



Programme Area: Buildings

Project: Building Supply Chain for Mass Refurbishment of Houses

Title: Draft supply chain design

Abstract:

Please note this report was produced in 2011/2012 and its contents may be out of date. This deliverable is number 2 of 8 in Work Package 4. The report presents the development of the framework of an adaptable and scalable supply chain to meet customers' requirements for whole house retrofit for improved thermal efficiency. The findings to date are derived from workshops held with members of the retrofit industry, in addition to WP4 they also feed into the design interventions developed in WP3. Subsequent work in WP4 will focus on the creation of a supply chain to deliver the detailed design solutions emerging from WP3.

Context:

This project looked at designing a supply chain solution to improve the energy efficiency of the vast majority of the 26 million UK homes which will still be in use by 2050. It looked to identify ways in which the refurbishment and retrofitting of existing residential properties can be accelerated by industrialising the processes of design, supply and implementation, while stimulating demand from householders by exploiting additional opportunities that come with extensive building refurbishment. The project developed a top-to-bottom process, using a method of analysing the most cost-effective package of measures suitable for a particular property, through to how these will be installed with the minimum disruption to the householder. This includes identifying the skills required of the people on the ground as well as the optimum material distribution networks to supply them with exactly what is required and when.

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Energy Zone Consortium

Optimising Thermal Efficiency of Existing Housing

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Draft Supply Chain Design



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Signature

Signature

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Executive summary

This report presents the development of the framework of an adaptable and scalable supply chain to meet customers' requirements for whole house retrofit for improved thermal efficiency.

A workshop approach was used to identify 10 different customer segments' perceptions of why and how they might retrofit their home. Using a 'Right to Left' approach benefits and sacrifices were identified followed by the development of a compelling value proposition and supply chain architecture to deliver mass retrofit. The workshops were attended by representatives from the construction industry, product manufacture, installers, logistics specialists, landlords and academia.

When the results from all 10 groups had been completed and analysed it emerged that all customer segments required a major improvement in the level of trust in building work providers: Both in the capability to meet their expectations and integrity to offer the right solution. This change is crucial to remove one of the major obstacles to householders embarking on a retrofit project. The distinction between groups was distilled to 3 points of divergence, each occurring at a defined stage of the retrofit process. The 3 key points of divergence can be summarised as:

- At the **pre sale** stage - "Tell me what to do" or "Involve me"
- At the **installation** stage - "Work around me" or "Move me out"
- After sale or **Through life** - "Fit and forget" or "Service contract"

In addition it has emerged that the motivation to carry out retrofit work cannot be assumed to be on payback alone. Expectations were that the retrofit work will be expensive and disruptive: So all wanted options for completing the work in stages or financing to enable a whole house solution.

The result of this is that 5 distinct supply chain routes are needed to deliver the value propositions which satisfy the groups reviewed, with benefits presented differently for each customer segment.

The following conclusions arise from comparing future state requirements with current capability:

- Householders want to limit the number of people in their home for retrofit work: This leads to a non trade based approach, crossing functional boundaries across all phases of work.
- A systems approach to design, manufacture, installation and maintenance of retrofit is likely to deliver significant benefits in cost, speed and efficiency.
- Integration of the whole spectrum of retrofit activities from survey, through design, product manufacture and installation is needed to retrofit of 26 million UK homes before 2050.
- Changes in incentives, accreditation and possibly legislation will be needed to allow required changes to working methods and systems of retrofit delivery to be successfully employed.

Conventional business processes with incremental improvement from current models (Left to Right thinking) is unlikely to result in sufficient supply chain performance improvement to deliver whole house retrofit at a mass scale. A step change or new disruptive propositions are required to achieve the required speed, reliability and customer service which current providers do not deliver today.

The next phase of work for WP 4.2 will cover development of detailed design solutions emerging from WP3 in cooperation with the supply chain and creation of standard work for survey, manufacture, logistics, installation and through life support for retrofit.

1. Background and link to other work packages

Buildings are responsible for 40-50% of the national primary energy consumption in the UK, half of which is used in domestic buildings for lighting, heating and cooling. Most of the UK's housing stock for the next 50 years will be composed of existing dwellings, the majority of which have proven to be inefficient in terms of thermal performance. To meet the UK's commitment of reducing CO2 emissions by 80% from 1990 levels energy demand for domestic use must be reduced. The Energy Zone Consortium Project is focussed on reducing domestic energy consumption through increasing thermal efficiency of domestic properties. The project is divided into 6 work packages described below and graphically in Figure 0:

Work Package 1 -Understanding thermal performance of housing stock.

Work Package 2 - Understanding our housing stock typology.

Work Package 3 - Developing retrofit solutions to improve thermal performance of our national housing stock.

Work package 4 - Developing a sustainable supply chain to deliver whole house retrofit on a national scale.

Work Package 5 - Understanding customer value & maximise the take up of retrofit.

Work Package 6 - Developing the policy and regulatory framework to manage, support and encourage whole house retrofit.

This report presents a first draft supply chain design to meet the needs of a national whole house retrofit programme.

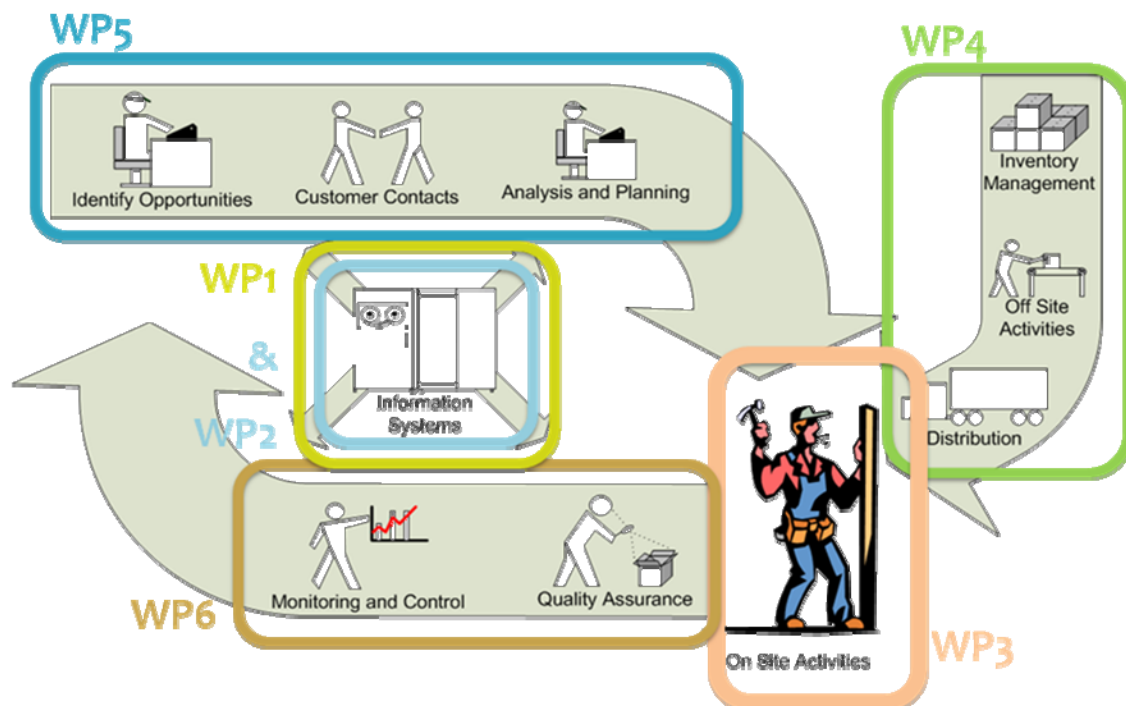


Figure 0: ETI Thermal Efficiency of Existing Homes Framework

2. Framework & Methodology

The objective of Deliverable 4.1 is to develop the first level iteration of a future state supply chain to deliver the needs of mass scale whole house retrofit. The customer-centric approach taken is shown graphically in Figure 1.

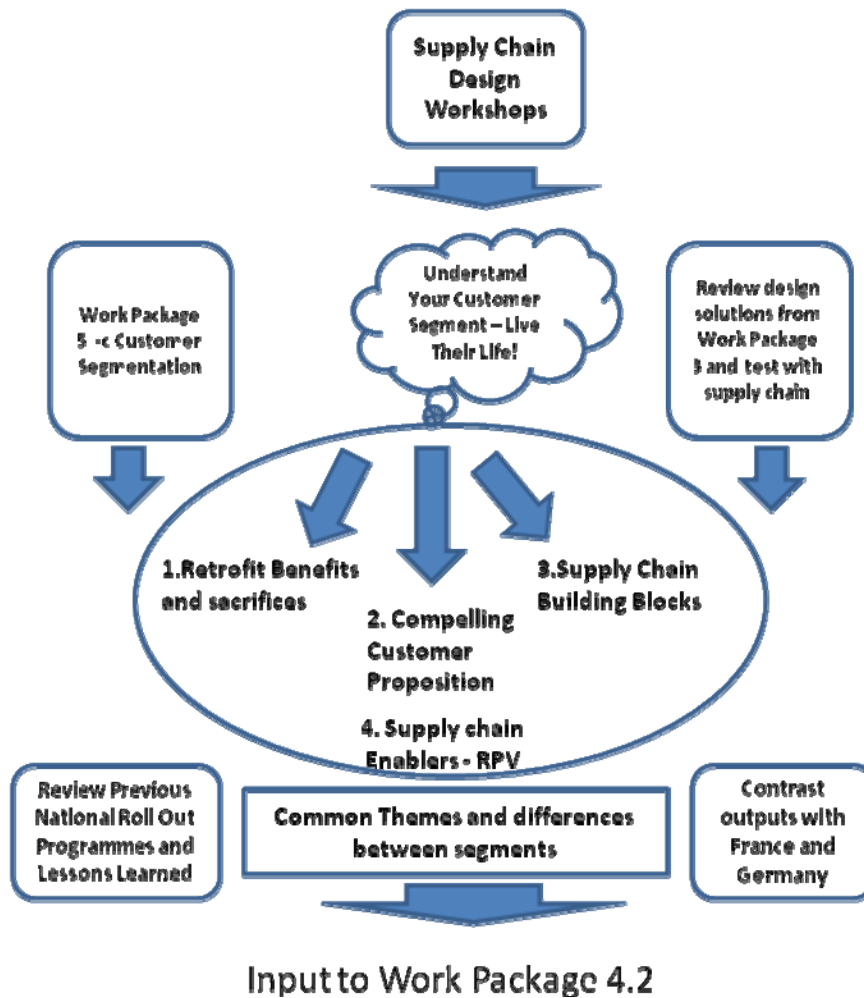


Figure 1: Initial Supply Chain Design Framework

2.1 Hypothesis

The initial hypothesis was that, because the market for retrofit covers virtually the entire UK housing stock, there are a broad range of customer requirements which need to be satisfied. As a result the expectation is that multiple supply chains with both different customer engagement and technical solutions would be required. Technical solutions will be developed in work package 3 and customer engagement studied in work package 5. Work package 6 will deal with the policy required to influence the market for retrofit.

At this stage of the research the goal has been to clarify the top level customer requirements to identify similarities and differences between individual householder groups or segments. This will enable the development of the supply chain architecture, rather than the detail.

2.2 Approach

The customer segments defined in WP5.1 and 5.2 were used as the inputs to workshops for delegates to work through a series of steps to generate a supply chain capable of delivering a value proposition specific to their needs. Workshops were chosen as the most effective way to provide input from a large cross section of stakeholders for retrofit.

2.3 Planned Workshop Process

The supply chain design was planned to be carried out in workshops attended by stakeholders including the following sectors (a full list is given in Appendix 2.):

- Construction companies and installers of retrofit solutions.
- Construction products manufacturers (insulation, windows and doors, heating).
- Logistics and distribution.
- Energy companies.
- Architects, surveyors, engineers, building control and construction skills.
- Social Housing Providers.

The detailed process is described in Chapter 5 and the outputs summarised in Chapter 6 (full results are included in Appendix 3).

The desired outputs from the workshops for each customer group were a detailed list of:

- Perceived benefits and sacrifices for major retrofit activities / products
- Concise and compelling value propositions
- Supply chain map and what they must deliver
- Enablers to encourage / allow retrofit to be delivered profitably and equitably

The intention was to hold one workshop to cover each of the 10 customer segments.

3. Workpackage Interdependencies

3.1 Design Solutions – Link to WP 3

Work package 3 is working to develop design solutions for whole house retrofit. These solutions will be superimposed upon the ideal state supply chain design and the view of the existing supply chain sought to define what action must be taken to make it a reality. Since design solutions have as yet not been fully detailed, this report considers the broad categories of retrofit solutions:

- Doors and Windows.
- Insulation (internal, external and cavity wall, roof, and floor).
- Primary heat source.

