DOI: 10.14621/ce.20170207

European Heat Pump Market Analysis: Assessment of Barriers and Drivers

Simon Pezzutto*, Gianluca Grilli, Stefano Zambotti

Institute for Renewable Energy, EURAC research
Viale Druso 1, 39100 Bolzano, Italy; simon.pezzutto@eurac.edu

Abstract

The European Union is currently undertaking unprecedented efforts to increase its use of renewable energy sources by 20% with respect to 1990's levels. In this perspective, heat pumps represent a powerful low carbon energy resource towards achieving the 2009/28/EC Directive's targets. Despite their benefits, heat pumps are still being implemented below their potential rates in large parts of Europe. In the aim of rising the market penetration of heat pumps at European Union level, this paper performs a qualitative feasibility study - strengths, weaknesses, opportunities and threats analysis – based on knowledge provided by the main stakeholders of the branch (institutional actors, industry, building professionals, power sector, and demand side). The study shows the main barriers (weaknesses and threats) to be: i.) Price ratio between alternative energy sources and electricity, ii.) Investment costs as well as iii.) Installation costs. In contrast, major drivers (strengths and opportunities) are: i.) Policies and legislation, ii.) Research and innovation, and iii.) Innovative heat pump systems. The pinpointing of the above barriers and drivers is capable of supporting in particular institutional actors in formulating possible policy and legislative developments to accelerate the penetration of heat pumps in Europe.

Keywords:	Heat pump; Market; Europe; Barriers and drivers; Policies and legislation
Article history:	Received: 07 March 2017 Revised: Accepted: 29 September 2017

1. Introduction

The EU is currently facing unprecedented energy, climate, economic, and social challenges. In an effort to confront them, its 20/20/20 targets formulate a set of measures aimed at reaching by 2020 a 20% increase with respect to 1990's levels in the use of renewable energy sources (RES), the reduction of greenhouse gas (GHG) emissions and the decrease of primary energy consumption by improving energy efficiency [1].

Not all EU Member States (MS) are currently on the right track towards achieving the RES share objectives by 2020 and further efforts are required to reach the 2020, 2030 and 2050 goals [2].

Heating and Cooling (H&C) account together for approximately 50% of Europe's total energy consumption, considering residential, service and industrial sectors. Whereas heating demand is forecasted to decrease, cooling is expected to grow incrementally in the next decades. In this perspective, the promotion of RES in H&C is key in achieving the 2009/28/EC Directive's targets. Within the European technological platform, heat pumps (HPs) represent a powerful resource towards the realization of the European Commission's (EC's) goals. Synergies between HP technologies – on the demand side – and decarbonisation – on the supply side – could significantly contribute in achieving the low carbon energy challenge [3].

Despite their benefits, HPs are being implemented below potential rates in large parts of Europe [4]. Their under-deployment raises a number of questions – in particular:

- What are the main barriers and bottlenecks towards increasing HPs penetration?
- What are the major drivers raising the European HP market?

- What are the most meaningful drivers in overcoming market obstacles?

Answers to these questions have been sought through a detailed analysis of the HP market, investigating realities from multiple perspectives (technical, economic, political, legislative, regulatory, social, etc.). The main purpose of our study is to deliver a clear understanding of the EU HP market starting from its current state of inadequacy and inconsistency of specialized literature data sources (e.g. [5-7]).

Towards this objective, we apply a so-called SWOT analysis: a qualitative methodology considering strengths, weaknesses, opportunities and threats. First developed by Humphrey [8], this methodology has been widely adopted for performance evaluation of both single enterprises and markets. In the present case, market data referring to strengths, weaknesses, opportunities and threats are arranged as entries of a SWOT matrix (Figure 1). We collected input matrix data interviewing stakeholders of the analysed field and we elaborated them to provide insights on its future development after acquiring a better understanding of its underlying mechanisms.

