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5	Corresponding Author	Family Name	Brown
6		Particle	
7		Given Name	Philip
8		Suffix	
9		Organization	University of Salford
10		Division	Salford Housing & Urban Studies Unit, Joule House
11	Author	Address	Salford M5 4WT, UK
12		e-mail	p.brown@salford.ac.uk
13		Family Name	Swan
14		Particle	
15		Given Name	Will
16		Suffix	
17	Author	Organization	University of Salford
18		Division	School of the Built Environment, Joule House
19		Address	Salford M5 4WT, UK
20		e-mail	
21		Family Name	Chahal
22		Particle	
23	Author	Given Name	Sharon
24		Suffix	
25		Organization	Places for People
26		Division	
27		Address	18 South Rings Business Park, Craven Drive, Bamber Bridge PR5 6BZ, Preston, UK
28		e-mail	
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Retrofitting social housing: reflections by tenants on adopting and living with retrofit technology

Philip Brown · Will Swan · Sharon Chahal

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Abstract Retrofit has been described as one of the major engineering challenges of the twenty-first century (Kelly 2009). However, the industry needs to look beyond regarding the problem as restricted to the physical upgrade of properties. Asset managers, engineers and installers work on and in people's homes and, in many cases, are subsequently changing the way householders use their homes to meet their comfort and wider energy needs. Here we consider how the twin issues of adopting and living with retrofit technologies have affected groups of residents in social housing. We discuss issues of trust, social norms, engagement and concern that have shaped the adoption process, as well as investigating the everyday experience of living with new configurations of energy consumption. The findings have relevance not only for the social housing sector but also raise questions as to how to effectively deliver programmes such as the Green Deal and the Energy Company Obligation within the UK.

Keywords Retrofit · Adoption · In-use · Social housing · Tenants

Introduction

The domestic sector accounts for more than 25 % of carbon dioxide emissions generated by more than 26 million homes in the UK (Swan et al. 2010). In addition, rising energy costs have led to increasing levels of fuel poverty in the UK (Hills 2012), with energy prices predicted to rise by 34 % for gas and 54 % for electricity over the next 10 years (Ofgem 2009). Given these twin issues of greenhouse gas emissions and fuel poverty, the sustainable retrofit of the existing domestic stock is predicted to play a central part of the UK's strategy to reduce carbon dioxide emissions (Boardman 2012; Ravetz 2008). Sustainable retrofit can be defined as the upgrading of the building fabric, systems or controls to improve the energy performance of the property.

There have been a wide number of programmes put in place over the years with the aim of delivering this improvement: the Carbon Emissions Reduction Tariff (CERT) (Druckman and Jackson 2008), Warm Front (Gilbertson et al. 2006) and the Community Energy Savings Programme (CESP) (Reeves et al. 2010), for example. The new Green Deal (DECC 2010) and Energy Company Obligation (DECC 2010) programmes continue the UK's policy commitment to domestic retrofit. However, it has become recognised that understanding behaviour, in terms of both adoption and in use issues, represents a vital component of the

P. Brown (✉)
Salford Housing & Urban Studies Unit, Joule House,
University of Salford, Salford M5 4WT, UK
e-mail: p.brown@salford.ac.uk

W. Swan
School of the Built Environment, Joule House, University of
Salford, Salford M5 4WT, UK

S. Chahal
Places for People, 18 South Rings Business Park, Craven
Drive, Bamber Bridge, Preston PR5 6BZ, UK

success of sustainable retrofit programmes (Chahal et al. 2012). Adoption is concerned with how to encourage households to take up retrofit measures and is a major issue, particularly with reference to the UK's Green Deal programme. A MORI poll undertaken for the UK government, which investigated the decisions related to the adoption of cavity wall insulation with householders, highlighted a wide range of reasons for non-adoption (HM Government 2010) ranging from a lack of understanding and knowledge to sheer apathy, highlighting the challenge faced by policy makers.

Once the difficult issue of adoption has been addressed, we are then confronted with how behaviours, social norms, habits and values all interact to influence energy use. The role of behaviour can be seen to have a huge influence on the consumption of energy (Summerfield 2010), driven by a number of demographic, lifestyle and cultural differences (McMakin 2002), but this is only part of the problem. New technologies often conflict with deeply engrained energy practices and contribute to a gap between designed and actual performance (Wingfield et al. 2008). The majority of energy consumed in the domestic sector is used for space heating (Palmer and Cooper 2011), and as such this plays a major part of the issues addressed within the study reported here. However, we do include observations on both hot water, electrical and ventilation systems, which are often installed as part of a retrofit package and often interact with changes made to heating systems.