3.2 Customer segments - link to WP 5

Work Package 5 has developed a segmentation hypothesis describing 10 discrete customer groups differentiated by their attitudes towards retrofit and their engagement potential (Figure 2). Developed with Experian data, the segments describe population segments primarily

according to their age and affluence. Work Package 5 has developed the hypothesis that life-stage (with age as a proxy) has the most likely correlation with householders' likelihood to retrofit. Similarly, affluence often links to ability to pay as well as to property type and location.

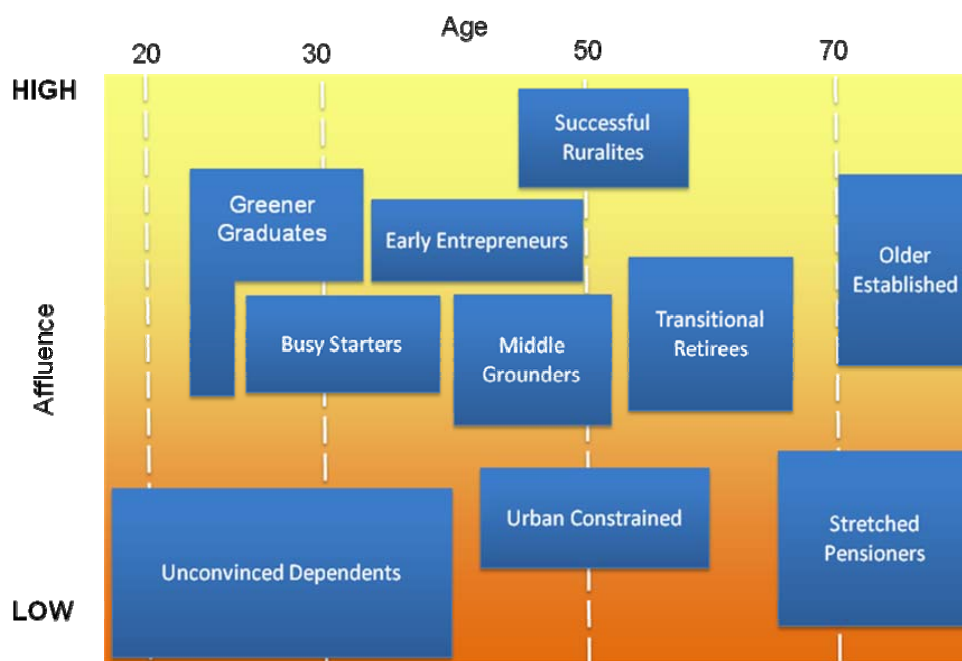


Figure 2: Retrofit First Cut Segmentation from WP 5.2

Note that the size of the boxes represents the range of age / affluence covered by the segments, not the population.

These ten discrete householder profiles were used in the workshops in WP 4.1, as described in section 5 of this report, to provide an initial insight into the current perceptions of the market place and provide different value propositions for their ideal retrofit experience.

The output from these workshops will then feed back into work package 5, to be tested further as part of the field questionnaires in 5.3 and 5.4.

3.3 Policy, Regulation and Market Stimulation - Link to WP6

WP6 is working to highlight the current regulations, legislation and market stimulation that are promoting or restricting the ability to deliver mass retrofit to the UK housing stock and to suggest future changes. These have been split into the following key areas:

- **Technical** (Regulation, performance and standards for materials and products)
- **Logistical** (Facilitate or restrict delivery of retrofit solutions including training and regional development)
- **Cultural** (Access to homes, planning, willingness to adopt)
- **Financial** (Financial incentives, barriers and mechanisms)

The success of retrofit on a large scale will be dependent on its ability to meet or exceed householders' expectations in terms of the benefits that will be gained from the work and in reducing their fears (sacrifices) based on perceptions that are often borne by personal experience. In order to understand what policy change is needed, it is necessary to clarify the

entire process from the viewpoint of the householder, using the different profiles as developed in WP5.

As such, particular attention will be paid to the householder experience to understand the following:

3.3.1 Technical

- What are the perceptions (benefits and sacrifices) of the current retrofit products and materials?
- What do we need to do to exceed householders' expectations in terms of the perceived benefits and remove the perceived barriers?

3.3.2 Logistical

- What are the perceptions of the current delivery and installation of retrofit products?
- How can we build on the positive perceptions / drivers and remove the barriers to take up of retrofit solutions caused in this area?
- How can policy influence the manufacturing capacity of retrofit solutions?

3.3.3 Cultural

- How do people want to be engaged (if at all)?
- What are the key drivers for take up and how these can be used to create incentives?
- What would be the best way to present policy and/or policy change to the public?
- How to access homes in a way that the householder is comfortable with?

3.3.4 Financial

- What funding options or incentives would be appropriate?
- Understand which customer segments;
 - will not be able to pay for retrofit, even with funding assistance (e.g. PAYS)
 - would be willing and able to pay for retrofit with funding assistance
 - would be willing and able to pay without funding assistance.
- What mechanisms would facilitate take up, for example low or zero VAT, reduced stamp duty, council tax, tax breaks for installers.
- Which customer profiles are likely to be the early adopters, as this could affect the timing that funding is required to provide solutions for harder to treat homes?

4. Supply Chain Design Workshops.

The workshops were held with industry and customer stakeholders where syndicate teams considered one customer segment and developed a supply chain design.

4.1 Workshop Process

The process involved thinking from right to left; from the customer back through the supply chain, throughout the process. This development process uses a system of 5 ideas:

- Strategic Breakthroughs (not being constrained by your current reality).
- Voice of the customer – dynamic balance of the consumers wants and needs.
- Right to left thinking.
- Customer values, value propositions and value delivery.
- Resource, process and value enablers.

The insight needed for strategic breakthrough is achieved when the voice of the customer is combined with both operational awareness and data to reveal innovative customer propositions that are truly remarkable. Thinking right to left enables solutions to be created without being encumbered by the limitations of current organisations or systems.

The process used during the workshops consisted of 5 distinct stages.

4.2 Stage 1. Understanding your customer.

This stage aimed to put the syndicate group in the shoes, mind and life of the target customer. The customer segmentation developed in work Package 5 gives a detailed description of the householder, where he or she lives and other details of their lives and habits. (Appendix 1 includes links short précis of these segment descriptions).

Each segment was worked through by a group of 6-8 during the course of a full day workshop.

Delegates were encouraged to use the first person when verbalising thoughts and specifying requirements.

The Mathias Grid (Figure 3 below) was prepared in advance for each customer segment. This allowed delegates to create a lens through which they experienced and observed the everyday life of the target customer.

The grid was used to understand the perception that the target customers have of themselves and how they would like to be – their aspirations.

Next an external view was taken. This described the target customer's perception of how their significant others perceive them and how they would like to be perceived.



Figure 3. The Mathias Grid

4.3 Stage 2. Benefits and Sacrifices.

The second stage placed the syndicate team in the shoes of the target customer and answered the following questions:

- What benefits do I perceive from replacement windows and doors, insulation, and replacement primary heat source? (anything to class A++)
- What sacrifices do I perceive / am I prepared to endure to enjoy the benefits?

The groups were encouraged to think in character and remember that **“my perception is my reality”**.

4.4 Stage 3. Remarkable Value Propositions.

Still “in character” the syndicate teams worked through each stage of the process of acquiring a whole house retrofit (pre sale, survey, sale, installation, through life) specifying what they required in terms of:

- Functionality - Specification, design, performance, quality required ...
- Speed – Time to fit, wait until ready, response time...
- Dependability – Key promises, turn up on time, does what it says...
- Flexibility – ability to change the schedule, add features, customise...
- Cost – Target price, payback and service costs through life...

At the end of this stage, the output was a specification, or value proposition, for the retrofit product and service delivery as defined by each customer segment.

4.5 Stage 4. Supply Chain Building Blocks.

During this stage syndicate teams were no longer working “in character”. The task was to specify what supply chain steps or building blocks are necessary to meet the above specification and to “deliver the retrofit product” from primary materials extraction, through life, to disposal.

This was again worked through right to left and each step was specified in terms of:

- **Functionality** - Performance is needed to deliver the requirements of the value proposition
- **Speed** - Response time required at each stage of the supply chain to deliver the value proposition
- **Dependability** - Key capabilities of each supply chain element
- **Flexibility** - Capability to change the schedule, change manufacturer, customise...
- **Cost** - Transaction price, transfer price

At the end of this stage the output was a map showing the supply chain building blocks required to deliver the value proposition developed during stage 3.

4.6 Stage 5. Supply Chain Enablers.

For a new improved supply chain to exist, new systems, processes and procedures will need to be created. For this to be possible existing frameworks may need to change or new ones created. For example new incentives from government may be needed to persuade the public to take part in a whole house retrofit programme.

During this stage of the workshop, the delegate teams were asked to consider “What Resources Processes and Values are necessary to make this happen / work?” at each stage of the supply chain:

- **Resources** - Things an organisation can buy, sell or build. –E.g. People, Plant, Equipment, tools, skills....
- **Processes** - Ways companies turn resources into products or services. –E.g. Installation, planning, design....
- **Values** - Attitudes. The thinking and behaviours that drive companies and industries -E.g. beliefs, power

Working Right to Left the delegates were able to retain a clear picture without being distracted by common paradigm views.

Common revelations when using this approach are:

- Our Resources may not be fit for purpose.
- Our Processes do not help us get the job done.
- Our Values prevent us from perceiving or acting upon the opportunity/threat.

5. Workshop process and outputs

5.1 Actual workshop process.

The planned approach of a single workshop day was modified based on the number of delegates attending. To ensure balanced numbers and adequate facilitation, six groups were tackled in the first event and the remainder were covered in two follow up workshops.

During the workshops delegates were split into syndicate groups, each group representing a different customer segment. Delegates then imagined they were living the life of a person of the segment and worked through benefits and sacrifices of retrofit interventions. Following this they designed a compelling value proposition free of the limitations of any current supply chain constraints.

With the value propositions complete, the groups then left behind their segment character to become supply chain designers. Their task: To assemble the building blocks of a future supply chain to deliver the value propositions. The final stage was to think through the enablers, they believed would make the future supply chain viable and profitable.

5.2 Review and Analysis

The results of the workshops were processed to extract the common themes amongst customer segments and to understand where there are differences. These perceptions were translated to form a series of supply chain hypotheses which will be tested when Work Package 5 carries out customer surveys in deliverables 5.3 and 5.4 and in the Virtual Retrofit – deliverable 3.4.

The challenge was to develop propositions which are sufficiently tailored to individual needs that they are attractive to householders, but not so bespoke that it becomes impossible to design standardised solutions which bring productivity and effectiveness.

The following sections summarise the results and start to draw out some of the trends.

5.3 Results from Workshop Stage 2: Benefits & Sacrifices

The tables below show the results and highlight the affinities of the Benefits and Sacrifices across the different customer segments. (Full descriptions / profiles of the customer segments can be found in documents linked to Appendix 1):

Key to customer segments

OE = Older Established

BS = Busy Starters

GG = Greener Graduates

MG = Middle Grounders

EE = Early Enterprisers

UC = Urban Constrained

UD = Unconvinced Dependents

SP = Stretched Pensioners

SR = Successful Ruralites

TR = Transitional Retirees.

5.3.1 Replacement Doors / Windows – Customer Segment Perceptions

Perceived Benefits	OE	UC	BS	UD	GG	SP	MG	SR	EE	TR
Improved Security	X	X	X	X	X	X	X	X	X	X
Improved Aesthetics		X	X	X	X	X	X	X	X	X
Image		X	X		X		X		X	X
Add value to property	X	X	X				X		X	X
Reduced Bills					X			X	X	X
Thermal Comfort		X	X	X	X					
Reduced Draughts					X		X		X	
Noise Reduction			X	X	X					
Low maintenance	X						X			
Low Impact Living					X					
Improved Guest accommodation							X			
Improved Health				X						
Perceived Sacrifices										
Hassle / Disruption	X	X	X	X	X	X	X	X	X	X
Cost		X	X		X	X			X	X
Don't trust installers	X						X			X
Redecorating hassle			X			X				
Planning Issues									X	

("X" indicates that the benefit or sacrifice was cited as being relevant during the exercise)

Table 1 Initial observations:

- All segments list improved security coming from new windows and doors as a benefit.
- **NB: Aesthetics, image, adding value to property all rank above energy saving.**
- All segments perceive disruption as a major sacrifice with cost of works being the second largest affinity.

