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Holistic narratives of the renovation experience: Using Q-methodology to improve understanding of domestic energy retrofits in the United Kingdom

Niall Kerr[a,*], Andy Gouldson[b], John Barrett[c]

[a] Infrastructure Business Model for Local Delivery (I-Build), Sustainability Research Institute, School of Earth and Environment, University of Leeds, UK
[b] ESRC Centre for Climate Change Economics and Policy, School of Earth and Environment, University of Leeds, UK
[c] Sustainability Research Institute, School of Earth and Environment, University of Leeds, UK

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ABSTRACT

The energy efficient retrofit of existing building stocks can help to address various social, economic and environmental objectives. As the most cost-effective and least disruptive retrofit options have regularly been implemented as a priority, initiatives that seek to encourage continued retrofit are likely to require thoughtful improvements in their design. Understanding the population of households that may be interested in retrofit as a heterogeneous rather than a homogenous group is a critical part of improving support for retrofit. In this research, we use Q-methodology to disaggregate the home owner-occupier population of the UK and create narratives that represent their experience of home renovations. We consider the experience of general home renovations as typically households do not see these as distinctive from energy efficient retrofit. The narratives present a holistic perspective by incorporating a comprehensive range of the influences on the renovation experience. The developed narratives – 'Organised and seeking greater comfort', 'Settled and performing a functional upgrade', 'Growing and needing a family home' and 'A lot to do and no time like the present' – provide the opportunity to better understand those making renovation decisions and subsequently develop more appropriate interventions to promote retrofit.

1. Introduction

In countries with low demolition and construction rates it is anticipated that the currently existing housing stock will constitute the majority of the future stock for many years to come [1,2]. The rationale for government policy and other initiatives that encourage the energy efficient retrofit of existing buildings can stem from a number of different social and economic objectives including reducing carbon emissions, addressing fuel poverty, and supporting employment [3]. Whilst it can help achieve various social, economic and environmental goals, retrofit also offers private benefits to a building's owners and occupants, through the potential for reduced energy bills and improved comfort, with investment in retrofit often coming from a mix of public and private sources [4]. Policy interventions regularly involve public funding being made available with the intention of leveraging the maximum possible private investment [5]. The potential longevity of existing built environments and the various public and private reasons for retrofit mean that the potential scope for implementation can be substantial.

While a wide variety of policy interventions promoting its uptake have been introduced, household demand for retrofit has been viewed as remaining stubbornly low in the face of these advances [6–11]. Many countries exhibit a housing stock that is majority owner occupied [12], with this form of tenure resulting in particular challenges when it comes to retrofit advocacy [13]. Retrofit support measures that have been successful, have often, understandably, prioritised the most cost-effective and least disruptive opportunities. This approach, however, means that future retrofit opportunities are necessarily more expensive and more technically difficult than those of the past [14] – raising questions over the facilitation of household demand for ongoing or deeper retrofit in the longer term. Research that seeks to inform the design of retrofit policy interventions has raised a number of criticisms of current approaches. It is frequently argued that policy intervention design too often conceives of household decision making as a solely technical and economic calculation, which is too removed from the social context. As a result, the introduction of more information on, and improvements in, the value proposition for retrofit have been presumed sufficient to achieve large scale behavioural change [15,13,16,17].

Behavioural research seeking to overcome the perceived shortcomings of current retrofit policy interventions has generated a variety

* Corresponding author. Present address: School of Social and Political Science, Chisholm House, University of Edinburgh, Edinburgh, EH1 1LZ, UK.
E-mail address: Niall.Kerr@ed.ac.uk (N. Kerr).

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of different recommendations. It has been suggested that conceptualisations of the decision-making process should be more *situated* within the social context of everyday domestic conditions, with a better appreciation of the different types and levels of influence that might affect a household's actions at different times [18,8,19]. It is the view of some authors that current policy sees retrofit activity (energy-related renovations) as unnecessarily distinct from other forms of home renovation i.e. amenity renovations (non-energy related renovations), and that this distinction decontextualises retrofit [17]. It is also regularly suggested that policy design would benefit from a more disaggregated, heterogeneous interpretation of the potential retrofitting population [20–22]. The details of a population's diversity in terms of personal and contextual information like property type, tenure and socio-demographics are regularly reported, but there are currently limited attempts to understand population diversity in terms of subjective viewpoints and experiences.

In response to these observations this analysis seeks to achieve a more *holistic and heterogeneous* understanding of the home owner occupier population, by carrying out a Q-methodological analysis of households that have recently been through a process of home renovation. Using a collected 'concourse' of statements that are taken from household's lived experience of the renovation process, we seek to develop a selection of representative household renovation narratives, considering both households that have had a focus on energy renovation (retrofit) and those that have not. Operating on the premise that households going through the process of home renovation are, to greater or lesser extents, subject to a wide variety of influences, we seek to create Gestalt (holistic) representations of the home renovation experience. Instead of assessing the relevance of *a particular influence* on a population as a whole, we use *a collection of the potential influences* on behaviour to develop narrative descriptions of households going through a process of renovation.

The paper begins with a summary of the background literature that helped to inform the research. This is followed by an explanation of why Q-methodology was deemed a suitable method for the analysis and the details of the research process itself. We then go on to use the concourse of statements to describe the renovator narratives developed. Finally, we reflect on the developed narratives and consider their implications for future retrofit support and research.

2. Background

2.1. Retrofit and policy interventions

Analyses that have considered the technological and economic feasibility of retrofit routinely conclude that the technology is well established, with much of it demonstrating a cost-effective economic case for implementation [23–25]. These findings help to contribute to retrofit being considered a logical priority in low carbon transition pathways [26], and often as the preferred means of addressing fuel poverty in the long term [27]. With many countries exhibiting housing stocks that are majority owner-occupied [28,12], efforts to retrofit have to obtain the consent and collaboration of the home owner-occupier population. It has, however, been observed for some time, that technical feasibility and economic cost-effectiveness are not sufficient conditions for large scale consumer investment in home improvement; retrofit or otherwise [29,13,30].

