

# **Experts and innovation**

## **An economic analysis on knowledge-intensive business services and energy efficiency consultants**

### **Dissertation**

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# **Chapter 1**

## **Introduction**

*"An expert is someone who has made all the mistakes that can be made, but in a very narrow field." (Nils Bohr, 1885 –1962)<sup>1</sup>*

The Danish physicist described the complexity that experts face in dealing with knowledge transfers, especially when it comes to academic knowledge. From an economic perspective, the public goods properties of knowledge – non-rivalry and non-excludability – result in a non-trivial discussion about knowledge transfers (Arrow, 1962). The growing relevance of this discussion is mirrored by the emergence of the endogenous growth theory (Romer, 1986, 1994) using innovative knowledge to explain economic development in developed and developing countries. In particular, knowledge spillover has been identified as contributing to the exchange of knowledge among different actors on the market (Audretsch and Keilbach, 2007). The global (Kautonen, 2010), national (Lundvall, 1992) and regional (Cooke et al., 1998) innovation systems are key for companies to gain a competitive advantage by commercialising knowledge spillover (Audretsch and Keilbach, 2007). The decision to use internal and external knowledge sources constitutes firms' innovative capacity. This can be difficult for companies due to the diversity of external knowledge-intensive sources, like universities (Laursen and Salter, 2004), research institutes (Tether and Tajar, 2008) and knowledge-intensive business services<sup>2</sup> (KIBS) (Landry et al., 2012). A growing strand of literature on service innovation and knowledge network structures provides evidence of its complexity (Sakata et al., 2013). To deal with innovative knowledge, expert companies for transferring knowledge have generated attention for research.

Despite the empirical evidence of growing demand for expert services (Muller and Doloreux, 2009; Sakata et al., 2013), standard economic theory struggles to explain the emergence of expert firms. In the neoclassical theory, the appearance of business models based upon distributing information violates the standard assumption of perfect information on markets. Information asymmetries existing ex-ante could be healed by adding new information on the respective market. Nevertheless, the information asymmetries appearing ex-post constituting a credence good cannot be explained in the neoclassic framework (d'Andria, 2013), since market participants perceive information homogenously on the neoclassical markets (Deligönül and Çavuşgil, 1997). The missing ex-post validation is the characteristic feature of experts services, since customers cannot overcome the credence goods in this case due to the costly or impossible

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<sup>1</sup> Quoted by Mackay (1991, p. 35).

<sup>2</sup> As KIBS are services defined with an over average share of academic employees who provide service mostly to other companies Miles et al. (1995). For a comprehensive definition, see chapter 2 and 3.

validation of information for the customers on credence goods markets (Dulleck and Kerschbamer, 2006).

The assumption of perfect information has been criticised in economic research since the emergence of neoclassical theories, whereby prominent examples include Arrow's (1962) seminal work on the role of knowledge for firms and Akerlof's (1970) contribution to understanding the establishment of a low quality level on so-called "lemon" markets. Nevertheless, economic policy still operates on the belief of overcoming the imperfect information distribution by providing additional information (Ek and Söderholm, 2010; Newell and Siikamäki, 2013). Partially low demand for certain expert services can be explained by misguided information policy; for example, in the case of publicly provided information about energy efficiency, customer do not change their demand and lower their demand for energy efficiency measures, while policy-makers aim at the opposite (e.g. Bartiaux, 2008; Gram-Hanssen et al., 2007).

Based upon the seminal work on fraudulent experts (Darby and Karni, 1973), the research on credence goods has been used to explain expert markets and their behaviour, mostly applying theoretical (d'Andria, 2013; Dulleck and Kerschbamer, 2006), experimental (Beck et al., 2014) and quasi-experimental (Balafoutas et al., 2013) methodology. Nevertheless, the knowledge about experts' behaviour remains in its exploratory phase. Dulleck and Kerschbamer (2006) confirm the need for "a more profound understanding of the specific problems associated with markets for diagnosis and treatment". To analyse expert markets, some qualitative and qualitative-quantitative approaches have been applied (Howden and Pressey, 2008; Latzy, Shannon et al., 2014; Owen et al., 2014; Virkki-Hatakka et al., 2013) to gain insights from case study research (Eisenhardt, 1989; Eisenhardt and Graebner, 2007).