5.3.2 Insulation – Customer Segment Perceptions

Perceived Benefits	OE	UC	BS	UD	GG	SP	MG	SR	EE	TR
Reduced energy bill	X	X	X	X		X	X		X	X
Improved Aesthetics	X	X		X	X		X	X	X	
Increase value of house	X				X				X	X
Improved Comfort		X	X	X	X	X	X	X		
Redecoration opportunity					X	X				
Perceived Sacrifices										
Intrusive	X	X	X	X	X	X	X	X	X	X
Disruption	X	X	X	X	X	X	X	X	X	X
Don't trust installers	X		X		X					X
Planning Issues					X				X	
Fear of Arising problems		X			X					
Overheating possibility							X			

Table 2 Initial observations:

- All but 2 segments list reduced energy bills as a perceived benefit of insulation with improved aesthetics being the second largest affinity.
- Only 3 segments list improved house value as a perceived benefit
- 7 list improved comfort.
- All segments list intrusion and disruption as perceived sacrifices, lack of trust for installers is the next largest affinity

5.3.3 Primary Heat Source – Customer Segment Perceptions

Perceived Benefits	OE	UC	BS	UD	GG	SP	MG	SR	EE	TR
Reduced energy bill		X	X	X	X	X	X		X	
More hot water		X	X	X	X		X	X		X
Improved Control	X	X			X				X	
Less Maintenance				X		X	X			
Easier to use				X			X	X		
Add value to property / sell ability			X						X	
Increased Comfort	X			X						
Integrated system, smart meter					X					
Improved Health		X								
Perceived Sacrifices										
Complex system	X	X		X	X	X	X			
Disruption					X	X			X	X
Cost		X			X				X	
Loss of drying space				X	X					
Payback risk					X					X
Don't trust fitters				X						

Table 3 Initial observations:

- Reduced energy bills and more hot water are the largest affinities for benefits.
- Improved control, low maintenance and ease of use are the next largest.
- 6 segments perceive system complexity as a sacrifice with disruption and cost being the next largest affinities.
- Loss of drying space is a concern for Greener Graduates and Unconvinced Dependents; this is probably due to the type of properties occupied being flats.

5.4 Results from Workshop Stage 3 - Value Proposition

5.4.1 Pre Site - Value Propositions- workshop output

Value Proposition – Pre Contract	OE	UC	BS	UD	GG	SP	MG	SR	EE	TR
Trust	X	X	X	X	X	X	X	X	X	X
Benefits – Clearly described, not over promised	X	X	X	X	X	X	X	X	X	X
At a time to suit me	X	X	X	X	X	X	X	X	X	X
Jargon Free	X	X	X	X	X	X	X	X	X	X
Control / give me a deal	X									
Options / choice / menu - quick to choose			X							
Clarity - cost / benefit - tell me where to look					X					
Demonstration - Case studies - showroom -								X		
Increased value - Incentives - reduced C Tax -							X			
Research Options					X					
Added value - improved home							X			
Targeted to me , I am anxious						X				
Visuals / reports / images, comfort & low bills										X
Fuel saving. slow pace - convince me	X									
Increased value- convince me and my family		X								
Why am I doing this? (respect and reassure me)				X						
Reassure convince me						X				
Need time face to face										X

Table 4 Initial observations:

- For the pre site value propositions common requirements are trust, clear benefits, jargon free communication presented at a time to suit me.

5.4.2 On Site Value – Propositions - workshop outputs

Value propositions	OE	UC	BS	UD	GG	SP	MG	SR	EE	TR
Minimal disruption	X	X	X	X	X	X	X	X	X	X
Zero defects	X	X	X	X	X	X	X	X	X	X
Reputable builder	X	X	X	X	X	X	X	X	X	X
Accreditation	X	X	X	X	X	X	X	X	X	X
No loss of utility / flexibility - adapt the plan			X							
Keep me safe / No surprises									X	
Look after my belongings / No surprises							X			
Local builder - community / good site mgt.								X		
Security		X								
Confidence in Specification / Safe for kids				X						
Regular progress updates										X
Could move out					X					
Day breaks	X									
Get me out – A week in Butlins or a cruise						X				

Table 5: Initial observations:

- Minimal disruption, Zero defects, accredited and reliable installer are common requirements of the On Site value proposition.
- Further analysis reveals that the On Site value proposition splits into “Work around me” and “Move me out”. This is discussed in section 6.3 below.

5.4.3 Through Life - Value Propositions

Value propositions	OE	UC	BS	UD	GG	SP	MG	SR	EE	TR
Simple Control	X	X	X	X	X	X	X	X	X	X
Low maintenance	X	X	X	X	X	X	X	X	X	X
Upgradeable hardware / controls	X	X	X	X	X	X	X	X	X	X
24/7 support: Self diagnostics	X	X	X	X	X	X	X	X	X	X
Single point of contact	X	X	X	X	X	X	X	X	X	X
Long warranty – transferable	X	X	X	X	X	X	X	X	X	X
Support Through Life	X	X	X	X	X	X	X	X	X	X
Optimise My Usage / Monthly payment	X									
Be sure it's performing										X
Specialist response								X		
Landlord pays, infrequent service				X						
No on-going cost	X									
I'll take the chance on repairs / Warranty					X					
Upgradeable							X			
Long Warranty		X								
Train me on how						X				

Table 6: Initial observations:

In the ‘Through life’ stage, all segments require:

- Simple control – potentially different zones.
- Low maintenance
- Upgradeable hardware / controls
- 24 / 7 support
- Single point of contact
- Long warranty
- Support through life.

5.5 Results from Workshop Stage 4 - Supply Chain Building Blocks

Each of the 10 syndicate teams representing the different customer segments developed a supply chain map, made up of supply chain building blocks. Each segment interpreted the supply chain differently and the common themes are shown in the table below.

The green columns indicate the areas most picked out by syndicate groups

Supply Chain Building Blocks																											
Customer Segment	Pre Sale					Point of Sale & Installation												Through Life									
	Marketing	Pre-survey DIY?	Community Engagement	Presale Impartial Advice Demonstration	Funding	Survey	Sale	Account mgt. single point	Design	Raw Material	Component Manufacture	Primary Distribution	Manuf're Assembly	Bespoke Design Options	Enabling Works	Consolidation	Inbound Logistics	Consumables	Decant Occupier	Install	Outbound Logistics	Waste	Training	Certification	After Sale	Through Life	Disposal
Early Enterprisers						X			X	X	X	X	X			X	X	X		X		X		X		X	X
Stretched Pensioners	X			X		X	X						X				X		X		X				X		
Busy Starters						X			X				X				X				X	X				X	X
Urban Constrained	X			X	X																						
Unconvinced Dependents																X	X	X		X		X		X		X	X
Transitional Retirees	X					X															X					X	
Successful Ruralites																											
Middle-grounders					X	X	X														X					X	
Greener Graduates		x	x		x	X		x	x	x	x	x	x	x	x	x	x	x	x	X	x	x	x	x		X	x
Older Established	x				X	X	X	x	x				x	x			x			X		x				X	

Table 7

Note that the Syndicate Team representing Successful Ruralites and unconvinced dependents did not complete the task as highlighted in yellow.

“X” Indicates Strong Identification / importance of the Supply Chain Element

"x" Indicates identification only of supply chain element

5.6 Results from Workshop Stage 5 - Supply Chain Enablers - RPV

Table 8 below summarises the themes that emerge from the results across the ten groups.

	Pre sale	Installation	Through life
Resources	Funding. Marketing, People Surveyor training, and Equipment – Data collection and logging. Stock solutions. Solution book / options.	Funding. Materials, plant, tools, people, training. Temporary accommodation for 'decanted' families and or personal belongings.	Insurance backed warranty. Response centre call-handling Site support team
Processes	Marketing Communication. On-line presence for exploring generic design solutions. Adaptable sales process, Rapid & robust survey with comprehensive data collation.	Design, planning, embodiment process, Safe systems of work Skills verification, logistics and material delivery process scheduling system. Accommodation booking process. Self certification scheme for retrofit. Waste recycling.	Certification and verification Support process
Values	Clear message. Trusted brand - longevity Respectful behaviour Value for money.	Security Trust, Value for money	Trust, Dependability. Longevity

Table 8

5.7 Limitations of Results

The following paragraphs give an outline critique of the planned and actual workshop process.

5.7.1 Workshop Attendees

Workshop attendees were made up from a broad group of retrofit stakeholders, each with varying levels of experience of current retrofit solutions, their installation and related customer behaviour and each with their individual commercial interests and attitudes to risk and to change.

Most delegate groups had little if any members from the population under review. As such the delegate groups were not expected to be representative of the segment groups considered.

Some delegates struggled to ignore current processes and their own experiences when putting themselves in the character of their customer segment. In order to reduce this, facilitators were pre-briefed to encourage the use of the first person and to reflect back to the customer profiles.

In stage 2 – 'Benefits and Sacrifices', many answers were common across all three solutions, but due to time constraints and to avoid repetition, may not have been documented across each of the solution types for all groups. For example, a group may have decided that 'warmer homes' was a benefit of all 3 solution types, but this was only documented against the first.

In stages 2 and 3 (in character), the points raised may be skewed by knowledge of those delegates present for that group. Due to industrial knowledge and experiences, results may be more technical than would be found in the actual workplace.

5.7.2 Workshop timings

Due to the fact that workshops were completed over 3 different days, facilitators and those delegates who were able to support more than one event became more sophisticated and comprehensive in their responses. As such more detail can be found at each stage for the 'Greener Graduate' group which took place on the 3rd day, than the 'Stretched Pensioners' which was one of the first six groups to be completed.

In the first workshop day, there was some confusion amongst delegates concerning the definition of Supply Chain Building Blocks. This was clarified in future workshop events, where suggested Building Blocks were provided to the group for discussion, this may have a slight skew on the results.

5.7.3 Cost Information

During the workshops syndicate groups found it difficult if not impossible to add a cost element to the value proposition matrix. This is explained by the lack of knowledge of cost for retrofit works and confusion about the benefits. This will be addressed through further work with stakeholders in work packages 3 and 4.

5.7.4 Supply Chain Enablers

Syndicate teams working through the Supply Chain Enablers found it difficult to articulate their requirements into the three categories of Resources, Processes and Values and to think broadly enough. The objective of this section was to develop a framework of requirements (including changes to supplier offerings, legislation, certification, regulation etc.) which are needed to create a compelling value proposition.

It has emerged that the resources, processes and values can be extracted when analysing the value propositions and supply chains for affinities. This insight will be used when developing detailed supply chain designs in the work package 4.2.

Despite these limitations, the output is felt to be representative and an excellent base for further development. Conclusions drawn should be considered as hypotheses to be tested further in the Virtual Workshops (WP3.4) and Customer survey (WP5.4).

5.7.5 Stakeholders

The purpose of involving this set of individuals was to engage a range of stakeholders in the disruptive process, so that they might understand the workshop outputs and conclusions better. From the feedback forms all delegates felt that they had gained value from the experience. More than three quarters of the organisations involved volunteered to contribute to further workshops.

It should be noted that although invited there was no representation from the financial or insurance communities (Council of Mortgage Lenders and Association of British Insurers). This will be addressed in the next iteration of supply chain design.

6. Analysis of Results

The previous section summarised the requirements of the ten stakeholder groups; this section looks to establish the commonalities and differences and attempt to coalesce the value propositions into clusters rather than totally separate propositions.

6.1 Common Values

Across segments and aspects of retrofit supply the following key themes emerged:

- Trust – There was a high need for trust across the entire retrofit experience, from the information presented; the integrity of the suppliers and their staff from survey through installation to after sales. Some look for trusted brands.
- Dependability – This was articulated in a range of ways, but summed up by quality of service i.e. keeping promises for time, cost and performance.
- Respect – Householders are nervous about having multiple people in and out of their home and the impact on their privacy, possessions, routine and safety. Familiar personnel and limited numbers on site required.
- Clarity – In order to facilitate the decision making process, clarity is required with respects to legislation and incentives, funding options, retrofit solutions and providers.

6.2 Three Phases

The results in Chapter 5 naturally aligned with 3 phases of the process from the householders' perspective:

- Pre- site – Marketing, Sales, Survey
- On-site – Material supply, installation and making good.
- Through-Life – Maintenance and support.

By adding these three phases to the most common elements in Table 7 (Supply Chain Elements); top-level supply chain architecture begins to emerge as explained in section 9 – Future State Supply Chain.

6.3 Three Points of Divergence

When all 10 value propositions had been completed and analysed it emerged that all customer segment value propositions could be distilled into 3 points of divergence, which fit well with the three phases of retrofit in Figure 4 below. The 3 key points of divergence can be summarised as:

6.3.1 At the Pre-Site stage - "Tell me what to do" or "Involve me"

The role of the surveyor is judged to be a vital ingredient to the success of the whole house retrofit programme. Householders want to deal with few people in their homes and have limited visits. To achieve this and avoid the associated costs a combined, sales and survey capability would be valuable.