The ambitious nature of climate change policy, the longevity of existing buildings and the current levels of energy use in buildings, mean that potential for energy efficient retrofit is substantial. In attempts to stimulate demand for retrofit, interconnected policy packages containing a variety of measures have been implemented with varying degrees of success in different national contexts [31,32,10]. Due to the prevailing liberal approach to economic governance in many national contexts [33,34], and the private nature of people's homes, retrofit policies that focus on the actions of households have tended to favour market mechanisms and information based systems, over regulations that enforce household behaviour change [35,36].

A prioritisation of cost-effective retrofit measures in the policy packages of many countries [37] has seen the most economically and technically achievable measures being addressed first e.g. loft and cavity wall insulation. Cost-effective prioritisation or 'cherry picking' of measures [38] can create a 'lock-in effect' [39] with future retrofit becoming progressively more expensive, more difficult and less attractive [40,14]. There are thus concerns in many countries that existing policy efforts are not sufficient to meet long term targets [7]. Particular concern relates to low levels of household *demand for* retrofit, with policy perceived to influence the decisions of those already interested, but not able to convert those currently unenthusiastic about retrofitting their property [41].

2.2. Policy intervention research

Policy interventions to promote retrofit are informed by studies of decision making and behaviour that can draw on a variety of different theoretical perspectives. It is argued that policy interventions in the recent past have frequently been heavily influenced by rational choice interpretations of behaviour [42,22]. Such conceptualisations present actors as generally rational and self-seeking, and with sufficient agency to seek out cost-effective economic opportunities [43,44]. Policy that emanates from this view, therefore, focuses on improving the overall value proposition of retrofit and on offering more information on the costs and benefits of retrofit. It has been regularly argued that such approaches to policy frame opportunities as overly financial, do not properly take account of the non-monetary influences on behaviour, and treat the social context within which decisions are made as of relative insignificance [45,46,17].

Behavioural economics research informs us that not only do people regularly behave in ways that contradict rational choice expectations [47,48], but that they are often reluctant to even enter into substantive decision-making processes [49]. Social Practice Theory sees individuals as no longer the focus of enquiry and instead as a "crossing point for practices" [18,16,50]. Under such a view, it is argued that retrofit should not be regarded as a social practice in its own right, but instead should be viewed as a "bundle of still separate practices such as installing an efficient boiler or insulating a roof" [18]. Sociological interpretations consider individual behaviour and resultant energy demand to be more a result of socio-technical context than individual agency. It is therefore suggested that attempts to influence behaviour by increasing the information available on possible options, or by tinkering with the overall value proposition of retrofit, as of distinctly limited potential [22].

Many variables have been considered as possible explanatory influences on retrofit behaviour and decision making, with influences able to be conceptualised in a number of different ways. Carrying out a review of studies that considered the decision making process involved with 'energy-relevant investment', Kastner and Stern [8] contend that the most commonly assessed explanatory variables – demography, housing type, location and decision maker disposition – are of less explanatory importance than the variables less commonly assessed, notably those relating to expectation of consequence – financial, comfort, environmental changes that are associated with the action. Meanwhile, contrasting different theoretical approaches to the process, Wilson et al. [17] observe that influences are often split between those that are personal – for example, attitudes and beliefs, or relevant experience and skills – and those that are contextual – for example, household and property characteristics. It is suggested, however, that these are only the immediate or proximate influences on behaviour, and that to appreciate the ultimate influences, research must be better situated within "the conditions of domestic life" [19]. It is argued that it is from imbalances and tensions within these conditions of life – a household's vision of their home, their additional commitments and the inspiration

they take from others – that ultimately influence the decision to renovate.

2.3. Retrofit, renovation and a heterogeneous population

In further attempts to alter the framing of retrofit, behavioural research comparisons have been drawn between the process of renovating for non-energy purposes (amenity renovations) and energy renovations (retrofit) [21,17]. Existing social norms are considered to have a greater influence on amenity renovations [19], with energy renovations, in contrast, currently considered a "discretionary investment" [51]. It has been observed that investment in amenity renovations, involving minimal policy incentive, has historically far outweighed that in retrofit [52]. It is argued that their popularity is related to the "aspirational" or "fashion and lifestyle" appeal of amenity renovations, with energy renovations more commonly made out of necessity [53]. The greater 'visibility' of some renovations is suggested as a critical factor, with renovators potentially applying higher short term discount rates and thus preferring the immediacy of renovations they can see [22].

Various authors contend that energy renovations should not be seen as distinct from amenity renovations, and that much more often than not, energy renovations will take place alongside amenity renovations [53,19]. Both forms of renovation are ultimately considered to stem from similar influences, and can be seen as 'adaptive responses to misalignment within certain conditions of domestic life' [19]. Many authors rightly observe that *both* amenity and energy renovations should not be conceived of as one-off events, but rather as processes or as a "continuous activity" [54,53,9,55,19]. It is argued that connecting energy renovation with amenity renovation could be an effective means of increasing retrofit activity [56,17].

Within behavioural research on both amenity and energy renovation there are regular calls to view households not as a homogeneous group but rather as heterogeneous, in a similar vein to that of a consumer market segmentation [20–22]. With a variety of potentially favourable consequences from retrofit, the perceived over-emphasis on its financial impacts is seen as an example of households being treated with a lack of differentiation, and that this doesn't engender widespread participation or uptake [22].

Segmentation analysis can be seen as a useful marketing tool and as a means of improving the appeal of policy [57,58]. Existing research that attempts to segment the amenity renovation, or retrofit population specifically, includes Mortensen et al. [59], who divide Danish households into the broad categories of young and old – with the young thought to be the more interested in renovation. Munro and Leather [30] who, via a set of interviews with home owners in the UK categorised renovators by their demographics, tenure, type of activity and motivations, with categories ranging from 'young households' to households coming to the end of their lives. Fawcett and Killip [60] disaggregate 'Superhome' retrofitters in the UK into those that are planned and those that are more emergent. Haines and Mitchell [61] meanwhile use a 'persona-based approach' to create 'archetypes' of home renovator. While considering only a sub set of renovators – owner-occupiers of solid walled dwellings – their focus on the motivations for the renovation and on what the renovation was meant to achieve, reveals considerable diversity. Personas range from those that have been 'stalled' in their ability to carry out work, to 'idealist restorers' that are willing to take on a large project.