2. Methodology

Our SWOT analysis is especially addressed to institutional actors (policy makers, legislators and regulators - competent administrative bodies and agencies) as a support in policy and legislative measures to accelerate HP penetration in Europe. However, our results are extendable also to all other actors operating in the HP market.

We compared the knowledge provided by the main stakeholders of the EU HP market with the information derived from scientific literature.

Available documentation on HP barriers and drivers was especially provided by the:

- European Heat Pump Association (EHPA) [9];
- Renewable Heating & Cooling Platform (RHC-Platform) [10];
- International Energy Agency Heat Pump Programme (IEA HPP) [11].

An empirical survey helped us to identify both the stakeholders of the HP market and the factors determining the SWOT analysis input data. In a first step, we carried out expert interviews to determine the stakeholders of the field and their specific role. Here experts designate professionals working in the HP field at EU level since at least ten years.

In a second stage, we asked the stakeholders to fill in a questionnaire identifying barriers and drivers of the European HP market.

Stakeholders were asked to provide exclusively empirical information; their representatives to elaborate on previously occurred barriers and drivers.

A sample size of n=30 experts served the purpose of finding stakeholders, while an additional sample of 30 stakeholders' representatives, resulting from the first survey, was interviewed with regard to barriers and drivers.

To generate an adequate statistical sample we used the rational of considering a minimum of 30 cases, following [12-14].

We designed our questionnaire following a two-step process: first, assembling relevant questions through an internal brainstorming process. Second, following a pretesting process submitting a first version to only a part of the interviewed (one third – ten experts). The procedure aimed at identifying questions considered irrelevant/not clear by respondents. Thus, we were able to create a concise (five questions) and easy to compile questionnaire, entailing the possibility of adding information whenever not covered by previous parts of the questionnaire [15].

A sample of our questionnaire is reported in the Appendix, while completed questionnaires are omitted for privacy issues. Interviews have been carried out by phone in order to allow for immediate clarifications on possible misunderstandings.

The SWOT analysis following the questionnaires includes factors (weaknesses and threats) harming the HP market sector as well as factors (strengths and opportunities) boosting HPs penetration.

Throughout the analysis, strengths and weaknesses were assumed as "internal factors"- characterizing the EU HP market itself, while opportunities and threats as "external factors" – relating to the surrounding environment [8].

Allocating a factor within the SWOT matrix entries is difficult since items might have floating limits: whenever the assignment to an entry was uncertain, we chose to allocate the factor by evaluating its affinity to an entry compared with each of the others.

The factors were ranked within the four sections of the SWOT matrix (strengths, weaknesses, opportunities and threats) by the number of times mentioned by interviewees – indicated as percentage of the interviewees mentioning a specific barrier or driver. The most indicated factors thus appear first.

