

Heating and Cooling Installer Study (HaCIS):

Technical Report



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Overview

This technical report details the methods taken to design and complete each strand of this research, in the order of completion.

Research Aims

The Department for Business, Energy and Industrial Strategy (BEIS) commissioned IFF Research (IFF) and ACE Research (ACE-R) to conduct a research study to develop a comprehensive understanding of the current characteristics, activities and attitudes of the existing heating and cooling installer workforce in England.

The findings will be used to understand the appetite of installers to develop the capability to install heat pumps in the future, and inform future Government policy on:

- Increasing the uptake and quality of training for current and future heat pump installers.
- Removing barriers to diversity in the sector.
- Ensuring all heat pumps are installed to a good quality.
- Support for installers and businesses as they transition to installing low carbon heating, creating new green jobs and supporting the Government's levelling up agenda.

The research was designed to answer the following five objectives:

- Objective 1: To develop a comprehensive understanding of the characteristics and activities of the heating and cooling installer workforce.
- Objective 2: To segment the heating and cooling installer workforce into distinct archetypes which can be used to inform strategies to support and encourage installers through the low carbon heating transition (this is referred to as the archetype analysis within reporting).
- Objective 3: To understand the extent to which heating and cooling installers can be upskilled to work on heat pumps in the future.
- Objective 4: To explore heating and cooling installers' attitudes towards standards and accreditation for low carbon heating and identify what factors influence these views.
- Objective 5: To understand how installer business models may need to adapt in the future to effectively install heat pumps, and explore potential challenges arising from these changes.

Research Questions

This research addressed the following five high-level research questions and a range of sub-questions.

1. What are the characteristics and activities of heating and cooling installers?

- What are their demographics and backgrounds?
- What skills, specialisms, experience, and qualifications do installers have?
- How diverse is the workforce in terms of age, gender, race and disability? (And does this vary?)
- What proportion of installers' activities is spent on heat pumps and other heating technologies? (Including how they split their time across installation and maintenance). How do they expect this to differ in 5 and 10 years' time and why?
- How do the installer workforce split their work across different types of buildings (e.g. off gas grid, new build, domestic, non-domestic, listed, urban, rural, houses, flats)?
- Where are installers located geographically? Do regional variations exist?

2. How can installers be categorised into distinct archetypes based on their willingness to install heat pumps, and upskilling required to do so?

- How can an understanding of these distinct archetypes be used to target engagement and support for installers through the low carbon transition?
- What factors could encourage these groups to upskill, install more heat pumps or take on heat pump apprentices?
- Do any groups consider themselves specialists, distinct from the wider sector?
- What are the attitudes of these groups to diversity in the sector?
- Which sources of information do installers trust or rely on (to shape their attitudes)?
- How far would installers travel to undertake work? (i.e. What regional granularity should be considered when assessing skills needs for different groups)
- How can installers be encouraged to advise on and recommend heat pumps as appropriate to their customers?

3. To what extent can heating and cooling installers be upskilled to work on heat pumps?

- How many are willing and able to be upskilled to work on heat pumps?
- What factors influence willingness and suitability for upskilling for heat pumps?
- What influences installers' attitudes towards training and apprenticeships?
- What factors influence these archetypes' decisions to upskill or increase the number of heat pump installations? How far would they be willing to travel, pay or spend time doing so? How does this compare to other available options?
- What are experiences of those who have undertaken specific training in heat pumps? How can these courses be improved? (cost, affordability, time, content)
- Would installers prefer to specialise, or remain flexible across technologies? What factors influence this?

- What factors influence their willingness to take on an apprentice, and who they take on (incl. diversity)?
- How confident would an installer be explaining to a consumer how to choose the right electricity tariff for their heat pump or signposting them to someone who could? (Or explaining how to use a heat pump alongside other related technology such as solar panels, batteries or electric vehicle chargers?) What additional information or resources could be provided to support this?

4. What are heating and cooling installers' attitudes towards standards and accreditation for low carbon heating and what factors influence these views?

- What accreditation bodies do installers belong to, why do they belong to these bodies and what are their experiences of accreditation? (e.g. Gas Safe, MCS, competent person schemes, consumer codes such as RECC and HIES, TrustMark)
- What factors influence decisions to join/not join specific schemes?
- Would they like these schemes to change, or be consolidated/replaced?
- What perceptions do installers have of installation quality issues within these schemes? What steps can be taken to ensure high quality heat pump installations and good customer experiences?

5. How might installer business models need to change to effectively install heat pumps, and what challenges could this pose for installers?

- What are the challenges faced by different types of installation businesses to install heat pumps?
- What are the potential approaches, risks, opportunities and business planning considerations for transitioning to becoming a heat pump installation business over time?
- Are they affiliated with a manufacturer or energy supplier? If not, other major factors in choosing which equipment to use?
- Does the installer offer smart controls, radiators or other additional energy efficiency measures?
- How do installers work alongside other professions? (e.g. retrofit advisors, builders, electricians, plumbers, renewables installers). Which of these are in-house and which are external? How do they expect this to change in future?
- What are the main factors driving cost and time to install a heat pump? How could these be reduced?
- What are the main sources of business? E.g. referrals, via manufacturer etc.
- How far should we expect businesses to specialise in certain technologies?
- How can businesses take steps to improve diversity within the sector?

Overview of project phases

The five key strands of the research and their outputs are shown in Table 1 and form the structure of this report.

Table 1. Overview of project phases

Project strand	Led by	Timescales
1. Literature review	ACE-R	September and October 2021
2a. Employer survey (quantitative online survey of heating and cooling employers)	IFF	October 2021 – January 2022
2b. Workforce survey (quantitative online survey of heating and cooling installers)	IFF	October 2021 – January 2022
3. In-depth interviews with heating and cooling installers (x50)	IFF	December 2021 – March 2022
4. Stakeholder workshops with trade associations, academics and BEIS (x3)	ACE-R	March 2022
5. Focus groups with heating and cooling installers and employers (x4)	ACE-R	March 2022

Limitations

While every effort has been taken to ensure that the findings presented in the main report are as accurate and reliable as possible, it is important to note some limitations of the research:

- It is worth considering the motivations of those responding to the surveys and subsequently qualitative interviews and groups. Installers who are more engaged or interested in heat pump technology, or conversely more opposed or critical, may have been more motivated to take part in the research versus those with more ‘neutral’ views.

Surveys

- At an overall level, the achieved response rate of the Employer survey was sufficient (n=687) but much smaller than the original target of 3,600. The number of medium and large firms who took part in the survey (n=19) limited the amount of sub-group analysis that could be conducted by employer size and therefore informed the size bands explored. More details on this can be seen in the [Descriptive analysis](#) section of this report.