As a result of calls for both a more situated understanding of influences on household renovation behaviour and a heterogeneous appreciation of the renovation population, our analysis uses Q-methodology (Q) to create narratives of home renovators. The following section describes some of the theory behind Q and why it was chosen for the analysis.

3. Q methodology: developing holistic narratives

Q is seen as a method of studying subjectivity in "a structured and statistically interpretable form" [62]. It operates on the premise of 'finite diversity' or that between individuals there are 'shared experiences' or 'patterns of belief' [63]. Q is conventionally used to reveal subjective viewpoints that relate to a particular political or social issue. To achieve this a 'concourse' of statements that are considered to be representative of the 'volume of discourse' on a particular issue, is gathered. A purposively selected group of participants each sort these statements on a grid in a structured manner according to a spectrum of opinion (for example, from agree to disagree, or, from most important to least important) in relation to their subjective viewpoint. A participant's arrangement of statements is termed their Q-sort. A study's collected Q-sorts are used as quantitative data within a factor analytic process to develop a set of *shared viewpoints or narratives* that exist within a population. It is not known what proportion of the population the developed narratives represent merely that they exist to some degree within the population.

By utilising a concourse of statements that relate to the experience of home renovation, we seek to carry out an analysis that is better situated within the broader context of the process of home renovation. The set of statements (the Q-set) used in this analysis were chosen to allow any household engaged in home renovation to satisfactorily describe their experience. The chosen statements relate to, but may not directly correspond with, the relevant conditions of daily life, the expected consequences of action, and some of the personal and contextual influences that affect renovating behaviour.

Q is considered a cross between quantitative and qualitative research and to lie between open and closed research methods [64]. It is used to create Gestalt interpretations and is therefore, fundamentally interested in the whole pattern, with individual component parts (statements relating to the renovation experience) only having meaning when they are related to the other parts of the entire configuration. Rather than intending to shed light on the influence of single variables within the renovation experience concourse, we instead seek to create representations of the *whole renovation experience*; a holistic rather than atomistic approach [65]. We seek to improve the understanding of renovating behaviours by using Q as a means of "combining the economic and sociological bases for behaviour" [22]. By incorporating a broad range of explanatory variables we seek to see "explanatory variables compete" with the intention of reducing bias in research findings [8]. The statements in our concourse intend to bring together the *proximate influences* on renovation – the influences on renovation, once the intention to renovate is formed – with the *ultimate influences* on renovation – the conditions of daily life that explain the formation of the intention to renovate [8,19].

4. Methods

4.1. Gathering the concourse

The concourse involves a "set of statements that represents the sum of discourse on the research topic" [Pg 414 66]. The composition of a particular concourse will often only be defined by the research process, and not have been set out anywhere beforehand (as is the case with the concourse in this research) [65]. To gather the concourse, 40 interviews with home owners that had some experience of home renovation were carried out, producing a pool of over 500 statements. Interviewees were identified via public advertising, contact with local renovation interest groups and a subsequent 'snow balling' technique. As previously highlighted there is a considerable grey and academic literature that looks at the possible influences on renovation decision making, both for amenity and energy renovators [67,60,61,8,30,68,17]. The pool of statements from the interviews were compared with this literature to ensure a comprehensive concourse.

Our concourse was gathered using the framing of "the conditions of daily life, expectations of consequence and personal values that influence the act of home renovations". This framing was developed in line with the observations that "household characteristics do not help explain renovation intentions directly, once other influences are taken into account" [19], the view of Kastner and Stern [8] that explanatory variables relating to *expectation of consequence* are more relevant than those of housing type, location and demography, and Wilson et al's [17] contention that the *conditions of daily life* "emphasise the ultimate influences that originate and shape the decision process". The statements considered do not necessarily specifically represent a condition of daily life, an expectation of consequence or a value, and may instead cut across these descriptions. The ultimate aim of the selected statements was to allow the renovator to satisfactorily describe their renovation experience. Additional contextual data relating to household demographics, house type, tenure and the form of renovation, were collected prior to the Q-sort process (see Appendix).

4.2. Refining the concourse and selecting participants

The initial pool of 500 statements was refined to a smaller set that is considered to broadly represent the full volume of discourse. The smaller, refined set of statements is referred to as the Q-set. The gathering of the initial pool of statements and the construction of the refined Q-set can often make up the bulk of research time [65].

To refine the initial set the 500 statements were categorised into groups representing similar sentiments, and thus multiple statements considered to be pertaining to the same sentiment are refined to a single representative statement. At first statements are recorded verbatim, but then, if necessary, they are edited so that they are comprehensible to any potential participant. Our final Q-set contained 49 statements.

Participants (the P-set) sort the refined set of statements (the Q-set) in a pre-defined grid, shown below (Table 1). The grid shape in our study involved a forced normal distribution in accordance with the logic generally applied in Q-studies. A normal distribution is generally favoured as it allows a less ambiguous and more convenient comparison of Q-sorts [65]. The final grid shape is ultimately decided by the subjective judgement of the researchers. The grid should not be too narrow so that participants are not able to distinguish between statements that they would like to, but also not too broad that they feel they are making what they find to be unnecessary distinctions. 5 pilot interviews were used to find an appropriate grid breadth as well as test the comprehensiveness of the Q-set. With a breadth that adheres to the criteria outlined above and the application of a normal distribution, the size of the Q-set i.e. 49 statements, largely determines the rest of the grid shape.