The significant divergence at this point is the level of interest in being part of the detailed design of the retrofit solution and the selection of materials and technologies used.

Some groups (notably Greener Graduates and Successful Ruralites) wanted to have a major input into the planning, expected outcomes and selection of products. Others were open to being convinced the retrofit was for them but wanted more straightforward choice based on brand, cost and disruption.

6.3.2 At the On-Site stage - “Work around me” or “Move me out”

Once the decision to go ahead has been made and work begins; there are two common requirements for the householder: Deliver on promises and minimise disruption. The divergence is between those who want to be in-situ in the home while the work is carried out and those who prefer to move out.

It is anticipated that there are two factors which will skew the proposition towards the ‘work around me’ option:

- Current lack of trust in installers to do a good job if left unsupervised.
- Perception that moving out would be a costly option to householders.

6.3.3 “Fit and forget” or “service contract” at the Through Life stage

After the work is done all householders want guaranteed work and a single point of contact if something goes wrong. The divergence occurs with those who are open to future involvement in their solution – through maintenance contracts, feedback of performance and potential upgrade. Others are looking for a fit and forget solution.

The graphic below illustrates these three stages and points of divergence.

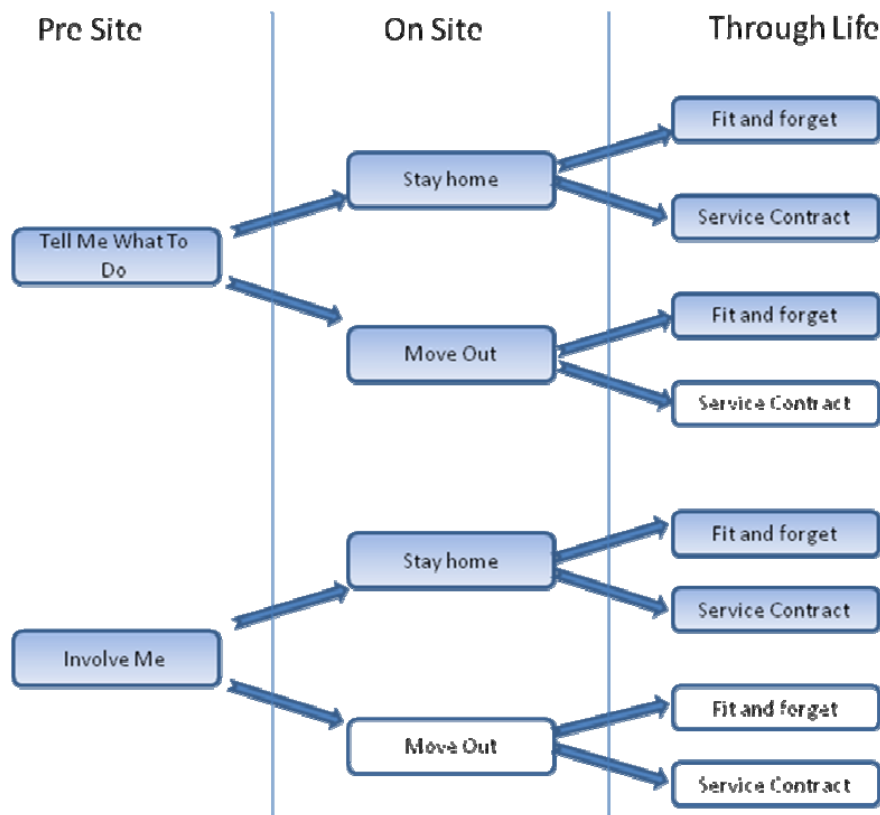


Figure 4: Shaded paths show the preferred decision routes

6.4 The value proposition summary

This can be further tested by tracing the routes for each of the Customer Segments as seen in Figure 5 below. From Figures 4 & 5 it can be seen that 5 different primary solutions are likely from the 8 possible routes through this matrix. This hypothesis will be tested during the customer survey work to be carried out in Work Pack 5.

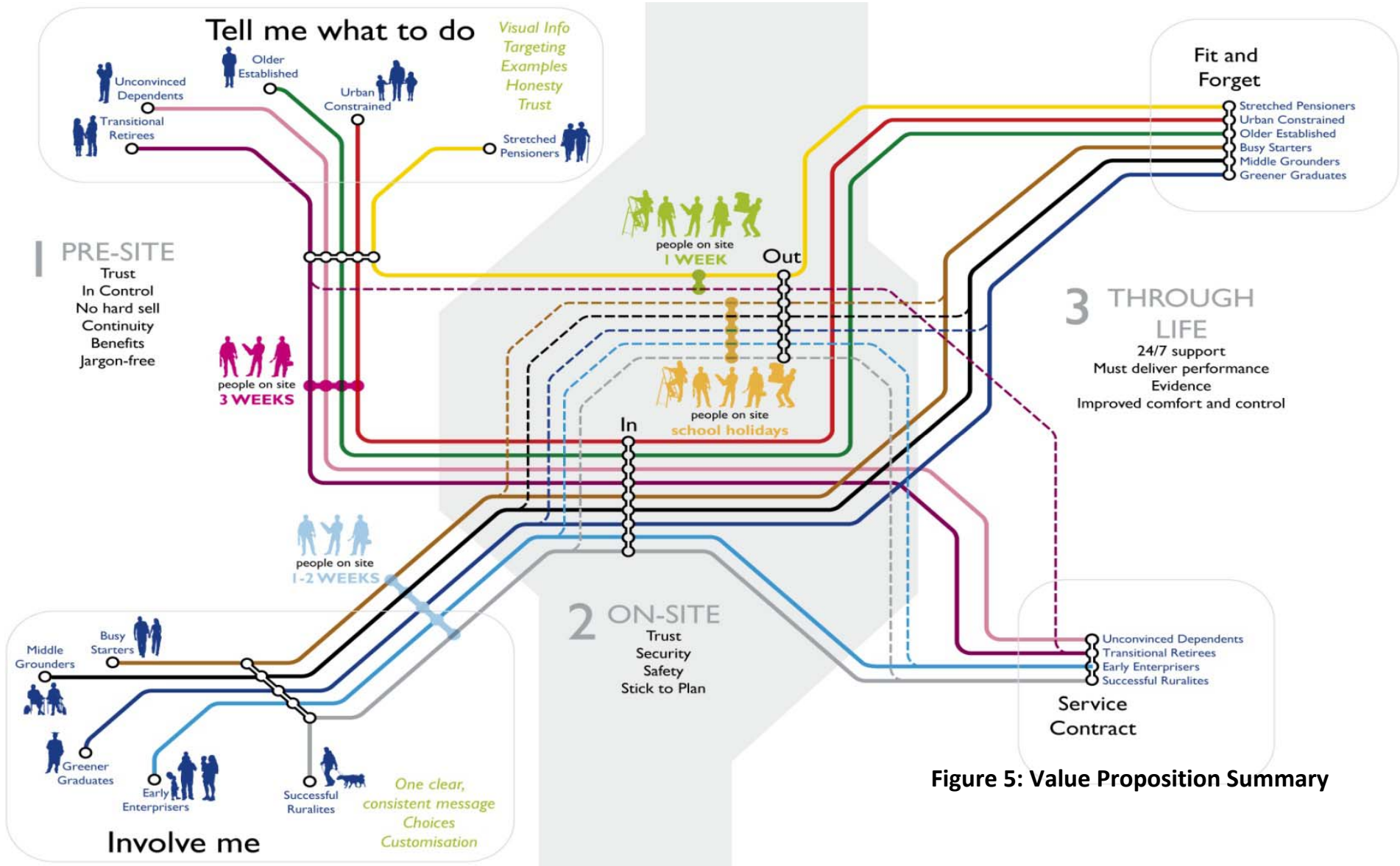


Figure 5: Value Proposition Summary

7. Comparisons and Contrasts

As with Work Package 4.0 the outputs from the workshops were contrasted with approaches used in France and Germany, highlighting any common themes, areas of difference and lessons learned.

Lessons to be learned from previous UK National rollouts have also been documented in this section.

A summary of findings can be found in Section 8.3.

7.1 Contrast with German Retrofit Market

The population of Germany is larger than the UK at approximately 82.5 million, compared with approximately 61 million in the UK. British households (average: 2.3) consist of slightly more members than German households (average: 2.1) (source: Eurostat), but overall the customer segments should be quite similar.

Nevertheless there are some differences that affect the supply chain:

- It is more common in Germany to rent a house /flat than buy (about only 43% of the dwellings are owner occupied (source: destatis))
- All customer segments can be found in rented dwellings, although higher income households are more likely to own the dwelling (source: bmvbs):
- German households tend to stay longer in a dwelling – especially when owning it; it is still typical to buy a house “once in a lifetime”. This results in many alterations of existing dwellings like attic/cellar – conversions or extensions.

7.1.1 Politics, motivations and supply chain for retrofit in Germany:

Some retrofit actions are compulsory by ENEV (German law for energy savings in the building sector). This includes insulation of attics and pipework, radiator thermostats and replacement of inefficient heating systems. The EnEV is redesigned every 2-3 years and requirements increase. Wherever planning permission is needed (e.g. for extensions or major maintenance work) energy improvements are mandated at the same time. These are known in the UK as Consequential Improvements.

Retrofit for value increase: The German tenant’s organization advised their members to rent only energy efficient dwellings. Rising energy costs made retrofitted dwellings more desirable and therefore increased their value. (Energy is more expensive in Germany than in Britain and people talked about “second rental fee” as the energy bills of non retrofitted dwellings could be very high.)¹

Retrofit for comfort: German weather conditions are more extreme than British with colder winters and hotter summers; as a result many people consider retrofitting for comfort in summer as well as winter; many roof insulation projects were triggered by “unbearable” heat in summer. Air-conditioning and good heating system in buildings and offices have resulted in people being unwilling to accept variation in temperature. Retrofit projects of friends and neighbours have influenced people to retrofit their own homes.

¹ September 2010 Electricity price was 0.2282 Euros per KWH against 0.1347 Euros in the UK and gas was .0538Euros / CuM against 0.04 Euros in the UK. Source www.energy.eu.

Retrofit information centres and energy checks: Energy checks and free information helped people to decide to retrofit. Country wide retrofit centres offer free advice for energy saving measures either by phone, e-mail or in person. Online or paper energy checks are available from councils, banks or other organisations. People could decide whether to adopt single measures or to have a whole house solution calculated by an energy consultant.

Customers also receive advice through chimney sweeps who regularly visit all German households.

Typical triggers for whole house retrofit:

- Newly purchased run-down properties before moving in (minimal disruption).
- Retrofit of inherited dwellings (no costs of buying, /more money for retrofit).
- Middle aged established people retrofit for environmental reasons and lower fuel bills.
- Properties with rapid pay-back (especially for rental, but some owner-occupied).
- Whole house retrofit because of tax savings (for renting out).

7.1.2 Strategies for different customer segments in Germany:

There are no different strategies for different customer segments. General strategy is making information and advice available for everyone and helping them to obtain Government funding. A positive side effect was widespread awareness of the increased value for retrofitted properties for their tenants.

7.2 Contrast with Retrofit in France

In 2005 energy laws were adopted to encourage energy efficiency with the following objectives:

- Cut energy use through voluntary actions by 25% per year until 2025
- Protect the environment through greenhouse gas reduction by 75% by 2050
- Secure competitive priced energy to provide resilience against oil price volatility
- Diversify energy sources through promotion of renewable energy

Energy companies have a mandatory obligation to make savings with a market of “white certificates”.

France’s Environment cabinet (Grenelle de l’Environnement) was set up in 2007 to develop government policy on sustainable development, it involved the state, regional authorities and civil society.

Figure 6 below summarises these elements and flow of retrofit in France.