The adoption of energy efficient measures

Under sociotechnical models, such as those proposed by Geels (2005), there can be a number of reasons as to why energy efficient measures are not adopted. Weber (1997) also identifies institutional, regulatory, market and social barriers that influence adoption. Here we will consider those barriers that are specifically encountered by the occupants of residential dwellings, something Geels may define as 'market and user practices'. Currently, the market for energy efficient measures can best be described as 'emergent' (van Sandick and Oostra 2010). There has been widespread adoption of basic measures in social housing, such as loft and cavity wall insulation, driven by incentives such as the CERT and CESP programmes. However, more sophisticated or 'deep' retrofits (Kelly 2009) are still in the stage of early

adoption (Fawcett 2011). Two successive UK governments have identified the social sector as a test bed for the sustainable retrofit market (HM Government 2010; 2010). The suitability of the UK's social housing for has been largely supported by the availability of professional decision makers, asset managers, building surveyors and project managers, who can address many of the knowledge issues that were identified in the MORI poll (HM Government 2010). They may have the skills to effectively identify potential energy efficiency measures, identify supply chains that can deliver them and have available capital to fund the measures, overcoming many of the issues that might prevent owner-occupiers or small-scale landlords from adopting sustainable retrofit technologies (Jenkins 2010).

However, removing these knowledge and capital-based barriers does not mean that adoption is guaranteed. Within the UK social housing, tenants do have the right to refuse improvements that are proposed by their landlords, as they appear to fall outside the legal repair framework for social housing. However, as our research indicates, this is not always fully understood by residents and may be clouded by the approach that the social landlords take in engaging with residents. A major improvement works programme undertaken by Affinity Sutton (a large social housing landlord) included packages of sustainable retrofit, ranging in value from £6,500 to £25,000, offered to residents on the basis of their house types. This programme experienced a refusal rate of more than 50 % with the reasons of disruption and inconvenience cited as the most common responses (Willey 2012). The nature and complexity of sustainable retrofit packages make it a more complex market to transform. The success of regulatory changes has had some success in appliances (Killip 2012), but it is clear that the application of this model is not as straightforward, when applied to more disruptive and complex products and processes. A better understanding of the market behaviours for these kinds of products is essential if regulation and market-making is to be used in this way (Boardman 2012).

This study focuses very specifically on the adoption of sustainable retrofit within UK social housing. Within the UK, social housing represents some 18 % of total housing stock (CLG 2011). The triggers and barriers involved in adoption, as highlighted by Jenkins (2010), differ when compared to the owner-occupier and private rented market (Mallaband et al. 2012), where financial decisions become a major part of the adoption decision.

Studies from Sweden (Nair et al. 2010), the USA (Niemeyer 2010) and Germany (Achttnicht 2011) replicate this perspective, although Achttnicht highlights the potential importance for climate change as a driving factor. Given that climate change awareness as a factor for adoption is partially driven by income and education (Semenza et al. 2008), it seems that Chahal's (2012) assertion that it does not drive adoption in UK social housing is potentially supported. However, issues of knowledge, access to information and supply chains appeared to be universal between tenures and countries. We can see that the grouping can be cut in a number of ways that will give us different adoption drivers and barriers; tenure, environmental values and individual countries will all have slightly different issues and approaches that will change the potential weightings of the adoption issue. This can make specific studies highly context sensitive.

Understanding why some households adopt and why their neighbours refuse offers an opportunity to understand this set of complex decisions. McMakin et al. (2002) state that individuals tend to identify energy efficiency strongly with their own personal circumstances, such as their health or comfort. In an earlier paper, Mills and Rosenfeld (1996) recognise the non-energy-related reasons for improving the energy efficiency of homes, identifying a wide number of environmental, financial and health benefits that can be brought about by sustainable retrofit. They recommend adoption might be improved by marketing these benefits, rather than pure energy efficiency. These ideas are concerned with the rational side of energy efficiency adoption. However, social norms and changing values also have a part to play. The social norms (McKenzie-Mohr 2000) and value-driven (Lovell 2004) aspects of energy use should be seen as a 'moveable feast'; patterns of use and the reasons behind them will change over time, so studies concerning this aspect are both time and geographically sensitive.

Using and living with retrofit measures

The gap between as-designed and as-performed energy efficiency of properties is well documented in new build homes (Wingfield et al. 2008). Factors such as installation and build quality, specification and, specific to our question, behaviour are all contributing factors. The issues can be logically extended to substantially

refurbished homes (Wetherell and Hawkes 2011). Focusing on behaviour, there are a wide range of issues that can impact our understanding of how people use energy (Economic and Social Research Council 2009). There are large variations in energy use (Summerfield 2010), with higher levels of use often being driven by wealth, and commensurate differences in property size, as identified in the National Energy Efficiency Database Framework Report (Department for Energy and Climate Change 2011). At the other end of the spectrum, comfort taking or the rebound effect can undermine predicted energy use (Chahal et al. 2012). Another key factor that influences how and the amount of energy consumed is the inability of individuals to effectively manage energy within their homes. The use of controls is highlighted as a significant part of energy consumption, yet their design and ultimately their interface with operators create problems for people (Peffer et al. 2011). New ventilation and heating systems may require different approaches. Moving from a gas fired heating system with radiators requires a different pattern of use when compared with air-source heat pumps and under floor heating. These changes need to be both effectively communicated and reinforced. For certain groups of householders, such as older people, new technology often presents additional challenges in the way they are understood, programmed and accessed, all of which compromise the predicted efficiency of retrofit measures (Lusambili et al. 2011). For technologies, such as photovoltaic micro-generation, benefits are maximised if people can change consumption behaviours to shift in line with the demands of the technology. This, combined with unpredictable weather (a major issue in the UK when considering renewable energy), can lead to expectations not being met (Bahaj and James 2007).

