Missing the point – the challenge of creating policies and programmes that tap into the motivations of the builders and installers

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Abstract

Encouraging and ensuring continuous low carbon retrofit of existing buildings remains a major challenge in moving towards zero-energy building stock. In recent years several researchers have confirmed what practitioners already know: small and medium enterprises (SMEs) and micro-enterprises are vital in implementing energy efficiency targets through effective, bespoke, renovation action to reduce energy consumption, particularly in private housing stock. These actors often work together, formally and informally, in networks connected by practice, customers and values. Trade practice includes the acceptable informal standards of low carbon work in that network. Customers can be important in setting expectations and standards and negotiating acceptable retrofit practice. The values of the tradesmen themselves affect what work is undertaken through the relative prioritisation of capital cost, running cost, carbon emissions, energy efficiency and their ambitions for their business. Separately, SMEs are also a major focus of EU and national economic policy; these policies typically encourage new enterprise and economic growth. Using qualitative empirical data currently being collected from micro-enterprises working on general renovation of buildings and heating systems in the UK, this paper illustrates how the drivers for SMEs taking decisions about whether or not to promote or carry out low carbon renovation are not aligned with those SME policy objectives. We use our analysis of the real motivations for SMEs in engaging with low carbon retrofit to suggest opportunities for policies and programmes that might support the potential of SMEs in achieving large scale energy efficient retrofit of private homes.

Introduction

This paper focuses on addressing the challenge of implementing widespread retrofit for energy efficiency in existing buildings. The terms retrofit, renovation, refurbishment and repair-maintenance-improvement (RMI) are loosely defined and to some extent used interchangeably in the buildings and energy efficiency literature. Retrofit perhaps implies a greater focus on energy intent, renovation suggests modernisation while refurbishment and RMI suggest regaining and maintaining the desired standard of a property. The need for such retrofit is described, briefly, before focusing on a particular group of actors who are vital to retrofit: builders, heating engineers and allied trades who are grouped together as 'installers', specifically installers who work in Small and Medium Enterprises (SMEs) or micro-enterprises. After exploring the potential influence of installers, the paper then examines how national policy currently relates to such SMEs/microenterprises, using mainly UK policy to illustrate the points made. This reveals a gap between drivers for policy and drivers for installers which means that policy will struggle to achieve its desired outcomes. Using the analysis of installer motivations and behaviour as a starting point, the paper suggests how policy which aligns with the drivers for installers might be designed.

RETROFIT OF EXISTING BUILDINGS

Retrofit encompasses a range of activities in repairing, improving and maintaining buildings, incorporating innovations that shape energy use directly or that influence user behaviour to reduce energy use. The range of measures addressed by retrofit includes energy efficiency measures and also microgeneration of electricity or heat where this might either change the energy use of the building user, or increase efficiency in the en-

ergy distribution system through reducing distribution losses. Buildings currently account for 40 % of energy consumption and 36 % of carbon emissions in the EU. The roadmap to achieving emission reduction targets by 2050 suggests that the residential building sector has one of the greatest opportunities for reduction, 88–91 % by 2050 (EC, 2014). With low rates of new build in most countries, in the UK it has been estimated that 70–80 % of the buildings that will need to be low carbon in 2050 are already part of the building stock (SDC, 2006), so finding ways to reduce energy consumption and increase the energy efficiency, of existing buildings remains a significant challenge. While achieving targets requires 'deep' retrofit which reduces energy demand to a minimum (Boermans et al., 2012), it seems likely that, in practice, improvements in energy efficiency will be delivered through continuous and incremental retrofit as householder finances and expectations allow (Fawcett, 2013).

HOW DO INSTALLERS AFFECT ENERGY EFFICIENCY IN EXISTING BUILDINGS?

Small firms will have the greatest influence on privately owned, single family homes, as multi-family homes are likely to be altered through arrangements with a landlord and become larger projects affecting several households at the same time, requiring larger firms to undertake the work. In European context, this means that influence is greatest where single family, private home ownership is highest. The mix of single family and multi-family homes varies significantly across Europe, with the greatest market potential likely to be in Denmark, Ireland, Netherlands and United Kingdom who have proportions of single family homes above 70 % whereas Estonia, Italy, Latvia and Spain have proportions below 40 % (Birchall et al., 2014a).