The final participants in the study, the P-set, were all home owner-occupiers living in the North of England that had been through some form of renovation process in the last 5 years. We followed the interpretation of renovation used by Wilson et al. [17] of "substantive physical changes to a building…typically carried out by professional contractors". In accordance with the inverted logic of Q, where the Q-set constitutes the study sample, and the participants constitute the variables, the P-set is purposively selected, in order to capture a range of perspectives that are of interest to the researcher [69]. Potential participants were identified using a snow-ball technique, by public advertisements and collaboration with local renovation interest groups. Final participants were selected in order to ensure a diversity of households according to various demographic and property details (see Appendix in Supplementary material for details of P-set). The P-set is not intended to be representative of the full population of households in our study area, but it is part of the logic of Q that a diverse P-set should allow for the development of a greater number of narratives.

In accordance with Watts and Stenner [65], our analysis used roughly half as many participants – 24 – as we had statements. To ensure that the P-set contained a proportion of households that had some focus on energy renovation (retrofit), a local retrofit co-operative group was approached in order to attract participants. Of the final 24 participants, 10 came from attendees to this group's meetings, although all of the 10 also had some amenity renovations as part of their whole renovation activity. The remaining 14 were purposively selected from a potential pool of candidates identified by the techniques outlined above. Energy renovations were defined as any substantive change made in order to effect the energy consumption and/or environmental impact of the property.

4.3. Q-sorting

The Q-sort process was carried out face-to-face, with some contextual influences such as demographics, property type, length of tenure, and details of renovation, recorded prior to the sort process (see Appendix in Supplementary material). These details were used to categorise the participants into those that had a minimal (one energy measure or less), moderate (more than one energy measure) or substantial (majority of measures) energy focus in their renovations, and whether their renovations were of minimal (one room involved in renovation), moderate (more than one room) or substantial (majority of rooms received some renovation) overall renovation levels. This method of categorisation takes no account of the time, cost or disruption of the renovation, as these details were considered too intrusive to be requested from all participants. The categorisation is, therefore, of limited accuracy but should still provide some useful information on the level of renovation and energy focus of each participant.

Participants were asked to arrange the 49 statements from 'Most agree' to 'Most disagree'. The research was interested in the pre-renovation influences and so the participant was asked to construct their sort accordingly. As the research was not carried out in a longitudinal fashion there is the potential for 'post-adoption' influences to feature in

Table 1
The Q-sort grid. The shape (number of columns and the depth of those columns) was decided based on the number of statements that made up the concourse (49) and guidance from the pilot Q-sorts.

Most Disagree — Most Agree

-4	-3	-2	-1	0	+1	+2	+3	+4

a participants sort [22]. The rationalisation of a particular action is likely to be different pre and post the event. It is also possible that the changes involved with a home renovation will result in emergent attitude and behaviour changes [70]. Research, such as ours, that takes places after the event of interest, will contain a degree of post-hoc rationalisation which is a limitation of the study. The rationalisation that is used after a decision is likely is give undue emphasis to desirable traits e.g. care for the environment (statement 36) or organisational ability (statement 11). There is also likely to be less emphasis given to traits that may be perceived as less desirable, such as a financial motivation (statement 40) or being under the influence of others (statement 32). The post adoption rationale, captured here, is likely to involve a different sorting of statements and thus ultimately different narratives than would be found if the pre-adoption rationale was able to be captured. How the eventually developed narratives would ultimately differ is, however, beyond the scope of this study.

A post-sort interview was conducted in order for the participant to elaborate on their given sort pattern. This information was used in the interpretation of the resultant narratives.

4.4. Factor analysis and interpretation of narratives

Factor analysis was carried out using the PQ-method software version 2.35 [71]. Q operates by correlating the resultant Q-sorts with each other in a correlation matrix, and identifying similar sorting patterns. Factor extraction was carried out using Principal Component Analysis (PCA) and Varimax rotation, which involves rotating factors according to statistical criteria as opposed to manual rotation. This approach was taken as the research was not drawing heavily on any a priori theory for factor rotation.

There are various objective means of deciding how many factors should be considered legitimate viewpoints within a particular Q analysis. In this analysis we adhered to the Kaiser-Guttman criterion, Humphrey's rule and had at least three participants loading significantly on each factor at a 0.01 level. In Q, however, deciding on eventual factors is ultimately down to the judgement of the researcher, who should use their experience to assess whether a factor is able to be explained as a narrative in an interpretable manner [65].

PQ-method produces 'factor arrays' – idealised patterns of a Q-sort that represents a factor. These factor arrays (see Table 2) are interpreted to create narratives. The interpretation of the factor arrays to create meaningful narratives broadly followed the systematic approach developed by Watts and Stenner [65]. The developed narratives were compared with the recorded socio-demographic, property and renovation details as well as the post-sort interviews in order to improve their overall descriptive potential. As highlighted in Section 3, the developed narratives do not represent the whole population under investigation, but they should exist as recognisable narratives within this population.

5. Results

The analysis produced 4 renovation factor arrays that adhered to the criteria outlined in Section 4.4. The factor arrays – idealised patterns of Q-sort in these factors – are given in Table 2. This shows that, for example, in the idealised statement pattern of Factor array 1, statement 1 was placed at the −4 position (the point of most disagreement).

Below we interpret the idealised Q-sort patterns given above, and create narratives using the position of the statements in each factor array [65]. The narratives make reference to the statements from which they are constructed in brackets when relevant. Narratives apply to the experience of renovation and are thus specific to a renovating household at a particular point in time. Particular households are able to experience different renovation narratives at different times.

The narratives have been structured with descriptions of *why* – the ultimate influences on the decision to renovate, *what* – the expected consequences of the renovation, and *how* – the proximate influences on the renovation process. This categorisation allows for some level of distinction between the proximate and ultimate influences on renovation.

Some statements can cut across the categorisation of why, what and how. For example, statements relating to what – expected consequences – can also be used to explain why – ultimate influences. The descriptions below may, therefore, entail certain statements used at times in the description of why, and at others in the description of what.

5.1. Narrative 1 – Organised and seeking greater comfort

Narrative 1 explains 19% of the study variance and it has 7 significantly loading renovators i.e. 7 Q-sorts significantly correlated with this narrative and thus contributed the most to its factor array. Renovators in this group had a broad age range and inhabitant type, a mix of property types and property ages, while they had a disproportionate amount of significant loaders that had recently moved to the property.