Established quantitative survey methodology struggles to add empirical evidence resulting from the nature of credence goods due to its missing ex-post validation of information asymmetries. The impact of credence goods – ex-ante and ex-post information asymmetries – requires a reconstructive methodology whereby the process of the whole transaction is observable (Mayring, 2004). Qualitative research has been considered a non-mainstream method in economics, receiving growing attention (Helper, 2000; Lenger and Kruse, 2012). Nevertheless, mainstream research has questioned the reliability, accuracy and credibility of this explorative approach (Starr, 2014). In particular, the fear that experts do not express objective opinions and lack information on the topic of the interview is formulated in the discussion about conducting research based upon qualitative methodology (Eisenhardt and Graebner, 2007). The

generalisation on an economical level can only be conducted carefully, especially in the case of implementing policy measures, since qualitative research cannot be representative by definition. Nevertheless, suitably defined research questions are key to enriching existing knowledge (Starr, 2014) since qualitative research makes human relations and social interactions transparent, especially in a complex environment (Lenger and Kruse, 2012). It allows dynamic interaction between the interviewer and respondents benefiting from the reciprocity of this methodology.

Qualitative research has to orient towards recognised social science standards to increase the reliability and robustness of data production (Malterud, 2001). For profound analysis, recorded and transcribed expert interviews are used in the next chapters. Beginning with a structured questionnaire from open exploratory questions to a set of closed questions based upon a literature review is suitable to generate new knowledge (Reja et al., 2003). By preventing biased answer behaviour, the theoretical sampling technique is applied (Glaser, 1965; Glaser and Strauss, 2008). In contrast to randomised research designs, careful selected interviewees assure the robustness of the data. According to pre-defined factors, the qualitative sample needs to cover the relevant variety of opinions concerning the research question. The selection process follows an iterative logic to fulfil theoretical saturation, assuring that all relevant opinions are included in the sample (Glaser and Strauss, 2008). Furthermore, the application of statistical methodology and the testing of hypothesis is limited (Edmondson and McManus, 2007). A rigorous analysis – like the qualitative content analysis (Mayring, 2004) – guarantees reliable research results.

Analysing expert markets, the knowledge-intensity of the research object develops a high degree of complexity. A case study design (Eisenhardt, 1989; Eisenhardt and Graebner, 2007) is particularly suitable for analysing the EEC (Energy efficiency consultant) sector<sup>3</sup> and the demand of KIBS by SMEs and sectors due to the following arguments. In a SME environment, CEOs prefer human interaction in research formats due to reciprocity and clarifying aspects (Bartholomew and Smith, 2006). In the field of KIBS expert firms, the majority of SMEs are hardly in touch with academic literature and its specific language used in the KIBS research. In particular, SMEs have a low response rate for surveys, explained by a low time capacity of responsible employees and CEOs, which makes it difficult to generate new knowledge (Newby et al., 2003). Furthermore, in the EEC field, the majority of the research field follows the

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<sup>3</sup> The EEC is a knowledge-intensive expert sector but does not belong to the group since the customers are predominantly private homeowners. Furthermore, the EEC sector in Germany is largely dominated by small firms according to Prognos et al. (2013).

definition and characterisation of the expert service due to heterogeneous markets in various countries (Gram-Hanssen et al., 2007; Owen et al., 2014; Virkki-Hatakka et al., 2013). The exploration due to dynamic changes in recent years on credence good markets and inexperience with some expert markets limits the choice of methodology.

### **Review of expert markets**

Reviewing the literature on expert markets, the theoretical and experimental insights focus on problems caused by credence goods and the fraudulent behaviour of experts. This is a prerequisite to analyse the literature on KIBS and EECs.

One of the first contributions about the effect of information asymmetries on customers comes from Akerlof (1970), discussing the low quality level on used vehicle markets. These “lemons” can be explained by imperfect information distribution, which shows that information is connected to the general quality of supplied goods. Categorising this problem, the definition in search, experience and credence goods classifies goods according to the information that customers possess (Darby and Karni, 1973). Building upon these seminal papers, the literature on credence goods deals with the principle (customer)-agent (expert) relation, discussing the fraudulent behaviour of experts in different markets. The literature builds upon Dulleck and Kerschbamer’s (2006) theoretical framework, which formulates the credence goods problem due to overcharging, charging the customer more than the received quality level; undertreatment, providing the customer with an insufficient level of quality to solve the customer’s problem: and overtreatment, where the customer receives an overly-level of quality. The first results have been published, addressing specific expert markets testing the theoretical assumptions in terms of laboratory (Dulleck et al., 2011; Mimra et al., 2014) and experiments; for example, taxi drivers (Balafoutas et al., 2013), car repairs (Beck et al., 2014; Schneider, 2012) and online reviews (Latzy, Shannon et al., 2014). All these papers confirm an impact on customers’ fear of experiencing fraud by experts, leading to a low market efficiency and low demand. The first implications for economic policy by sharing information publicly have been suggested. Especially various forms of advertisements implementing reputation mechanism, observing liable experts’ behaviour and certified experts could signal additional information (d’Andria, 2013).