- Due to a low response rate for the Workforce survey (n=154), findings should not be treated as representative of the installer population¹. In addition, limited sub-group analysis for this survey was possible (e.g. between installer archetypes). The installer archetypes should be considered indicative rather than statistically representative of the installer population because of the small sample size which was used to create them. The research aimed to mitigate the effect of this limited sample size through the stakeholder workshops and focus groups in order to increase confidence in the archetype designs.
- Despite being extremely strong and distinct in attitudes, two of the five archetypes ('Retirees' and 'Disengaged') were based on a sample size of less than 30 and so should be interpreted with more caution.
- The Workforce survey data were not weighted to be representative of the wider installer population. Whilst an estimate of installer population profile was created using the Employer survey, this was not considered robust enough to be used to weight the Workforce responses.

Qualitative strands

- Although a broad range of installers across the different archetypes took part in the qualitative research, it was not possible to represent all the different installer characteristics e.g. ages and regions, because of the total number of interviews and focus groups being conducted. Focus groups were only able to be conducted with micro (<9 employees) and small (10-49 employees) employers because of the low number of medium (50-249 employees) and large (250+ employees) installers who took part in the workforce survey (which informed the sample for the qualitative elements).
- Whilst efforts were made to try and capture as much nuance and detail as possible through breakout rooms, Miro boards and detailed discussions, it was not always possible to ensure that all participants in workshops engaged.

¹ The original target for the workforce survey was 2,500 completes.

Stage 1: Literature Review

This chapter explains the approach and rationale for the first project strand which was led by ACE-R.

As the first phase of the project, the Literature Review performed two key functions

- Provided a context for the study and ensured readers of the report have an accessible summary of existing publications exploring heat pump skills development.
- Informed the content of the primary fieldwork, particularly by assessing where there were gaps in existing literature and research.
- Collated available information on the profile and characteristics of the heating and cooling installer workforce.

In addition to providing a summary of evidence for BEIS, setting the context for the project, early findings from the Literature Review were fed into the development of other stages of the research (the employer and workforce surveys, stakeholder workshops, in-depth interviews and focus groups).

Evidence gathering for the literature review was undertaken through a parallel approach of desk-based research and stakeholder engagement. The latter aimed to identify and secure additional and emerging evidence, and sought to provide initial commentary on the research questions and project scope.

Whilst the Literature Review was not finalised until later into the project, regular discussions were had between ACE-R and IFF Research to ensure the latest understanding was informing the design of all other strands.

Desk-based research

Keywords for the literature search were developed, initially based on the research team's existing knowledge, and then refined through stakeholder engagement and exploration of identified literature. The team accessed a wide range of both grey and white literature. Appendix A provides details of the search strategy that was employed.

Two academic databases, Web of Science and SCOPUS, were used for searching white literature, and both broad and targeted Google searches (on organisations known to be active in this area) used for the grey literature. In both cases, this was augmented by suggestions from stakeholders and literature previously identified by team members. Findings were logged thematically and structured according to the five research objectives for this study.

The literature review provided an evidence synthesis of 73 sources of literature, including 63 peer-reviewed 'white' papers and 13 pieces of industry produced grey literature.

Stakeholder engagement

ACE-R mapped a range of stakeholders from across the sector. Stakeholders representing 55 organisations, from the following categories, were then contacted by email:

- Trade associations across the decentralised energy sector, including specific heat pump, heating and ventilation and plumbing specific trade bodies
- Heat pump manufacturers
- Consultants
- Bodies involved in skills and standards
- Academics
- Policymakers
- Wider decarbonisation supply chain actors

Stakeholders were invited to be interviewed and a short topic guide was developed. This provided a structured resource for the team to discuss the project’s research questions, asking stakeholders whether they were the right questions and whether there were any gaps, as well as seeking specific evidence to support their commentary and any additional stakeholders that should be engaged.

Nine stakeholders provided commentary (Table 2), and this evidence was added to the Literature Review.

Table 2. Stakeholders who provided commentary to the Literature Review

Stakeholder categories	Number who provided commentary
Standards and accreditation	1
Heat pump manufacturing	2
Heat pump trade body	4
Heat pump consultant	1
Wider decarbonisation supply chain	1
Total	9

Some stakeholders declined to be interviewed, but instead shared links to literature, which were subsequently added into the Literature Review.

Secondary analysis

The research team engaged with several organisations to secure data on accredited installers (e.g. Gas Safe, Competent Persons Scheme, TrustMark and MCS) and those that are part of broader membership and trade bodies. This engagement was not fruitful. Data was not available for a variety of reasons including lack of resources to gather data, data protection requirements and planned restructuring of databases and websites. In addition, limited data was available from the Literature Review on workforce diversity and size as well as differentiation between installer archetypes. Moreover, there were gaps in the evidence base on quantitative data on a range of issues of interest such as the skills, specialisms, experience, and qualifications of installers. However, data on the installer workforce was provided by the BEIS team and is included within the Literature Review.

Stage 2a: Employer Survey

This chapter explains the approach used for the first of two online surveys disseminated to the heating and cooling sector by IFF. It includes details on the sampling strategy, questionnaire design, response rates (and efforts to increase them), as well as weighting and analysis.

Approach

A two-phased approach (surveying employers and then disseminating a workforce survey) was designed to address the following methodology challenges posed by the study:

- There were no population estimates of the heating and cooling workforce. Surveying employers enabled the collection of demographic information of their heating and cooling installers.
- Some research objectives were going to be more adequately addressed by employers e.g. business model information, than going directly to the workforce.
- There was no easy way of accessing the workforce e.g. through traditional survey panels.

The first survey, to employers, was a push-to-web survey which aimed to capture the views and characteristics of employers within the heating and cooling industry. Employers were invited to take part in the online employer survey via a postal letter (Appendix B). This letter detailed why the study was being conducted, why taking part in the survey was important and provided a link to the online survey (and a unique access code) for each business. This push-to-web approach was supported by telephone chasing and email reminders to employers who had provided a contact email address via telephone chasing.

Fieldwork ran between mid-October 2021 and mid-January 2022 (after the initial deadline of 8th December was extended to boost response rates), with telephone chasing taking place from late October 2021 until the end of fieldwork.

At the end of the survey, respondents were asked if they would be willing to disseminate (or complete, if a sole trader) the link to the second survey: the [workforce survey](#).

Sample

Source

Market Location (a provider of B2B wholesale business data) sampled all heating and cooling employers on their database with the SIC code 43220 “Plumbing, heat and air-conditioning installation”. In total, they were able to share contact details for 17,766 employers (in England). Contacts using Market Location’s own industry classifications (shown below) were added to

maximise the size of the sample. This added a further 4,694 contacts in England, making the total sample size 22,460.

- Air Conditioning Contractors
- Central Heating Systems (Installation and Servicing)
- Dehumidifiers and Humidifiers Suppliers of
- Emergency Gas Leaks
- Freezers and Refrigerators Servicing of
- Gas Installers
- Gas Service Engineers
- Heating Contractors
- Heating Contractors - Under Floor
- Plumbers
- Radiators - Domestic
- Window Consultants

This sample will not exactly match the number of heating and cooling employers in the population reported by ONS (e.g. in the Inter-Departmental Business Register (IDBR)). These figures will include dormant non trading businesses reported on Companies House, whereas Market Location clean their database annually to ensure that all businesses included are active and have relevant contact details.