Why? The ultimate influences on the renovation

Their desire to renovate is a firm, premeditated decision that has not been overly influenced by external events or trigger points (statement 28, position −4; s29, −1; s30, −1; s31, −3; s32, −3). Changing family conditions (s31, −3) or the general influence of others (s32, −3) have not played a major role in their decision making process. There was minimal economic influence on the renovation rationale (s9, +1; s40, 0; s49, +1).

They see themselves living in the property for some time (s5, +2), and they felt the work would be good for the long-term future of the house (s41, +2). They are slightly less concerned with it bringing immediate benefit (s42, +1). Overall they seem keen to re-invent their home, to match their 'taste or style' (s3, +3), or to make it more 'appropriate' (s38, +3).

What? The expected consequences of the renovation

Improving the comfort of their home is at the forefront of their mind (s25, +4). The property is considered somewhat uncomfortable (s37, +2), and there is a desire to improve the feeling of living in their home (s23, +3).

There is ample consideration given to the homes appearance, with the narrative fundamentally concerned with how things look (s1, −4), and interested in making the property more attractive (s2, +2). They are not overly concerned with altering the general layout (the position of walls, doorways and windows), of the property (s19, 0; s26, 0).

How? The proximate influences on the renovation process

An important characteristic of this view is that they considered themselves to have a plan in mind for 'what should be done and when' (s11, +3), and that they viewed the house as a 'project' (s48, +4). This organised approach is reflected in the minimal time between the thinking and acting stages of the renovation (s17, −3).

Their decisiveness can be seen in a desire for different parts of the project to be carried out simultaneously (s13, +2), and a general lack of concern that the work would be overly burdensome (s12, −2; s10, −2; s15, −2). They do not, however, see themselves as willing to become too directly involved with the work (s47, −3).

5.2. Narrative 2: Settled and performing a functional upgrade

Narrative 2 explains 14% of the study variance and it has 5 significantly loading renovators. Again, there is a mix of ages, inhabitant types and property types. There is a disproportionate amount of the homes in the oldest category and inhabitants in the longest length of tenure category. There are also no significant loaders in the lowest income category.

Why? The ultimate influences on the renovation

This renovator has a green agenda (s36, +4), and an interest in reducing their energy bills (s49, +3). There is a degree of general satisfaction with much of the home as it is prior to renovation, which is

Table 2
Positions of each statement in the idealised pattern/factor array of the developed Factors.

	Statements	Factor array 1	Factor array 2	Factor array 3	Factor array 4
1	I/We were not that bothered about the look of things.	−4	0	−2	0
2	I/We wanted to make the property more attractive.	2	1	3	1
3	The house was habitable but it wasn't to my/our taste or style.	3	−1	−2	−1
4	I/We were worried the renovation would make the house look wrong.	−1	−1	−2	−1
5	I/We thought I/We would be in the house for a long time, so it was sensible to renovate.	2	3	0	1
6	I/We didn't want to needlessly waste stuff or get something new that I/we don't need.	0	1	1	1
7	I/We had some extra cash and saw renovation as a good way of using it.	−1	2	0	−2
8	I/We thought a poor installation would make it difficult to sell the house.	0	−1	0	2
9	I/We thought that it would be good for the value of the house.	1	1	2	3
10	I/We were very worried about the level of disruption involved.	−2	0	0	−1
11	I/We had a plan in mind about what should be done to the house, and when.	3	0	1	−3
12	I/We were worried that the things that needed doing were big things.	−2	1	−2	1
13	It seemed daft not to try and do everything at the same time.	2	−2	−1	−2
14	I/We wanted to carry out one renovation at a time, and not have too much on at once.	−1	1	1	−3
15	I/We only wanted to do things that were stress-free.	−2	−1	0	0
16	The scale of possible work was off-putting	0	1	−1	2
17	I/We had wanted to renovate for a while but didn't have the time.	−3	−1	3	−2
18	I/We wanted to renovate but weren't sure what the best options were.	0	1	2	0
19	I/We weren't using the rooms/space in the house well.	0	−1	2	0
20	I/We were interested in cutting down the noise that was coming from outside.	−1	−2	0	−4
21	Creating a new space was very important.	1	−3	2	−1
22	I/We wanted to do it because of health and safety concerns.	−2	−3	−4	3
23	I/We wanted to improve the feeling of living in the house	3	2	4	2
24	I/We wanted to spend money on something that would give us pleasure.	2	0	3	0
25	To improve the comfort of the home I/We had to renovate.	4	4	2	4
26	The layout of the house was not appropriate for us.	0	−3	1	0
27	Certain rooms in the house were not liveable.	1	−2	−1	2
28	There was a major incident that resulted in renovations being needed.	−4	−1	−4	−3
29	I/We renovated because something was broken.	−1	0	−1	1
30	My/Our lives changed and I/We had more time to think about renovating.	−1	0	−1	−3
31	Changing family conditions made some renovations necessary.	−3	−2	3	0
32	I/We had a friend that had xxxxx and I/We thought it was great.	−3	−2	1	−1
33	I/We had a tradesman that I/We trusted.	0	0	1	−2
34	Because of various one-off issues, I/We decided to invest and solve the problems.	−1	1	−1	−2
35	I/We were reasonably knowledgeable about what needed done.	1	3	1	−1
36	I/We wanted to make our home greener, more environmentally friendly.	1	4	−2	3
37	The house was cold and uncomfortable.	2	2	−3	3
38	The house was old and tired and was not appropriate for us.	3	−4	−3	0
39	I/We wanted to maintain the existing appearance.	−2	2	−1	−2
40	I/We worried whether we would get the investment back if we sold it.	0	−3	0	1
41	I/We saw the work as being good for the long term future of the house.	2	2	2	2
42	I/We wanted the work to bring us an immediate benefit.	1	2	4	1
43	I/We really didn't want to live in a messy building site	−1	0	0	−1
44	I/We normally like to maintain what we have, rather than install something new.	1	0	0	−1
45	I/We could borrow money cheaply and thought it a good idea to use it.	−2	−4	−3	−4
46	I/we worried about something going wrong with the work.	0	−1	1	2
47	I/we are quite handy and thought we had the skills to do some things ourselves.	−3	3	−2	1
48	I/we saw the renovations that were carried out on the house as a project.	4	−2	−3	−1
49	I/We were interested in reducing our energy bills.	1	3	−1	4

detected via disagreement with the idea that the home is 'old and tired' (s38, −4), or that it is unliveable (s27, −2). The possibility of renovation is at least partly facilitated by the existence of some extra cash (s7; +2), and a feeling that the occupants will inhabit the home for some time to come (s5, +3).