French Retrofit Supply Model

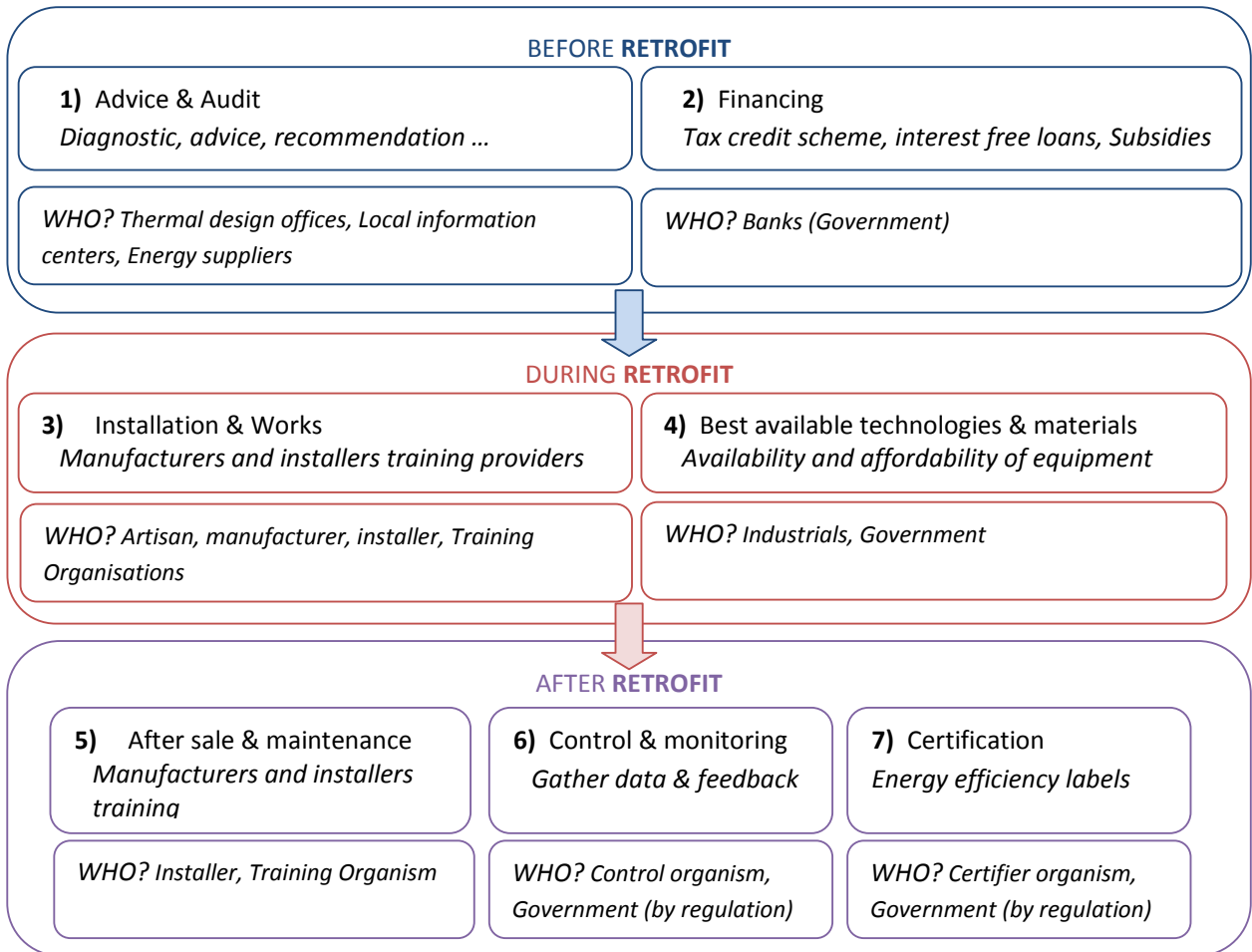


Figure 6: French Retrofit Supply Model

7.2.1 Advice

- In 2000 Local Energy Centres set up to increase householder awareness
- In 2006 Numbers of centres increased to 187 with 340 advisors
- -2007 4.3 million people advised of which 56% take action on average spending €8,500
- Energy performance audit has been mandatory on sale, rental and new build.
- The advisory companies must be accredited and skilled.
- Energy companies are obligated to support their customers in energy reduction.
- For EDF this mechanism resulted in 350 000 house refurbishments.
- All customers are handled in the same manner with the same products, and services available to every customer. Tailoring the retrofit offer for different customer segments has not been considered

7.2.2 Financing

- For existing stock, the **tax credit** has been successful. It was extended in 2005 and a total of 49,000 properties have been audited since 2000.
- Interest free finance is available for retrofit for up to €30,000 payable over 10 yrs.
- VAT is reduced to 5.5% for energy efficiency measures from the standard rate of 19%.
- A table of other finance available is shown in Appendix 4.

7.2.3 Installation & Works

In France, there is no obligation for manufacturers and installers to have accreditation. The government sets specific performance standards to define what equipment and materials are eligible for tax credits (whoever the installer manufacturer is). Different training schemes exist to help construction professionals to improve and update their competences

7.2.4 Best available Technologies and materials

The government and the ADEME created partnerships with industry, manufacturers, universities, research centres and energy suppliers to launch research programs on innovative materials and equipment. In 2011, a project piloted by the National Scientific and Technical Building Centre - CSTB began updating Building Best Practice documents for construction professionals.

The government also promotes the development of innovative equipments through the tax credits.

7.2.5 After sale and maintenance

In France, there is no obligation for Manufacturers and installers or maintenance companies to be accredited.

In 2006 the importance of highly skilled construction professionals for retrofitting was recognized. An organization was created to provide 3 types of training.

- Whole house retrofit
- Analysis and thermal assessment of building
- Presentation of best available technologies

In addition, an E-learning programme was launched in 2010 providing construction professionals with retrofit fundamentals (www.energiebat.fr). ADEME has set-up regional training centres with local authorities, to focus on practical skills testing.

7.2.6 Control of works and monitoring

Today there is no regulatory control of the French retrofit market; but all the main stakeholders agree this must improve.

7.2.7 Certification

In 2009, the energy efficiency label for retrofit was launched by government (Low Consumption Building - BBC). This is designed for the dwellings built between 1948 and 2004. Effinergie (www.effinergie.org) leads different kind of activities -Workshops, Tools development, Standards diffusion.

7.3 Previous UK National Roll-Out Programmes

The UK has implemented a variety of national roll out programmes including, the digital television switch over, the social housing decent homes programme, the launch of channel 5, and the natural gas changeover. All previous roll outs have impacted society in various ways however their success is generally dependant upon its complexity and the levels of disruption their introduction has caused.

7.3.1 Natural gas change over

The discovery of natural gas in the North Sea meant that the country could be provided with a cheaper more efficient fuel source. In 1967 the first of the 13 million gas customers had their gas appliances converted so that they could benefit from the newly found natural resource.

The initial objectives of the programme were to establish which areas of the country could be isolated from the gas distribution network. In order for an efficient change over programme to be carried out each gas consumer was surveyed to establish what components would be required to convert each appliance within the property.

On the day of change over each consumer was required to isolate each appliance so that the town gas could be purged from the local mains and network. An army of gas engineers then went from house to house each day to change the components on the appliances.

Once a section of the area was completed the natural gas was released into the system. The major problem encountered during this process was in ensuring that the correct components were in the right place at the right time, that access was provided by the consumer and that the safety of the consumer was not put at risk by the conversion process.

On completion of the change over programme 40 million appliances of all types had been converted, this included around two thousand different cooker types. The conversion programme started in 1967 and was completed in 1977. The cost to British Gas was huge, £563 million or £42 per property was the final cost of the conversion programme. Partly as a result of the conversion programme the number of deaths caused by burnt or un-burnt gas fell from 1246 in 1963 to just 271 in 1970.

7.3.2 Digital TV

The digital switchover aims to enable all UK households to convert from the current analogue TV signal to a digital one, in order to save broadcast space to allow for new services such as broadband and HDTV. The four year programme (2008 – 2012) will be carried out in regional stages starting with Wales and the West Country and will affect an estimated 60 million TV's.

As there are already several ways of receiving TV broadcasts there is a great deal of confusion about how and what must be done in each circumstance. To inform the nation of the change a massive information campaign costing £200m is being spent during the switch over period. Help schemes have been set up to provide information about why the switch over is taking place, what services are available and how individual properties as well as business can switch over. Schemes have also been set up to help provide people with the necessary equipment to convert their existing sets and anyone needing help or information can utilise the help line number of website. Those on benefit are eligible to funding help from TV licensing.

7.3.3 The Decent homes programme

The programme aims to provide social housing occupiers with a home that is weather tight, warm and has modern facilities. Ultimately the aim is to improve the standard of living and thus improve the health of the residents. Residents were given the choice, whether or not to have the upgrades and to date 92% of properties have been upgraded.

The programme has been carried out over a period of 10 years and has affected 2.1 million houses. Initially some residents were reluctant to take part in the programme due to their lack of understanding about how works are carried out and what levels of disruption to expect. These concerns were tackled with the aid of information packs, specially commissioned DVD information films, community open days, drop in centres and door to door property visits by experienced customer liaison officers and surveyors.

During the course of programme, the booming construction industry experienced a skilled labour shortage. Skilled trades people with choice saw working on social housing sites as unappealing and the overall quality of work dropped as a result, with contractors being forced to use whatever labour was available regardless of ability.

The most successful decent homes programmes have ensured residents were consulted, engaged and active in deciding how the schemes would be managed from the earliest opportunity. Communication with the residents at all stages of the programme was vital to achieving the desired results.

The average cost of making a home decent has been estimated at £7200 although figures between £15000 and £21500 have been mentioned when landlords consider enhanced energy performance with improved facilities.

7.3.4 Channel 5 Launch and retuning of TV's

In 1997 the new Channel 5 was launched to 70% of the UK population, however in order for people to receive the channel their televisions required adjustments, a filter to be fitted and or and new antenna erected. People wishing to receive the channel could either phone a helpline for retuning instructions or book an engineer visit to make the adjustments themselves. The offer of a new free service and an effective advertising campaign ensured take up of the channel was significant with people positively engaged in arranging access for engineers or following helpline instructions. Due to demand specific training courses were developed for engineers to avoid a shortage of installers.

7.3.5 Review of study

The above national roll out programmes have identified that:

- The desire of the population to participate is key to success. Instrumental in affecting this are the clarity of key messages / aims of the programme and the effectiveness with which they are communicated. Communication has to engender belief and trust, without which participation is unlikely.
- Availability of resources and training requirements for future work levels need to be considered to avoid skills shortages and reduction of quality levels.
- National programmes should be broken into smaller manageable segments relevant to the work. I.e. Regions, networks, house types etc.
- Funding options need to be in place.

7.4 Summary of Germany, France and previous national roll outs.

Previous national roll out programmes have been driven by either continuity of service or in the case of decent homes, the national desire to improve living standards.

In one case the motivation of householders is to enjoy continuity of supply (Gas changeover, channel 5, digital TV) and the other is enjoyment of more comfortable and healthy living conditions; both have clearly understandable and visible benefits and all require little or no outlay for the householder. In all previous national roll out programmes the following were seen as critical success factors.

- Creating public awareness
- Providing multiple modes of access to relevant information
- Training for those involved
- Detailed planning of the rollout activity

In the case of the decent homes programme shortage of skilled trades- people became a problem as the building trade was enjoying a period of strong growth.

German and French experience

- Both Germany and France:
 - Make information freely available
 - Offer free energy surveys to households
 - Offer interest free loans and a system of grants and subsidies to encourage energy efficiency measures to be taken up.
- In Germany
 - Specialists and installers of measures must be qualified and accredited
 - Independent specialists advise on energy efficiency and manage embodiment of measures and access to finance
 - Considerable emphasis is placed on formal, regulated training for energy surveyors.
- In France
 - Energy companies are charged with increasing the adoption of retrofit measures.
 - Accreditation of advisors and installers is not required; instead minimum performance standards required by government are employed.
- Neither Germany nor France has used customer segmentation to tailor their marketing activities for maximum take up.

8. Future State Supply Chain

This section documents the Future State Supply Chain as developed from the workshop results, their analysis and the observations from Germany, France and previous UK rollouts. It includes a Gap Analysis between ideal and current state.

8.1 Future State Supply Chain

It is clear from research carried out for this report that in order to meet the value propositions identified in our workshops, the supply chain of the future must be ordered in a structured sequence to facilitate the flow of design, product creation and delivery.

The map below shows the Future State Retrofit Supply Chain Map. The boxed areas indicate the 3 phases of retrofit as relevant to the householder.

- Pre-site
- On-site and
- Through Life.

Future State Retrofit Supply Chain Map.