Table 3 shows the proportion of heating and cooling employers (by size) within the population and sample, as well as the estimated employment population in England.

It's worth noting that whilst the number of medium (50-249 employees) and large (250+ employees) employers account for a very small proportion of all businesses, these businesses account for 20% of the employment population.

The survey originally aimed to receive a total of 3,600 responses from employers. This target was based on assumptions regarding available sample, likely employer response rates and the proportion of employers who would subsequently disseminate the workforce survey. These assumptions were informed by previous workforce surveys conducted by IFF.

Table 3. Proportion of employers in the population and sample, by business size

Business size	No. in population	Proportion in population	Number of employees ²	Proportion of employees	No. in sample	Proportion in sample
Micro (1-9)	32,410	95%	105,000	62%	20,164	90%
Small (10-49)	1,640	5%	30,000	18%	2,061	9%
Medium (50-249)	195	1%	18,000	11%	217	1%
Large (250+)	25	<1%	16,000	9%	17	<1%
Total	34,270	100%	169,000	100%	22,460	100%

Questionnaire development

IFF Research collaborated with BEIS and ACE-R to design the employer survey. Due to the overall timescales of the project it was not feasible to cognitively test the survey before launch.

A copy of the final survey is included in Appendix C, but the below summarises the research questions/themes covered:

- The characteristics of employer's workforce (size of the business, length of time workforce has been in the industry, workforce age, workforce qualification levels, and their workforce's gender, ethnicity, and disability status proportions).
- Training currently offered (what training they offer currently, barriers to training, training funding, whether they offer apprenticeships, reasons/barriers for offering apprenticeships).
- Business models (types of buildings worked on, types of clients, types of heating and cooling worked on, business memberships and standards, how business is generated).
- Heat pumps (whether they install them, their attitude towards them, expectations for the future of the industry).

At the end of the survey there was an open-ended question asking for additional feedback on the survey. This feedback was considered when drafting email reminders and chasing (via telephone) employers who had not yet completed.

² Employer figures taken from latest ONS IDBR business counts; employment figures estimated based on BEIS Business Population Estimates

Feedback from the open-ended question also suggested some reasons why response rates were lower than expected (discussed in the next section) e.g. some respondents said they received a high number of requests to complete surveys, whilst others expressed a lack of trust in the government to deliver on low carbon technology.

Response metrics

In total, 687 employers completed the employer survey from a sample of 22,460, which is a response rate of 3%³. As shown in Table 4, the majority of employers who took part in the study were micro or small businesses, in line with the population profile.

Table 4. Employer survey response rates by business size

Size	Population	Sample	Responses achieved	Proportion of responses	Response rates (versus sample)
Sole Traders and Micro (<9)	32,410	20,164	547	80%	3%
Small (10-49)	1,640	2,061	117	17%	6%
Medium (50-249)	195	217	18	3%	8%
Large (250+)	25	17	1	<1%	6%
Total	34,270	22,460	687	100%	3%

As shown above, only 18 medium and one large employer took part in the survey which impacted the sub-group analysis by size that was possible.

The employer survey took respondents an average of 18 minutes and 28 seconds to complete when excluding responses that took over an hour⁴.

Boosting response rates

A number of actions were taken to try and boost the response rate when it became apparent that uptake was slower than originally expected. Actions included:

- Alternative telephone numbers were sourced via desk research for small, medium, and large businesses whose number had been inaccurate or uncontactable during telephone chasing.

³ The research project was aiming for an achieved sample of 3,600 employers.

⁴ These respondents typically completed the survey over multiple sessions

- 4,000 email addresses were sourced via desk research to support email reminders (email addresses were not included in the original sample from Market Location)
- 2,832 SMS reminder invites were sent to sole traders, of which 2,641 were delivered, in the hope of enabling those who were on site to more easily access the survey.
- In response to feedback from telephone interviewers and the survey feedback question, script changes were made to explain that BEIS were interested to hear about employers' views, regardless of whether they were positive or negative, and that it was important to voice their concerns if they did not like the direction of the industry.
- To enhance the reach of the survey, the survey was promoted in the Association for Decentralised Energy's (ADE) newsletter alongside an explanation of the importance of participating in the research.
- To improve response rates amongst large employers, BEIS disseminated links directly (via email) to ten of the 17 large employers via email.
- A charity donation was introduced as an incentive for each employer survey completion.

Weighting

For the analysis of the employer survey, two population weights were created based on:

- The size of the businesses (employer weight)
- The estimated employment population (employment weight)

The employer weight was applied to the majority of the employer survey questions. The employment weight was applied for analysis of the demographic questions so that the gender, age, ethnicity, disability status and length of time spent working in the industry of the overall workforce could be better estimated.

Table 5. Weighting grids

Size	Proportion of responses	Employer weight	Employment weight
Micro (1-9)	80%	95%	62%
Small (10-49)	17%	5%	18%
Medium and large (50+) ⁵	3%	1%	20%
Total	100%	100%	100%

⁵ Medium and Large businesses were combined due to low population and achieved sample figures

Unweighted and weighted responses to three survey questions are shown in Table 6, Table 7 and Table 8 to illustrate the impact of the employer weight.

Table 6. A1: How many people work for your business or at your branch/location?

	Unweighted %	Weighted %
1	38%	45%
2-4	27%	31%
5-9	15%	18%
10-24	13%	4%
25-49	4%	1%
50-99	2%	<0.5%
100-249	1%	<0.5%
250+	<0.5%	0%

Table 7. C1: What types of projects do your heating and cooling installers typically work on?

	Unweighted %	Weighted %
Domestic projects in new buildings	39%	38%
Domestic projects in existing buildings e.g. retrofit	84%	89%
Commercial/ non-domestic projects in new buildings	24%	19%
Commercial/ non-domestic projects in existing buildings e.g. retrofit	39%	34%
Service and maintenance (unspecified)	2%	2%

Table 8. D1: Does your company offer heat pump installation services?

	Unweighted %	Weighted %
Yes	31%	25%
No	67%	74%
Don't know	1%	<0.5%
Prefer not to say	1%	1%

Analysis

Descriptive analysis

Descriptive statistics from the survey data were presented in excel tables, which showed responses for each question at a total level as well as broken down by key sub-groups, including:

- Number of staff (heating and / or cooling installation specific)
- Number of staff who installed heat pumps at least once in the last year
- Qualification level
- Whether employer has heating and cooling apprentices
- Whether employer offered internal training for heating and cooling in the last 24 months
- Whether employer offered external training for heating and cooling in the last 24 months
- Business model
- Installation of new systems and/or maintenance or improvement of existing systems
- Whether employer is a member of any Competent Person Schemes
- Whether employer is able to deliver retrofit standards
- Whether employer offers heat pump installation services
- Region(s) in which business operates
- Proportion of employees that were heating and cooling installers
- Type of heating and cooling technology employers work on

Numeric responses to open ended questions were coded into logical groupings based on responses given. Verbatim responses (e.g. to an “other (please specify)” option) were reviewed to see if answers could be assigned to existing coded answers or needed to be assigned to new codes. Suggested new codes were reviewed by the research team and then agreed.

