagement (both internally and with research participants). In-person face to face meetings were clearly not desirable to the potentially more vulnerable interview participants for example. These all had a knock-on effect in terms of efficiency and particularly the inter-personal relationship

and bond which builds with in-person meetings, that can allow a freer flowing and creative conversation to occur.

7.4 Further research opportunities

Further research opportunities are listed below in order of least cost, shortest period, most likely to be practically achieved due to the urgent nature of the climate crisis and with the initial assumed consideration that there will be no change in current policy making nor philosophical drivers behind it and the present chosen delivery path remains the same. Whilst these are the key further research opportunities, a more complete list can be found in Appendix 7.

7.4.1. Communication and engagement

Future research could explore how to better communicate, and by what specific medium or channels, information around the personal benefits of energy efficiency upgrades to homes to an age defined HRP. How would the HRP like to receive this information? One example may be an AI persona modelled engagement platform with supportive role model output. The research aim would be to increase the likelihood of engagement and action in the HRP age group. This could be done by using ‘super-hero’ stories of (self-created) relatable role models, with the role models following a learning process and overcoming perceived barriers to successfully install, and then benefit from, energy efficiency upgrades.

An example of how this may work in practice is that the HRP could engage with a Large Language Model AI via a verbal interface and simply talk to it and verbally answer set questions such as personal details, address etc to allow data capture; this is then followed by questions about what they are interested in doing to their home. The AI scrapes public data on the property in the background (and potentially also energy usage) and creates the engaging role model story as mentioned, with the key use of behavioural economics in its output and asks if they would like to take the next steps etc. All the required support links, funding platforms and trusted installers can be provided in one place to remove sludge, creating a sense of agency with a direct call to action being made.

In practice when generating the role model story this may result in a tailored output whereby, if the householders are (for example) a couple aged 70 and live in a 3-bed semi then the role model story generated could have the example couple have one of the top 5

names for that year of birth, also live in a semi, have identified the same desired upgrade, could mention their challenges and fears and then discuss the benefits they received once they overcame them.

The research would look to evidence the practicality of this approach as a project and trial the affect it has on people who were already stating they were looking at some form of upgrade via a double-blind test through a survey and interview.

7.4.2 Trusted messengers

Future research could explore the issue of trusted messengers and who Governance Entities should use to engage with the HRP.

The research aim would be to Increase likelihood of retrofit action in HRPs by overcoming trust barriers. Using action research, the project would seek to identify if there are primary/secondary and tertiary examples of a preferred Trusted Messenger the HRP is most likely to listen to when thinking of future retrofit decisions.

Whilst recognising the benefit of bespoke Trusted Messengers based on individual circumstance, queries remain around general messengers, who has the most buy-in for the most people and can provide a template for future engagement? This will be important to increase trust levels in SMEs if they are to remain the Delivery Entity of choice. The research would look to evidence the impacts of different potential messengers on trust for people who were already stating they were looking at some form of upgrade via a double-blind test via survey and interview.

7.4.3 Trusted installers and funding

A further area of research emerging from this thesis would look at the number one barrier to action stated by the research participants, that of finding a trusted installer, with an eye on financial practicality. It would aim to explore if government should offer an alternative to SMEs; that is, if an alternative model engagement and delivery being left to SMEs could be effective.

The research could involve investigation of the implications of Local Authorities providing a ‘reserve installer’ option as a default to all Governance Entity provided future funding schemes that use TrustMark™ approved SME Delivery Entities. By allowing the HRP a default fall back choice that can potentially inspire greater trust than SMEs, that adheres

to the highest quality levels (without profit being the primary driver), would it drive greater installation rates? What would be the consequences to the local economy and employment market?

As a sub-question consideration could be given to asking should such a scheme could follow a combination of Irish one-stop energy shops and Home Energy Scotland's local show-home network.

Whilst the Green Home Finance Accelerator (DESNZ, 2023) research program has yet to report on private capital loans for the HRP, consideration may also be given to Local Authority provided low-interest, long term, loan structures funded from the National Infrastructure Bank. These would be accessible, by default, to the HRP meaning they do not have to use SME-provided funding sources or find their own. This approach would follow the recent funding platform example agreed by the Strategic Banking Corporation of Ireland (SCBI, 2024) to be used by Irish HRPs via the One-Stop Shops.

7.5. Implications and practical application potentials

This section provides three illustrations and discusses implications of the research for each of the key three stakeholder entities, offering a vision of an impactful approach to energy efficiency retrofit and how it would affect them all. The section closes with a holistic statement of the current challenges faced to achieving retrofit of UK homes.

7.5.1 Governance entity implications

Philosophically, Governance Entities externalise responsibility for delivery of energy efficiency to the SME marketplace but provide minimal direct support to the HRP nor the SME. The role of trusted messenger is not effectively fulfilled by Governance Entities and the HRP does not feel supported to act. There is a need for better understanding of whom the HRP is, and specifically whom the decision maker is (as they may not be one and the same) to allow better understanding of drivers and barriers for both the HRP, in terms of accessing appropriate support, and for SMEs who are trying to provide it if Governance Entities continue not to do so. Effectively there is a lack of appropriate, targeted and engageable marketing of benefits to the HRP nor follow-up support structures to enable behaviour change if the HRP does indeed decide to act.

Key areas to address here are the concepts of the HRP as an age-specific and correctly gendered group with the related neuro-economic effects this may have. This would then link to the role of non-financial benefits for this older group and appropriate marketing campaigns based on behavioural economics using trusted messengers whom they will engage with and approve of. The challenge of the HRP being more likely to also be a Conservative voter (McDonnell & Curtis, 2019) has clearly skewed how the situation has been addressed, with no requirement at all for this group to take action to upgrade their homes energy efficiency at present, nor in the near future. This leads to an undeniable risk that for this demographic group – the largest category of property tenure type in England, the outright owner-occupier – that the lack of appropriate engagement, motivation and support will leave them stranded in increasingly lower grade homes compared to the norm which will continue to have effects on their health, wealth and lifespan.

To achieve the successfully delivery of all suitable recommendations, along with appropriate funding structures, an independent Cabinet level Office outside of the DESNZ could be created that has its own regulatory authority, financial controls and oversight to allocate central funding to regions. Within this model, it would be effectively outside of politics and the five-year electoral cycle and would exist for a specific purpose, being staffed by experts, specialists and scientists and informed by internally-ran delivery bodies specialising in public education, marketing and behavioural economics. A key purview of this office would be to decarbonise housing stock, not to make a profit for the government, nor specifically for business. Profit (in the form of tax or reduced budget spending), if made, is a by-product not a focus from a Governance perspective and SMEs are allowed to look after their own margins following a free-market economy principle.

This separation of responsibility from political governance conforms with the current delivery ethos as it distances the present or future government from things that may be less palatable to their voting core. As such it would in the minds of citizenry be more akin to a body like OFGEM but in practice would wield real political, regulatory and financial power to affect the retrofit market. From the perspective of the government, they could either distance themselves from it or claim responsibility for victories as appropriate with no political risk to themselves. Initial seed funding would come from the National Infrastructure Bank which was set up to support this very purpose and holds £22billion of capital at present. Future running and investment costs could come from cross sector savings identified by a research review into delivery models.

Finally, in support of the delivery mechanism above, greater initial investment into research, be it academic, engineering or business innovation, is recommended. This extends to publicly owned start-ups being made to come into the delivery market to set the standards and meet the pressing needs which could be then spun off at profit to the taxpayer.

7.5.2. Delivery entity implications

The Delivery Entities (SMEs) are overwhelmingly constituted of small SMEs or sole traders who do not, in many cases, have the internal resources or knowledge to offer the appropriate levels of support required by the HRP to take positive action. Providing any services to householders on energy efficiency beyond what helps to create and consolidate the sale of their services potentially risks losing the primary sale which is their ultimate aim. This philosophical driver for profit underpins all SME actions and is a key barrier to the HRP getting appropriate support, information and product recommendations from the Delivery Entities currently in place. The large nationwide installation companies are the most untrusted along with the politicians however, SMEs do not engender much trust as many interview participants recognise their profit incentive. Access to accurate, useful, accessible, understandable, engageable and impartial information, that is clearly for the best interest of the HRP, is an area of support that the Delivery Entities would benefit from as they struggle to achieve this themselves in most cases as they are rarely a holistic deep retrofit company offering the complete marketplace of solutions with appropriate financing options.