The shift from using one sort of heating system to another, requiring new energy practices, is further complicated as a result of apathy or apparent resistance from householders in changing the way they use their homes. People, for the most part, appear largely unaware of how much energy they use and research suggests that they are rarely interested or engaged in the subject (Retallack et al. 2007; Whitmarsh et al. 2011; Yohanis 2012). Although we know there is a performance gap between predicted to actual use, we know comparatively little about what meaning and significance the presence of retrofit measures have for households. As such we still do not have adequate feedback from householders about what aspects appear to close the performance gap and

how this can be used to improve the roll out of these technologies. Often this longer-term engagement is not resourced as part of the retrofit project. It is often part of other resident liaison activities, and as such, data regarding levels of support to occupants in newly retrofitted properties is difficult to evidence. Affinity Sutton (2011) identified that from survey to completion, the number of visits to 102 homes within their retrofit programme ranged from 6 to 20, although this includes a certain degree of pre-adoption engagement.

Methodology

This paper reports on the findings from an initial exploratory study that formed part of the work of a Knowledge Transfer Partnership between the University of Salford, UK and Fusion 21 (a large social enterprise specialising in public procurement). The overall aim of the KTP has been to produce guidance for social housing sector on how best to deliver retrofit measures in partnership with their tenants. As part of delivering this guidance, a number of research activities have taken place; these include a literature review, a survey of 253 tenants in the social housing sector, six focus groups with tenants involving a total of 34 participants and extensive consultations with social landlords. The findings arising from the survey and literature review have been discussed elsewhere (Chahal et al. 2012). This paper reports on an analysis from the focus group phase of the research.

Tenants from six different social housing landlords located in the North West of England were invited to participate in focus group discussions during early 2011. The focus groups aimed to consider what were the drivers and barriers for tenants when presented with a programme of retrofit and what their experience was of living with the measures. Focus groups were seen as a method of data collection well suited to this stage of the research as they allow for the discussion of differences of opinion and experience within groups and facilitate a collective understanding of the particular norms and values that a specific group brings to the research (Morgan 1988; Lewis 2003).

Individuals with recent experience of retrofit were invited to take part in the focus groups. Although it was not discussed in detail, it is thought these retrofits were made possible either through the Decent Homes programme, CESP or CERT. From the 34 people who

participated in the focus groups, there was an even gender split of 17 men and women across all groups. The majority of participants were older people, over the age of 55 years. The focus groups were guided by a question schedule devised by the research team developed from the related literature review. The question schedule included issues relating to their housing type, energy consumption, their energy practices, their experience of retrofit installation and how they use their home and the technology that was installed. However, in keeping with the apparent gap in the literature, the main focus of these discussions was on the meaning the retrofit measures had for the tenants and how they fitted within their everyday lives, as opposed to the effectiveness at increasing the energy efficiency of their homes. The main technologies that were discussed were generally delivered in 'packages', specifically around insulation, heating and ventilation. Insulation will have included cavity wall insulation, loft insulation, windows and doors. In some cases, there was external wall insulation. Heating provided is predominately gas-fired combination boilers, while ventilation was provided by mechanical ventilation and heat recovery in cases where high levels of ventilation were provided. Also included were a number of photovoltaic installations.

The research team took ethical issues seriously and were guided by a number of principles, namely respecting the dignity, rights, welfare and safety of research participants; ensuring informed consent and voluntary participation; protecting anonymity and doing no harm. Information sheets were provided to participants which outlined the study and provided details of their rights as voluntary research participants and how the data generated might be used; signed consent was obtained from those who took part. The study was subject to the procedures required by the appropriate Ethical Approval Panel within the university. The focus groups were recorded and transcribed verbatim. The qualitative software package, QSR Nvivo, was used to store, manage and analyse the textual data. A sequential approach to thematic analysis was used following the guidelines of Braun and Clarke (2006) and King and Horrocks (2010). The analytical strategy involved a process of sustained reading and re-reading of the transcripts. Throughout this process the text was coded, sifted and sorted into key issues and themes. Although such a process shares characteristics with a grounded theory approach (Glaser 1992), the researchers significant pre-engagement with the literature and broader objectives

around the delivery of outputs meant that such a process was not possible. As a result, the objectives of the researchers to explore the issues that underpin the drivers and barriers to adopting retrofit measures, and using them efficiently, have an inevitable influence on the analysis of these accounts. However, it is thought that by adhering to the principles of rigorous qualitative analysis, such influence is made transparent in order to enhance the validity of the findings presented here.