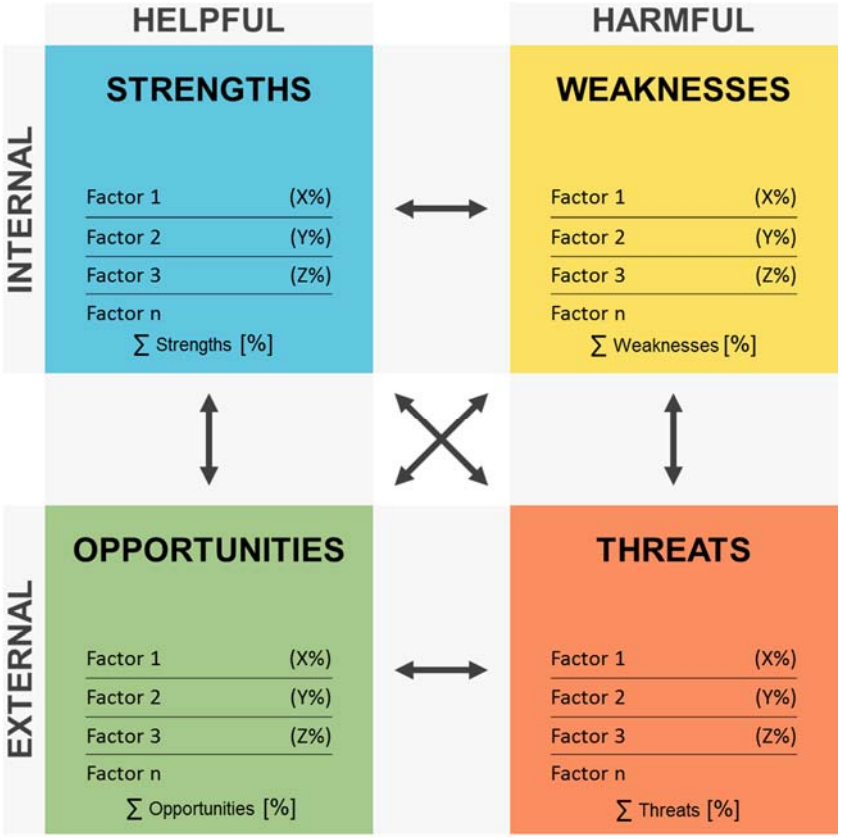

Figure 1. Qualitative approach of the utilized SWOT matrix

After assigning the percentage value to each factor in the SWOT matrix, the values are summed up for each section and the total sum is computed.

In the final step of the process, we surveyed stakeholder representatives to identify the most relevant drivers to overcome weaknesses and threats. This step is depicted in Figure 1 by black arrows.

The SWOT analysis represents an applied methodology, rather than a theoretical research approach, providing institutional (and other) market actors with a deeper knowledge of the HP branch and increasing their operating efficiency.

3. Results

Our first survey aimed at identifying the most relevant stakeholders in the European HP market, determined the following professional groups (interest groups are ranked by the highest number of entries received by expert interviews – please find in brackets, expressed as a percentage, how often the above described factors have been named):

- Institutional actors (i.e. policy makers, legislators and regulators such as relevant competent administrative bodies and agencies) developing policy, legislative and regulatory instruments influencing the penetration of HPs at EU, national and local levels (52%);
- Building professionals (e.g. architects, engineers, installers, energy managers etc.) and intermediaries (e.g. associations like the associations of engineers etc.) advising consumers on HP solutions (33%);
- HP industry (e.g. manufacturers etc.) bringing constantly new HP solutions on the market with higher energy efficiencies (29%);
- Demand side (i.e. consumers, investors such as real estate companies or project developers etc.) acquiring and applying HP solutions instead of conventional H&C systems (25%);
- Power sector (e.g. energy supply companies etc.) providing adequate tariff schemes for HPs utilization (11%).

As indicated above by the percentage values, institutional actors weigh twice as much as the second most indicated group (building professionals) and almost five times as much as the third one (power sector).

Two were the issues relating to the list of stakeholders above which were highlighted by the experts interviewed:

i.) Building professionals – in particular installers – play an extraordinarily important role being final users' advisors on H&C installation type for their homes and thus hold a remarkable power within the market's system.

ii.) The power sector influence through the creation of advantageous tariff schemes for the utilization of HPs played a crucial role in HP penetration in a handful of European countries (e.g. Switzerland [16]).

The results of the first survey set the ground for the outcomes of the second, thus providing the information for the questionnaire on barriers and drivers to feed in the SWOT analysis.

We exploited the second survey's outcomes to identify the most frequent barriers and drivers of the HP market: over 40 barriers and almost 30 drivers covering especially technical, policy, legislation and economic fields.

This section describes the significance of the three most named factors per SWOT section and specifies their classification (strength, weakness, opportunity, or threat).

— Multifunction (strength)

While conventional H&C equipment uses multiple machineries and fuels to provide thermal services, the HP technologies can provide heating, cooling and DHW with a single appliance. The resulting advantages are plural: reduction of equipment costs, decrease in expenses for system maintenance, space savings etc. [17, 18].