In terms of implications for the energy efficiency retrofit construction industry, this would be a time equivalent to the disruption caused by the ‘dot.com’ revolution where some older, smaller or less agile companies may find it challenging to compete with those that take advantage of the new support structures and engagement tools recommended above being provided by the newly invigorated Governance Entities through the proposed Cabinet Office for domestic retrofit. Cleary support must be given to allow a just transition to a new paradigm of greater opportunity; however, not all SMEs will want to be engaged appropriately. Although having the opportunity and the ability to provide a fair product or service at a fair rate to more, and more engaged, customers should far outweigh any perceived downside. The greater market size should mean that there is opportunity for all to prosper and where one client may prefer to spend their resources on one aspect of retrofit for their home (as might be communicated through a digital passport) another may prefer to spend elsewhere. Having a better-informed client base making better decisions is not a net loss to individual niche installer companies as there are more clients to go

around. The provision of Local Authority provided low-cost, long-term loans for energy efficiency retrofit could greatly remove barriers to uptake by the aged HRP population and facilitate a sales boom in the market place once benefits are appropriately identified and marketed.

It is likely there would be a growth of independent, third-party professional surveyors or building engineers to provide trusted reports as part of a digital home energy passport scheme. This would allow the SMEs to use them as trusted messengers and go back to doing what most do best – installing suitable hardware. Those still reaching out with more direct marketing would benefit from the HRP personae profiles and support being provided by the Governance Entities and would find it easier to identify their needs and meet their desires in ways that the HRP will respond to.

7.5.3 Decision-making entity implications

One of the key areas of challenge for the Decision-Making Entities (HRP) is that they are mostly not aware of any suitable strong motivators to engage them with upgrade of their home beyond what they have historically done. At this stage of their life energy efficiency upgrades are not particularly engaging for their own rights but may be done as part of other renovation works. They live in a bounded rationality of foreshortened time horizons which affects their perception of value for money and fear of loss, especially around novel, less understood, areas or products. With fixed or limited resources in terms of capital reserves or monthly budget (and potentially few opportunities to increase them) risks and choice effects are magnified. This is further exacerbated by the loss of affective decision-making caused by neuro-economic effects in this aging populus. With a “make-do and mend” post-war mindset and relatively comfortable living standards, there is little motive to act, and knowledge of any potential benefits is low. Even if the HRP did feel strong motivation, they now feel less able to find trusted installers and are challenged with the ability to compare new technologies to existing ones and to perceive a positive outcome being achieved. As such, they satisfice rather than optimise and are likely to maintain the status quo using heuristic shortcuts for future decision-making based on these principles. Their philosophical driver is predominantly a good quality of life at this stage with many being in a state of managed health conditions, and even though they may be aware of social norms around the need for action to fight global heating, this often does not translate into personal action as it is remote and does not outweigh their fear of loss combined with their lack of understanding of potential personal benefits.

In contrast, the ideal scenario for the HRP's experience of energy efficiency retrofit is one in which their recognised needs are being met with proven information provided by trusted messengers whom they engage with. Their lives would feel improved, and their comfort levels increased, with themselves healthier and living longer with no impact on their current capital reserves nor monthly cashflow. Life has never been so good in terms of running a house.

Practically, there is little expected of this stakeholder in terms of what they should do. It is up to the Governance Entities and Delivery Entities to identify their needs and meet them in ways which provide better choice architecture to them, with removal of sludge and barriers, and appropriate social marketing to make the upgrades desirable with recognition of benefits. It is unrealistic to expect the current HRP to reach out for help on retrofit when they currently do not perceive a benefit, are happy with the status quo and have many internal and external barriers to acting. Recognition of this group as a specific sub-section of society and consequent treatment thereof is not a bad thing and they are used to preferential treatment as exemplified by the triple lock on pensions. If the results mean that owner-occupiers also happen to decarbonise their homes at the same time as they receive comfort and lifestyle benefits, they will not be opposed.

Regulations may need introducing as the result of future research recommendations around meeting legal carbon reduction targets; these may be unpopular, as this group is unused to not getting their way politically. However, with suitable support structures in place and no exemptions (i.e. perceived to be universal and so equitable), then there is likely limited pushback. Support will be more likely once the first few retrofits are completed in each locality and the received benefits and story of the householders' easy and successful journey is shared to prospective HRPs considering retrofit.

7.5.4 Overview of implications

If the status quo holds and no further useful action is taken beyond business as usual it is extremely unlikely that English homes will hit the legally binding decarbonisation targets for the group of householders that this thesis focuses upon – if not nigh on impossible. At the present rate, England has no chance of meeting retrofit targets of all homes to have a C rated EPC (where practically possible) by 2035 - it will not even be a near miss. Millions of older citizens will continue to live in less efficient homes than they could have, with all the consequences this will have to them in terms of reduced health, comfort, lifespan and monthly spending power. The knock-on effects to the UK Budget in terms of NHS costs, social care costs, reduced economic growth in the construction industry (and so reduced

tax yield), is hard to quantify without an in-depth study. However, the collective pool of money both saved and raised would likely be in the billions of pounds sterling a year and it could well be ringfenced to be invested back into this area to create a positive feedback loop if there were political will to do so.

The current philosophical mantra of valuing economic benefits over non-financial ones, and consequently offering incentives then measuring success primarily in just economic terms, will doom the current system to failure. Current levels of engagement will not increase to the levels required by themselves without direct intervention that disrupts the present business as usual model.

There needs to be significant change in all stakeholder areas, with understanding that the HRP themselves are never going to actively reach out for greater energy efficiency in their homes purely on their own initiative at the scale required. Governance and Delivery Entities need to change to create the appropriate sludge-free environment and support an increase in desires if this sector is not going to be both regulated for and then enforced.

If the recommendations in this thesis are followed, then there is hope for a cleaner and better future where nobody has to lose in the process, and it would result in the improvement of circumstances for all.

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Appendices

Appendix 1 - Rotary survey questions and aims.

No.	Question/request.	What I am trying to find out.
Demographic questions to test if the government idea of the owner-occupier profile is correct.		
1	I consent to complete the survey and am happy with the way my data will be used.	Permission approval.
2	Type of ownership - is your home mortgaged or owned outright?	Do they own outright or have a mortgage?
2a	How many years have you lived there?	To show likelihood of stagnancy. Check English Household Survey and Household Reference Person data for recorded trends and analyse – people upgrade more often when moving in or out of a property.
3	What is your gender?	What is their gender status? Can we see trends affecting decision-making for Owner-occupier? This provides data for future research.
4	What is your ethnicity?	Ethnic background to check Household Reference Person.
5	Age group?	How old are they? Can we see trends affecting decision-making for Owner-occupier? This provides data for future research
6	Are you retired?	Are they retired? This may indicate a fixed income and issues around ability to earn more or access loans as desired/required.
7	What is your religion?	To find publicly and socially stated religious affiliation. Tests English Housing Survey and Household Reference Person accuracy.
7a	Please describe.	Open text response to identify non-standard responses.

7b	Do you consider yourself actively religious, or do you tick the box on a survey out of habit or tradition?	Are social norms and conditioned responses skewing government expectations? Do politicians build policies for the wrong “value set” that they think people have?
8	Who do you live with?	Are they alone, with a partner, or with family? This may impact expendable income.
8a	Please describe.	Open text response to identify non-standard responses.
9	Do you have a long-term illness or disability?	This affects COM-B factors and may also indicate financial constraints as well as ability to interact with upgrade outcomes.
Your home and information regarding previous energy efficiency decisions.		
10	How satisfied are you with this accommodation? This may include areas such as comfort, running costs, practicality, ease of maintenance etc.	Checks English Housing Survey results for Owner-occupiers emotions and is a good indicator of likelihood to improve Energy Efficiency or not.
11	Who authorises (potentially after discussions) financial decisions around whether you choose to install an energy efficiency measure?	Checking the government HRP statement around home ownership with the Household Reference Person making the decisions e.g., an assumption that only the men make the decision for example since they are the predominant Household Reference Person. Is there more government research into this and policy guidelines around this in the same vein as the Green Book?
12	Have you ever engaged in home DIY or had work done by a company for the purposes of increasing energy efficiency? Such as insulation, double / triple glazed windows, more efficient boiler etc.	Experience check – the best indicators of future actions are those taken in the past not those stated/intended. Aligns with the theory of Value/Action Gap.
12a	If so, what was it?	Quantitative information and data of previous work undertaken – can show trends in preferences – good information for further investigation as to why.
12b	What motivated the decision to install an energy efficiency measure?	Both quantitative and qualitative data collection around emotionally driven decision-making.
12c	What, if anything, would you like to have seen done differently?	Data to show if Owner-occupiers were happy with the service provision and choices offered by SME in addition to larger systemic issues potentially being highlighted such as funding or payback/value concerns.
Knowledge of, and opinions around, government policy, trust and current engagement/delivery methods.		