Findings and analysis

The findings are explored following the processes that retrofit programmes are experienced by the households, from pre-installation to in-use. In particular, we look at the experiences arising around what people consider the drivers to adopting retrofit measures, as well as those aspects that are seen as barriers in some way. The installation process is explored before looking at the experience of learning and living with the new technology. While the main focus of this paper is concerned with the adoption and in-use factors, the installation process has been considered as it impacts on issues of trust between the landlord and resident. Additionally, handover processes on completion, where the property is completed and handed back to the resident, have a significant potential impact of how people might understand how to engage with their retrofitted home. The issue of handover processes and how they link to how occupiers use buildings cannot be ignored (Way and Bordass 2005), particularly in people's homes (Gupta and Chandiwala 2010). We then look at two of the main themes arising from our analysis which appear to have significant implications for delivering retrofit programmes at scale; these are issues around trust and the impact of shared knowledge, expressed in the form of community level stories, about retrofit, by residents. Quotations arising from the focus groups are presented below in order to illustrate the findings from the data. Two forms of quotation are used: one where an issue was raised by a single individual without the input of others in the group and the other where an issue was raised in discussion with other group members and possibly the facilitator. In the case of the latter instance, the speakers are distinguished by the prefix Int for the interviewer/facilitator and P (followed by a number) for each focus group participant.

Barriers to adopt retrofit measures

Although familiar issues of cost, return on investment and information are effectively redundant for households in the social rented sector, it was clear from the analysis that there were a number of significant barriers arising around the adoption of retrofit measures. In particular, the fear of the disruption caused by the installation of measures played a significant role in people's decision-making process:

The thing is with loft insulation... we put it in ourselves and then we boarded it. When they came round and said we've only got 6 inches and it needs to be 8 inches, I was going to pull all my walls up and put it in again. There is no point. We don't couldn't empty the loft when they came round to do it. Because I couldn't empty it they wouldn't do it so it never got done.

Indeed, similar to previous research regarding the adoption of cavity wall insulation (HM Government 2010), the disruption caused by installing insulation in the loft was a key barrier for some people. This is something that is well known, and some of the tenants reported no support in place from their landlords:

Int: I know for some housing associations or providers they provide loft-clearing services.
P1: They never offered. It never got done.

Although the upfront cost of purchasing the equipment and technology was not an issue for people, the fear of a cost arising from the installation still concerned some residents. For example, for one tenant there was an assumption that there might be a liability on them to address the maintenance costs of the technology, particularly where this involves micro-generation:

Who carries their own cost where there will be maintenance on them and there will be transfer systems and you've got so many different things going on with these. Who looks after it?

Another tenant assumed that the installation of this technology would be followed by a subsequent increase in their rent levels to pay for it.

Another barrier identified was the apparent lack of engagement of residents in most aspects of community governance or, it seems, a lack of engagement with any issues at all. One resident, who also sat on the board of

443	their social landlord, described the apathy pervading	Drivers to adopting retrofit measures	499
444	tenants in their area:		
446	We do a satisfaction survey once a year. How	None of the participants reported having had a	500
447	many did we get back? A couple of hundred, three	choice in the adoption of retrofit measures and	501
448	or four hundred, five hundred if we are lucky. We	so it was difficult to understand fully what their	502
449	send out to three and a half thousand properties.	motivations were to consenting to the measures	503
450	We get a very low figure back. Anything like that,	being installed. However, when the groups started	504
451	people don't, they are not bothered. The only way,	discussing what they thought could be done to	505
452	I've said this loads of times and people have heard	encourage a greater take-up of retrofit measures,	506
453	me say, the only way is if you sent a letter out	these revolved around the provision of information	507
454	saying, 'A week on Monday we are knocking your	or making residents care in some way. When taken	508
455	house down and we are going to put you in a tent.'	with the comments of one participant above, the	509
456	You would have them outside within an hour.	provision of information could be seen to be both	510
457	They would be queuing to knock hell out of you.	a driver and a barrier. Although for people who	511
458		could possibly be seen as 'positive-greens'	512
459	Another participant in a different group framed their	(Government Office of Science 2008) there was	513
460	residents as mostly content but similarly apathetic to	an apparent need for specific and accredited infor-	514
461	change of any sort:	mation in the form of informative leaflets about	515
463	I think because with anything like that, people are	specific contacts, people could consult with for	516
464	quite happy. Nobody really, there is not many	more detailed information:	517
465	people that can say they are not happy in their		
466	homes.	P1: Give a leaflet out telling you what is available.	519
467		Int: Do you think that would work?	520
468	However, offering a more extreme observation, a	P2: What we asked for was some advice on how	523
469	number of people in one of the groups acknowledged	to do about energy efficiency. And also, which	524
470	that some people would refuse measures because they	company is the best company for us in this area.	525
471	actively refuse to engage in any other issues:		
473	P1: If they don't want to let you in they won't let	Another person noted that signposts to solutions need to	526
474	you in. I've known people on our estate, when	be clearer and easier than is currently the case, 'People	527
475	they do electrical checks which is for their benefit,	need to know where to get them from. You need to make	528
476	they wouldn't even let them in.	it easier for them'	529
478	P2: Gas as well.	Another way that was seen to motivate people was by	530
480	P1: They wouldn't answer the door.	making them care about the issue in hand, or by linking	531
482	P3: There is some [people] you won't get any-	it to something people did care about:	532
483	where with.		
484		It's like it's always been said and I totally agree	533
485	One participant thought that more should be done, by	with it, ever since I've been involved, you will get	535
486	their landlord, to be much more active in engaging with	people round this table who want to be involved	536
487	residents. This resident thought that the mere provision	and want to know and want to learn, but a very	537
488	of written information provided through the post was	small minority. The only way you draw people out	538
489	not sufficient:	is if you have an issue and it's got to be a burning	539
490		issue.	540
492	The problem I think you would find is, the same as	Children were seen to have a role to play here,	542
493	we find with things like we ... we do things like	in the way they wielded 'pester power' or if the	543
494	energy efficiency. What happens to them? They	adoption of energy efficiency measures was linked	544
495	don't look at them they bin them. They are not	to other activities in and around their communities	545
496	interested. Not because it doesn't impinge on their	such as schools:	546
497	lives. Not bothered. So we bin them. It's some-		
	thing you send. It's like getting junk mail.	The kids are really big on it...If you set a target at	548
		the local schools in the area. They will get the	549
		information and they are going to go back home	550