What? The expected consequences of the renovation

As with most energy renovators there is a desire to improve the comfort of their home, which is seen as somewhat cold and uncomfortable (s37, +2), with renovation necessary to improve comfort levels (s25, +4).

There is not much desire to alter the existing appearance of the home (s39, +2), with aesthetic considerations generally of a secondary nature (s1, 0; s2, +1; s4, −1). The house's existing physical layout is considered appropriate and something that shouldn't be altered. There is minimal concern with the previous layout of the home (s26, −3) or how the existing rooms/space were being used (s19, −1), and there is no desire for a new space (s21, −3).

Perhaps in keeping with the possible moral agenda of a renovator that is more focused on energy performance improvements in their home, there is a distinct lack of concern with whether there will be a return on investment from the renovation (s40, −3), but there is some acceptance that it may be good for the value of the house (s9, +1).

How? The proximate influences on the renovation process

This narrative looks on the renovation work as something that they want to be engaged with and informed about. They consider themselves knowledgeable about what needs to be done (s35, +3), but also as capable of contributing to the work or 'having the skills to do some things ourselves' (s47, +3). They do not display any strong feelings about the scale (s12, +1; s16, +1) or level of disruption involved (s10, 0; s15, −1).

5.3. Narrative 3: Growing and needing a family home

Narrative 3 explains 10% of the study variance and it has 3 significantly loading renovators. All significant loaders are from the 'Family' category and in the age range 35–55. Property type, age and length of tenure are all mixed, while there are none of this group in the lowest income group.

Why? The ultimate influences on the renovation

Changing family conditions had a considerable influence on the work that was carried out (s31, +3), while non-family trigger points are of little influence on the decision to renovate (s28, −4; s29, −1; s34, −1). There was also a relatively low level of agreement with the idea that they knew they would be in the house for a long time (s5, 0).

Although this narrative shows some interest in improved comfort (s25, +2), they are overall less motivated by comfort than others. Prior to the work the house was not considered to be uncomfortably cold (s37, −3), or old and tired (s38, −3) and it was generally considered liveable (s27, −1). There is minimal environmental drive for the work (s36, −2).

What? The expected consequences of the renovation

There is a desire for the renovation to bring immediate benefit (s42, +4), whilst it is also viewed as something that should bring a tangible reward, or that it should "give pleasure" (s24, +3).

This renovator feels that the space within the house could be better used (s19, +2), and that a new space is important (s21, +2). There is some feeling that the renovation would be good for the value of the house (s9, +2), and little concern that investment won't affect their home's value (s40, 0). They are somewhat interested in how things look (s1, −2) and there is a feeling that the home should become more attractive as a result of the work (s2, +3).

How? The proximate influences on the renovation process

They had wanted to renovate for a while but did not have the time (s17, +3). This narrative displays resolve in the face of challenging work (s12, −2), and ambivalence toward the potential disruption that might be involved (s10, 0; s15, 0). The necessity for change that comes from a developing family means that there was little possibility of this narrative being put off by the scale of the work (s16, −1). The renovation is not seen as a 'project' (s48, −3) and renovators in this narrative may not necessarily be aware of what the best options are (s18, +2).

5.4. Narrative 4: A lot to do and no time like the present

Narrative 4 explains 10% of the study variance and it has 3 significantly loading renovators. This narrative had either a grown up family or there was still a family present. There was a mix of property types, ages and length of tenure. Two of the group were from the lowest income category.

Why? The ultimate influences on the renovation

Overall there is a feeling of considerable unhappiness with the property prior to renovation, with renovators in this narrative having multiple reasons to carry out work. These renovators viewed their home as 'cold and uncomfortable' (s37, +3), with an improvement in the comfort of their home of fundamental importance (s25, +4). The home is even viewed as somewhat of a health and safety concern (s22, +3), with some of the rooms regarded as not being liveable (s27, +2).

There does not appear to be as much of an impact on this narrative from influences that are external to the house itself. General life changes (s30, −3), or the possible influence of a cash windfall (s7, −2) scored lower in this narrative than in any other.

What? The expected consequences of the renovation

There is an intention to improve the energy performance of the property, with a desire to reduce the cost of energy bills (s49, +4) and to make the home more environmentally friendly (s36, +3). Despite the overall dissatisfaction, there is relative indifference to aesthetic considerations (s1, 0; s2, +1), although there is still some desire to change the overall appearance of the property (s39, −2).

They are not primarily concerned with altering the layout of the property (s19, 0; s26, 0) and did not make any connection between renovation and reduced noise pollution (s20, −4). There is confidence that the work would be good for the value of the house (s9, +3) with some attention paid to whether there would be a return on investment (s40, +1; s49, +4).

How? The proximate influences on the renovation process

Possibly due to the overall discontentment and thus the potential amount of renovation deemed necessary, there is some trepidation about the scale of work (s16, +2; s12, +1), and a feeling that something might go wrong (s46, +2). They are the least likely to have a trusted tradesman in mind (s33, −2) and to declare themselves knowledgeable about what needed doing (s35, −1). They have a somewhat ad-hoc approach to the work, and disagreement with both the idea there was a plan (s11, −3), and that things should be done one at a time (s14, −3). Alongside this, however, they also do not believe that things should necessarily be all done at the same time (s13, −2). Despite the potential scale of the work there is minimal concern about the work causing intolerable levels of disruption (s10, −1; s15, 0). In line with the other narratives, there was disagreement with the idea that they would borrow money to carry out renovations (s45, −4).