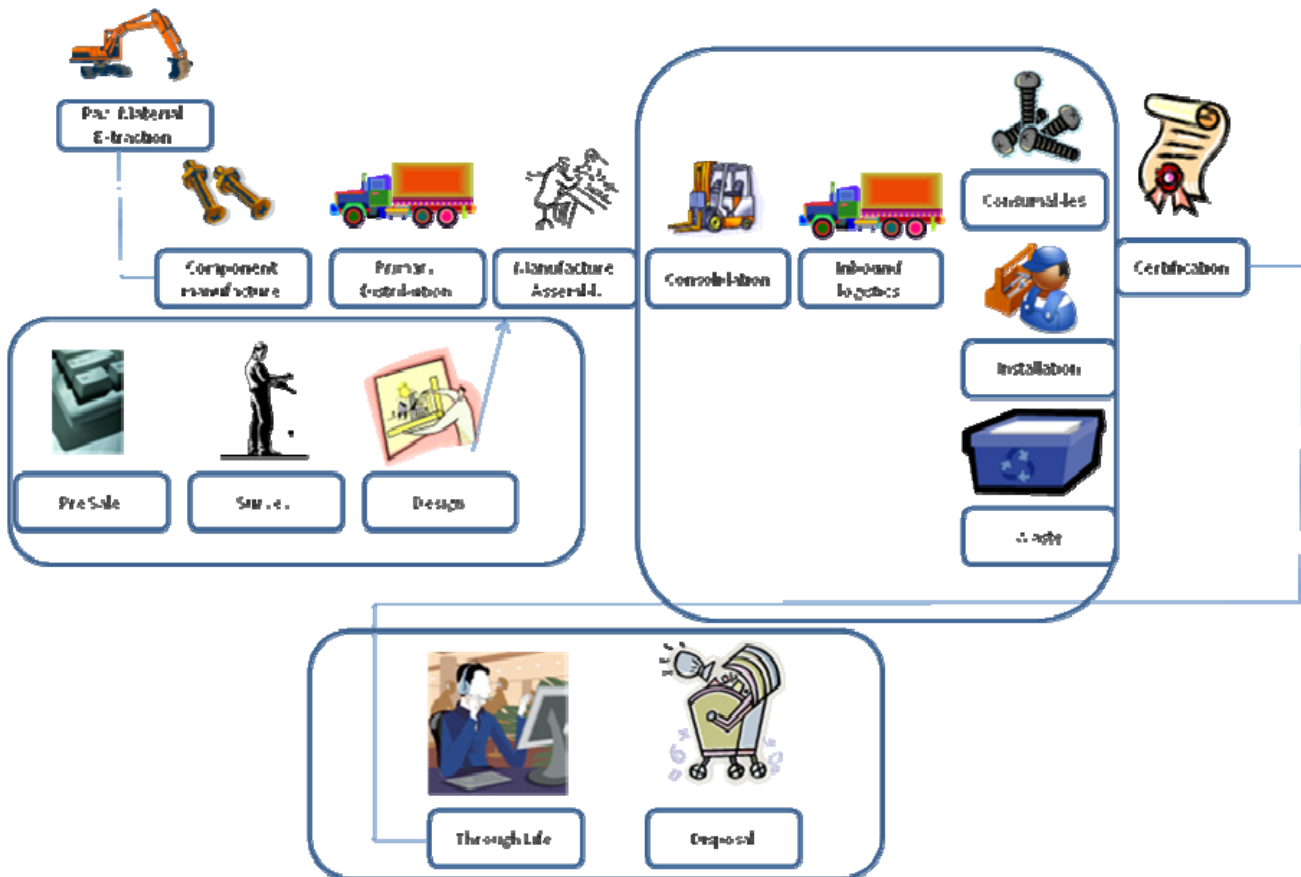


Figure 7: Future State Supply Chain Map

Five key stages have been identified as critical in order for the supply chain to deliver a successful service. The 5 key stages are:

- Survey.
- Manufacture.
- Consolidation & Logistics.
- Installation.
- Through Life.

The architecture of these stages is detailed below.

8.1.1 Survey

The role of the survey is seen as key in both engaging the household decision maker and ensuring the subsequent supply chain solutions address the correct issues.

The survey needs to be fast, accurate, and unobtrusive, incorporating design / engineering and must result in effective individually tailored solutions for the whole house.

Inputs must include the latest design solutions, costing information and expected CO2 benefits, and availability and timings of resource including manufactured materials and installers.

Outputs must link directly to manufacturers and installers, funding and insurance brokers / providers. It is important to identify the potential for unintended consequences such as damp and mould.

8.1.2 Manufacture

The future state supply chain will need to shift to manufacture or configure to order. This is likely to help minimise the disruption, time and waste on site.

Manufacturers will need to work collectively or upgrade their individual capabilities to enable whole house retrofit solutions to operate as integrated systems. A scalable solution can be envisaged where a configuration and delivery package is pre-fabricated and replicated to deliver retrofit as demand increases.

8.1.3 Logistics & Consolidation

With a shift to manufacture to order and systems solutions a new logistical approach is required.

- Make or configure to order.
- Consolidation point to be determined at the detailed design phase:
 - Manufacturer, distributor, merchant, or system-installer.
- Ensure “last mile” vehicle utilisation is maximised and highly fuel efficient, possibly electric vehicles.
- Back hauling to be maximised.
- Identify opportunities from multiple functions in logistics such as:
 - Client removals and property storage.
 - Waste removal.
 - Fleet fuelling facilities etc.

8.1.4 Installation

In the supply chain of the future, installations will be conducted by small teams of multi skilled trades people capable of completing all stages of the retro fit project; each tradesman prepared to adopt assisting roles when their specialities are not required. .

- Multi skilled workforce – well equipped with tools and systems which minimise dust and risk of accidents.
- Customer service skills – able to resolve queries and allay householders concerns.
- Quality assured by design – self certified; not inspected.

8.1.5 Through Life

Customers are keen to have systems that are “fit and forget” and should problems arise they want problems to be fixed quickly in one visit or remotely where possible. There will be a single point of contact for all works with UK based 24 hour support.

- Single point of contact.
- Fit and forget preferably.
- Upgrade service.

8.2 Contrast and Gap Analysis between Ideal and Current State Supply Chain.

In order to evaluate some of the key differences between the current and ideal state supply chains and understand the gaps it is helpful to refer to the Current State Retrofit Supply Chain Map and the Future State Retrofit Supply Chain Map as follows:-

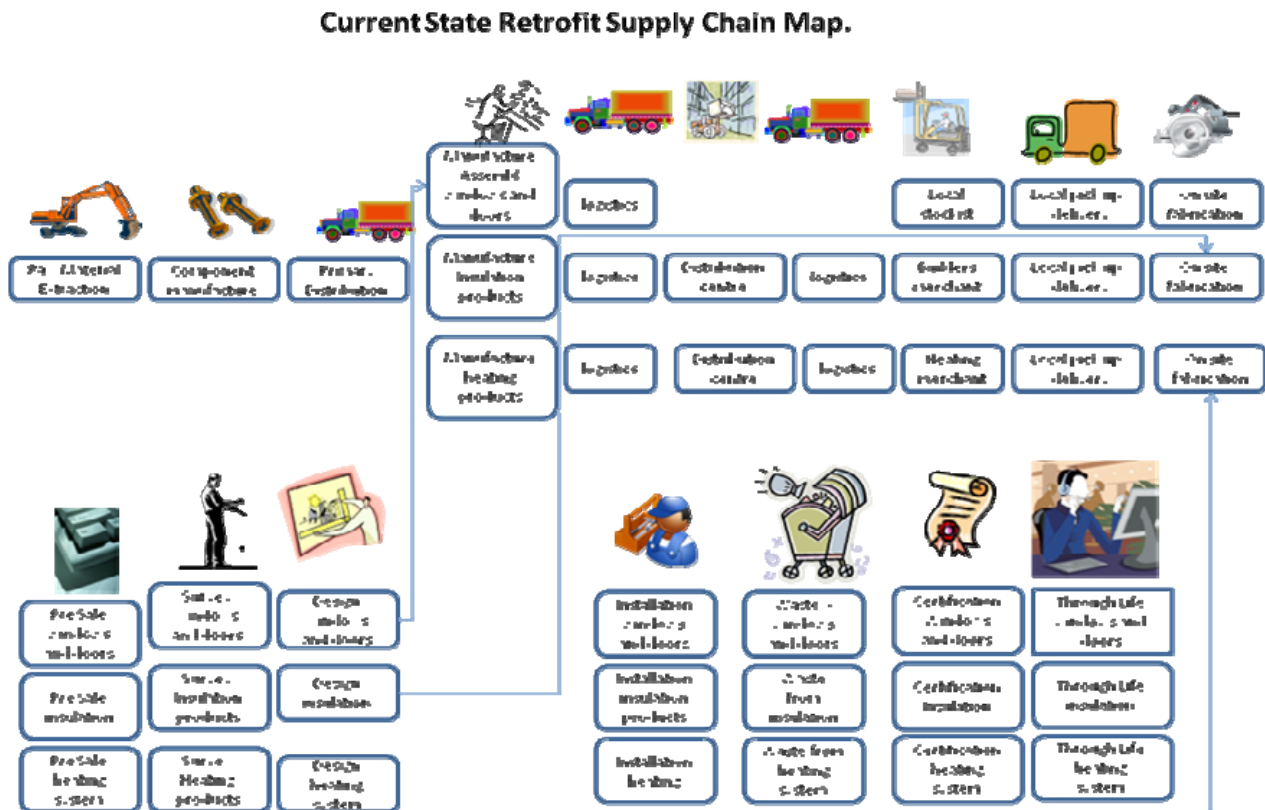


Figure 8: Multiple Supplier Retrofit

Figure 8 illustrates the duplication throughout the process if individual solutions are supplied and installed by their respective organisations.

Future State Retrofit Supply Chain Map.

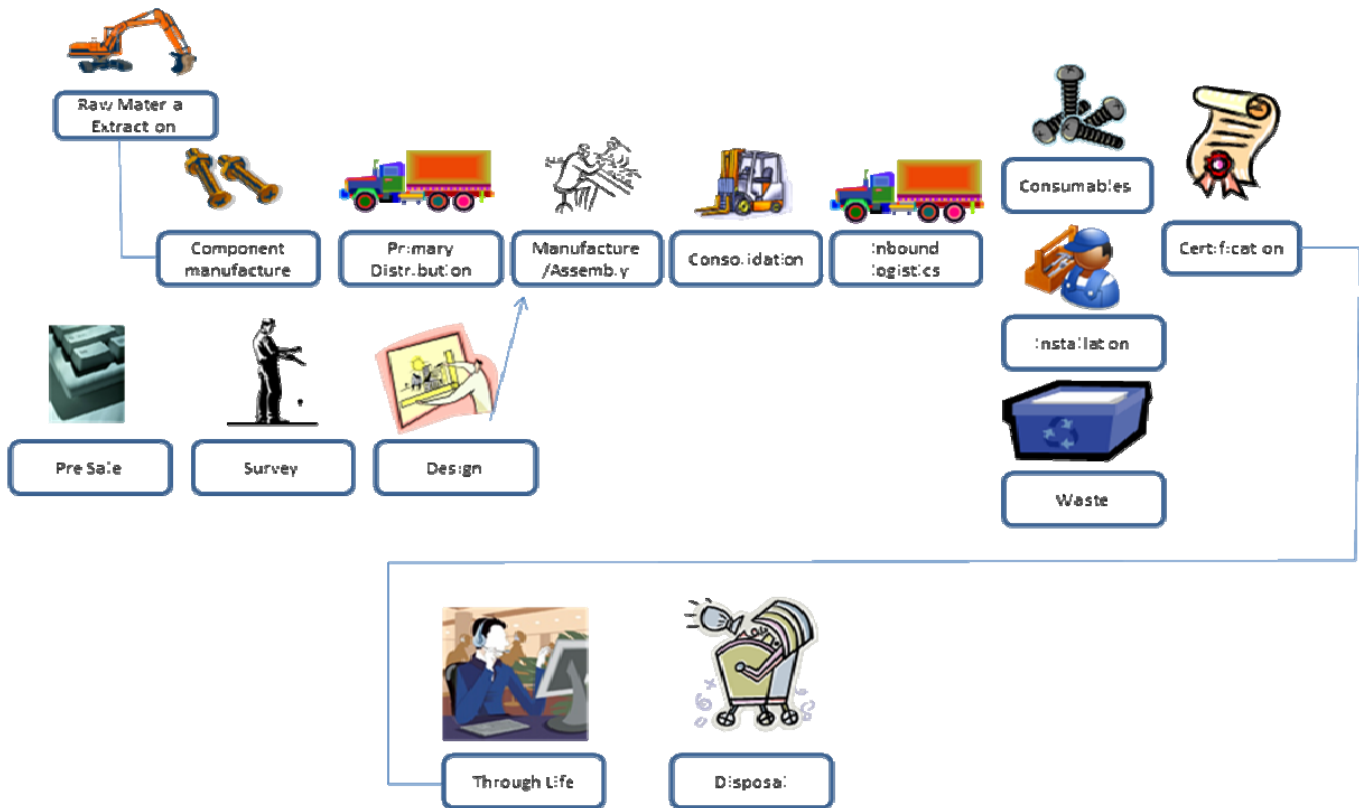


Figure 9: Future State Supply Chain Map as derived from Workshop Supply Chain analysis

The future state supply solution in figure 9 is greatly simplified by a single organisation at each phase and potentially a single entity throughout.