— Environmental protection (strength)

HPs offer an energy efficient way to provide thermal services. Hence, the investigated technology represents one of the most promising technologies to save energy and reduce greenhouse gas (GHG) emissions [19, 20].

— Safety (strength)

HPs are safer to operate than conventional H&C systems: they do not involve fuel combustion, do not emit dangerous gases and reduce maintenance.

— Investment costs (weakness)

Compared to conventional H&C systems (e.g. oil and gas burners), HPs are characterized by relatively high investment costs. The market price of HPs within the EU is two to three times higher than competing products [21]. A rational costumer would choose on the basis of the calculated total cost of ownership (TCO) over the expected useful life time of each alternative product. Based on this evaluation, a higher initial investment in a system can be overcompensated by lower operating costs. In reality, investors typically decide on short-term investment considerations, ignoring the TCO perspective [22].

— Installation costs (weakness)

HP installation and its coupling with other technologies (e.g. shallow geothermal systems for ground source HPs) is often complex in dense urban environments. Installation costs typically vary depending on the country, the system type, HP size, price and the installer company size [21] reaching up to 30% of the entire system's expenses [19].

— Building professionals' know-how (weakness)

Malfunctioning of HP applications because of suboptimal installation and inaccurate design represents a major obstacle to their diffusion in Europe. Thus, forming building professionals (i.e. architects, engineers, installers, energy managers etc.) on how to overcome these issues is a crucial mean of accelerating HP market penetration [23].

— Policies and legislation (opportunity)

The HP market relies upon a vital political and legislative support aimed at accelerating its growth: a set of institutional and financial subsidies/incentives to increase energy efficiency and RES exploitation, at national and EU levels [22, 24, 25].

— Research and development (opportunity)

Research and development (R&D) is especially important to rise energy efficiency values of HP applications and consequently reduce primary energy consumption, decrease carbon dioxide (CO_2) emissions and rise the amount of renewable energy usage. Another important aspect of R&D activities in the field of HPs concerns the reduction of environmental impact by replacing ozone-depleting refrigerants [18, 22, 26-28].

— Innovative heat pump systems (opportunity)

Innovative HP applications deserve a special focus since they foster the further extension of renewable generation capacity by supporting electricity grid stabilization (e.g. by innovative system integration). Additionally, innovative systems offer cost reduction potentials (e.g. state of the art integrated power management) by reducing maintenance costs and assuring expected lifetimes of HP systems [18, 29-31].

— Price ratio between alternative energy sources and electricity (threat)

This factor describes the price of (fossil) fuels compared to electricity. In most EU MS the price ratio has

significantly decreased (as a result of fossil fuel prices reduction and an increase of electricity prices) decreasing even further the operating cost advantage of HP technology [22].

— Awareness (threat)

In spite of the technology enhancements and economics improvements, consumer awareness is still low and corresponds to a low confidence in the product for both installers and end user side [22, 32, 33].

— Inertia (threat)

Inertia refers to resistance towards adopting a new technology and accounts also for aspects as behavioural changes and development of new habits. Inertia can occur in both individuals and organisations, leading to an inefficient use of resources [34].

An additional factor mentioned by a relatively high percentage of interviewees (22%) either as a barrier or as a driver - for nearly the exact amount of times was the:

— Construction and refurbishment market (opportunity/threat)

HP sales volumes greatly depend on the rate of construction and refurbishment activities. At a European level, the construction/refurbishment sector lived through several years of decline - a trend further supported by the economic crisis. Should the market develop following its 2014 turnaround, it should impact positively on the development of the HP market as well vice versa continue to hamper it [22].

Table 1 indicates how often the above described factors have been named (in percentage). The following factors are ranked by the highest number of entries received by expert interviews.