By definition, architects are a vital profession in building design to ensure energy efficiency, and for major renovation jobs involving building extensions, loft or basement conversions, then an architect may be involved. Even for architects, their role in energy efficient retrofit could be developed (Nosberger et al., 2011, Janda and Killip, 2013). However, a substantial number of retrofit projects take place without significant architect intervention. A small building project may be undertaken using drawings produced by an architectural technician, but many projects are done without architect input at all.

The important role of installers in building retrofit is now being recognised in academic literature (Janda and Parag, 2013, Owen et al., 2014, Killip, 2013). Small firm installers influence energy efficiency in retrofit through, in project chronological order,

- **Identifying** potential energy efficiency options in design. The process of design, particularly for small repair-maintenance-improvement works (RMI) may be informal and collaborative, with or without architect or engineer input. Being aware of how energy efficiency of a building might be improved and identifying when such improvements might be made requires a level of technical interest in how energy efficiency is altered.
- **Selecting** viable energy efficiency options in design. Viability may be assessed through cost, functional/technical knowledge, or supply constraints. If a renovation job is being done on a fixed price estimate, then the options for improving energy efficiency are, in effect, solidified when an option is selected and costed.
- **Implementing** energy efficiency measures (effectively) though the renovation works. Most retrofit jobs will require some element of problem solving and ad hoc adjustment as they are undertaken, thus the installer needs the ability to adjust their work while also maintaining (or improving) the anticipated changes to energy efficiency, within the agreed costs.
- **Commissioning** energy efficiency and **maintaining** property post commissioning. While changes to the fabric of a building may improve energy efficiency immediately, many other building changes made in renovation require some element of use behaviour change in order to achieve the expected impact. Examples might be developing an understanding of how to operate thermostatic or timed boiler controls, or timing the use of appliances to make the most of micro-renewables. As post-commissioning time is rarely an acceptable element of a fixed price quotation, few small firms will undertake this work, unless they all called back to rectify errors or make changes to installed equipment.

This influence may be direct i.e. the installer takes decisions themselves, or it may be indirect where the installer's knowledge and beliefs or values shape the advice offered to the householder client and the decisions that the client subsequently takes.

WHO ARE 'INSTALLERS'?

Several trades influence energy efficiency through the retrofit of existing buildings, as retrofit may be done through renovation of a single room, reconfiguring several rooms, a change to the heating system of the home, or creating new space in a home through an extension or conversion of unused space, such as a loft or basement. General builders often act as the lead contractor, although formal contract arrangements may not be in place. Other trades then contribute to a retrofit project with perhaps the most influential being heating engineers and plumbers although joiners (carpenters), electricians and plasterers can each play a role. In the UK, with widespread mains gas available, heating engineers often style themselves 'gas engineers' and prioritise certification to gas safety standards, which leads to preferences over the selection and design of space heating technologies.

While there are many large firms in the construction sector, this paper focuses on the smallest firms, typically tied to one specific locality, with customers who are individual home owners and occupiers. Taken together, small construction firms likely to be undertaking retrofit are a large group supporting significant employment. The UK situation seems likely to be broadly representative of the wider picture across Europe: in March 2013, 269,000 individuals were registered as self-employed across the whole construction of buildings sector in the UK, about 0.9 % of the UK workforce (Office for National Statistics, 2013, cited in Owen et al., 2014). UK figures also suggest that three quarters of all firms who work on residential property employ three people or less while the proportion of such small firms is slightly higher for the allied trades of electricians,

plumbers and heating engineers (Office for National Statistics, 2012, cited in Owen et al., 2014). For these three trades, electricians, plumbers, heating engineers, allowing for one person per firm only, there are at least 95,000 individuals in these types of firms whose work could influence and accelerate domestic property retrofit in the UK.