6. Discussion

As highlighted, previous research on the topic of household retrofit behaviour has considered the influence of a wide variety of explanatory variables. Within this however, it is thought that there is still a need to properly "add people" into research design and policy considerations [13].

The premise for this Q-methodological analysis is two-fold. Firstly, that every renovation experience is likely subject to the influence, to varying degrees, of numerous different variables concurrently; a household may want to reduce their environmental impact, while thinking themselves capable of some DIY, but also be unsure as to how long they will remain in their current property. Rather than atomistically studying the relevance of single variable influences, we aim to represent the sum of many influences in a holistic or Gestalt configuration. Secondly, that it is critical to understand that household experiences of home renovation will be diverse, but that this diversity will be, to some extent, finite, with some important aspects of household experience shared.

Using the multiple possible influences on home renovation this analysis reveals potential narratives for home renovators, and provides interpretations of their shared experiences. We develop our narratives by considering the influences on the decision to renovate, what the expected consequences of the renovation were and what the experience of the renovation process was.

The analysis is useful as a reflexive exercise in relation to previous studies that have considered typologies of home renovator [61,30]. Our analysis, however, seeks to learn more general rules about renovation by focusing on a range of households and property types, as well as renovations that have both an energy and a non-energy focus. The developed narratives are also distinct as they are descriptions of households at particular points in time, rather than simply of particular households.

4 factor arrays were identified with the use of the 3 objective criteria highlighted in Section 4.4. These factor arrays accounted for 53% of the total study variance. Despite 47% of the study variance not being accounted for, any study accounting for above 35% is ordinarily considered a sound solution in factor analysis [65]. 18 of the participants loaded significantly on one of the factors, the remaining 6 Q-sorts did not load significantly on any factor – there were no confounders (sorts loading on more than one factor). The narratives developed using Q are intended to achieve depth rather than breadth and do not account for all renovation experiences. While only accounting for 53% of our sample's variance, there is also likely to be additional renovation narratives that could be captured from a different sample of UK households.

6.1. Renovation narratives

The factor interpretation stage revealed 4 factors that were

considered distinct. The idealised factor arrays have been interpreted as renovation narratives in the Results section. As highlighted renovation is better conceptualised as a "continuous activity" rather than a one-off event. The participants in this analysis were households that had been through a renovation experience in the last 5 years with their sorts ordered according to their experiences. Narratives apply to the experience of renovation and are not attached to particular households. A household may experience different renovation narratives at different points in their lives.

6.1.1. Narrative 1 – Organised and seeking greater comfort

The first narrative describes households that expected a more comfortable home but also gave serious thought to how the renovation would affect their home's aesthetic appearance. Changing the layout of the house or how space is used is not such an important consideration. Their renovation is conceived as a project – akin to the 'idealist restorer' of Haines and Mitchell [61] – with the household more likely to plan out what they want to do, and for the various aspects of the work to take place simultaneously. It applies to renovators that anticipate staying in a property for the near future, with this view reflective of the disproportionate amount of Q-sorts correlating with this narrative that had recently moved into their property

The narrative relates to households carrying out substantial overall renovations, where energy renovation is not a priority, and is likely to apply to those that have recently moved into a property and want to make the home feel more like their own. The potential for promoting energy renovation at the point of homeowners relocating has been observed in other studies [72].

6.1.2. Narrative 2: Settled and performing a functional upgrade

Narrative 2 is interested in energy renovation, but, as with other narratives, improving the comfort of their home is also at the forefront of their mind. Similar to narrative 1 they are not interested in changing the layout of the property, but unlike the first narrative, they have minimal interest in altering their home's existing appearance. They are reasonably content with their home prior to renovation, and expect to be living there for the foreseeable future. They are more likely to want to be involved with the work that is being done, both in terms of knowledge of what the work involves, and potentially also carrying out some work themselves. This is a finding that resonates with the description of energy renovators in other research [60]. Again, with similarities to narrative 1 this renovator is organised and premeditated and not overly influenced by trigger events. They are driven by internal attitudes and/or values, or by the 'delineating' condition [22,19].

Of the 5 participants that most correlated with this narrative, 4 have been in their property for over 10 years and all the properties are over 100 years old. There is also an absence of young children in the families of the 5 participants, a characteristic which is connected with pro-environmental behaviour in other research [73].

Households renovating under this narrative firmly identify comfort as an expected consequence but they are not interested in significant aesthetic alteration. The functional rather than aesthetic nature of energy renovations is highlighted by Gram-Hanssen [53], while in their renovator personas, Haines and Mitchell [61] outline the different characteristics of a functional and an aesthetic renovator. Although aesthetic delineation may not be a driving factor for retrofit it is important to also appreciate that home owners may be concerned that retrofit could affect their homes current appearance.

6.1.3. Narrative 3: Growing and needing a family home

The participants contributing to narrative 3 are all representatives of family households with young children. This narrative is the most influenced by 'changing family conditions' and the possible implications of family life is interpreted as the ultimate influence that gave rise to the intention to renovate. The household had 'wanted to renovate for a while' and the renovation is seen more in terms of its 'immediate benefit'. Improved comfort is a consideration but the house was not considered cold, tired or uncomfortable beforehand. This narrative is focused on creating a new space or using the space in the house better – the households contributing to this narrative had all carried out work to, at least in part, create a new bedroom. The participants most correlated with this narrative tended to carry out smaller overall renovations and have minimal interest in energy improvements. Although external influences are often underestimated in self-reporting scenarios [8], this narrative is the most likely to admit to being influenced in this way.

This renovation narrative is a reaction to changing family conditions. The work is more an adaptive necessity than a means of expressing identity [19]. This state of affairs arguably means that the overall opportunity for renovation is therefore limited, and encouraging energy renovation will be more difficult than in a more proactive renovator such as narrative 1.