As exhibited in Figure 2, the highest total entries' sum (about 300%) is given by the weaknesses of the SWOT matrix. This section is marked by the highest amount of factors mentioned by interviewees (26). Opportunities, with almost 200%, have the second highest entries value (20 factors). The third highest entries number of approximately 150% corresponds to the threats (17 factors). Strengths received the lowest total entries value, nearly 100% (11 factors).

Counter positioning the sum of entry values of internal factors (strengths and weaknesses), the weaknesses exceed the strengths by three times - both in terms of entries percentage sum as well as total number of factors per section. The opposite holds for the external part of the obtained SWOT matrix (opportunities and threats). In this case, the opportunities overtop the threats with regard to both sum of entries percentage and total amount of factors per section.

The three drivers used to overcome the barriers most frequently mentioned by experts (ranked by the highest number on entries received by expert interviews – expressed as percentage in brackets) are:

— Policies and legislation (69%)

Almost three quarters of stakeholders interviewed mentioned policies and legislation as the most valuable solution to overcome barriers of the European HP market. The interviewees related their indication in particular to incentives and subsidies, useful to overcome the high costs of HP applications.

— Awareness (44%)

The second most named factor turned out to be awareness, with nearly half of the interviewees' indication. Creating awareness both for the concept of TCO as well as for the benefits (reduction of GHG emissions, new jobs creation, monetary savings, increased efficiency in the energy sector etc.) of HP systems is crucial for accelerating their EU market uptake.

— Research and development (28%)

The third most indicated driver was identified to be R&D. Almost one third of the queried stakeholders

Table 1: Number of entries per factor (barriers and drivers)

FACTORS	ENTRIES (%)
• Price ratio between alternative energy sources and electricity (threat)	34%
• Policies and legislation (opportunity)	31% (31.4%)
• Investment costs (weakness)	31% (31.2%)
• Installation costs (weakness)	29%
• Building professionals' know-how (weakness)	27%
• Awareness (threat)	25%
• Research and development (opportunity)	22%
• Innovative heat pump systems (opportunity)	20%
• Inertia (threat)	16%
• Multifunction (strength)	15%
• Environmental protection (strength)	13%
• Safety (strength)	11%