The work carried out by these smaller enterprises is also an area of significant economic activity. The total annual spend on construction trades working on the repair, maintenance and improvement (RMI) of UK residential property in 2011 was £22.3 billion (€28.5 billion) (Office for National Statistics, 2012, cited in Owen et al., 2014). Clearly, this is not all aiming to achieve energy efficiency or aligned with low carbon goals at present. However, the potential market spend on 'repair-maintenance and improvement' (RMI) of UK private homes – providing low carbon retrofit on a room-by-room basis – was estimated at £12.5 billion (approx. €16 billion) per annum in 2009 (45 % of the total UK RMI spend that year), a vast sum and potential compared to a spend on energy efficiency by the larger energy companies through the regulatory energy efficiency scheme (Carbon Emissions Reduction Target – CERT) who spent £800 million (approx. €1.02 billion) on measures such as insulation and draught proofing in the same year (Killip, 2012). The amount of this spend on residential retrofit undertaken by the smaller companies will be less than these dramatic totals, but a UK trade association representing small and medium sized building firms recently reported that they expected UK homeowners to spend up to £6 billion (approx. €7.7 billion) per annum on refurbishment and renovation of existing homes (Federation of Master Builders, 2014) and each refurbishment project will offer an opportunity for energy efficiency improvements.

Even where homeowners are keen to incorporate energy efficiency into their renovation plans, finding the tradesmen who can undertake such work effectively can be challenging (Fawcett and Killip, 2014, Mallaband et al., 2013). It is therefore helpful to understand how installers might affect the energy efficiency of retrofit projects and what influences them, in order to identify how the potential of the sector might be realised.

WHAT INFLUENCES INSTALLERS?

Three areas of influence can be readily identified – delivering value for customers; avoiding risk; and participating in networks. These have emerged from exploratory study and are empirically observed rather than derived from theory and so these three areas are unlikely to be comprehensive. Rather, they offer a starting point for further research and analysis.

Delivering value for customers is vital for a small business as customer satisfaction is essential both to ensure bills are paid in a timely manner and to ensure being referred for further work, either with this customer or another customer linked to this one through a social or professional network (see below). What is 'value', however, is a subject for discussion. The main meaning of 'value' when deployed by a construction SME is 'low cost' and, specifically, low one-off installation costs. Whole life costs should be important to the rational home owner investing in their property but in practice, the one-off installation cost is what tradesmen are asked to estimate and quote for, and those price quotations form the basis of selection (Galvin, 2014).

Customer demands and perceptions can influence this perception of value. Installers report that if a homeowner expresses a particular interest in environmental issues, then the installer might recommend slightly more costly equipment or materials. They also report baulking at materials suggested by enthusiastic homeowners when the cost increase is considered, by the installer, to be unjustified. An example would be the use of wall ties through insulation; wall ties designed to avoid thermal bridging can be up to ten times more expensive than the standard type used for general building works.

Once a shared understanding of value has been established between an installer and a customer, and there is trust that this value will be delivered, then advance pricing may become less important. An existing customer may trust to the high quality and value of a particular installer and ask for work to be done without a fixed price, on a time and materials basis, in the future. This suggests that repeat work may offer more opportunities to include energy efficiency measures, when perceived cost barriers are a smaller concern.

Avoiding risk is essential, as small businesses require certainty that work can be delivered within estimated costs, which includes working within planned timescales given that labour is a significant element of many retrofit projects. Small businesses prefer to work with known technology. This may be a general technology preference based on market dominance, e.g. gas heating in the UK. Prior experience also plays a role; there are still prejudices against cavity wall insulation among older general builders who worked with early versions of technology which did not work effectively due to issues with thermal bridging (Owen, 2013).

Participating in networks shapes installer action in different ways, depending on the type of network. Four types of network are identified below: inter-trade, intra-trade, supply chain and customer networks.

- Inter-trade networks to deliver projects. Small firms will usually collaborate in order to deliver multi-trade projects, and installers have preferred partners who they have worked with before i.e. a builder will have a 'usual' electrician, joiner, plumber, plasterer and so on. Trust between trades in the quality of work delivered is vital, as a large amount of work for small installers comes from customer referrals and repeat work, meaning that the impact of poor quality work is significant for all the tradesmen involved in a project. The importance of energy efficiency measures, and the level of technical knowledge which ensures the integrity and effectiveness of any energy efficiency measures installed, may be one aspect of a shared set of values and priorities shared amongst an inter-trade network.
- Intra-trade networks. Sole traders in the same trade e.g. plumbers/heating engineer will usually have a network of fellow professionals who they draw upon for advice, and who they may also receive work from or pass work on to. Once again, trust between individuals in the network that work will be delivered to acceptable standards is very important. Professional networks may be maintained in part through local training networks, where updating skills in order to maintain certification provides an element of peer learning and expectation.