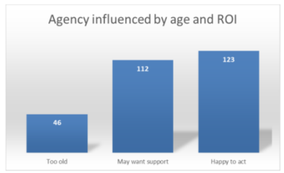
13	Are you aware that reaching Net Zero Emissions by 2050 is a legal requirement for the UK?	Knowledge and education check – how well is messaging reaching its intended target?
13a	How important do you feel this is?	Looking to see if there is a creation of a social norm as a default narrative. Following rule of law is a minimum requirement for any societal system change or regulation.
14	Do you trust governments to place the needs of the nation above the interests of their own political party?	Trust is a key issue as to whether people will take action on a subject when encouraged if no enforceable regulation exists. Is the government the correct messenger?
14a	Does this affect whether you feel that you should follow government recommendations?	Quantitative data to support previous question – provides supporting evidence of the need for a new (or potentially revised) engagement and marketing strategy.
15	Are you aware of any UK government policies on energy efficiency within the home?	Seeks to understand the market penetration of government engagement campaigns that might influence policy uptake – if people do not know something exists…
16	Do you think government announcements encourage Owner-occupiers to increase their home energy efficiency?	Quantitive data on how impactful the message is if received – does it align with their values and create a motivational effect?
17	Do you think Government policies support Owner-occupiers to increase their home energy efficiency?	Quantitive data on much buy in and belief they have in the support being offered, even if the message aligns with their belief structure and creates desire to take action. In essence – are the polices felt to be effective?
18	Who, potentially including the Government, do you feel offers you support and encouragement towards increasing your home's energy efficiency?	Seeking to find opinions on who else both provides support and has effective messaging and engagement strategies – is there a best practice provider/method that appears to be recognised. If so, is it because they are regulated to do so? E.g., Local Authorities?
18a	Do you trust businesses to put your best interests ahead of theirs?	As a subset of offered choices these are the only ones that are profit motivated – even with this inherent philosophical driver, do they trust the business to put the consumers interests first? Investigating profits and philosophy – SME v state service providers.
19	"Receiving positive government support makes it more likely that I will improve the energy efficiency of my home." Do you agree? – (Likert scale)	Seeking to find strength of support for positive case studies/information/communication as a narrative style of engagement rather than purely factual releases.
19a	If you agree, what form would you like to see this take for you?	Free text responses to gain qualitative data on desires. Seeking to find new emergent trends or confirm support for traditional issues such as “Funding”, in addition to potentially learning of preferred communication methods.
Beliefs & opinions – what you feel, why and your priorities.		
20	With a warming planet, do you believe that society needs to take action to prevent further temperature increases? I.e., that there is a current climate crisis?	Baseline for Value/Action gap analysis. Sets up a further research question of “do you not see yourself as part of society if you have stated that you will not improve the Energy Efficiency of your home?”

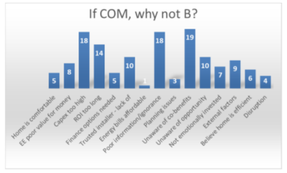
21	Do you believe that by making homes more energy efficient it would help limit any future temperature increases in our climate?	Supports previous further research question of asking belief in relationship between Energy Efficiency, home ownership and responsibility.
22	Do you believe that your quality of life is the most important thing to you on a day-to-day basis?	What is the underlying thing that supports their mental model/value structure in the Iceberg Principle of their systems thinking when it comes to the events we see?
22a	If quality is not the most important thing, what is?	Free text responses to gain qualitative data on desires. Seeking to find new emergent trends or confirm support for traditional issues such as health or money.
23	"Installing energy efficiency measures into homes could contribute to a longer life" - Is this something that you believe? (Likert scale)	Seeking understanding of consumer awareness of benefits other than standard financial message provided by government. Starting to consider the perezhivanie concept as a delivery narrative in the persona model output.
24	"Installing energy efficiency measures into homes could contribute to a healthier life?" - Is this something that you believe? (Likert scale)	Seeking understanding of consumer awareness of benefits other than standard financial message provided by government. Starting to consider the perezhivanie concept as a delivery narrative in the persona model output.
25	What importance do you personally place on the need to improve the energy efficiency of your home? (Likert scale)	Baseline for Value/Action gap analysis. Adds to question 21 + 22. Separated so that one did not lead to another to allow it not to be led but considered individually. Allows follow on question of what measures they prefer to install if they feel it is important.
Decision-making influences and practical implementation questions.		
26	Rank in order what is important to you when deciding to install energy efficiency measures?	Further information on decision-making process and motivations driving the choices made when the behavioural change decision is taken.
26a	When initially considering installing an energy efficiency measure how important is the opinion of others?	Is there a social element to the decision-making process that is not captured and addressed in the current information-based policy delivery/engagement mechanism?
26ai	Whose opinion in particular matters, if anyone's, and why?	Free text responses looking for more data to check/challenge the government assumption that the Household Reference Person is making the decision and if it is being influenced, if so by whom. In addition to looking for trends in this can we establish trends of why they listen to those particular people?
27	If you were given case studies of local homeowners successfully upgrading their homes - who had previously faced the same challenges as you do now - would this encourage you to improve your own home?	Looking for specific support for the idea of a narrative story engagement tool that is factually based showing the hero/learning arc of demographically/geographically located relatable Owner-occupiers as a tool for empowerment towards behaviour change.
27a	How encouraged would you feel? (Likert scale)	Looking for some quantitative data to apply to the positive answers for the previous question allowing for more nuanced analysis.

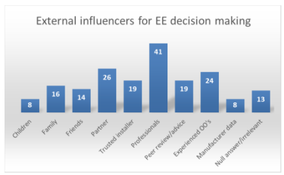
28	How confident are you that you have the capability necessary to plan and deliver a project to install an energy efficiency measure? (Likert scale)	Specifically checking against COM-B elements but also setting up follow on question to barriers. Allows later sub-section analysis of statistics/demographics/barrier in further research.
28a	Please tick all that apply: What are the barriers to you feeling capable to take action?	Providing granular data for specific reasons why the negative sub-sect from 28 do not take action at present – what opportunities does this afford government in policy making or engagement methods to address these issues?
29	Is your age influential on your likelihood of installing an energy efficiency measure, i.e., you may feel that you won't get value for money?	Seeking to understand if the current policy style of financial incentives is misaligned with a significant percentage of the Owner-occupier market? Will it indicate that more non-financial benefits driven engagement would be of greater efficacy for a significant proportion?
29a	Would knowing that you might achieve additional benefits rather than just financial help remove that barrier? Such as increased comfort, lifestyle, health, lifespan and future provision for family?	Follow up to previous question that builds upon belief questions 22,23,24. Asked later as this is not a belief question but an influence question to guide data used to establish support may be leveraged later to create narrative arcs that support this statement.
29ai	How much would this influence your decision to go ahead with an energy efficiency measure? (Likert scale)	Looking to establish weight of perceived influence on those who responded positively to question 29a.
30	Please tick all that apply: When thinking of your home and installing an energy efficiency measure in the future, do you feel that: (COM-B check).	This question literally asks if the respondents feel agency to respond positively to the three separate components of COM in the COM-B framework. This should allow establishment of a practical over-arching percentage of Owner-occupiers who will take action to improve their energy efficiency. E.g., 53.4% of them would. This can be extrapolated to larger society. Facilitates creation of Value/Action Gap report analysis.
30a	If you ticked all three boxes and an opportunity currently exists, why haven't you done so yet? Especially if it is to your benefit to do so?	Free text responses looking for more data to establish why, if 53.4% of respondents say they could take action, they have not to-date. Awareness needs to be had of the fact that there is a pro-environmental value held by respondents than the average person as indicated by the amount who have said that they have installed solar compared to FiT installation reports when compared to the number of UK properties.

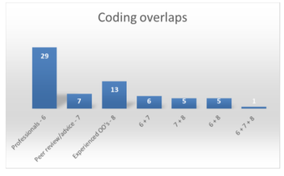
Appendix 2 - Mind Map image of survey results

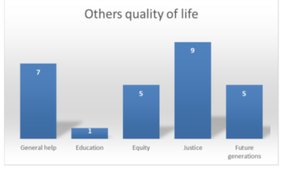
Mind map of Rotary survey questions with data - clockwise from top right