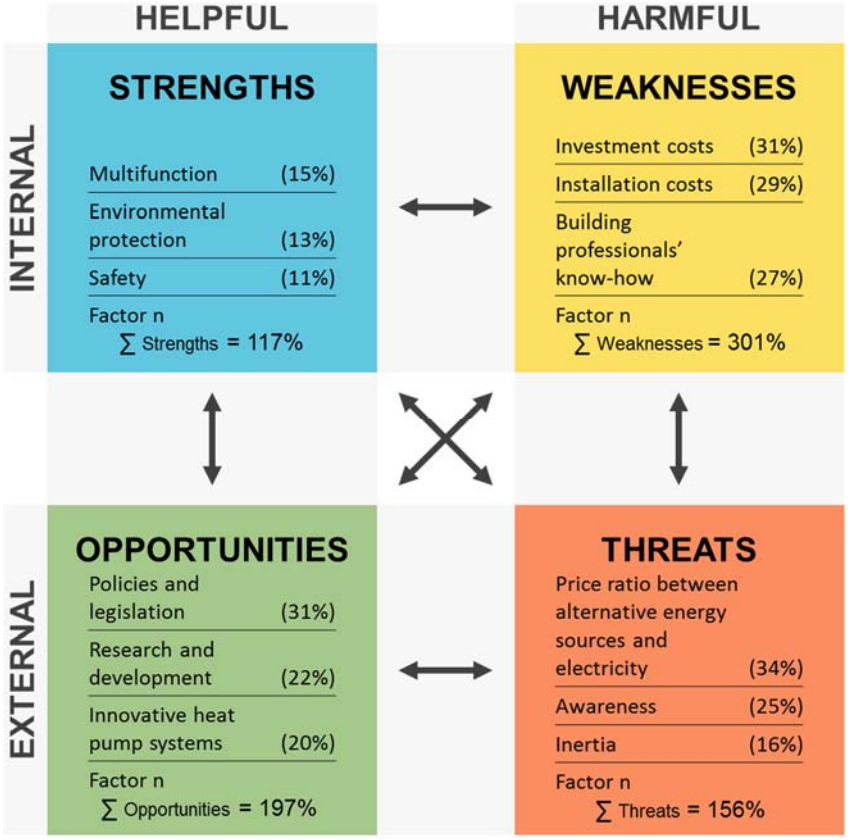

Figure 2. provides the key factors identified using the SWOT analysis

underlined that R&D will be beneficial to the HP market by performing investigations on how to rise the energy efficiencies of HPs and reduce their environmental impact due to the use of ozone-depleting refrigerants.

Finally, experts were asked to provide a prognosis on the future development of HPs in Europe within the next decade. Lumping up the statements of 67% of interviewees, the EU HP market turned out to have slightly positive future projections following the recovery of the economic crisis.

4. Conclusions

The qualitative results of the strengths, weaknesses, opportunities and threats analysis show that the European heat pump market is characterized by promising potentialities, which have not been exploited yet.

Comparing internal factors (strengths and weaknesses) between them, we find that these internal factors hinder the penetration of heat pumps in regards to the heating and cooling market in Europe. In contrast, counter positioning external factors (opportunities and threats) shows that these external factors support the diffusion of heat pumps within the European Union.

As shown in the strengths, weaknesses, opportunities and threats matrix, negative internal factors result to be nearly three times higher than positive ones. This means that the internal section of the market results to be persistently unfavourable.

The most impactful factors appear to be price ratio between alternative energy sources and electricity, policies and legislation as well as investment costs. All three are directly or indirectly cost related.

The entries number of internal factors indicates that the most mentioned strengths are multifunction, environmental protection and safety. This information leads to conclude that high technical feasibility is eminently important for the HP market.

The most meaningful weaknesses are investment costs, installation costs and building professionals' know-how. Thus, costs result to be relevant even compared to professional concerns.

Among the opportunities, the most indicated by stakeholders are policies and legislation, research and development and innovative heat pump systems. Once more cost related issues show their overhand with regard to other matters.

The most discussed threats are price ratio between alternative energy sources and electricity, awareness and inertia. In this case, again an economical factor is top ranked.

Policies and legislation is the most commonly used driver to overcome barriers. As this factor also has the highest entries value of all drivers in the strengths, weaknesses, opportunities and threats matrix, it is safe to conclude that policies and legislation is the key driver of the present SWOT analysis.

It has to be stressed that the main barriers of the investigation carried out (costs), the most important driver to overcome these hurdles (policies and legislation), and the most named stakeholders of the European heat pump market (institutional actors) are strictly connected. In fact, our study indicates political and legislative measures, such as subsidies and incentives, as the key to overcome heat pumps costs obstacles.

Our investigation sheds light on the most relevant drivers, internal, and external barriers of the European heat pump market. It can assist market players by indicating possible risks and opportunities. These barriers and drivers also relate to a number of important considerations awaiting decision makers who consider entering this market. However, the main target group of the present work is represented by institutional actors who are supported by our findings in formulating possible policy and legislative developments to accelerate the penetration on heat pumps in Europe.

Our next direction of investigation will include determining the means by which the European heat pump market is affected through barriers and drivers once the economic crisis is over.

Acknowledgements

We would like to convey our deepest appreciation to all interviewees for their time and patience in carrying out the surveys, making this work possible. We are thankful to Dr. Petra Scudo (EURAC research), who edited the entire text of the present investigation. Finally, our gratitude goes to Amy Segata (EURAC research) for designing the graphs of this study.