- Supply chain networks (notably builders' merchants and plumbers' merchants). These are not the supply chains visible to the consumer – the hardware and DIY stores and chains – although these may have 'trade' outlets. Builders' and plumbers' merchants are often a source of technical knowledge, as well as maintaining strong local connections and understanding the nature of the local property renovation market. Merchants may also act to enable or constrain the flow of innovative products into local retrofit projects through their stock choices and advice to their customers.
- Customer/social networks. Another reason why customer satisfaction is so important is that trust can be passed on through customers' social networks and provides a route to further work for the installer. Trust in an installer is particularly important when working in homes; the installer is working in and changing a household's private space. The respect that they demonstrate for the home is very important. Thus, asking friends for recommendations of installers is reassuring for the customer. In some cases, the installer is also a direct participant in the social network with customers. This may be a social interest group such as a sports club, or a network such as having children at the same school.

Customer networks may also be geographically or spatially focussed. This is evidenced by the level of work that small businesses get from previous customer referrals, and by the preferred marketing methods of many small construction businesses. Two such methods are: leafleting everyone else in the street when microgeneration is installed, or other visible work is done; and repeat advertising in locally distributed leaflets and publications. Both methods capitalise on spatially concentrated networks. A household which moves to a new home in the same area is likely to want to use trusted tradespeople and it is known that life events such as moving home or having children provide particular windows of opportunity to retrofit for energy efficiency (Schäfer et al., 2012). Thus maintaining links with existing customers is an important strategy for micro-enterprises. This is sometimes done through an annual communication, perhaps simply a Christmas card to remind former customers of the installer's contact details, or a letter in mid-summer from a heating engineer reminding the customer to service their central heating boiler before it is needed in winter.

POLICY AND SMES

Turning now to how policy treats SMEs and micro-enterprises in general, this paper looks at how these general policy approaches are relevant to construction SMEs and micro-enterprises active in energy retrofit. SMEs are defined by employee size and turnover. A small company, in EU terms, is one which employs less than 50 people with a turnover of less than €10 million, while micro-enterprises employ less than 10 people and have a turnover of less than €2 million.

First, SMEs are seen as vital economic actors, making up two thirds of employment across the EU (88.8 million people) and accounting for 99 % of all enterprises in the EU (Muller et al., 2014). They are therefore unsurprisingly seen as offering significant potential for growth. Growth here specifically means increase in GDP, i.e. levels of economic activity, or increasing the financial turnover of each firm.

National policy therefore offers encouragement to SMEs to increase their turnover. In the UK, there are incentives to increase the number of employees in SMEs, which would allow increased turnover. An 'employment allowance' was introduced in 2013 which allows small firms to deduct up to £2,000 (approx. €2,500) per annum from their employer's national insurance bill, the element of corporate taxation which is directly related to the number of people employed in the firm and how much they are paid. However, empirical data suggests that these incentives are outweighed by the personal reluctance of sole traders to take on responsibility for other's livelihoods. There is a tradition of taking on apprentices, but the expectation is that these apprentices will become sole traders in their own right in time.

Value Added Tax (VAT) deserves special mention. In the UK, a lower VAT rate of 5 %, rather than the usual 20 %, applies to a specific list of equipment such as heating control systems (but not replacement boilers), draught proofing and microgeneration, where they are installed in households where the householder is in receipt of welfare benefits and where they are installed by a tradesman rather than as a DIY project (HMRC, 2014). However, a wide range of trade organisations linked to the retrofit industry, as well as organisations concerned with cutting climate emissions, continue to campaign for the lower VAT rate of 5 % to be applied to all retrofit works, arguing that all such projects offer the potential to reduce energy demand, thus lowering the cost of retrofit will increase the amount of energy efficiency improvements in the building stock (Experian for the 'Cut the VAT' campaign, 2014). In the UK, all new building work can benefit from a reduced VAT level of 5 %. There has been considerable debate across the EU about the harmonisation of VAT and clearly, there are other issues to consider beyond the need for extensive low carbon retrofit, but since 2009 the EU VAT directive (directive 2006/112/EC) does allow for a VAT rate of 5 % on private dwelling renovation.