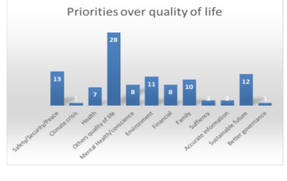


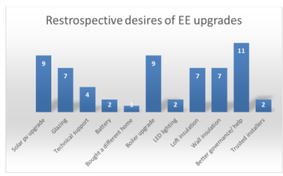


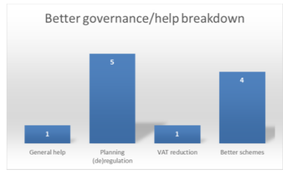


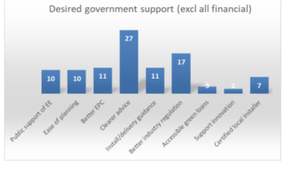


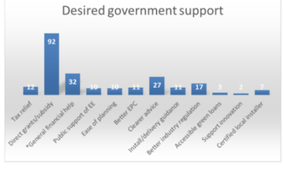












- Survey analysis sectors
  - Demographics questions
    - Type of ownership - is your home
      - Mortgaged 14.0%
      - Owned Outright
    - How many years have you lived there?
      - Mean 23.4
      - Median 22
      - Mode 20
    - What is your gender?
      - Male 79.0%
      - Female 21.0%
    - What is your ethnicity?
      - White 98.3%
      - Mixed/Multiple Ethnic 0.3%
      - Asian/Asian British 0.3%
      - Black/African/Caribbean/Black British
      - Other 1%
    - Age group
      - sub 30 0.3%
      - 31-35 0%
      - 36-40 0.3%
      - 41-45 1.7%
      - 46-50 1.7%
      - 51-55 4.5%
      - 56-60 4.9%
      - 61-65 10.1%
      - 66-70 18.5%
      - 71-75 28.7%
      - 76-80 13.3%
      - 80+ 15.7%
    - Are you retired?
      - Employed 25.5%
      - Retired 74.5%
    - What is your religion?
      - Christian 72.7%
        - Are you actively religious
          - Yes 46.3%
          - No 53.7%
      - Atheist 24.5%
      - Other 2.49%
    - Who do you live with?
      - Single 16.1%
      - Couple 74.8%
      - Family 7.7%
    - Do you have a long term illness or disability? Self-defined.
      - Healthy 78.0%
      - Long term illness 22.0%
  - Home and previous energy efficiency decision making
    - How satisfied are you with this accommodation? This may include areas such as comfort, running costs, practicality, ease of maintenance etc
      - Very satisfied 54.2%
      - Fairly satisfied 29.7%
      - Neutral 5.6%
      - Slightly disatisfied 4.5%
      - Very disatisfied 5.9%
    - Who authorises (potentially after discussions) financial decisions around whether you choose to install an energy efficiency measure?
      - Joint decisions 63.3%
      - You (Avatar HRP) 34.3%
      - Partner/other 2.4%
    - Have you ever engaged in home DIY or had work done by a company for the purposes of increasing energy efficiency? Such as insulation, double / triple glazed windows, more efficient boiler etc.
      - Yes 88.1%
        - What were they?
          - Loft Insulation 77.8%
          - Double/Triple glazing 66.7%
          - Boiler upgrade 65.1%
          - CWI 38.9%
          - Draft excluders 29%
          - Solar panels 20.2%
          - EWI 8.3%
          - Solar gain 4.4%
          - Creating shade 3.6%
          - Ventilation 3.2%
          - ASHP 1.6%
          - Passive cooling design 0.0%
      - No 11.9%
        - What motivated the decision to install an energy efficiency measure?
          - Expected comfort 79.4%
          - Expected financial benefits 79.4%
          - Environmental and climate concerns 42.5%
          - Lifestyle benefits 25%
          - To help society be cleaner 13.1%
        - What, if anything, would you like to have seen done differently?
          - Thematic coding 1 - retrospective desires
  - Achieving Net Zero & government support.
    - Are you aware Net Zero is a legal requirement?
      - Yes 88.1%
        - Level of importance
          - Extremely important 28.2%
          - Very important 30.2%
          - Quite important 16.7%
          - Moderately important 12.3%
          - Slightly important 5.6%
          - Not very important 3.6%
          - Not at all important 3.6%
      - No 11.9%
    - Do you trust governments to place the needs of the nation above the interests of their own political party?
      - Almost never 26.6%
      - Some of the time 54.9%
      - Most of the time 17.1%
      - Almost always 1.4%
      - Does this affect whether you feel that you should follow government recommendations?
        - Yes 60.8%
        - No 39.2%
    - Are you aware of any UK government policies on energy efficiency within the home?
      - Yes 65.4%
      - No 34.6%
    - Do you think government announcements encourage Owner Occupiers to increase their home energy efficiency?
      - Yes 51.8%
      - No 48.2%
    - Do you think Government policies support Owner Occupiers to increase their home energy efficiency?
      - Yes 27.4%
      - No 72.6%
    - Who, potentially including the Government, do you feel offers you support and encouragement towards increasing your home's energy efficiency?
      - No one 44.2%
      - Local Councils 31.6%
      - Direct Government 29.5%
      - Charities and other NGO's 15.4%
      - Local Businesses 12.6%
        - Do you trust businesses to put your best interests ahead of theirs?
          - Yes 19.4%
          - No 41.7%
          - Dont'know 38.9%
      - Other 9.8%
    - "Receiving positive government support makes it more likely that I will improve the energy efficiency of my home."
      - Strongly agree 14%
      - Agree 28%
      - Mostly agree 24.9%
      - Neither agree nor disagree 17.8%
      - Mostly disagree 4.5%
      - Disagree 3.1%
      - Stongly disagree 3.1%
    - If you agree, what form would you like to see this take for you?
      - Thematic coding 2 - desired government support
- Drivers and barriers
  - When thinking of your home and installing an energy efficiency measure in the future, do you feel that:
    - Thematic coding 5 - if COM, why not B?
      - 63.3% Capability
        - If you ticked all three boxes and an opportunity currently exists, why haven't you done so yet? Especially if it is to your benefit to do so?
        - I think I could either do it myself or organise the installation
      - 54.2% Opportunity
        - I could / can recognise an opportunity to do so
      - 53.5% Motivation
        - I feel that I would / do want to improve my energy efficiency
  - How much would this influence your decision to go ahead with an energy efficiency measure?
    - 4.1% Extremely influential
    - 9.2% Very influential
    - 34.4% Quite influential
    - 31.3% Moderately influential
    - 17.4% Slightly influential
    - 3.1% Not very influential
    - 0.5% Not at all influential
  - Would knowing that you might achieve additional benefits rather than just financial help remove that barrier? Such as increased comfort, lifestyle, health, lifespan and future provision for family?
    - 69.0% Yes
    - 31.0% No
  - Is your age influential on your likelihood of installing an energy efficiency measure, i.e you may feel that you won't get value for money?
    - 4.5% Extremely influential
    - 11.9% Very influential
    - 27.6% Quite influential
    - 12.2% Moderately influential
    - 14% Slightly influential
    - 15.4% Not very influential
    - 14.3% Not at all influential
  - Please tick all that apply: What are the barriers to you feeling capable to take action?
    - 71.1% Finding trusted installers
    - 66.4% Getting value for money
    - 56.3% Upfront cost
    - 45.5% Knowledge of financial support
    - 44.8% Knowledge of process
    - 27.1% Disruption
    - 25.6% Not understanding new technology
    - 15.5% Lack of access to finance
    - 10.5% Digital skills
    - 8.3% Mobility/Health
    - 6.5% Communication
    - 4.0% Other
    - 2.9% Isolation
  - How confident are you that you have the capability necessary to plan and deliver a project to install an energy efficiency measure?
    - 9.4% Extremely confident
    - 22.4% Very confident
    - 22.7% Quite confident
    - 20.3% Moderately confident
    - 9.4% Slightly confident
    - 10.1% Not very confident
    - 5.6% Not at all confident
  - How encouraged would you feel?
    - 4.2% Extremely encouraged
    - 12.1% Very encouraged
    - 44.4% Quite encouraged
    - 23.4% Moderately encouraged
    - 15.4% Slightly encouraged
    - 0% Not very encouraged
    - 0.5% Not at all encouraged
  - If you were given case studies of local homeowners successfully upgrading their homes - who had previously faced the same challenges as you do now - would this encourage you to improve your own home?
    - 75.2% Yes
    - 24.8% No
  - When initially considering installing an energy efficiency measure how important is the opinion of others?
    - 1% Extremely important
    - 9.4% Very important
    - 22.4% Quite important
    - 16.4% Moderately important
    - 17.1% Slightly important
    - 17.5% Not very important
    - 16.1% Not at all important
    - Thematic coding 4 - external influencers for EE decision making
    - Whose opinion in particular matters, if anyone's, and why?
  - Rank in order what is important to you when deciding to install energy efficiency measures.
    - 40.2% Potential savings
    - 30.4% Helping the environment
    - 14.7% Increased comfort
    - 10.8% Better Health Outcome
    - 3.8% Help make society cleaner
- Beliefs
  - What importance do you personally place on the need to improve the energy efficiency of your home?
    - 9.8% Extremely important
    - 25.9% Very important
    - 32.2% Quite important
    - 16.4% Moderately important
    - 9.8% Slightly important
    - 5.6% Not very important
    - 0.3% Not at all important
  - Installing energy efficiency measures into homes could contribute to a healthier life?
    - 8% Strongly believe
    - 18.5% Believe
    - 25.9% Mostly believe
    - 33.6% Neither believe nor disbelieve
    - 5.9% Mostly disbelieve
    - 6.3% Disbelieve
    - 1.7% Strongly disbelieve
  - Installing energy efficiency measures into homes could contribute to a longer life?
    - 5.9% Strongly believe
    - 14.7% Believe
    - 17.1% Mostly believe
    - 43.7% Neither believe nor disbelieve
    - 9.1% Mostly disbelieve
    - 6.6% Disbelieve
    - 2.8% Strongly disbelieve
  - Do you believe that your quality of life is the most important thing to you on a day-to-day basis?
    - 76.6% Yes
    - 24.2% No
    - Thematic coding 3 - priorities over quality of life
    - If quality is not the most important thing, what is?
  - Do you believe that by making homes more energy efficient it would help limit any future temperature increases in our climate?
    - 76.6% Yes
    - 12.6% No
    - 10.8% Dont know
  - With a warming planet, do you believe that society needs to take action to prevent further temperature increases?
    - 87% Yes
    - 6.7% No
    - 6.3% Dont know

Appendix 3 - Rotary Interviews slide pack

The primary questions were asked first and in the slide notes for the interviewer there were set explanations to use to ensure that all people had the same information provided as well as subsequent follow up question examples to ask to prompt more information if a suitable response was not originally elicited.