8.2.1 Gap Analysis

The supply chain of the future needs to be structured in a sequence to enable the design, flow of product and delivery to minimise cost, time and disruption.

This is in stark contrast to the existing supply chain which is set up on product based chains, which are often chaotic, with no single clear progression route. It is characterised by silo behaviour at every stage and step.

Gaps are found at each of the key stages of the supply chain and can be presented using the Resource, Process and Value Gaps as follows:

8.2.2 Gap Analysis - Survey

The current survey is often conducted in isolation from the rest of the supply chain by totally independent bodies. The main purpose is to assess the situation of the property and to make recommendations for that property. The focus is currently on lowest cost (eg: UK domestic EPCs), rather than best performance (as in Germany). This is in contrast to the future state, where the survey is seen to be key to engaging the customer, providing the appropriate design options and delivering reliable information essential to all other stakeholders. In effect the survey is the foundation for successful retrofit solutions.

Resource gaps

- Identify who conducts surveys (not necessarily independent from delivery; but trusted).
- Surveyors training to fit wider scope of responsibilities; ability to collect information for entire supply chain in one visit.
- Tools to enhance speed of survey.
- Tools which facilitate instantaneous design solutions with options.
- Tools which integrate with manufacturers and installers.
- Funding required (only 2 customer segment groups willing to pay).

Process gaps

- Need to identify the trigger for survey – e.g. geographical roll out, change of use, planning, consequential improvements (optional or mandatory).
- Standardising the survey and energy assessments of dwellings.
- Need to understand the benefits and potential negative effects of implementations.
- Need consistent measurements of life style effects on energy consumption.
- Need to account for future life style changes.
- Link to sales process needs to be clear.
- Need to set KPIs for Performance, Speed, Dependability, Flexibility & Cost.

Value gaps

- Householders don't see surveys as a necessity; the understanding of surveys is low and are used only if required to gain planning permission.
- May need to make surveys compulsory so that energy saving opportunities are identified and stock is understood.
- Collaborative working amongst surveyors, designers, engineers etc.
- All outputs should be clear and easy to understand.

8.2.3 Gap Analysis - Manufacture

Currently products are predominantly supplied from stock, to be cut to fit on site. This is a huge contrast from the envisaged future approach of manufacture or configure to order.

Resource gaps

- Confidence to make capital investment in retrofit products at scale.
- Availability of highest performing products and materials.
- Tools to accurately capture (survey) and translate design information into an appropriate format for manufacture.

- Tools to track manufacture to order stock in the system.
- Warranty.

Process gaps

- A rapid product approval process which robustly tests performance (carbon efficiency) and likely energy savings through life and predicts lifespan and ageing characteristics.
- Current inflexibility of manufacturing processes which are geared up for stock sizes supplied to distributors with commodity pricing.
- Ability to manufacture whole house retrofit kits under the same roof or in close proximity.
- No current capability to link survey information directly to manufacture.
- Need to feed in product specification changes into all areas of the retrofit programme.
- Engineering change and configuration control process.

Value gaps

- Lack of appetite for systemic change amongst many product manufacturers.
- Minimal recognition of the need to shift from product focus to integrated solutions.
- Poor collaboration with distributors and installers to improve the provision of products.
- Little appetite for a step change in speed and customer focus.
- Inertia based on fear of negative reaction to innovation by competitors and merchants.

8.2.4 Gap Analysis - Logistics & Consolidation

Need to improve the 'last miles' of the logistics process as this is currently ineffective with multiple van trips to the merchant for materials.

Resource Gaps

- Regional / local consolidation points (rather than consolidation on site).
- Ability to support other value added activities (waste management, consolidation, storage of householders' furniture and effects).

Process Gaps

- Few 'System solutions' from multiple manufacturers to deliver project kits as a single delivery; reducing site traffic and distribution points.
- Need a broader range of services at consolidation points to reduce the need for multiple service providers on-site.

Value gaps

- Lack of recognition of the need for or benefits of make / configure to order solutions.
- Need for a greater focus on dependability: Right first time 'delivery to promise'.
- Systemic over-ordering of product 'just in case' adding 20% to the cost of materials.
- Lack of awareness of cost in time, fuel and process disruption, of multiple trips to merchant.
- Ineffective ownership of material supply and forward planning.

8.2.5 Gap Analysis - Installation

Currently installation is seen as disruptive and chaotic, with frequent overruns against budgeted costs and time. Whether the existing supply chain adapts, or new installation providers are created, the following gaps need to be addressed:

Resource Gaps

- Resource guidance for best available solutions by house type.
- Whole house design solutions.
- Retrofit business model template for scaling capacity; possibly through franchise.
- Training tailored to retrofit: Apprenticeships and retraining.
- Product innovation to facilitate “no tools” working.
- Design and Manufacturing innovation to facilitate “zero waste” on site.
- Clear and practical H&S standards for site work.

Process Gaps

- Quick, efficient standardised retrofit processes.
- Low disruption solutions with minimal cutting and wet trades on site.
- Option of “whole house”, “room by room” or “measure by measure” solutions to meet householders value requirements. Possibility of “whole street” in some instances.
- Development of approved working practices to mitigate health and safety risks.

Value gaps

- Insufficient recognition of a need for accuracy, right first time quality and ‘installation to promise’.
- Dispel traditional “that’s not my job” mentality and encourage cross trade teams: Each with specialist skills to be able to tackle all elements of a retrofit project.
- Improved customer service ethic.
- Eliminate the attitude of “how little can I get away with?”

8.2.6 Through Life

Through life support of whole house retrofit is complicated by the number of suppliers / contractors who have partial ownership of the retrofit.

Resource Gaps

- Contact Centre and personnel for advice and problems.
- Remote diagnostics capability.
- Availability of all spare parts over the long term.
- Lack of ‘whole system’ warranty / guarantees.

Process Gaps

- Collection and recording of information on property and products fitted (What has been fitted, when and by whom?).
- Database of “as installed” for rapid diagnostics and repair.
- Ability to offer upgrade path.
- Training and advice to householders for features and options.

Value gaps

- No “System Warranty” ownership when problems occur: Even with a single contract warranties are passed down to element / component level.
- Concern that supplier will not be trading in the future when I need them.
- Warranty “wriggle room”.

9. Future Work & Challenges Across All Workpackages

The output from this report will be shared with other stakeholders and reactions will be documented as appropriate:

- Government Departments: DBIS, DECC, DCLG.
- Energy Technologies Institute.
- Energy Saving Trust.
- Supply Chain Stakeholders: CPA, NHBC, Construction Trades.
- Workshop Delegates.

The hypotheses in section 6 and the Future Retrofit Supply Chain in section 8 will be tested using the new information on stock, ownership and retrofit solutions coming out of work packages 1, 2 and 3.

The hypotheses will be developed to greater levels of detail and tested in work packages 4, 5 and 6

9.1 Dwelling and Housing Stock Model - WP1 and WP2

Outputs from work packages 1 and 2, stock modelling and energy performance modelling will benefit from data collected during the survey process and further from the impact on energy consumption post works. A tool for surveyors to collect house data and update both the models and stock data would be valuable (although currently out of scope) to include the following:

- House type, construction type, dimensions, extensions and energy performance.
- Use of virtual retrofit as a sales tool, including regional variations in house types.
- Indicative cost and benefits of retrofit solutions for discussion with householders.

9.2 Retrofit Design Challenge - Implications for WP3.

To further develop the supply chain for WP4, clear guidance about the likely energy saving per intervention is needed (and what will improve or reduce it) contrasted with the whole life cost.

Once more detailed design solutions have been developed from WP3, it will be possible to evaluate performance with the supply chain and cost the interventions across the different house types. Approaches to reducing product and process cost and predicting cost reduction over time will be developed.

The following strategies may be employed to achieve these aims.

- Design to target cost (system solution).
- Reduce material cost through manufacturing and supply process improvement.
- Eliminate non-value adding parts and processes, simplify & combine elements.
- Reduce manpower – use multi skilled personnel to improve work flow.
- Pre-fabricate and assemble kits off site. Make to order and deliver to site.
- Introduce standard work on site to reduce variability, errors and accidents.
- Set the objective of: No cutting tools or wet trades on site.
- Increase material and process performance and dependability.

These will be examined in detail when design solutions emerge.

9.3 Supply Chain Challenges (WP4)

The next step, WP4.2, will focus on development of the next level of detail of the Future Retrofit Supply Chain. This will be come from considering how integration between surveyors, installers, logistics and manufacturers can eliminate duplication and cost. Reactions from current players will clarify whether the solutions will be evolution, or creation of totally new supply models.

9.4 Customer Value Challenges (WP5)

The Hypothesis with respects to the Value Proposition Summary in section 7.4 will be tested through the field questionnaires and surveys in WP5.3 and 5.4.and virtual retrofit studies in 3.4.

Further Customer Value questions which came directly from the workshops and the analysis of results can be found in Appendix 5. They can be summarised as follows:-

9.4.1 Retrofit Benefits

- Is there an opportunity to add additional value to retrofit works by linking with other modifications to the home, for example extensions, loft conversions?
- Can householders be encouraged to retrofit with a 'ladder' of incremental improvement?

9.4.2 Retrofit Sacrifices

- Will customers tolerate disruption in the home for 2 weeks with 5 people working?
- Are customers prepared to vacate their home during retrofit works? Under what circumstances

9.4.3 Marketing and Communication

- Who is the trusted entity to deliver the retrofit? (contractor, branded retrofit delivery company, energy company?) Do customers value a strong brand enough to trust them to work within their home?
- Current customer perception is of low professionalism and poor project management of installers. All customer segments want recognised, trusted, quality brands and their message was clear in terms of the delivery of performance:
- Installers must demonstrate high customer service skills, be tidy, safe and be respectful.
- Installers and product supply must be well managed and must stick to the planned costs and timings.
- Installers and products must deliver 'right first time' quality.

To remove these barriers, future policy must ensure approved retrofit installers develop reliable capability in their technical offerings, customer service and project management.

9.5 Policy Challenges: Implications for WP6

The detailed analysis of results and the line by line implication to policy makers can be found in Appendix 5. Key points have been extracted and recommendations detailed against each of the policy areas (Technical, Logistical, Cultural and Financial as defined in section 4.3) as follows:

9.5.1 Technical

- Trust in retrofit solutions may need to be promoted through the use of incentives and subsidies for those manufacturers which meet the standards required in terms of:
 - Be a significant step improvement over products that they are replacing.
 - Be simple and quick to fit.

- Be simple to use.
- Provide noticeable differences in comfort.
- Be reliable and maintenance free or low maintenance.
- Be future proof and upgradeable.
- Have warranties that cover their expected lifetime.
- Support the principle of return on investment over their expected lifetime.
- Have clear guidance on cost vs. efficiency gain over their expected lifetime for the different applications.
- Accreditation process may slow innovation and market entry if overly bureaucratic.

9.5.2 Logistical

- An independent surveyor is not the priority: Accreditation and training are required along with tools to support the entire process and provide consistency.
- Installers training should include customer service and project management training.
- Installers and products must deliver 'right first time' quality and be capable to complete their own sign off.
- Measures to avoid 'cowboys' should work on a reward basis more than punishment. I.e. New jobs issued to quality installers
- Performance monitoring could be collected at Through Life stage
- Trusted brand recognition could be achieved through retrofit training qualifications.
- Options of room at a time rather than whole house retrofit should be considered to meet speed, disruption and cost requirements of some customer segments.

9.5.3 Cultural

- Clarity and consistency are key needs of all customer segments. This spans promotion, calculation of benefits, recommended measures, branded solutions and planning requirements.
- Options and choices are important, but they must be clearly presented with no confusion and no surprises. Ideally this will be linked to the product expectations -cost vs. carbon saving followed by other benefits for each household and presented in a cost- benefit comparison method such as those provided on websites such as 'Go Compare'.
- Consistency required across all stakeholders (in promotion, survey output, on energy bills and/or meters, in the home energy ratings) to allow non- experts to contrast the value of a range of solutions on a like for like basis.
- Vulnerable sectors (such as 'stretched pensioners' and 'unconvinced dependents') want to be lead by people they trusted, others seem prepared to take their direction from government and the mass media. "Tell me" or "Involve me"
- All customer segments need a knowledgeable support helpline for after-sales service. This would need to be a requirement/ expectation for approved operators.