551 and go, mum, mum you have go to do this. You've
552 got to do this. They will nag the older generations.
553 It's not that scary, gran. It's not that scary. Come
554 and see this. I think that could possibly work.
555

556 The install  of retrofit measures

557 The people who took part in the focus groups appear to
558 have had a generally positive experience when their
559 technology was installed. One contractor provided a loft
560 clearance service that was seen as positive, whilst, in the
561 same group, another participant relied on a family mem-
562 ber to help rearrange their belongings that were stored in
563 their loft:

564 **Int:** Did you have to clean your loft out for the loft
565 insulation?

566 **P1:** They did it...it was a contractor but I didn't
567 have much stuff in the loft then.

568 **P2:** My loft is very small. They moved my stuff
569 from one end to the other. I had to have my son
570 come in. I couldn't physically do it myself. I
571 couldn't get in other than swinging on the top of
572 my ladder.
573
574
575
576

577 The tenants of one landlord, in particular, reported
578 being impressed with the way in which the contractors
579 worked during the installation. As was discussed be-
580 tween them in one of the groups:

582 **P1:** They were clean. They were really tidy ...
583 even when they had finished the job they tidied up
584 after themselves.

585 **P2:** Mopped down the hall.

586 **P1:** Mopped down the hall and everything. Give
587 us your mop bucket. They did look after us that
588 way. They did clean up.
589

592 **P3:** They covered everything. They closed the
593 door in the room when they were doing it. There
594 was nothing coming out the room. They cleaned
595 up after themselves and brushed up and mopped
596 up.
597

598 Learning and living with  retrofit measures

599 An area that dominated the discussion was how partic-
600 ipants learnt to use the new technology that had been
601 installed. For some the instruction they had been pro-
602 vided with regards to how to use the new system was

minimal and, for some people, insubstantial for 603
example: 604

Int: Were you shown how to use a new boiler. 606

P1: Only a one day effort. 608
609

There was clearly a desire for more information about 610
how to use their new system effectively: 611

Really, it would be better if people were asked if 613
they need advice. If a leaflet was sent out to your 614
household and for them to tick if they would like 615
someone to come round and chat to them. I think 616
that would be better. 617
618

In order to learn about the technology, people instead 619
opted to call upon their family members, friends and 620
neighbours. There was a sense of drawing upon the 621
knowledge of people who were in some way 'technical- 622
ly proficient': 623

 laughter is quite good, she's set it down and 624
advised me I know she's checked how it works. 625
I've got it on that little thing [points to room 626
thermostat], we had one on the wall.  627
I'm lucky, I've got a son who is technical. He 628
teaches me these things and I can say to him, 630
because you can say, bloody well slow down. Just 631
show me and show me in plain English what I'm 632
doing and where I'm going wrong. That is how I 633
do my computer.  634
My mother is 84. She quite often gets confused 635
with any new equipment at all. We do have to sit 636
down and explain everything to her. I think the 637
elderly do need more help. 640

Alternatively, people in the local area who were known 641
to take an interest in energy efficiency were often used 642
as key sources of knowledge, as one participant 643
recounted, 'a lot of people come with problems to me'. 644

There was a sense of significant discomfort in having 645
to learn how to use their heating system. One person 646
talked about how learning technology, with which he 647
was not particularly engaged, was just 'aggravation': 648

I'm 58...unless it's something I'm really interest- 649
ed in, I just don't want to know. I don't want the 650
aggravation of having to work it all out and see 651
how it works and then do it. Older people than me 652
think housing associations tend to have a higher 653
proportion of older people rather than younger 654
people who shy away from technology complete- 655
ly anyway. 656
657