List of abbreviations, acronyms and symbols

CO_2	Carbon dioxide
EC	European Commission
EHPA	European Heat Pump Association
EU	European Union
GHG	Greenhouse gas
H&C	Heating and cooling
HP	Heat pump
HPP	Heat Pump Programme
IEA	International Energy Agency
MS	Member states
O&M	Operation and maintenance
RES	Renewable energy sources
RHC	Renewable heating and cooling
R&D	Research and development
SWOT	Strengths, weaknesses, opportunities, and threats
TCO	Total cost of ownership

References

[1] EC, 2020 climate & energy package, http://ec.europa.eu/clima/policies/strategies/2020/documentation_en.htm (last accessed 20.01.2017).

[2] EC, EU TRACKING ROADMAP 2015, http://www.keepontrack.eu/contents/publicationseutrackingroadmap/eu_roadmap_2015.pdf (last accessed 23.01.2017).

[3] EC, Horizon 2020, Work Programme for 2016-2017, 10. Secure, Clean and Efficient Energy, http://ec.europa.eu/research/participants/data/ref/h2020/wp/2016_2017/main/h2020-wp1617-energy_en.pdf (last accessed 24.01.2017).

[4] EC, Heat Pumps, https://setis.ec.europa.eu/system/files/Technology_Information_Sheet_Heat_Pumps.pdf (last accessed 25.01.2017)

[5] EurObserv'ER, HEAT PUMPS BAROMETER, https://www.eurobserv-er.org/heat-pump-barometer-2015/ (last accessed 25.01.2017).

[6] Dawson Krystyna. Latest trends in the World Traditional & Renewable Heating Markets, http://www.iea.org/media/workshops/2014/buildingwebinars/webinar4/4bsriakrystynapresentationforieafinal.pdf (last accessed 26.01.2017).

[7] BusinessWire, Research and Markets: European Heat Pump Market and Statistics Report 2015, http://www.businesswire.com/news/home/20161103005735/en/European-Heat-Pump-Market-Statistics-Report-2016 (last accessed 27.01.2017).

[8] Pahl Nadine, Richter Anne, SWOT Analysis - Idea, Methodology And A Practical Approach, Grin Publisher, Berlin, Germany, 2009.

[9] EHPA, European Heat Pump Association, http://www.ehpa.org/ (last accessed 13.02.2017).

[10] RHC-Platform, European Technology Platform on Renewable Heating and Cooling http://www.rhc-platform.org/ (last accessed 13.02.2017).

[11] IEA, Heat Pump Programme (HPP), https://www.iea.org/ (last accessed 13.02.2017).

[12] Lacy Stephen, Riff Daniel, Sampling error and selecting intercoder reliability samples for nominal content categories: sins of omission and commission in mass communication quantitative research, Journalism and Mass Communication Quarterly, Volume 73, 1996, pp. 969–973.

[13] Hogg V. Robert, *Tanis Elliot, Probability and Statistical Inference*, Prentice Hall, London, UK, 2005.

[14] Hill Robin, WHAT SAMPLE SIZE is "ENOUGH" in INTERNET SURVEY RESEARCH?, *Interpersonal Computing and Technology*, *Volume 6*, 2012.

[15] Schwarzbauer Peter, Datenerhebung in der empirischen Wirtschafts- und Sozialforschung (Data collection in empirical economic and social research), http://www.boku.ac.at/lehrentwicklung/e-learning-und-didaktik-neuer-lehr-und lernformen/vorlesungsaufzeichnung/archiv/wintersemester-2012/735185-datenerhebung-in-der-empirischen-wirtschafts-und-sozialforschung/ (last accessed: 30/01/2017).

[16] EHPA, DELTA Energy & Environment, Unleashing the Opportunity, http://www.ehpa.org/media/studies-and reports/?eID=dam_frontend_push&docID=920 (last accessed: 27/02/2017).

[17] Modera Mark, Woolley Jonathan, Grupp David, Dakin Bill, Koenig Michael, One Machine for Heating, Cooling, and Domestic Hot Water: Multi-Function Heat Pumps to Enable Zero Net Energy Homes, ACEEE Summer Study on Energy Efficiency in Buildings, Pacific Grove, USA, 2014, 232-247.