Another aspect of VAT and SMEs arises in the area of whether a firm is registered to pay VAT on its turnover or not. In much retrofit work, where energy efficiency is embedded into the construction decisions, the costs lie in labour, rather than materials. If a small business has a turnover of more than a threshold value (in the UK, £79,000, approx. €100k, in financial year 2014/15) then they must charge 20 % VAT on their costs. If their customer is a VAT-registered business, this is, in effect, cost neutral as the customer business can reclaim the VAT through their own tax returns. However, the private residential customer cannot reclaim VAT and so simply sees a bill 20 % higher than they would if they use a business which operates below the VAT threshold (or outside the VAT system, resulting in cash payments that do not appear in the SMEs' formal accounts). This counteracts any incentives to increase turnover as the perceived extra (paper) work in being VAT registered is a significant disincentive for micro-enterprises. Their motivation to work comes from carrying out the trade and maintaining a steady level of income, rather than administering and growing a business.

The roadmaps and national action plans required by both the 2010 Energy Performance in Buildings directive (directive 2010/31/EU) and the EU Energy Efficiency directive (directive 2012/27/EU) make it clear that retrofit of existing buildings is a priority. There is a package of 'concerted action' to tackle

the energy efficiency of existing building (Concerted Action EPBD, 2013) and this recognises that development of installers as a specific area of need. But action in these areas has, to date, not focussed specifically upon realising the potential of SMEs and micro-enterprises in construction undertaking renovation. This is understandable given the highly fragmented and often locally-focussed nature of this sector. Individually, the impact of such actors is small, but as outlined above, collectively, their impact is significant. While policy proposals do tackle the issues outlined through regulatory instruments, fiscal instruments, and advice to householders (Klinckenberg and Sunikka, 2006, Birchall et al., 2014b, Oxera Consulting, 2006, Atanasiu and Kouloumpi, 2013) the design and evaluation of such policy options largely ignores small firms (Oxera Consulting, 2006).

THE GAP BETWEEN POLICY AND PRACTICE

Increasing the energy efficiency of our buildings (and our lifestyles) is already recognised as limited by a number of gaps. There is the value action-gap which contrasts what people say they want to do with what they actually do (Blake, 1999), the performance gap which lies between the design intent of buildings and what is achieved and the more broadly defined energy efficiency gap between what is possible and what is achieved (Barr et al., 2005, Palmer et al., 2013, Pelenur and Cruickshank, 2012, Shove, 1998). This paper identifies a particular section of an implementation gap, opened up because the desired outcomes for policy makers are substantially different to, and sometimes opposite to, the desired outcomes for this group of practitioners, installers.

Where SME policy with respect to the environment is discussed the focus tends to be on the direct impacts of SME operation and increasing their role in the green supply chains of larger organisations (Blundel et al., 2013). In retrofit activity, the influence of installer on energy efficiency is indirect; through the work they undertaken that can reduce (or increase) their customer's energy consumption.

Economic growth is the overarching policy goal for all business as far as most governments are concerned. A healthy economy, and a degree of economic growth is the necessary background for small firms to undertake property renovation work, although high levels of economic growth may actually mean that homeowners are more likely to move house rather than upgrade their existing property, thus limiting small firm retrofit activity. But macro-economic growth is not the primary consideration for construction SMEs, when they take decisions on how to advise and implement energy efficiency measures in retrofit projects. Very specifically, many micro-enterprises actively work to stay below the VAT threshold on their turnover. Materials might be bought directly by the customer rather than going through the installer's accounts. Other tradesmen who act as sub-contractors will bill directly to the customer rather than to the main contractor, with trust in their trade networks playing a vital role. There is an understandable reluctance to employ others when the additional regulatory and financial burden of managing a larger business is not aligned with the individual's installer's motivations of independence, self-determination and the satisfaction of carrying out a trade. The responsibility of finding work to keep other people busy is not attractive. The 'zero-hours contract' is a contractual arrangement which sets terms, conditions and rates of pay but which does not guarantee any work. This has been the subject of much discussion in the UK because of its potential to allow large companies to exploit vulnerable workers. However, the zero-hours contract may be a solution which works for small construction businesses who want to be able to call on peers without committing to a regular salary.