658	For a number of people, the technology, specifically	Mechanical ventilation and heat recovery systems	711
660	the way the technology was controlled, was seen as	prompted the most animated discussions. These were	712
661	mysterious. For example, one person who had a heat	framed mostly negatively in that they made their home	713
662	pump and a mechanical ventilation and heat recovery	cold:	714
663	system installed was unable to understand what the		
664	warning lights and instructions were telling her and	We've got one in the loft. It makes it cold.	716
665	whether the signals were things she should be acting	For the first 3 years that we lived in the property it	718
666	upon:	didn't work. We didn't know that, because when	719
		you used to talk to somebody you could actually	720
		see your own breath come out. It got fixed.	721
668	[The landlord] do know about this. I am not		722
669	complaining... But it is three o'clock in the morn-	They were also concerned about circulating dust and	723
670	ing and this is a horrible time to wake up. I don't	dirt around their home:	724
671	know what's causing it [respondent referring to		
672	warning lights] and I don't honestly think it should	Mine's made all my ceiling black. It gets all like	726
673	be causing it. It's something I think maybe wrong	black dust. The landing is quite cold.	727
674	and I put it in the loft, presumably. It's a bit		728
675	frightening. Everything about it doesn't sound	Other respondents talked about how the new system	729
676	right. The other thing is this emersion heater. Is	was located in inconvenient locations within their home:	730
677	that connected with this system? Is the immersion		
678	heater part of that system or is that completely	Int: Did they not show you how to use it?	732
679	separate? I found to my horror and for the first	P1: There are no controls. It's just fused. It's in the	733
680	10 days I was in, I got this thing—there was a red	loft.	735
681	switch that goes to the right panel and two red	P2: We had a switch on our one, a little switch.	736
682	switches on the side. That was turned off. The red	P3: We've got nothing.	739
683	one underneath is still.	P1: It's up in the loft. If the fuse blows you have to	740
684		go up in the loft. It means we've got to climb up	742
685	This resident, in particular, objected to being made to	into the loft.	743
686	feel like a novice—and powerless—whilst living in their		744
687	own home:	The role of trust and the relationships with key	745
		practitioners	746
688	If I start turning off switches ... I'm not an idiot.		
690	Obviously these switches are to do with the im-	Across the focus groups, it became increasingly clear	747
691	mersion but is it all right to turn them off or	that trust plays a multi-faceted role in the way in which	748
692	something?...I don't know what the one switch	residents within social housing view and experience the	749
693	is doing. It hasn't stopped the water from coming	installation of retrofit measures. The issue of trust was	750
694	out boiling.	discussed in relation to their landlord, the contractors,	751
695		'experts' and, perhaps inevitably, the technology and	752
696	A number of people openly acknowledged that they	measures themselves. In terms of their landlords, it	753
697	did not understand how their systems worked and im-	was clear that for a number of tenants how their land-	754
698	plied that they realise they are probably not using them	lords, and the contractors they have appointed, have	755
699	efficiently:	approached repairs and demonstrated an apparent lack	756
700	I can't say I fully understand. But I understand	of expertise in the past helped frame their landlords as	757
702	enough to work them, I think	potentially incompetent in the installation of retrofit	758
703	I'd understand it if mine worked efficiently or	measures:	759
705	properly, but it doesn't.		
706	Interestingly, the focus group setting obviously allowed	Getting the repairs done and draughts, that's the	760
707	people the space and opportunity to seek the advice	worst. I applied for the wall insulation and a chap	762
708	from people like them on how best to operate their	came out and said, it's been done. I said, funny	763
709	new heating systems, to ask questions and to share	that mate, I had a repair done in the cavity wall and	764
710	knowledge and experiences.	the chap took a couple of bricks out of one end of	765
		the wall and a couple of bricks out the other and	766

767 we both put our heads through and there was
768 nothing there.
769 What you should have is a proper surveyor that's
771 got nothing to do with [the landlord] come out and
772 say, that's needs doing.

773 Although most people in the groups had had a
774 positive experience of retrofit installation in the
775 recent past, by far the most suspicion was directed
776 at those who undertook the installation of mea-
777 sures. Most tenants were able to recall some inci-
778 dent that illustrated a lack of sufficient attention to
779 detail:
780

781 I had a problem with the boiler. It was wired
782 in wrongly by somebody from a contracting
783 team. It worked for about 4 h after they
784 went. After they'd installed it they'd gone
785 and then it just conked out. It was all be-
786 cause it was wired wrongly. Luckily, there
787 was a number that I could ring from the
788 contractor. They came back out with fan
789 heaters for us to have some form of heating.
790 They just put these windows in...when I moved
791 in, the day we moved in they were putting them in
792 while we were there. They put them in, but the
793 strip of plastic they had was the wrong strip. It's
794 short. I'm getting a draught in the back kitchen.
795 I've got one of the largest windows on the landing.
796 Being on the end I've got at least an 8 foot win-
797 dows and you might as well not having it in. The
798 draught comes through terrible.
799 Our loft, they just threw the insulation in. It's not
800 even put down properly.
801
802
803

804 With 'experts', who were supposed to provide a level
805 of diagnostic help and analysis, similarly offering very
806 little comfort at all:
807