[18] RHC-Platform, 2020-2030-2050 Common Vision for the Renewable Heating & Cooling Sector in Europe, RHC- Platform, Brussels, Belgium, 2011.

[19] Melograno Patrizia Norina, Pezzutto Simon, IEA-HPP ANNEX 34 – Italian country report, EURAC research, Bolzano, Italy, 2010.

[20] Silberstein Eugene, HEAT PUMPS, THOMSON DELMAR LEARNING, New York, USA, 2003.

[21] EC, SET-Plan–ISSUES PAPER on strategic targets in the context of Action 5 "Develop new materials and technologies for energy efficiency solutions for buildings" CROSS CUTTING HEATING AND COOLING TECHNOLOGIES FOR BUILDINGS, EC, Brussels, Belgium, 2016.

[22] EHPA, European Heat Pump Market and Statistics Report 2015, EHPA, Brussels, Belgium, 2016.

[23] Domanski Piotr, Henderson Hugh, Payne Vance, Sensitivity Analysis of Installation Faults on Heat Pump Performance, NIST Technical Note 1848, National Institute of Standards and Technology U.S. Department of Commerce, Gaithersburg, USA, 2014.

[24] Nowak Thomas, Heat Pump incentive schemes: Experiences from EU Member States, PROCLIMATE 2009, Poznan, Poland, 2009.

[25] Bergmann Lukas, Wave of new, renewed, and extended incentives to improve heat pump prospects in Europe, http://www.delta-ee.com/chs-news-brief/authors/lukas.html (last accessed 15.02.2017).

[26] International Energy Agency, Data Services, http://wds.iea.org/WDS/Common/Login/login.aspx (last accessed 16.02.2017).

[27] EC, CORDIS, http://cordis.europa.eu/home_en.html (last accessed 27.01.2017).

[28] Pezzutto Simon, Analysis of the space heating and cooling market in Europe, PhD Thesis, University of Natural Resources and Life Sciences, Vienna, Austria, 2014.

[29] DHPA, Heat pumps in domestic housing and demand management, DHPA, Naarden, Netherlands, 2015.

[30] Asare-Bediako Ballard, SMART energy homes and the smart grid: a framework for intelligent energy management systems for residential customers,

PhD Thesis, Eindhoven University of Technology, Eindhoven, Netherlands, 2014.

[31] Yoon Ji Hoon, Bladick Ross, Novoselac Atila, Demand response for residential buildings based on dynamic price of electricity, *Energy and Buildings, 80*, 2014, pp. 531-541, 10.1016 /j.enbuild.2014.05.002.

[32] EurObserv'ER, HEAT PUMPS BAROMETER, http://www.energies-renouvelables.org/observ-er/stat_baro/observ/baro218_en.pdf (last accessed 16.02.2017).

[33] Bosma Joel, Heat Pumps for Energy Efficiency and Environmental Progress, ELSEVIER, Maastricht, Netherlands, 1993.

Sorrell Steve, Schleich Joachim, Scott Sue, O'Malley Eoin, Trace Fergal, Boede Ulla, Ostertag Katrin, Radgen Peter, Reducing Barriers to Energy Efficiency in Public and Private Organizations, Project JOS3CT970022, SPRU, 2000.

Appendix

Barriers and drivers questionnaire utilized to feed the SWOT analysis

Data	Profession	Institution	Contact person
1. Which are in your opinion the most significant barriers for the European heat pump market? Please name at least three in order of significance.			
2. Which are in your opinion the most significant drivers for the European heat pump market? Please name at least three in order of significance.			
3. Which are in your opinion the most suitable drivers to overcome related barriers of the investigated branch? Please state at least three concrete examples.			
4. How do you estimate the future development of the heat pump market in Europe within a time range of ten years?			
5. Are there any further relevant information on the heat pump market in Europe you would like to add?			