Only statistically significant differences (at a 95% confidence level) have been highlighted within the main report, and caveats provided for base sizes of 30 or lower. Significant differences are indicated in the charts in the report with an asterisk and explained within the source information underneath each chart.

Due to the smaller number of medium (n=18) and large (n=1) employers who took part in the employer survey, sub-group analysis by size was conducted between those with 1 (n=260), 2-9 (n=287) or 10+ (n=136) employees and between those with 1 (n=291), 2-9 (n=309) or 10+ (n=71) heating and cooling installers.

Stage 2b: Workforce Survey

This chapter explains the approach used for the second of two online surveys disseminated to installers operating in the heating and cooling sector by IFF. It includes details on the sampling strategy, questionnaire design, response rates (and efforts to increase them), as well as weighting and analysis. It also details the rationale and methodology for the creation of installer ‘archetypes’.

Approach

At the end of the employer survey, respondents were asked whether they would be willing to participate in the workforce survey, either by disseminating the link themselves to their workforce if they were employers (Appendix D) or by completing the survey themselves if they were sole traders (Appendix E).

Employers were sent email reminders (Appendix F) as well as chased via telephone chasing to encourage them to disseminate the link to their workforce (to take part) and to encourage sole traders to complete the survey.

Fieldwork ran between mid-November 2021 to the end of January 2022 (after the initial deadline of 24th December was extended to aid response rates), with telephone chasing taking place from late November 2021 until the end of fieldwork.

Sample

In total 386 of the 687 employers who took part in the employer survey agreed to be re-contacted to support the workforce survey, as shown below.

Table 9. Number of employers who agreed to take part in/disseminate the workforce survey

Size	Agreed to support workforce survey
Sole Traders and Micro (<9)	320
Small (10-49)	59
Medium (50-249)	6
Large (250+)	1
Total	386

Questionnaire content

IFF Research collaborated with BEIS and ACE-R to design the workforce survey.

Ahead of fieldwork commencing, IFF cognitively tested the workforce survey with ten installers in November 2021. Cognitive testing was done to check the length of the questionnaire, the question wording, and the pre-codes used. A number of changes, including updating wording and routing were made as a result of the feedback collected.

A copy of the final survey is included in Appendix G but the below summarises the research questions/themes covered:

- Attitudes to training and heat pumps (covering issues on whether they think they could install heat pumps, outlook for the future of the industry, importance of climate change, how confident they are in the relevance of their skills for the future of the industry).
- These questions were particularly important for creating the installer archetypes.
- Skills and experience (what they can install and how frequently they do it, what types of customers they have, what they work on, what their responsibilities are).
- Heat pump installation (whether they install, outlook to the future of heat pumps, whether they plan to install in future, length of time it takes to install).
- Standards (attitude towards standards and schemes, responsibilities when it comes to standards and signing off work).
- Characteristics and demographics of the installer (retirement plans, length of time spent travelling, view on apprenticeships, length of time in the industry, age, qualification levels, gender, ethnicity, and disability status).

Response metrics

Workforce survey

Due to the snowballing sampling method it is hard to capture a true response rate, but in total 154 installers completed the workforce survey from 386 employers agreeing to complete or disseminate this survey (40%)⁶. A target of 2,500 workforce survey completes was originally anticipated based on assumed employer (to the employer survey) and installer (to the workforce survey) response rates. Please see Limitations section for information about the implications of the smaller achieved sample size.

The mean average completion time when excluding responses that took over an hour was 21 minutes and 4 seconds⁷.

⁶ 22 duplicate responses, as a result of installers taking part in the survey twice in error, were removed from the original total of 176 completes. Duplicate responses were possible due to the 'open' nature of the survey link which was required to enable multiple (different) installers from the same employer to take part.

⁷ These respondents typically completed the survey over multiple sessions.

In a similar vein to the employer survey, a number of actions were taken to boost the response rate of the workforce survey:

- 53 SMS invites were sent to sole traders who had not completed the workforce survey (identified by their unique employer reference number used throughout the project).
- In response to feedback from telephone interviewers and the survey feedback question, script changes were made to explain that BEIS were interested to hear about individuals' views, regardless of whether they were positive or negative, and that it was important to voice their concerns if they did not like the direction of the industry.
- BEIS disseminated links directly (via email) to the one large employer who took part.
- Financial incentives were used to encourage completion. Every installer who completed the survey was entered into a prize draw to win one of three iPads. Part way through fieldwork two additional incentives were added for those who completed the survey: a payment of £5 via PayPal/Amazon and a £5 donation to Shelter (on behalf of the employer).

Analysis

Descriptive statistics from the survey data were presented in excel tables, which showed responses for each question at a total level as well as broken down by key sub-groups. Due to the achieved response rate being lower than expected (n=154), limited sub-group analysis was possible within the main report.

Verbatim responses were reviewed to see if the answer option could be assigned to an existing coded answer (if applicable) or needed to be assigned to a new code. Suggested new codes were reviewed by the research team and then agreed.

Archetype modelling

In partnership with the statistical consultancy The Stats People, IFF developed installer archetypes using the workforce survey results to help answer the second research question. These installer archetypes statistically segment the installer workforce into different 'types' of installers based on their willingness to install heat pumps, and the upskilling required to do so.

Segmenting the installer workforce in this way is intended to help inform future strategies to support and encourage installers through the low carbon heating transition. The segments are a starting point for BEIS to consider who makes up the installer workforce, which types of installers are more likely to help meet the associated heat pump transition targets, as well as what communication and resources are best suited when engaging with these groups based on their motivations and barriers.

Those attending the three different [stakeholder workshops](#) were asked to reflect on the archetype model further to help inform its design and interpretation. Delegates were asked to

consider whether they felt the archetypes were representative of installers within the heating and cooling industry and what they would change.