6.1.4. Narrative 4: A lot to do and no time like the present

In the fourth narrative, work is expected to improve comfort and reduce energy bills, while there is also a significant energy renovation imperative. Altering the layout of the property is not of particular interest in this narrative, and while aesthetic considerations are not paramount they do want to ultimately alter the existing appearance. This renovator exhibits significant concern with the state of their home prior to renovation. Certain rooms are considered not liveable, there are some health and safety concerns and the overall scale of the work is off-putting. The perceived *need for* improvement appears to be the ultimate influence for this narrative. They show the most concern for issues around return on investment and the work being good for the property's value. This narrative relates to the idea that "house owners often have a dream list of renovations they would like to do, but as there is not always time, money or other resources, and as it is not always fun to live in a house that is being renovated, some renovations are postponed and others are carried out" [53]. The potentially delayed nature of renovation in narrative 4 is comparable to the 'Stalled' personas developed by Haines and Mitchell [61], with this persona divided into those that are stalled due to a lack of finance and those that are delayed by the pressures of life.

The considerable dissatisfaction with the current state of the home implies a desire for substantial renovation that is unfulfilled. Such a narrative could relate to new inhabitants of a property, or to existing inhabitants that have seen their property experience gradual wear and tear, and whose priorities have led to renovation being considered infeasible.

6.2. Summary observations

The narratives provide a holistic perspective on the experience of home renovation, with the multiple influences on renovation having varying degrees of relevance to each narrative. Cotton [74] considers the points of agreement and disagreement between narratives as a useful basis for comparison. There were some statements that were relatively consistently positioned within each of the 4 narratives. All narratives, for example, considered improved comfort to be something naturally expected from renovation, a finding that resonates with other research [12]. It may also be useful to compare the narratives most associated with energy renovation i.e. 2 and 4, to those more focused on amenity renovation i.e. 1 and 3, in terms of their positioning of non-energy statements. Although 1 and 3 renovate for different reasons there is a desire within both narratives to get "pleasure" (s24) from the work, in contrast to the ambivalence of 2 and 4 toward this statement. There is also a hesitancy in the energy renovation narratives to do 'big things' (s12) that was not seen within the amenity renovation narratives. Finally, as would be expected, 'the look of things' (s1) and the property's 'attractiveness' (s2) were more important within narratives 1 and 3, although they are still of relevance for 2 and 4.

The development of a more heterogeneous understanding of a particular population should assist with policy design in any area. Different forms of policy incentive will have a different level of appeal to different types of home owner-occupier. It is not, however, necessary to develop specific policies for specific narratives or segments of the population. Rather it is important to ensure that the developed policy package properly caters for as much of the diversity of population that exists as possible. The narratives also have the potential to be useful for the general marketing of retrofit.

Some narratives describe renovations that are driven by external reasons, like the trigger point of changing family conditions in narrative 3, while other renovations are more driven by internal attitudes and values, like the environmental considerations within narrative 2 [22]. Often, however, established trigger points may combine with a household's values, for example, in narrative 1 where the opportunity of relocation may have allowed for a household to express their identity through renovation. By developing holistic descriptions of renovating households, the narratives should encourage consideration of the multiple – both proximate and ultimate – influences on retrofit decision making, in policy design.

7. Conclusions

The objective of our analysis was to better understand the diversity of experience that is encountered by home owner-occupiers renovating their property, with a particular interest in renovations that included some aspect of energy performance alteration. The resultant 4 narratives – 'Organised and seeking greater comfort', 'Settled and performing a functional upgrade', 'Growing and needing a family home' or 'A lot to do and no time like the present' – offer insight into the diversity that exists within the experience of renovation.

The research seeks to recognise the diversity within the household renovation population, and highlight the potential utility in representing this diversity in comprehensible and recognisable segments. The diversity of households is more regularly considered in terms of contextual details like demographics and house type, and there have been limited attempts to understand population diversity in terms of narrative or viewpoints. The subjective experience of households occurs under the influence of a wide variety of variables and it is useful to conceive of these experiences in a holistic manner that incorporates the variety of influences. Q-methodology was chosen as it allows a holistic representation of the renovation experience. By forcing participants to arrange a full concourse of statements relating to their experience, we are able to reflect on the relative relevance of a wide range of the possible influences on behaviour. By taking this approach we are able to better represent both the proximate influences and the ultimate influences on renovation and, therefore, offer a novel explanatory perspective on home renovators behaviour and decisions. By considering households with a focus on general amenity renovations alongside those interested in energy renovations the narratives also importantly do not conceptualise energy renovations as distinct from general home improvements.

The resultant narratives do not encapsulate all renovators and by purposively selecting some renovators that were known to have an interest in energy renovations the study is likely to disproportionately relate to those involved with energy renovation. The narratives are unlikely to be a precise match for many individual viewpoints, and some renovating households may see elements of different narratives in their experience. They apply only to a portion of the full renovating population with potentially many other narratives in existence. Our narratives should, however, be recognisable as genuine renovation experiences, and they have some similarity to other research attempts at disaggregating households according to their renovation experience, as highlighted above.

With the promotion of energy efficient retrofit increasingly identified as in need of a firmer basis in the social context of domestic life, those seeking to promote retrofit should give greater consideration to potential interventions in terms of how relevant they are to different population subsets. There is also the potential for marketing campaigns for retrofit that utilise recognisable narratives of household experience. Further research could identify particular households that relate to each of the developed narratives, and assess the relative appeal of different interventions to each of the narrative groups. Representatives of each narrative could also be considered in different, additional ways, for example, with respect to the household's attitudes and beliefs with regard to the purpose of a home. Finally, there is the potential for reflection on the research findings by using the same collected concourse of statements on further sets of households. This may allow for verification of the narratives interpreted here, as well as offering the opportunity to develop additional renovation narratives. Many of our narratives reflect understandings of the renovation process seen in previous research, for example, those triggered to renovate by changing family conditions or those 'stalled' in their renovation efforts. Our home renovation narratives add value by expanding on these previous insights and outlining a holistic view of the shared but still heterogeneous experiences of home renovation.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.erss.2018.02.018.

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