808 They reckon it's [installation of cavity wall insu-
809 lation] been done. They didn't actually look at my
810 property. It doesn't appear as if it's been done. If I
811 go away, even just for a few days, as I do every
812 other week and you can smell the mustiness in my
813 hallway and that shouldn't be. It shouldn't be in
814 any home.
815
816

817 A potential solution to improve performance and
818 confidence, noted by some respondents, was the need
819 to embed transparent quality assurance processes in
820 the retrofit works in the form of post-installation

inspections. Apparently no resident in the focus
groups had experienced an inspection:

You know when you are in the building trade, you
can't do anything without an inspection. He in-
spects everything you do. He gets something 6
inches out of place. If you had somebody follow-
ing these guys around and you've got a bit more
power than them and saying, you are not leaving
this property until it's right. That would be a better
idea. You need somebody who knows all the
specs, all the modifications

P1: I've just had that done from the gas checks. I
had an inspector come round to check that the
check had been done.

P2: Set up a bit more regular it would be better for us.

P3: They are supposed to come round and inspect
the properties aren't they every now and again?
No-one has ever been round to inspect me.

Such findings offer an insight into tenants' reasoning
when they are considering the value of adopting retrofit
measures and engaging with those practitioners who
work in the retrofit industry. The accounts above suggest
that the installation of retrofit cannot be separated from
the experience the vast majority of tenants have had with
housing repairs and modernisation programmes of the
past. There appears a lack of confidence in the quality of
the workmanship and expertise available which is per-
haps compounded by the relative novelty of some of the
measures being installed.

Sharing experience of sustainable retrofit

An emerging finding from this study indicates that the
reason trust takes on a central role in the discussion of
retrofit is because it forms a key barrier to adoption and
efficient use as a result of the way it is transmitted
through the stories residents tell themselves and each
other about the work being undertaken. The stories
people tell about their lives are important to consider
as they are strategies we all use to bring order to what
can be seen as disorder (Murray 2003). Stories serve as a
way for transmitting knowledge to others, as well as
making sense of things to ourselves, about our beliefs
about who, what, when, why and how things are done.
Therefore, in the case of energy efficiency—and the
refurbishment of homes—such stories offer a useful
insight as to how this knowledge is being understood.

871	For some participants, their learning about how to be	924
872	efficient in their consumption of energy and their use of	925
873	technology was transmitted through their discussions	926
874	with others. One person talked about how they use lights	927
875	in their home based on information she had obtained	928
876	from some unknown source:	929
877		930
878	I tend to leave mine on in the evening when I'm in.	931
879	Leave my hall light on. If I should walk just into	932
880	the bathroom, I don't put the bathroom light on or	933
881	if I just go into the bedroom for something, I don't	935
882	need to put the bedroom light on. I don't bother to	936
883	switch—we are told that it takes more electricity	937
884	to switch them on and off.	938
885		939
886	Some people recounted reasons for inaction by ten-	940
887	ants towards initiatives because they appear 'too good to	941
888	be true' for social housing tenants, for instance:	942
889		943
890	None of this applies to us and we can't—every	945
891	time we have these things coming through the post	946
892	and it says, do you want loft insulation and do you	947
893	want this and do you want that. You can send them	948
894	all off and I've often done it, just as a joke,	
895	because I know quite well it's just going to come	
896	back and say, you are with a landlord in social	
897	housing. You don't qualify.	
898		
899	Here their status as tenants was seen to locate them as	
900	'undeserving' of initiatives. This narrative shares similar	
901	characteristics with the assertion by another participant	
902	outlined above who thought that the acceptance of ret-	
903	rofit measures would lead to them having to pay more in	
904	rent to their landlord as a direct result. Another example	
905	of this would be another participant who thought that if a	
906	utility company were installing 'free' insulation the	
907	householder would end up paying for it anyway through	
908	a hidden charge attached to their utility bill:	
909		
910	I heard somewhere that when they undertake cav-	
911	ity wall insulation say it was your gas company or	
912	electric company on the bill they take a small fee. I	
913	don't know whether that's correct or not. I've	
914	heard that.	
915		
916	Finally, one of the most damaging aspects of stories	
917	when discussing the retrofit of properties is the rumours	
918	that emerge about the process or the technology not	
919	working correctly:	
920		
921	We are lucky in this respect as when we moved in	
922	we had under floor heating that wasn't working	
923	properly. We had heaters, storage heaters that were	
	falling off the wall. So we contacted the landlord	
	and through their agents we'd had all new heating	
	put in, you know, storage heaters. Ours are work-	
	ing perfect. But in saying that, there is a rumour	
	that even though these are only just over 12	
	months old, they have been coming out and a	
	better system again put in. Whether they do it that	
	way or not I can't really say until I see what they	
	are doing.	
	Not my problem. I've heard negative stories, be-	
	cause I mean I know what it's like when one	
	person will hear something, 'Oh well, that's	
	it—I'm not having that'. By the time that story	
	has got back to the landlord it's gone so far round	
	and got so convoluted	
	Or the negative financial implications such changes	
	to their homes could have:	
	When, I've just told you that our bungalows are	
	terraced. The first person to have gas central	
	heating put in she reckoned that her account dou-	
	bled, immediately and have stayed that way since.	
	Looking at the stories people tell about why they do	
	or do not do something offers an interesting starting	
	point in order to begin to unpick how decision making	
	is constructed within everyday life. As the findings	
	above suggest, rumours, myths and misinformation	
	transmitted by unknown and non-specific sources can	
	have serious impacts on the ability of practitioners to	
	introduce new programmes in local areas. This, howev-	
	er, offers a new way of looking at how occupants can be	
	engaged in order to work towards a more successful	
	programme of retrofit. Offering information, comprising	
	of facts and figures but also positive descriptive ac-	
	counts grounded in experiences within the	
	neighbourhood, transmitted by trusted sources in ways	
	in which people can easily absorb, may help to provide	
	reassurance within community settings.	
	Conclusions	965
	The findings discussed here throw new light on some of	966
	the issues arising when households are asked to adopt	967
	and use measures and technologies that aim to make	968
	homes more energy efficient. As a result of the lack of	969
	empirical research into the everyday experiences of	970
	households adopting retrofit measures, the participants	971
	in these groups help us to better understand what some	972