Pre-interview survey.

We would like a snapshot of your opinion on the current energy price rises – This is in the format of :

There are 6 short questions – the link for this is now in your chat box.

The link to the MS Forms questionnaire is: **https://forms.office.com/r/nzFumnw2xd**

Question 1.

What do you think are the financial benefits are of improving home Energy Efficiency?

Such as insulation, modern heating systems like air source heat pumps and power generation such as solar panels and batteries?

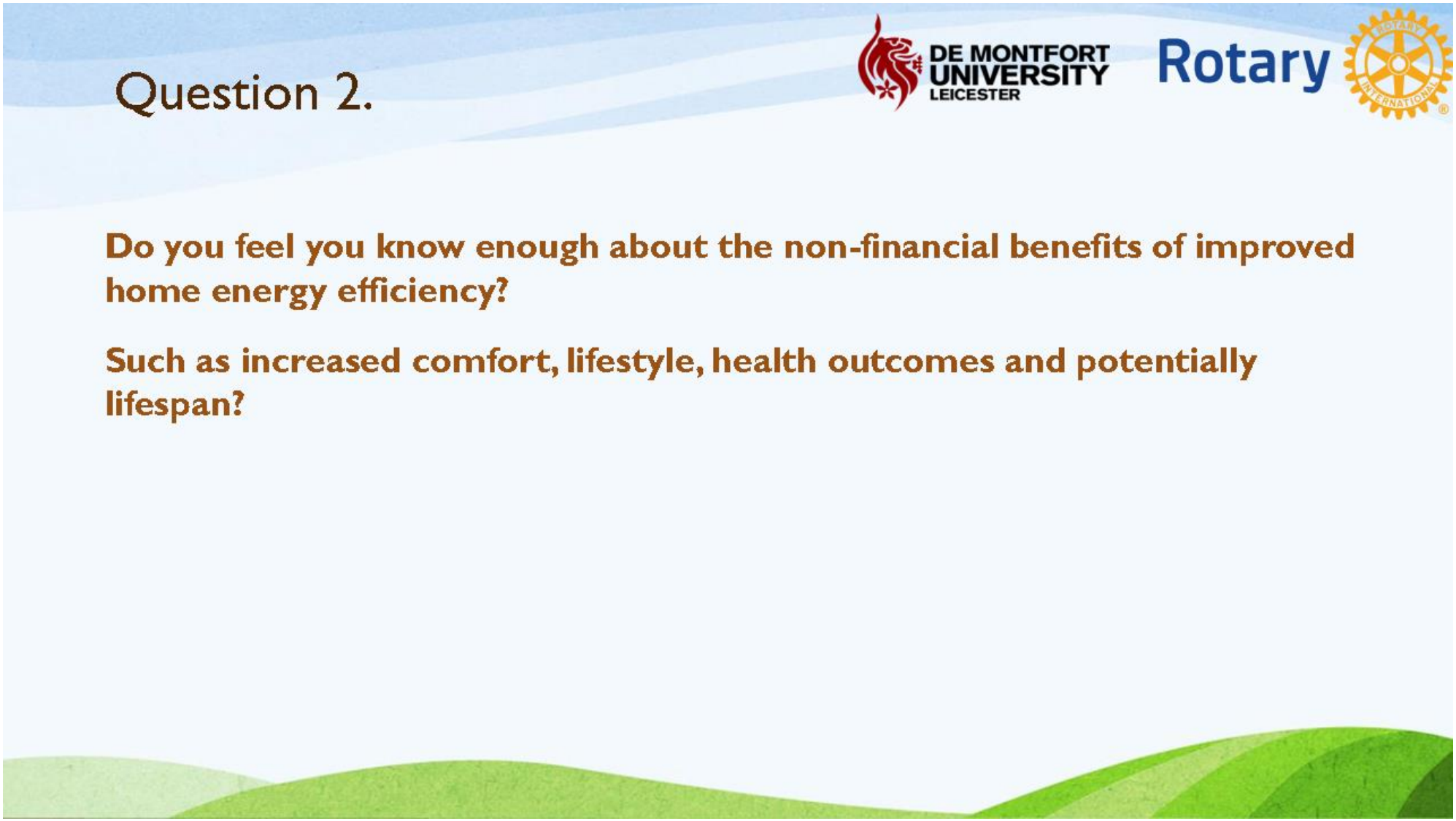
Q1 explanation - Imagine you were thinking of upgrading your heating system, do you feel it may make a difference to your household running cost?

Do you feel the benefits you have mentioned apply to your own home?

How would you think through the finances around this? (Who, when, where, what and how etc)

Do you feel that improving your home's Energy Efficiency would increase the value of your home?

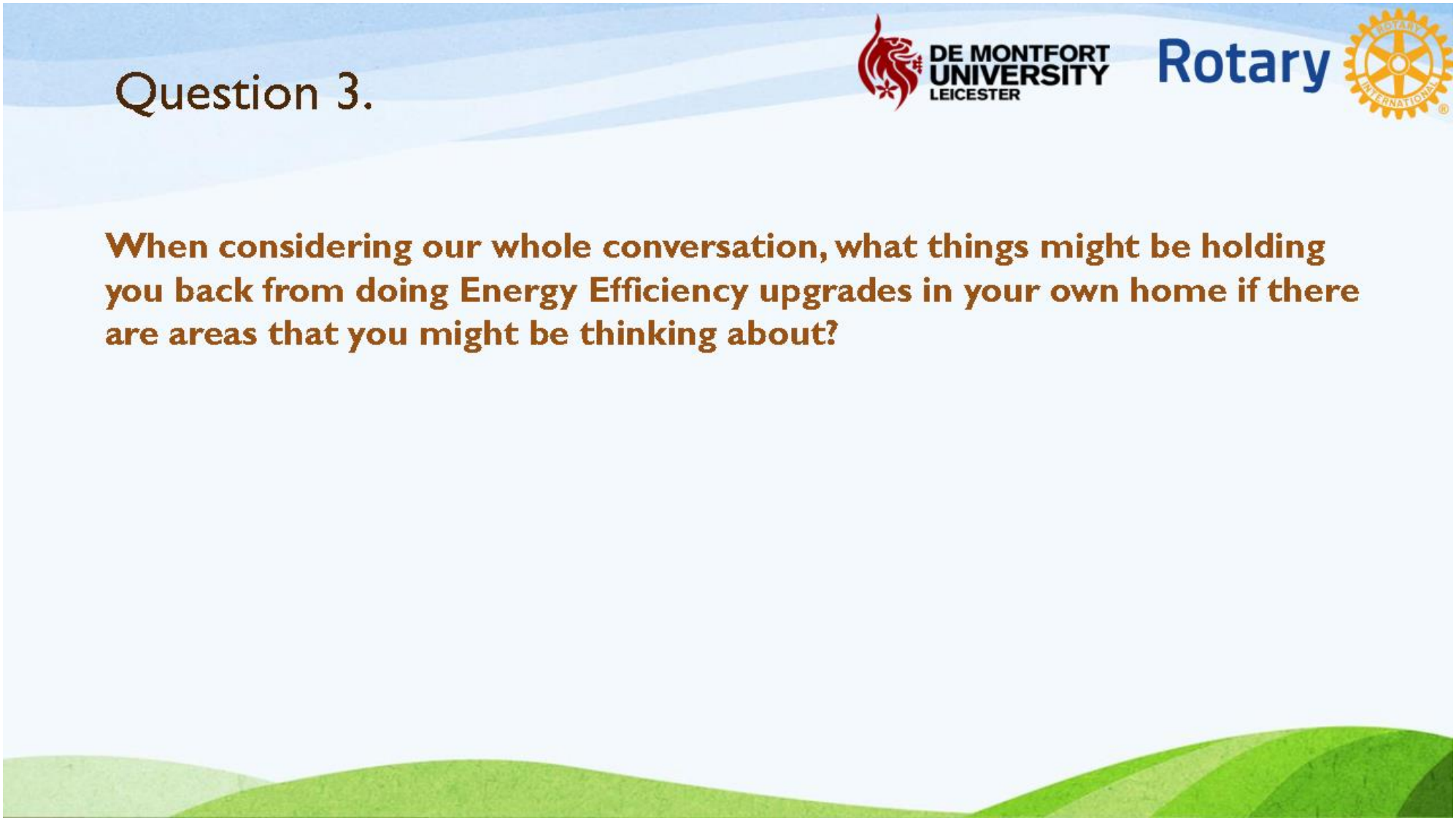
Did they say something specific in the pre-interview questionnaire that is worth following?