Approach

The Stats People team used Latent Class (LC) Analysis, which employs a mathematical modelling approach to identify segments. The aim of the model is to find (relevant) patterns within the data i.e. grouping installers who give similar answers to the same questions. A summary of the method used is described below:

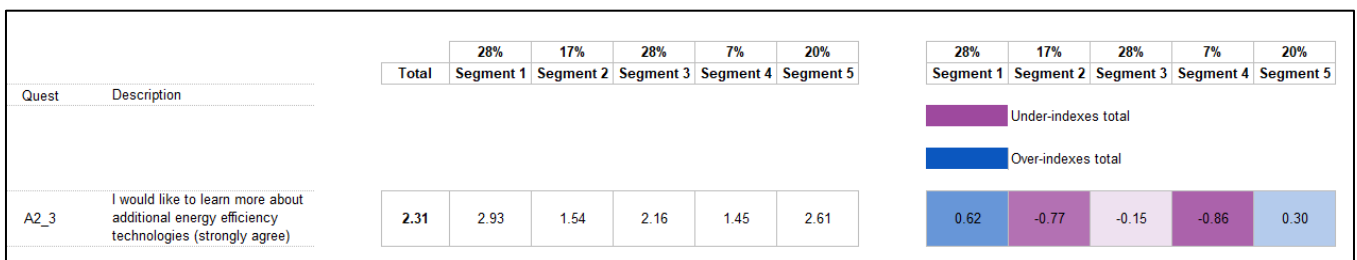
- IFF shared a copy of the workforce survey questionnaire and response data. IFF highlighted questions which they felt might be more or less useful to include in any model and explained the overall objectives of the research project.
- Principal Components Analysis was used to understand the correlations between these questions and the main 'themes' within the data. The main purpose was to remove any excess of questions correlating with any one theme, to ensure the themes are equally represented by the questions used to create the segments.
- Models were then created using LC analysis on the responses from the workforce survey. Interim models were run during fieldwork to provide an early indication of their scope, before they were re-run once fieldwork completed. The models varied in their level of complexity and how many segments they included, ranging between three to five segments.
- When calculating interim models, it was agreed there would be a 'forced' segment of those who are already installing heat pumps, because of the small number of respondents in that group and because of the distinct experience of these installers, which yielded a very different response pattern of key questions.
- The Stats People then recommended which model was the 'best fit' for the data, using various statistics from the latent class framework such as BIC⁸ and R-squared⁹ (Appendix I) to determine how well underlying questions could predict installer segments. However, goodness of statistical fit is not the only criteria used to choose the segmentation model and the following principles were used to help determine which model was most suitable for our needs:
 - Strong relationship with the primary segment defining survey questions.
 - Good trade-off between complexity in defining the model and fit to the primary data.
 - No dominant segments (40+%) or very small segments (<5%).
 - A clear narrative (which is useful and actionable) can be attached to the segmentation.

⁸ Bayesian Information Criterion provides a single measure of how well the underlying questions are predicted; it penalises more complex models, favouring good fitting simpler models

⁹ R-squared provides a single measure of how well each underlying question is predicted using fit criteria appropriate to the question scale.

- The most statistically sound and usable option was a five-segment model. Demographic questions were not included in the segmentation modelling but are used as profilers to help describe the segments.
- The following outputs were created by The Stats People during this process:
 - An Excel document which cross tabulates the questions used within the model and the five segments. A colour coding system then shows which questions the different segments were likely to ‘over’ or ‘under’ index in. For example, in the example below those in Segment 1 were most likely to ‘strongly agree’ with the statement “I would like to learn more about additional energy efficiency technologies” whereas Segment 4 were least likely.

Figure 1. Example of the how segments over/under index on question A2_3



- Written descriptions of each segment based on these indexes. These descriptions were used to help inform the names assigned to each segment as shown in Table 10 below.
- An Excel document of ‘golden questions’ which if asked of installers who have not completed the workforce survey, would assign them to a segment with 94% accuracy. This document was simplified into screening questions for the purposes of recruiting external installers for in-depth interviews and focus groups (Appendix J). This enabled those who had not taken part in the workforce survey to be allocated to an archetype.

Table 10 summarises the five archetypes found within the final model. More information about these segments can be found in the main report.

Table 10. Final archetypes identified

Archetype Segment	Description	Proportion of workforce survey respondents
Retirees	Those planning to retire, or leave the industry, so upskilling / training is not a priority.	11 (7%)
Disengaged	Those not interested in heat pumps or new heating and cooling technologies and who don’t believe they will play a big role in the future.	26 (17%)

Archetype Segment	Description	Proportion of workforce survey respondents
Demand influenced	Those who have some interest in heat pump installation but have enough work without them / their customers aren't demanding the technology.	43 (28%)
Keen to learn	Those who are interested in keeping their skills up to date and have specific interest in new heating and cooling technologies / heat pumps	43 (28%)
Current heat pump installers	Those who have installed a heat pump in the past 2 years	31 (20%)

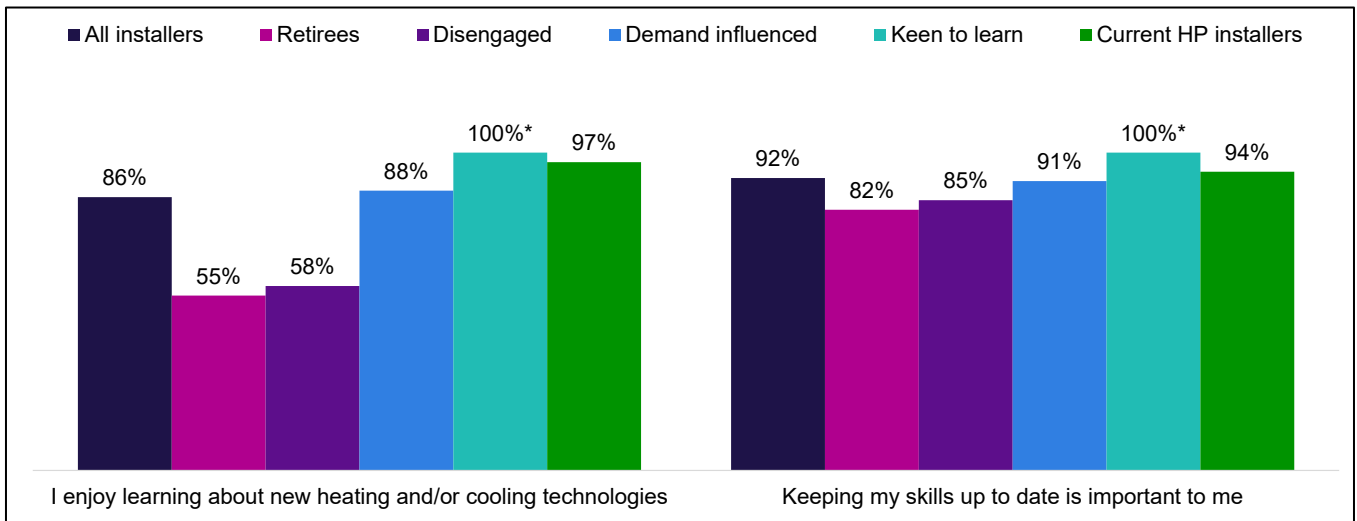
These archetypes helped to determine which installers were more or less of a priority to interview during the [in-depth interviews](#) and [focus groups](#). For instance, it was more important to speak to those in the “Keen to learn” and “Demand influenced” segments because of their greater likelihood to be upskilled to install heat pumps.

Differences in attitudes between archetypes

Figure 2 illustrates how installers' views of learning and skills (both generally and regarding new heating/cooling technologies) informed the archetype modelling. For instance, all installers in the archetype Keen to learn agreed with each of the two statements.