9.5.4 Finance

- Different funding solutions required for different market segments:
 - Cannot fund (fuel poverty, hard to treat = Energy Company Obligations - ECO).
 - Can fund with assistance (Pay As You Save - PAYS)
 - Can fund without assistance (triggers such as change of ownership, rental, energy saving upgrades mandated during planning approval as in Germany)
- Take up encouraged by reducing the cost point through the use of VAT reduction and Interest Free loans as in France.

- Take up encouraged by increasing benefit of implementation such as increasing the value of the home (e.g. by linking the EPC rating (or equivalent) linked to the value of the home through council tax banding.
- There is a strong need for simplicity and clarity in finance for retrofit. Options must be flexible and transparent for all sectors.
- Making the most of consequential improvements – financial packages could be flexible to accommodate redecoration and wider home improvement works they would be a strong influence in driving the market.
- Financial packages could accommodate indirect rewards such as a weekend away whilst work is being completed.
- No on-costs - All segments want to avoid surprises or opportunistic “up-selling”. Assurance is required that there will be no on-cost (even if asbestos, an ancient burial ground or rare breed of bats is found on the premises as work is being undertaken) and insurance should cover the home dweller against such eventualities.
- All costs included - Most segments are unwilling to pay for anything other than the installation, so the cost of survey and ongoing maintenance should be factored into quoted costs for the installation or funded from other sources.

These are summarised in the executive summary.

Appendices

Appendix 1: Summaries for the 10 Customer Segments.



Busy Starters 1.0



Early Enterprisers
1.1



Elderly Established
1.2



Greener Graduates
1.3



Middle Grounders
1.4



Stretched Pensioners
1.5



Successful Ruralites
1.6



Transitional Retirees
1.7



Unconvinced
Dependents 1.8



Urban Constrained
1.9

Appendix 2: Organisations Contributing to the Workshops

Anglian
BASF
Baxi
BRE
British Gypsum
CCF
CSC
DHL
DMU
Earthshine
Earthshine
EDF Energy
EH Smith
Energy Saving Warehouse
Enterprise
EST
Eurocell
INCA
Isothane
Kingspan
Peabody
PRP
SIG
St Gobain
Totalflow
Travis Perkins
UCL
Wates
Westport
Wier Waste
Worcester Bosch

Appendix: 3 Results from WP4.2 and how they impact on WP6

Customer Perception – Benefits and Sacrifices

The success of the Green Deal will be on its ability to meet or exceed home dweller’s expectations in terms of benefits and in not meeting their fears and dreads (sacrifices) which are based on perceptions often borne by personal experience. The following tables look at the perceived benefits and sacrifices and the associated requirements of any legislation, policy, incentive or penalty

Key: Score shows the number of profile groups (out of ten) which specified the benefit/ sacrifice in their analysis.

D= Doors & Windows, I = Insulation, H = Heating System

Benefits	D	I	H	Policy requirements
Add Value to the Property	6	4	2	Must link the carbon efficiency to the value of the house e.g. Use of EPCs in valuations, council tax bands, tax incentives
Reduced Energy Bill	4	8	7	Must ensure that the golden rule is applied and that any changes do result in energy bill reductions.
Improved Comfort	6	7	2	Products and their installation must provide noticeable changes in the comfort for the individual.
Better Product	x	x	9	Must ensure that new installations are substantial improvements over existing technologies.
Less Maintenance	?	?	3	Must ensure that new installations require less maintenance than existing technologies

Appendix: 3 cont'd.

Sacrifices	D	I	H	Policy requirements
Hassle & Disruption	10	10	4	Must ensure products, installers, surveyors, etc cause minimum disruption, included in:- product design (simple to fit) accreditation & training (professional) project management (minimum impact) joined up supply chains (seamless)
Cost	6	x	3	Must enable simple solution and clear guidance on funding options. Any solution must meet the golden rule. Support required to support any indirect costs (decanting, redecoration)
Don't trust installers	3	4	1	Must ensure that installers are well trained, safe and professional.
Intrusive (insulation)		10		Must encourage new innovative materials and solutions that solve these issues.
Planning Issues	1	2		Must involve the relaxing of planning requirements and/or clear guidance thereof.
Fear of Arising Problems		2		Must include warranties, guarantees against products and installers and support good quality 'right first time' installation.
Complicated (heat)			6	Must ensure that new products are simple to use, with instructions and training / support post fitment.
Payback Risk		2		Green Deal 'golden rule' must be enforced and supported to the end.

Appendix 4: French retrofit Finance Options

Subsidies in case of thermal refurbishment	Terms	Beneficiary	Amount
Tax credit	All kind of thermal insulation & energy efficiency diagnostic	Occupant owners, Lessor owners, tenants	8000€ - if single person 16 000€ - if couple + 400€ for each dependant person (restricted at 8000€ by dwelling)
Free interest loan	Package of renovation works (at least 2) or global energy efficiency improved Dwellings built before 1990	Occupant owners	30 000€ if 3 kinds of renovation works 20 000€ if 2 kinds of renovation works
VAT 5.5%	All kinds of thermal insulation works Dwellings built more than 2 years ago	Occupant owners, Lessor owners, Tenants	Applied to the global amount of works & equipments
Anah* subsidies	All kinds of thermal insulation works (Present Thermal Regulation criteria required) Dwellings built more than 15 years ago	Modest occupant owners, Lessor owners (with maximum rent)	
Eco – subsidies (Anah)	All kinds of thermal insulation works (Minimum Energy efficiency required)	Modest occupant owners, Lessor owners (with maximum rent)	1000€ if occupant owner 2000€ if lessor owner
ADEME* subsidies	Thermal assessment	Co-ownership	Pre-diagnostic: 70% of the cost (max. 2300€) Diagnostic: 50% of the cost (max. 75 000€)

*Anah: Agency Improving Housing Conditions

*ADEME: French Environment & Energy Management Agency

Appendix 5: Value Proposition Results & Impact on WP 5&6

Presale

Presale	EE	UC	BS	UD	GG	SP	MG	SR	EE	TR	Total	Comments for WP6 (Policy)	Comments for WP5 (Community)
Government lead			x		x						2	Need Clear and Simple Guidance, copied across all media forms and by community leaders	Who do people want to hear this from? Test
Mixed Media lead		x			x		x	x		x	5		
Tradesmen lead	x										1		
Community Leader / Warden lead	x	x		x		x					4		
See examples	x			x	x	x				x	5	More Pilot houses needed as examples?	Do people want to see examples (on paper, general examples or transposed onto their home, physical visits)
Clear guidance on grants and legislation.			x	x					x		3	Clear Guidance	Are people confused by current grants, etc?
Clear guidance on cost vs. savings			x						x		2	as above	Show some examples of how this could be presented.
Online information / comparisons			x		x				x	x	4	as above	

Appendix: 5 cont'd.

Survey

Survey	OE	UC	BS	UD	GG	SP	MG	SR	EE	TR	Total	Comments for WP6 (Policy)	Comments for WP5 (Community)
Independent surveyor - e.g. Carbon trust or other charity		x	x		x						3	Independent Surveyor not no.1 priority, more important that they are accredited.	Is it important to have an independent surveyor? Or is accreditation sufficient. Check brands.
Accredited Surveyor		x	x		x	x				x	5		
Accurate record of current energy use / costs					x		x		x	x	4	Need to have a clear and consistent method to record current energy use to monitor & test Golden Rule	What is people's current understanding of costs, potential improvements?
Thermal images					x		x		x	x	4		Do people like and understand these / think they are useful?
Self assessment / EPC type tool					x		x				2	Assessment tools	Would people be happy to do their own pre-survey (paper or online)
Two stage survey			x		x		x				3	Common process	
Professional results with graphs and pictures			x		x	x	x		x	x	6	Clear and informative format showing detail as an output - set the standard	Show examples of outputs & gauge reactions (how easy to understand, how useful & like or not like)
Surveyor recommends installers.			x								1		Do people want this?
Free Survey		x	x	x		x			x		5	Grants required for free surveys (or refundable)	Will people pay upfront for this? Gauge attitude to different cost points / refundable or if need incentive.
Pay for survey					x		x			x	3		
Incentive to do survey				x		x					2		

Appendix: 5 cont'd.

Sale / Funding	OE	UC	BS	UD	GG	SP	MG	SR	EE	TR	Total	Comments for WP6 (Policy)	Comments for WP5 (Community)
Flexible funding options - bank/energy co.. Added to mortgage?	x	x	x		x	x				x	6	Funding options needed	Gauge response to different funding options & need for choice.
No Cost; incentives required		x		x		x					3		
Interest Free solutions		x	x						x		3		Gauge response to different interest rates
Investment offset against future purchase			x								1	Is this a possibility?	
Costs can be negotiated down									x		1	n/a	Do people want to negotiate?
Mix & Match options					x	x		x			3	Cherry Picking to be encouraged?	Will options (provide list) cause confusion or are they required?
No extra costs (direct or indirect) once quoted		x	x			x		x	x		5	Costs guaranteed no matter what problem uncovered (e.g. bats)	Would people accept (e.g. 10%) on cost on original quote. Would people pay for insurance against added cost?
Like to see an incentive - holiday, 35k nectar points			x	x		x					3		What is the reaction to different incentives?
Like to see an additional improvement to house e.g. kitchen or garden	x								x	x	3	EST approach of addition to existing work.	Which is the driver: Retrofit for EE / other home improvement? How many people already planning work on their houses?
Lower Council Tax			x		x				x		3	Options to consider.	Gauge reaction to options
VAT Free interventions									x		1		
Compensation for late delivery									x		1		
Payment on completion	x										1		

Sale / Funding	OE	UC	BS	UD	GG	SP	MG	SR	EE	TR	Total	Comments for WP6 (Policy)	Comments for WP5 (Community)
Code of Conduct and Plan				x							1		
No rent increase				x		x					2		Could EE houses attract higher rents, or will payback on meter outweigh this?
Cooling off period			x	x	x		x		x	x	6	(legal requirement)	
Clear Contract / jargon free			x	x	x	x	x		x		6		

Appendix: 5 cont'd.

Installation	OE	UC	BS	UD	GG	SP	MG	SR	EE	TR	Total	Comments for WP6 (Policy)	Comments for WP5 (Community)
Professional firm	x	x	x	x	x	x	x	x	x	x	10	Professionalism of builders and strong PM is essential. (training)	Test to see what kind of 'badge' required - from proof of initial training and CPD to an accountable body.
Well Project Managed / Liaison	x	x	x	x	x	x	x	x		x	9		
Accredited installers	x						x	x	x		4	Formal accreditation was less essential from customers perspective	
Limited number 3 or 4 suppliers / recognised Brands	x		x		x	x	x		x	x	7	Strong emphasis on recognised, reliable brands	Test view on different brands to carry out this work (Retail, DIY, Energy, Utilities, Large Construction or Small builders (white van man))
Limited number of tradesmen on site				x		x					2	Enable multi-skilling / shared trades (Retrofit trained) to reduce numbers on site & speed up process	Test to see if this is important - can we have lots of different tradesmen traipsing through house?
Leadtime < 2 week	x		x	x	x	x	x	x	x		8		Test this
Decanting (move out) or holiday mentioned					x	x					2	Health & Safety implications	Ask if people want to move or stay
Assurances on quality of products and work.	x	x		x	x		x	x			6	Quality Products, approved and guaranteed?	What type of product assurance needed
User Training / Handover				x		x					2		Ask people if are open to this/ accept this.

Appendix: 5 cont'd.

Through Life	OE	UC	BS	UD	GG	SP	MG	SR	EE	TR	Total	Comments for WP6 (Policy)	Comments for WP5 (Community)
Maintenance Free		x	x	x	x						4	Implications for product approval	Gauge attitude on servicing – type & frequency. Proactive vs reactive. Who would they be happy to do the maintenance? Installers or other 3rd party?
Future Proof		x	x	x			x		x		5		
Regular upgrades as standard									x		1		
Clear Instruction Manual						x					1		Would people read this? Product leaflet, supported by online?
Metering - Remote control panel to see benefits.			x		x	x					3	Common requirements for metering / other results (showing payback and benefit)	Attitudes to Meters and the results needs to be tested further
3-5 year warranty			x		x						3	Common standards for extent and ownership of guarantee / warranty both products and installation.	Expectations for Warranties / Guarantees Needs testing further
25 year warranty	x	x					x				3		
Guarantees	x						x				2		
Warranty stays with house			x				x		x		3		
Warranty pack	x						x				2		
Free regular servicing		x		x			x		x	x	5	Regular service schedule required. Who responsible?	Test if people will pay for this.
24/7 Helpline	x		x		x	x		x	x		6	Helpline required	Test