Q2 explanation – Imagine upgrading your homes heating system so that it gave a more enjoyable and stable temperature in the home no matter the weather outside – it kept you snug. Are you aware of any benefits this may give you along the lines of comfort, better health (especially as we age) and potentially longer lifespan compared to traditional UK systems?

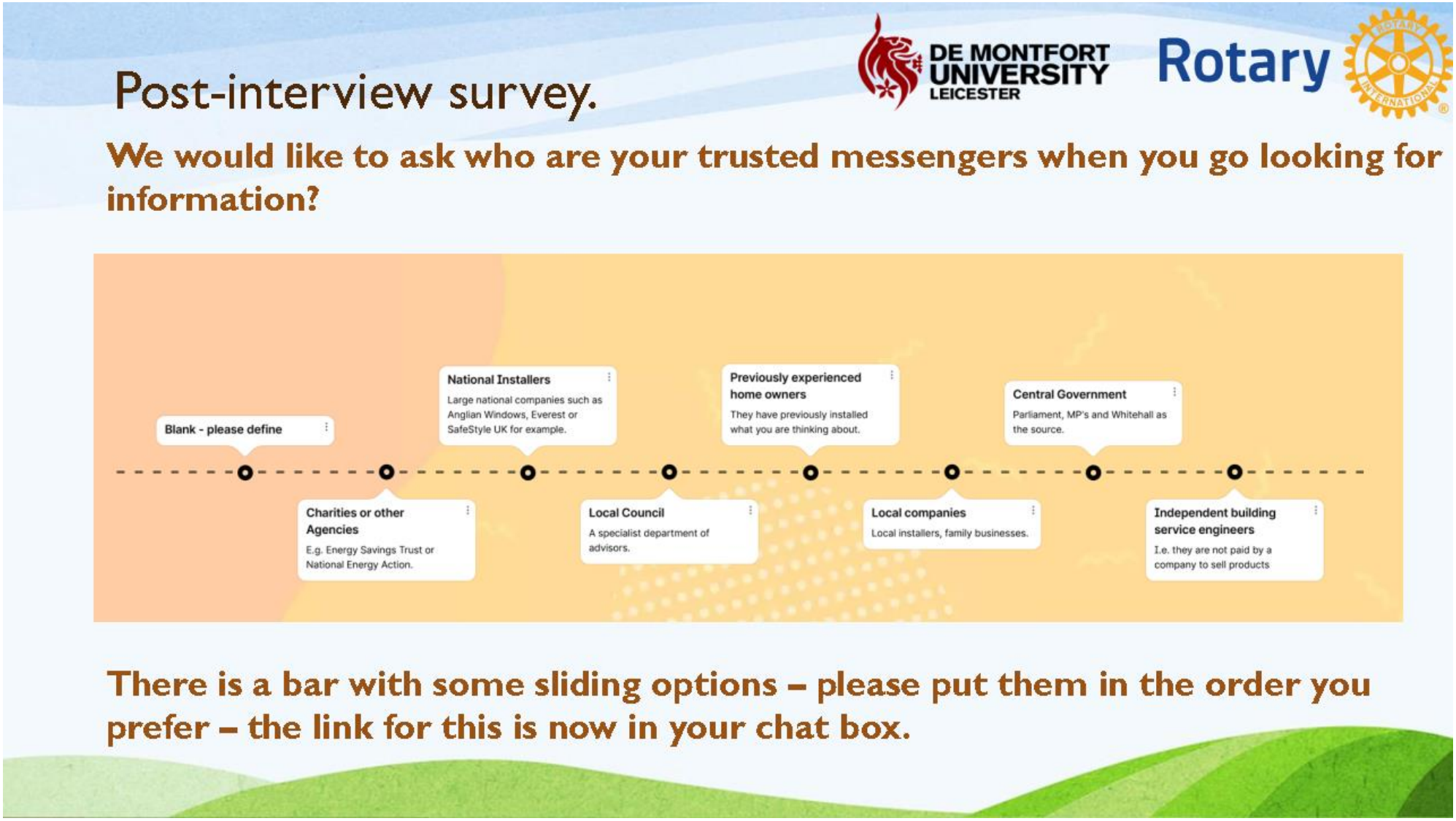
Who would be your most trusted messenger if they were to tell you this?

Who do you feel should be responsible for your energy efficiency upgrade cost and why?



Q3 explanation – Broadly these might include, but are not limited to, areas such as knowledge of options, financial considerations, finding trusted partner to engage with… along those lines.

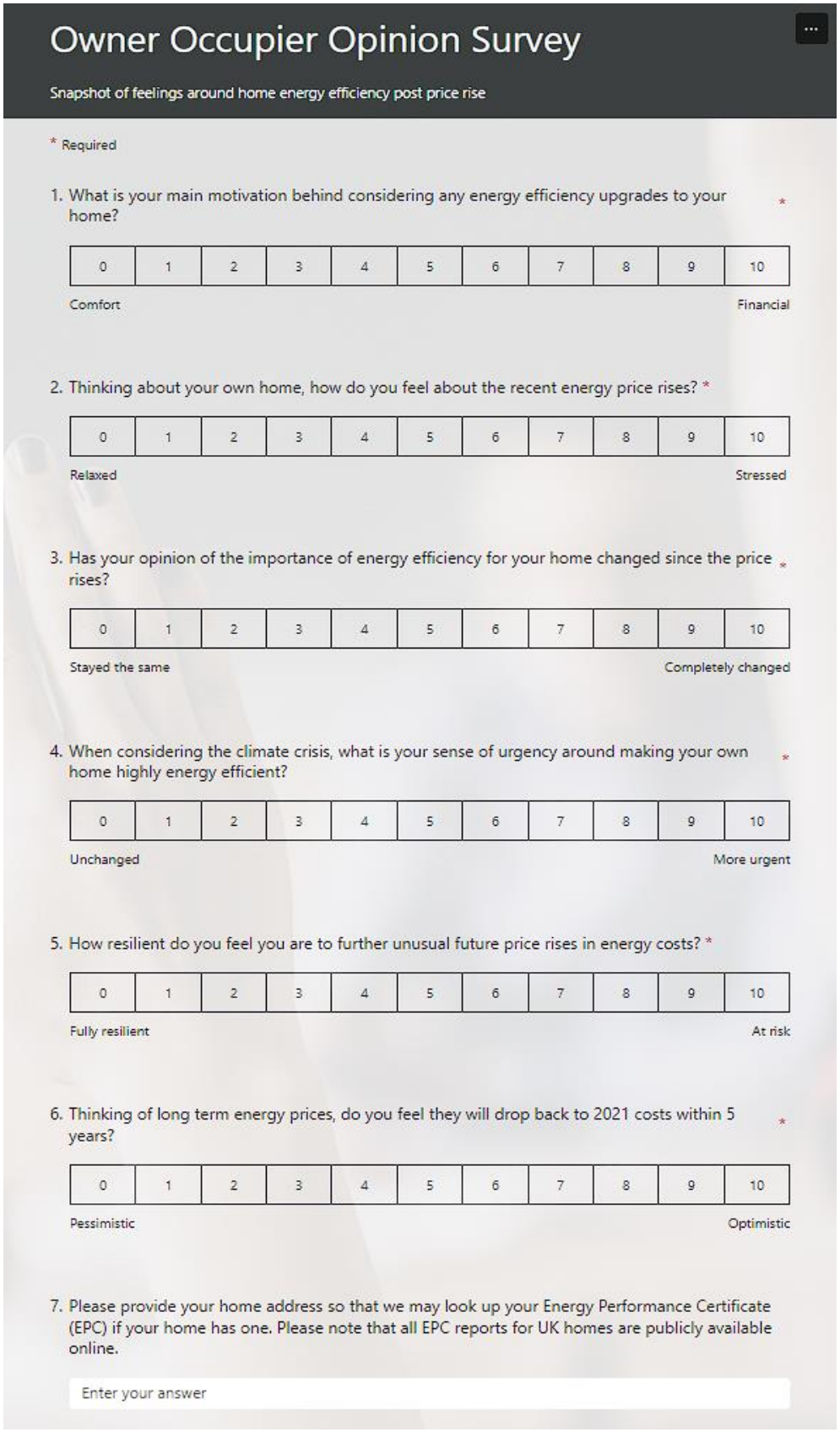
One way to support people to think through any home upgrade is with an interactive system that allows them to choose a scenario similar to their own and then to explore different choices, potential costs, and benefits with no risk to themselves. This could be done either alone on a pc or scaled up to a group run by a qualified leader, and either way you get the results to keep for yourself with links to additional support. What are your thoughts on this?