Whilst the majority of those in the Disengaged archetype were keen to keep their skills up to date, they were less likely to enjoy learning about new heating and cooling technologies and hence less likely to be motivated by this to upskill to install heat pumps.

Figure 2. The proportion of respondents who agree with statements about learning and skills, by archetype

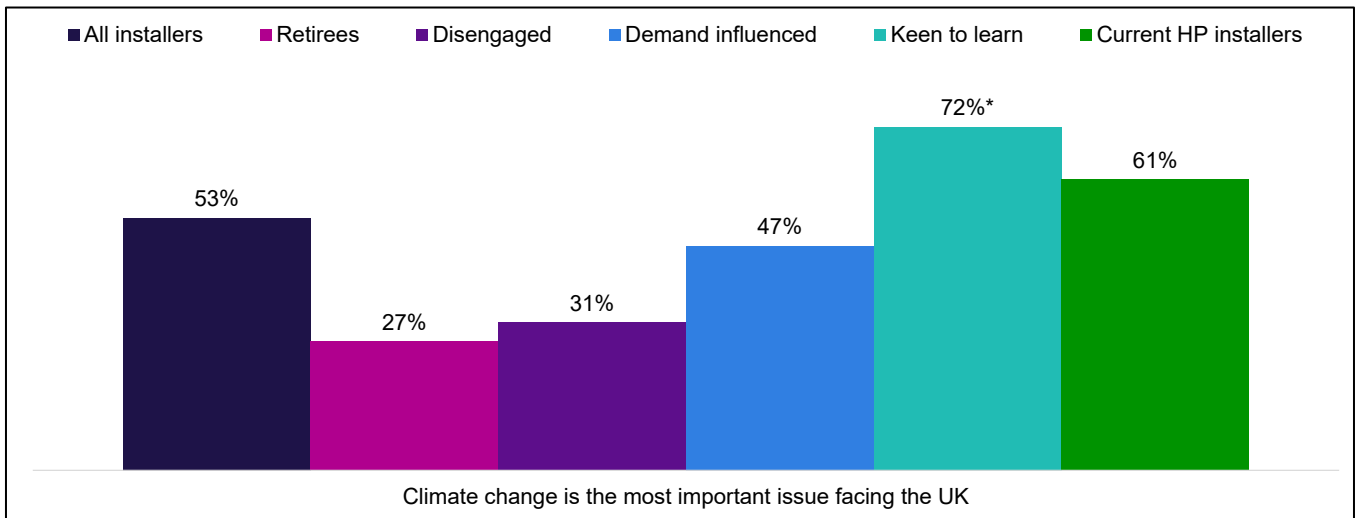


Source: Workforce Survey. A1: To what extent do you agree or disagree with the following statements (net agree or strongly agree shown in chart). All installers (n=154), retirees (n= 11)¹⁰, disengaged (n= 26), demand influenced (n= 43), keen to learn (n=43), Current heat pump installers (n=31). *Indicates a significant difference between installers within archetype(s) and all installers.

Compared to all installers, those who were 'Keen to learn' were more likely to agree that climate change is the most important issue facing the UK, as shown in Figure 3. This could suggest climate change may be a motivating factor in encouraging these individuals to upskill to heat pump installation.

¹⁰ Retirees and 'Disengaged' archetypes should be considered indicative rather than conclusive.

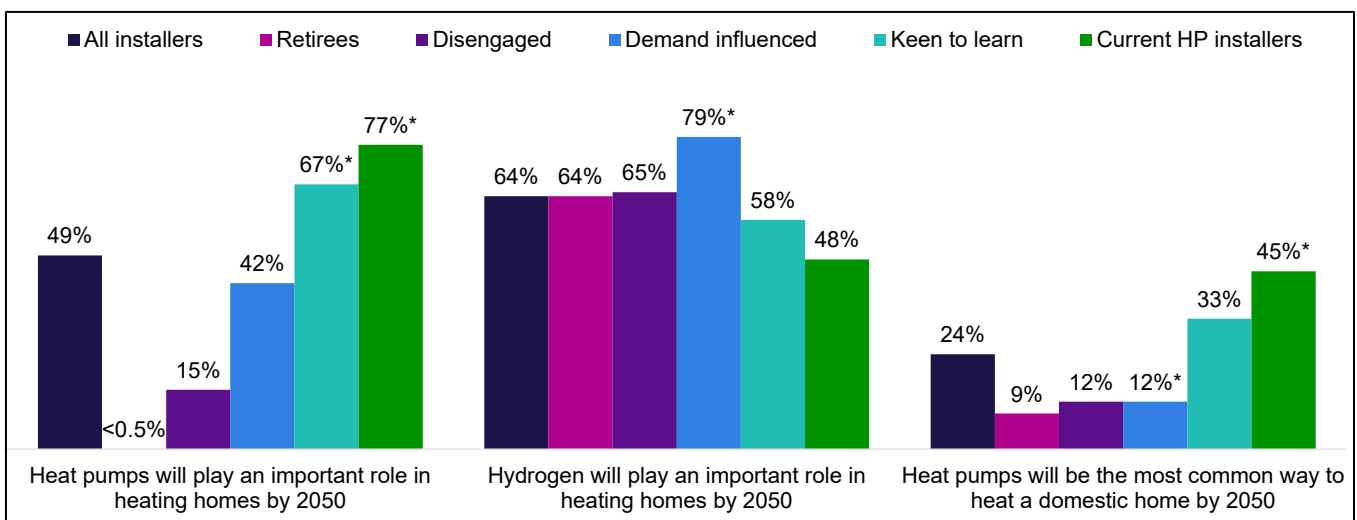
Figure 3. The proportion of respondents who agree that climate change is the most important issue facing the UK, by archetype



Source: Workforce Survey. A3: To what extent do you agree or disagree with the following statements (net agree or strongly agree shown in chart). All installers (n=154), retirees (n= 11)¹¹, disengaged (n= 26), demand influenced (n= 43), keen to learn (n=43), current heat pump installers (n=31). *Indicates a significant difference between installers within archetype(s) and all installers.

As shown in Figure 4, those who are Current HP installers or are Keen to learn are more likely to agree that heat pumps will play an important role in heating homes by 2050. Meanwhile, those in the Demand influenced archetype were more likely to agree that hydrogen will play an important role in heating homes by 2050, compared to other archetypes. Unlike heat pumps, hydrogen heating is not yet an option for domestic homes, and UK Government has indicated that it will take strategic decisions on the role of hydrogen in heating by 2026¹².