Policy which seeks to increase the demand for energy efficiency in retrofit by increasing householder interest overlooks the inertia in the system associated with the preferences and knowledge of the installer, who influence retrofit decisions in several ways, as outlined above. At the other end of the supply chain, policy which seeks to encourage technical innovation rarely looks far enough along the supply chain to see how the capacity of the installer sector, the SMEs involved in retrofit, matches what is required to accelerate the diffusion of a technical innovation.

A POLICY APPROACH ALIGNED TO INSTALLER MOTIVATIONS

So what would policy look like if it started from the installer's motivations to undertake energy efficiency retrofit? Based on the analysis above, this paper suggests three areas to be explored; there are doubtless others. The three identified here are: delivering customer value, de-risking innovation and trade supply chains. We do not make claims for the impact of shifting policy in these areas, and further research is required to understand their potential and relative importance; these ideas are set out simply to illustrate new dimensions consider in policy.

Policy that focussed on **delivering customer value** would align with the installer's need for happy retrofit customers who paid bills on time, came back to the installer for future jobs, and referred the installer on to other parts of the customer network for future work. This means that in addition to paying attention to the carbon energy efficiency potential of retrofit technologies, and certification of installers to underpin achieving those energy efficiency savings, policy would support installers, and networks of installers, to develop whole project views of retrofit activity. For example, if price estimates for retrofit work were able to include an easy to apply and consistently calculated estimation of the added value of energy efficiency savings, alongside the capital and labour costs, then installers who were interested in energy efficiency would have some incentive to highlight how their work would deliver extra benefits to the customer. Allowing a lower rate of VAT on renovation projects might form part of a policy package in this area, so that renovation was framed as a special type of work, because of its potential for energy efficiency improvements, this increasing the profile of energy efficiency with installers (and clients).

Policy that **de-risked innovation** would remove the barriers that small businesses face in trying out new energy efficient technologies and would encourage more continuous retrofit activity. A major barrier is the potential for a new (to the installer) technology to require much more time from the installer in terms of commissioning and post-commissioning adjustment. If the cost to the installer of such adjustment is automatically included as part of the equipment price, i.e. the cost of equipment is consistently recognised as incorporating some labour costs, this barrier would reduce. Builders' and plumbers' merchants would be vital in ensuring that this apparent price increase was consistent and supported small firms who were

willing to try something new by actively promoting it to their customers.

Policy that encouraged **trade supply chains** would focus on the aspects of supply less visible to the consumer – the builders' merchants and plumbers' merchants rather than the DIY chains who serve the domestic market, even if the latter are a brand more visible to consumers (and politicians or electors). Actively supporting those supply networks would also mean strengthening local networks for retrofit since the trade suppliers are often a hub of knowledge sharing and provide the fixed costs associated with material supply.

Such policy approaches would be supported through a renewed focus on training and capacity building in the SME construction sector. This would encompass not only technical training, but the other capacities needed to advise a customer and implement an energy efficiency solution that requires household behaviour change effectively (Owen et al., 2014, Morgan, 2013).

Conclusions

The challenge of deep, and continuous, retrofit of Europe's building stock remains a significant challenge in achieving energy efficiency and carbon emission reduction targets. There is a portion of the existing building stock: privately owned, owner-occupied homes, where small businesses in several construction trades have a significant role to play. These small firms influence energy efficiency in existing buildings through identifying, selecting, installing and maintaining energy efficiency measures in retrofit projects, whether those projects are routing property maintenance, room-by-room refurbishment or larger projects extending or reconfiguring the space in the home. How small firms exercise such influence will be dependent on their technical knowledge and prior experience but also their values and beliefs about what is important to their customers, as well as their motivations in carrying out the work that they do. Small firms operate in a number of connected networks, often based in a particular locality: networks between trades, within a trade, along a supply chain or with customers. The potential of this large group will only be realised if policy and projects align both with the values and motivations of these firms, which need to be better understood, and with the networks that allow the flow and development of knowledge and values and beliefs. Such networks, defined socially and spatially as well as professionally and technically, need to be understood and supported. Much building energy efficiency policy focuses either on technology supply (encouraging technical innovation) or on individuals as actors with direct influence on energy consumption (e.g. householders) but this misses the opportunity to operate the policy lever of the indirect influence of how installers work and advise. This is too large an opportunity to continue to be overlooked.

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