The link to Padlet for this is: https://padlet.com/johnrowlatt/xd7pykjhivqftgo7


DE MONTFORT UNIVERSITY LEICESTER
Rotary
Thank you so much for your time, you are greatly valued.
Any follow up questions please contact –
John.rowlatt@my365.dmu.ac.uk

Appendix 4 - MS Forms questions for interviews



Owner Occupier Opinion Survey

Snapshot of feelings around home energy efficiency post price rise

* Required

1. What is your main motivation behind considering any energy efficiency upgrades to your home? *

0	1	2	3	4	5	6	7	8	9	10

Comfort — Financial

2. Thinking about your own home, how do you feel about the recent energy price rises? *

0	1	2	3	4	5	6	7	8	9	10

Relaxed — Stressed

3. Has your opinion of the importance of energy efficiency for your home changed since the price rises? *

0	1	2	3	4	5	6	7	8	9	10

Stayed the same — Completely changed

4. When considering the climate crisis, what is your sense of urgency around making your own home highly energy efficient? *

0	1	2	3	4	5	6	7	8	9	10

Unchanged — More urgent

5. How resilient do you feel you are to further unusual future price rises in energy costs? *

0	1	2	3	4	5	6	7	8	9	10

Fully resilient — At risk

6. Thinking of long term energy prices, do you feel they will drop back to 2021 costs within 5 years? *

0	1	2	3	4	5	6	7	8	9	10

Pessimistic — Optimistic

7. Please provide your home address so that we may look up your Energy Performance Certificate (EPC) if your home has one. Please note that all EPC reports for UK homes are publicly available online.

Enter your answer

The link to the MS Forms questionnaire is: https://forms.office.com/r/nzFumnw2xd

Appendix 5 - Calculation of impact of barriers to retrofit

As a worked example, assume a best-case scenario where survey participants (who expressed moderate to extreme confidence in their present capability (n=210, 74.8% of N=281)), planned to use a tradesperson but also a worst-case scenario of not being able to find a trusted installer as a hard barrier - how could this affect the actual likelihood of work going ahead?

1 – multiply the total number of survey participants x the percentage of participants who expressed moderate to extreme confidence in their present capability.

281 x .748 = 210 felt moderate to extreme levels of capability to act as needed.

2 – multiply the number of survey participants who feel moderately to extremely capable of action against the percentage of participants: 28.9% (n=81) of (N=281) who did not state that finding a trusted installer was a key barrier to Capability.

210 x .289 = 60 as a subset of motivated participants (n=210) did not feel finding a trusted installer was a barrier.

3 – divide the subset of motivated survey participants who do not personally feel trust is a barrier to their Capability into the total number of survey participants (N=281)

281 ÷ 60 = 21.4% (n=60) of (N=281) feel capability and do not have trust as a barrier to action.

However, as noted in section 4.4, only 23.5% of respondents felt capability, opportunity & motivation at the same time. If this is used as a reasonable norm across the standard HRP then applying the same formula but with only 23.5% of the 281 participants results in only 6.8%, not the 21.4%. This is before even applying the effect of foreshortened time horizons or finding a trusted installer.

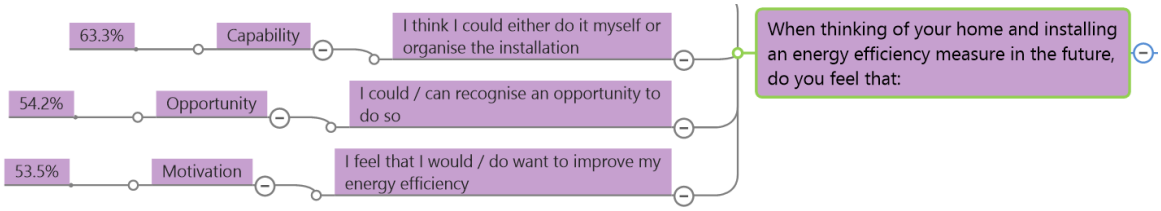
Without seeking to repeat any part of the main thesis body it would be instructive to see if the research results found around capability, opportunity and motivations from the survey can be mapped onto a real-life example of policy uptake such as the Green Homes Grant roll out. As previously noted, the GHG was poorly received and did not reach its target of 600,000 homes.

Appendix 5, table 1 - Shortfall to desired GHG scheme target

OO, PRS, HA households		23000000
Target for GHG measure engagement		600000
Intended coverage of scheme	2.61%	
Population made aware of measure %	100.00%	600000
Targeted Population % engaged	10.86%	65172
Service uptake of % engaged	49.01%	31938
Success uptake % by targeted population	5.32%	
Impact on housing stock	0.14%	
Shortfall to original target	94.68%	

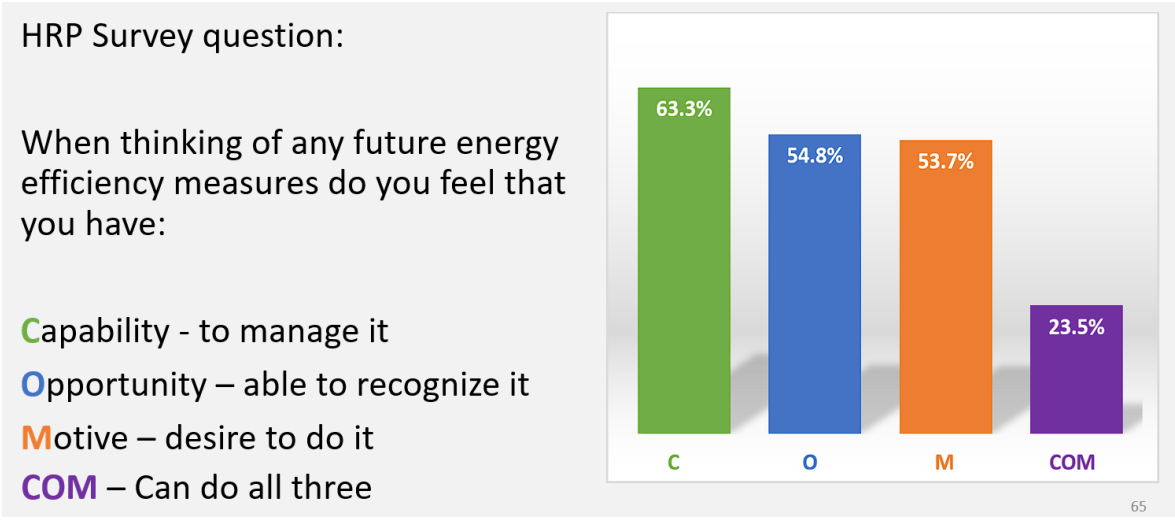
OO – Owner Occupier
PRS – Private Rental Sector
HA – Housing Associations

When we look at capability, opportunity and motivation, the survey respondents (N=281) displayed varying levels of belief affecting any future energy upgrades when asked the question in Appendix 5, Figure 1 (below). If this is mapped onto the likelihood of engaging with suitable government schemes such as the Green Homes Grant, how may this affect their uptake? This is done with the assumption that is free funding was available to applicants via the Green Homes Grant, and they felt full agency to act, why would they not ask for it?