Figure 4. The proportion of respondents who agree with statements about heat pump and hydrogen technology, by archetype



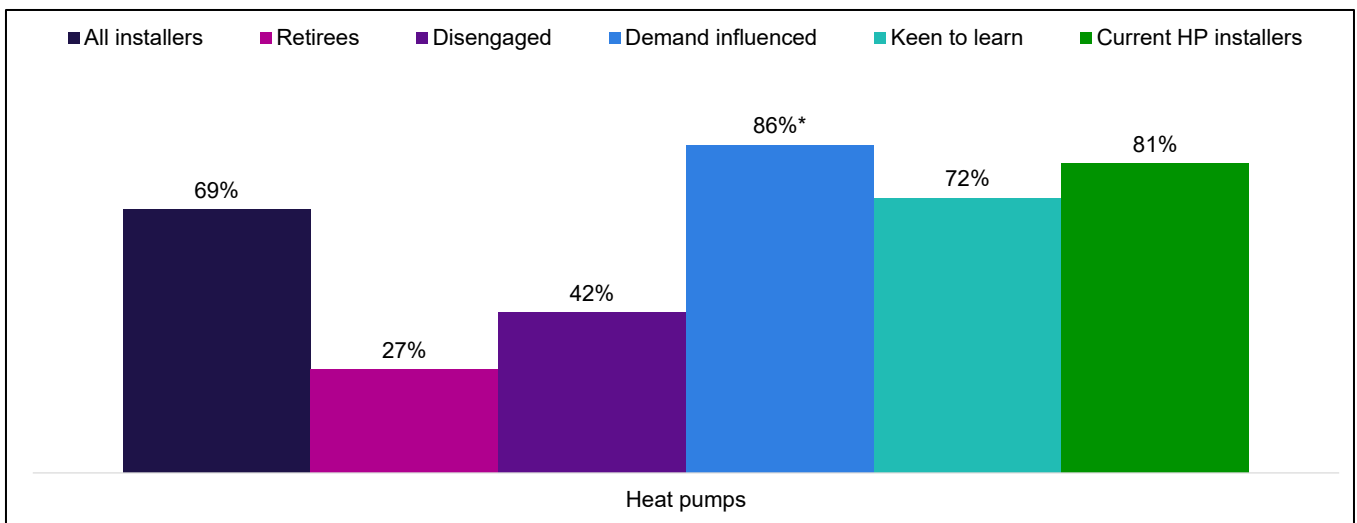
¹¹ Retirees and 'Disengaged' archetypes should be considered indicative rather than conclusive.

¹² www.gov.uk/government/publications/heat-and-buildings-strategy

Source: Workforce Survey. A3: To what extent do you agree or disagree with the following statements (net agree or strongly agree shown in chart). All installers (n=154), retirees (n= 11)¹³, disengaged (n= 26), demand influenced (n= 43), keen to learn (n=43), Current heat pump installers (n=31). *Indicates a significant difference between installers within archetype(s) and all installers.

When asked which technologies they would like to receive training on, those in the Demand influenced archetype were most likely to select heat pumps, despite only 42% of them reported that ‘heat pumps will play an important role in heating homes by 2050’. Training in heat pumps was important for both those Keen to learn and Current heat pump installers.

Figure 5. The proportion of respondents who would like to receive training on heat pumps, by archetype



Source: Workforce Survey. B2. Which of the following technologies, if any, would you like to receive more training on? (Only heat pumps shown). All installers (n=154), retirees (n= 11)¹⁴, disengaged (n= 26), demand influenced (n= 43), keen to learn (n=43), Current heat pump installers (n=31). *Indicates a significant difference between installers within archetype and all installers.

Considerations

Segments with under 30 cases will be subject to a larger sampling error, and so caution should be given when interpreting these findings. However, their profile can be taken as a strong indication of their differences with other segments. The smallest segment is ‘Retirees’ which has only 11 installers, out of a total of 154 (7%), however the profile of this group is extremely strong and distinct, so is likely to exist in the full population despite the low base size.

¹³ Retirees and ‘Disengaged’ archetypes should be considered indicative rather than conclusive.

¹⁴ Retirees and ‘Disengaged’ archetypes should be considered indicative rather than conclusive.

Stage 3: In-depth interviews

This chapter details the approach used to conduct in-depth interviews with heating and cooling installers, following the two online surveys.

Approach

At the end of the workforce survey, installers were asked whether they agreed to be re-contacted to take part in either an in-depth interview or focus group. In total, 97 of the 154 installers (63%) agreed to be re-contacted.

Recruitment focused on the focus groups first (given the lack of flexibility with dates) and moved on to recruiting for in-depth interviews. An external recruitment agency also helped to ‘top-up’ the installer sample by recruiting 15 installers externally for the in-depth interviews.

In total, 50 in-depth interviews were conducted (either) via Zoom, Microsoft Teams and telephone, lasting around 60 minutes each. These interviews aimed to expand and triangulate evidence from survey findings, regarding the characteristics, activities, attitudes and experiences of heating and cooling installers. They were an opportunity to inform understanding of enablers and barriers to the installation of (more) heat pumps and other low-carbon systems.

The first six interviews were conducted by IFF between December 2021 and January 2022¹⁵, with the remainder taking place between February and March 2022.

Interviewees

Table 11 below shows the installers who took part in the in-depth interviews, split by the archetype segments. Those in the ‘Current heat pump installers’, ‘Keen to learn’, and ‘Demand influenced’ segments were prioritised during recruitment (with a target quota of ten respondents each) because of their greater likelihood to install heat pumps or upskill to install them in the future.

Table 11. Number of in-depth interviews conducted

Archetype	Number interviewed
Retirees	4
Disengaged	6

¹⁵ Recruitment for interviews was paused due to the workforce survey fieldwork being extended.

Archetype	Number interviewed
Demand influenced	13
Keen to learn	13
Current heat pump installers	14
Total	50

Topic guide

The first version of the topic guide was designed in November and December 2021, for the first six interviews. It was structured as follows:

- Views on domestic heat pumps & other technologies
- Attitudes towards standards & accreditation
- Business model
- Engaging with customers
- Views on diversity
- Information sources

Findings from the first six interviews, as well as from both workforce and employer surveys, informed amends made to the second version of the topic guide, in February 2022. The structure remained the same, but some questions were modified and added, to ensure research objectives and key areas of interest were explored fully.

Both versions of the topic guide used ‘routing’, meaning that different installer types were asked questions relevant to them only.

A full copy of the final topic guide can be found in Appendix H.

Analysis

Individual analysis of each interview was entered into an analysis framework, under headings relating to the objectives. This mirrored the structure of the topic guide, with priority sections highlighted in yellow, and some areas combined or split out to ensure specific findings were clear. Using an analysis framework allowed for the interviews to be compared, and judgements made about the commonality of experiences. The framework contained ‘demographic’ variables to identify subgroup differences. Due to the qualitative nature of this strand, subgroup differences will be indicative not conclusive.

Once interviews were completed and written up into the analysis framework, two analysis sessions took place to share findings (from both interviews and focus groups) between IFF and ACE-R. The findings were then incorporated into the main report.

Stage 4: Stakeholder Workshops

This chapter details the approach and rationale for the three stakeholder workshops conducted by ACE-R. The main aim of these workshops was to share emerging findings and gather feedback on the draft installer archetypes and specific project research questions.