of the barriers to adoption are, what it is like living with these measures as well as some of the factors that underpin this area.

Although the participants in these groups were not exclusively older people, these findings build on the research of Lusambili et al. (2011) into how older people respond to technology in the home. In their paper, Lusambili et al. talked about the apparent disconnect between the ways in which technologies were designed and the requirements of the end user. Our findings would tend to support this as it was clear that the technologies and interfaces were often mysterious to the end user. Many people appeared to lack a 'conceptual model' (Norman 2011) of how their system worked and their role within it. People often sought the advice of those who they already trusted and relied upon, regardless of their familiarity with the specific technology, to help them navigate the controls for their heating system. Again Lusambili et al. (2011) had a similar finding where, in their sample, the vast majority of older people tended to rely on friends and family for advice and assistance. Those who were most excluded, lacking in connections in their social networks, often did not know how their system worked. However, Lusambili et al. point out that even those who relied on their social networks to understand how their system worked did not necessarily use the technology efficiently. It simply meant that there were other people who were able to understand the principles of the control interface, not how the heating system as a whole worked.

Such findings provide worrying conclusions in that although the homes of some of the most vulnerable and those on the lowest incomes are being retrofitted, the process of handover from an installer and landlord to the resident appears inadequate. However, there was evidence of a certain amount of identity work by householders who refused to be seen as novices in their own homes for not being able to use the system efficiently and who railed quietly against being forced to develop technical operating skills they did not feel comfortable with. It is unknown what was being done by the landlords to counter such crucial issues, but it could be suspected that with the scale of the task required to retrofit and upgrade the social housing stock, coupled with the general reduction in public spending, staffing resources to re-visit properties and spend time [re]training tenants in 'best practice' in using their domestic heating systems is unlikely.

What emerges from this analysis is the centrality of trust in the retrofit process. Tenants appear suspicious about apparently 'getting something for nothing' and assume there to be some kind of catch, either that they will pay additional rental charges or that their utility bills will increase. Similarly, although most participants had had positive experiences with the contractors installing retrofit measures in the recent past, there was a theme of distrust about the quality of installation that they could expect from contractors appointed by social landlords. This draws upon a broader cultural narrative of 'shoddy workmanship' of public sector maintenance workers. These findings indicate the need for more research into how trust can be developed and maintained between the different actors in the retrofit supply chain, particularly the tenant–installer–landlord relationship. This may though be only one part of a multi-faceted solution as it emerges as crucial to work with tenants to enhance their confidence in the retrofit endeavour as the biggest advocate and driver for the broader public acceptance of retrofit technologies will be people themselves. If we are to succeed in the mass deployment of retrofit across the UK, we will need to support the narration of positive stories about the technologies that will be re-told from home to home.

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AUTHOR QUERIES

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- Q1. Please check if the affiliations are correctly captured.
- Q2. "Hills 2012" is cited in text but not given in the reference list. Please provide details in the list or delete the citation from the text.
- Q3. The citation "Ravetz 2009" (original) has been changed to "Ravetz 2008". Please check if appropriate.
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- Q6. The citation "Achnicht 2010" (original) has been changed to "Achnicht 2011". Please check if appropriate.
- Q7. The citation "ESRC 2007" (original) has been changed to "Economic and Social Research Council 2009". Please check if appropriate.
- Q8. The citation "DECC 2011" (original) has been changed to "Department for Energy and Climate Change 2011". Please check if appropriate.
- Q9. The citation "Sutton (2012)" (original) has been changed to "Sutton (2011)". Please check if appropriate.
- Q10. Caird et al. (2008), Chappels & Shove (2004), DCLG (2006), DECC (2011a, b), DEFRA (2009), Department for Business, Innovation and Skills (2010), National Audit Office (2009), Walker (2008) and Wright (2004) were not cited anywhere in the text. Please provide citations. Alternatively, delete the items from the list.