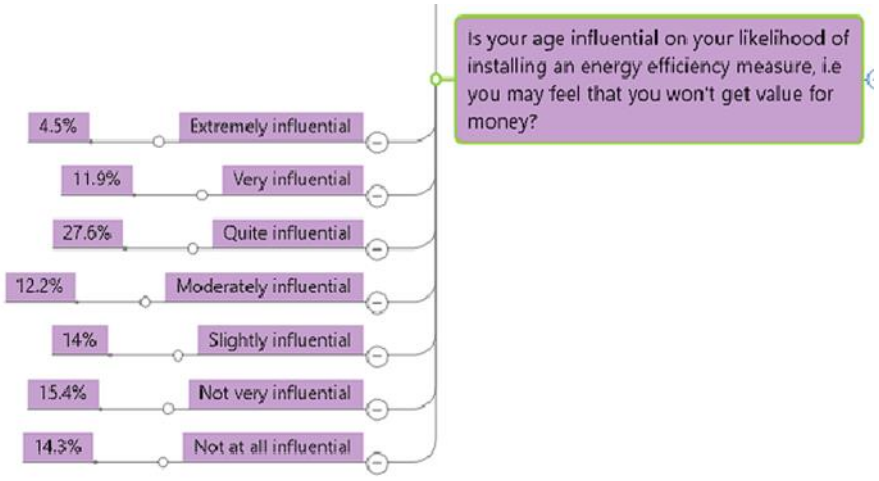
Appendix 5, Figure 1 - Excerpt from survey of capability, opportunity and motivation from MindMap of data results around upgrading home energy efficiency

At first glance the results presented in Appendix 5, Figure 1 would appear to indicate at the least 53.5% (n=150) of all respondents (N=281) would feel fully empowered to act on future energy efficiency measures. This is because whilst 53.5% is indeed the lowest percentile answer provided by the survey respondents regarding the questions of perceived Capability, Opportunity and Motivation. However, all needed be present in the same individual for any likelihood of Behaviour Change occurring - before barriers apply. When filtered for those who stated they had all three, the data showed there was a significant reduction (Appendix 5, Figure 2).



Appendix 5, Figure 2 - Analysis of capability, opportunity and motivation results

This would therefore suggest for every 100 people who were a target audience for the GHG only 23.5% may have felt capability, opportunity and motivation at the same time. If this example is then multiplied by the percentage of survey respondents, who stated that age was a negative factor (moderate to extreme as shown in Appendix 5, Figure 3) in deciding to proceed with any retrofit work, we potentially have a much lower number:



Appendix 5, Figure 3 - Does age affect your decision-making regarding energy efficiency?

((100% target audience) x 23.5% “COM-B”)) x 43.8% unaffected by age = 10.3% will act

The Public Accounts Committee (2021) review of the Green Homes Grant scheme chaired by Dame Meg Hillier, evidenced that “By August 2021, 52% of homeowners’ voucher applications were rejected or withdrawn, and 46% of installer applications failed.”

If these percentages regarding drop out and rejection are then applied to the 10.3% of the target audience still potentially considered likely to act, eases understanding of why the uptake of the Green Homes Grant scheme was only around 5% of its desired levels. Whilst this is a simple example, as not all 56% of HRP will be put off by their age, other barriers may apply, such as that of finding a trusted installer as noted earlier, which may again apply a modifier (in this case it was 71.1% stating it as a barrier). Again, not all people will be put off by these barriers and some will overcome them. However, this creates a reasonable illustration of what can occur and why sometimes targets are widely missed. Whilst not providing answers in terms of what to do it does highlight the severity of the failure and the need for radical improvement if we are to hit Net Zero targets with clear and consistent support of both Delivery Structures and Decision-Making Structures. As the Public Accounts Committee (2021) stated:

“We are not convinced that the Department has fully acknowledged the scale of its failures with this scheme…The Scheme’s primary aim was to support jobs, however, the Scheme’s design and duration limited its impact on employment, and its abrupt closure may have in fact led to redundancies.”

Appendix 6 - Research results summary

The following is listed in order of appearance in the thesis structure:

- The HRP gender used by governance is incorrect if the purpose of the HRP is to define the decision maker for spending authority.
- (79.4%, n=223) stated that their previous renovations were equally motivated by financial and comfort benefits, when later asked separately about future motivations (76.6%, n=215) stated that their quality of life was most important.
- The HRP is an age-defined group and this affects:
    - Decision-making capabilities
    - Affective risk-taking ability
    - Willingness to invest due to fore-shortened time horizons
- There exists a gap in marketing to non-financial benefits targeting quality of life, lifespan and health benefits.
- Trusted messengers:
    - SMEs are not trusted delivery partners
    - Government and politicians are not trusted as policy messengers
- Professionals are the most trusted messengers for SME with a key point being that they are not paid to sell a product.
- Government policy marketing is not fully penetrating the HRP target audience, where it is there is a significant lack of felt motivation and it endows even lower feelings of support within the HRP.
- Most desired supports by the HRP are financial aid or green finance products, clearer information and advice followed by better industry regulation.
- Energy upgrades are not done holistically nor for best synergy.
- Energy efficiency may not be recognised as a benefit of renovation.
- Only 23.5% of respondents stated that they felt they had full capability, opportunity and motivation to do a future retrofit project.
- Finding a trusted installer to do it was a barrier for 71.1% of respondents.
- Age was a significant disincentive to take future action for 56.2% of respondents.
- Thematic analysis of survey results showed information and education as the most prevalent theme over all three stakeholders.
- Marketing and behavioural economics were a strong latent theme underpinning many areas.
- Thematic analysis of interview results showed financial concerns being most prevalent, followed by belief statements and then Value/Action gaps being evidenced. Age, again, was a significant factor in the decision-making process.

Appendix 7 - Further Research opportunities.

This is presented in order of the least cost, shortest timeframe, most likely to be practically achieved due to the urgent nature of the climate crisis and with the initial assumed consideration that there will be no change in current policy making nor philosophical drivers behind it and the present chosen delivery path remains the same.

- Using AI generated, persona-modelled case studies with the HRP and the use of this technique to increase the likelihood of a behaviour change towards energy efficiency by the HRP. This is done by using super-hero stories of (self-created) relatable role models, with the role models following a learning process and overcoming perceived barriers to successfully install, and then benefit from, energy efficiency upgrades. All required support links, funding platforms and trusted installers can be provided in one place to remove sludge, creating a sense of agency with a direct call to action being made. How efficacious is this?
- Why, specifically, do SMEs choose not to recommend holistic deep retrofits and how this barrier can be overcome?
- Trusted messengers – whom should the Governance Entities use? Is there an avatar that can be researched, which is practically possible, that has most HRP traction that can provide a template for future engagement? How can industry increase trust levels in SME if they are to remain the Delivery Entity of choice?
- How to better communicate, and by what specific medium or channels, information around the personal benefits of energy efficiency upgraded homes to an age defined HRP. How would the HRP like to receive this information?
- Investigation of the HRP under study to be legally defined as an age-specific group to be treated differently in accordance with Scottish Judiciary example for under 25's. Do disability laws apply if they are?
- Creation of data led decision-maker avatars for the HRP sectors (both outright owners researched here and mortgaged) that include drivers and barriers to energy efficiency – to be shared across all Governance Entity stakeholders but also promoted to Delivery Entities.
- Specific research by Governance Entities into optimism bias in HRP engagement with schemes and policies as at present it does not appear to be allowed for. Does a simple formula combining those who feel full COM-B, perceived age barriers from the HRP, and scheme administrative failure percentage rates provide an accurate model for future predicted uptake if factored together?
- How big is the cognitive blind spot (Value Action Gap) in the HRP between self-perceived belief that they are motivated to take action against global heating, their present actions to-date and their actual likelihood of doing it in the future?

- Creation of a unified best practice data resource for smaller SMEs to access accredited information to provide the HRP that can be trusted by the HRP.
- Investigate why TrustMark has not achieved greater penetration and desired installer trust with the current HRP?
- Research into the risks of failure to reach Net Zero targets in domestic energy efficiency if we continue with the present policy and engagement paradigm. Will we miss, by how much and what are the consequences of doing so? Both in carbon tonnage effects but also in the loss of improved health by the HRP population. How does this affect healthcare and community-based social services with inherent economic costings included? How does this affect business growth, sector employment and reduced taxation yields?
- A better EPC system that links current grid carbon footprints to smart meter energy usage data allowing more accurate modelling of the HRPs home, potentially building on the Domestic Operational Rating principle for a richer and more accurate picture.
- Local Authority provided low interest, long term, loan structures funded by the National Infrastructure bank that are accessible, by default, to the HRP meaning they do not have to use SME provided funding sources or find their own.
- Creation of a digital home energy passport system building on the recommended upgraded EPC format would allow all stakeholders to see a live, real-time, regionally accurate data-set of each home in its current state.
- Investigate the practicality of providing a national programme of energy efficiency upgrade surveying to provide a digital home passport to every household (on a street-by-street toll-out basis). Run by Local Authorities using professionally trained and qualified frontline and back-room staff for trust generation.
- Provision of accurate and up-to-date information in the home energy passport in a personalised retrofit plan, seeking to engage reciprocity, endowment and removal of sludge with a direct call to action.
- Can and should Local Authorities provide a reserve installer option as a default to all Governance Entity provided future funding schemes that use TrustMark approved SME delivery entities? Allowing the HRP a default fall back choice that can inspire trust, that adheres to the highest quality levels, without profit being the primary driver. If so, should they follow a combination of Irish one-stop energy shops and Home Energy Scotland's local show-home network?