Approach

Stakeholder engagement

As noted in the Literature Review section, the research team had already engaged with stakeholders representing 55 organisations by email. These stakeholders were contacted again and invited to attend one of three virtual workshops.

Categories of stakeholders included:

- Trade associations across the decentralised energy sector, including specific heat pump, heating and ventilation and plumbing specific trade bodies
- Heat pump manufacturers
- Consultants
- Bodies involved in skills and standards
- Academics
- Policymakers
- Wider decarbonisation supply chain actors
- Civil servants from within BEIS and DEFRA

Design

Each workshop was approximately 2 hours in length and was hosted by ACE-R virtually using the videoconferencing platform Teams and online whiteboard applications including Miro and Google Jamboard.

A sample design framework was used in the development and delivery of each workshop. Details of this and the runsheets for each workshop can be found in Appendix K. Each session introduced the research and its objectives, provided a precis of the key research findings to date and shared details of the draft installer archetypes. Each workshop then included a series of facilitated discussions, the focus of which depended on the target group.

Workshop 1: Trade Associations and Energy Industry

The first stakeholder workshop covered three research questions:

RQ2: How can installers be categorised into distinct archetypes based on their willingness to install heat pumps, and upskilling required to do so?

Feedback was sought on the draft installer archetypes. Delegates were asked to consider whether they felt the archetypes were representative of installers within the heating and cooling industry and what would they change.

RQ2a – How can understanding of these distinct archetypes be used to target engagement and support for installers through the low carbon transition?

This research question was a core focus within the workshop. Delegates were asked to provide commentary on how their organisation, and the wider industry, expect to engage and support a new heat pump installer workforce, and what lessons could be learnt from previous technology transitions in the industry.

RQ5 – How might installer business models need to change to effectively install heat pumps, and what challenges could this pose for installers?

This research question was a core focus within the workshop. Delegates were asked to provide commentary on how installer business models would need to change to effectively install heat pumps, and what lessons could be learnt from previous technology transitions in the industry.

Workshop 2: Skills, Standards and Academics

The second stakeholder workshop covered three research questions:

RQ2: How can installers be categorised into distinct archetypes based on their willingness to install heat pumps, and upskilling required to do so?

Feedback was sought on the draft installer archetypes. Delegates were asked to consider whether they felt the archetypes were representative of installers within the heating and cooling industry and what would they change.

RQ2a – How can understanding of these distinct archetypes be used to target engagement and support for installers through the low carbon transition?

This research question was a core focus within the workshop. Delegates were asked to provide commentary on how their organisation, and the wider industry, expect to engage and support a new heat pump installer workforce, and what lessons could be learnt from previous technology transitions in the industry.

RQ3 – To what extent can heating and cooling installers be upskilled to work on heat pumps?

This research question was a core focus within the workshop. Delegates were asked to provide commentary on how installers will need to change how they undertake training and

accreditation, what lessons could be learnt from previous technology transitions in the industry and the different types of training – both technical and wider ‘soft skills’ (e.g. business development and project management) that would be required and the challenges that this could bring.

Workshop 3: BEIS

The third stakeholder workshop covered three research questions:

RQ2: How can installers be categorised into distinct archetypes based on their willingness to install heat pumps, and upskilling required to do so?

Feedback was sought on the draft installer archetypes. Delegates were asked to consider whether they felt the archetypes were representative of installers within the heating and cooling industry and what would they change.

RQ2a – How can understanding of these distinct archetypes be used to target engagement and support for installers through the low carbon transition?

This research question was a core focus within the workshop. Delegates were asked to provide commentary on how their organisation, and the wider industry, expect to engage and support a new heat pump installer workforce, and what lessons could be learnt from previous technology transitions in the industry.

RQ5 – How might installer business models need to change to effectively install heat pumps, and what challenges could this pose for installers?

This research question was a core focus within the workshop. Delegates were asked to provide commentary on how installer business models would need to change to effectively install heat pumps, and what lessons could be learnt from previous technology transitions in the industry.

Delivery

Delegates were provided with pre-reading documentation ahead of each workshop (found in Appendix L). This included a summary of the HaCIS project. Delegates were also asked to pre-register to MIRO and Google Jamboard to ensure access issues were minimised during the workshops.

Details of the organisations that attended the three workshops, as well as copies of the pre-reading material, can be found in Appendix M.

Analysis

Following the sessions, ACE-R analysed and summarised the workshop sessions – both in terms of the verbal discussions, and the commentary added to the virtual MIRO and Google Jamboard whiteboards. Thematic research methods were applied during this analysis.

Stage 5: Focus groups

This chapter details the approach and rationale for the focus groups conducted with both heating and cooling installers and employers.

Approach

IFF recruited and ACE-R delivered a total of four focus groups. The first two engaged directly with the installer workforce, whilst the second two focused on employers.

It was agreed with BEIS that the installer focus groups should be attended by the 'keen to learn' and the 'demand led' installer archetype segments. This was agreed due to the more positive attitudes these archetypes had towards the transition to heat pumps, but the lack of current experience and skills to install and maintain them. They therefore represented the installers with the most potential for upskilling.

The limited volume of installers (in each archetypes) who took part in the workforce survey and agreed to be re-contacted regarding the focus groups, also informed the sampling. Consequently, two focus groups with employers (both micro and small businesses) were also recruited via the employer survey.

IFF recruitment specialists recruited attendees for all groups and participants were given a financial incentive for attending the sessions.

Design

Each focus group was approximately 2 hours in length and was hosted virtually using the videoconferencing platform Zoom. Focus groups for installers were held in the early evenings between 5-7pm, whilst the employer focus groups were held during business hours.

The groups gathered feedback on the installer archetypes, as well as feedback on archetype specific policy recommendations and wider government and industry strategies; attitudes towards training, accreditation, new business models and ways of working, and potential challenges for the future.

A sample design framework, including prompt and questions, was used in the development and delivery of each focus group. Details of this can be found in Appendix N.

Delivery

Table 12 shows the number of installers / employers recruited to attend each focus group, and the number who subsequently attended. Following initial recruitment, individuals were

contacted on the day of the group to remind them of the session and confirm attendance. Despite this, there were still a handful who chose not to attend the sessions.

Table 12. Focus group attendees

Respondent type	Recruited	Attended
'Keen to learn' installers	8	4
'Demand focused' installers	7	7
Total installers	15	11
Micro employers (<9 employees)	7	3
Small employers (10-49 employees)	4	3
Total	11	6

Analysis

Following the focus groups, ACE-R analysed and summarised the sessions using thematic analysis research methods.

Individual analysis of each focus group was entered into an analysis framework, under headings relating to the research questions. This mirrored the structure of the sample design framework.

Using an analysis framework, commentary from all participants from all focus groups could be compared, and judgements made about the commonality of experiences, attitudes and emerging themes.

Once the focus groups were completed and written up into the analysis framework, two analysis sessions took place to share findings (from both interviews and focus groups) between IFF and ACE-R and agree on the key findings. The findings were then incorporated into the main report.

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