## **The demand side of the KIBS sector**

The KIBS service has been analysed according to its impact on the productivity and innovative capacity of client firms, especially at the European (Camacho and Rodriguez, 2007; European Commission, 2005), national (Czarnitzki and Spielkamp, 2003) and regional level (David Doloreux, Richard Shearmur, 2012). The use of KIBS influences knowledge exchange processes being fostered and the access to knowledge-intensive sources for companies becoming easier (den Hertog, 2000). In particular for SMEs, KIBS have the function to diffuse innovative knowledge (Muller, 2001; Muller and Zenker, 2001). Especially in peripheral regions, the function does not work due to the low density of KIBS (Camacho-Ballesta et al., 2013). Furthermore, transferring innovation in these regions is considered problematic (Karlsen et al., 2011). The support of KIBS has been identified as an effective instrument for regional policy (Varis et al., 2012). Nevertheless, credence attributes have only been discussed in a few KIBS sub-sectors; for example, the legal (Camignani and Giacomelli, 2010), marketing (Howden and Pressey, 2008) and accounting sector (Demski, 2007).

While the literature on KIBS has concentrated on service innovation activities, the demand side cooperating with KIBS has been underexplored with respect to SMEs' internal perspective. The positive impact of the use of innovative knowledge (Doloreux and Shearmur, 2013; Mas-Verdú et al., 2011; Simmie and Strambach, 2006) has mostly been stated, whereas relatively little is known about firms' strategic decisions to cooperate with KIBS and companies' reactions towards the KIBS' induced knowledge. Accepting KIBS as key in regional innovation systems (Muller and Zenker, 2001; Pinto et al., 2012), the contribution to the competitiveness of regions – especially in peripheries – varies due to the density of KIBS, which can explain differences in regional innovative capacities (Muller and Doloreux, 2009). The mechanism of using KIBS offers a more detailed perspective on regional development. Therefore, SMEs as cooperation partners require more research focusing on the ex-ante and ex-post evaluation of SMEs and the role of their CEOs. In particular, detailed insights into the effect of the low density of KIBS changes the selection process of KIBS and thus warrants further analysis.

## **Energy experts for the reduction of energy consumption**

The EEC sector in the European Union is characterised by public interventions. The Directive on End Use Energy Efficiency and Energy Services (Directive 2006/32/EC) has the strongest influence, aiming to reduce the energy consumption of the residential sector with expert

services. This has been transformed into different national regulations with the existence of public, private-public and private EECs. The distinct small literature strand on EECs has stated only a minor influence of the services on the energy efficiency in the residential sector (Gram-Hanssen et al., 2007; Palmer et al., 2013; Virkki-Hatakka et al., 2013), although customers request the support from EECs in hypothetical choices (Achtnicht and Madlener, 2014). Just to highlight the most important results, the self-perception of experts' performance contributes to customers' satisfaction with energy audits (Mahapatra et al., 2013), the EEC sector comprises diverse educational and professional backgrounds (Virkki-Hatakka et al., 2013) and a considerable adjustment to policy-makers' rather than customers' needs can explain the low effectiveness of EECs (Palmer et al., 2013). Furthermore, the low knowledge about the existence of EECs by homeowners (Palmer et al., 2013) and the invisibility of EECs' impact (Owen et al., 2014) reflect the complexity of the EEC service.

While some stylised facts have been presented as determining challenges for the EEC sector, the problem with the limited resonance of homeowners increasing the retrofit activities in the residential sector has not yet been solved. Since the literature mostly focuses on the complexity of the retrofit activities (Galvin and Sunikka-Blank, 2013; Stieß and Dunkelberg, 2013), the author identified a need to analyse the complexity of the use of experts adding to the pre-existent complexity; namely, even before implementing EECs, the retrofit market was characterised by credence attributes. Beforehand, customers perceived ex-ante information asymmetry about the outcome of energetic refurbishment measures, since the largest share of homeowners are private individuals in the residential sector with little experience (Stieß and Dunkelberg, 2013) due to a renovation cycle between 30 and 50 years. Additionally, the ex-post evaluation remains difficult due to the technical complexity of energy efficiency measures. Furthermore, the behaviour of crafts companies and builders participating in the retrofit makes the identification of the outcome ex-post difficult, especially because the homeowners' or inhabitants' behaviour intendedly or unintendedly influences the outcome of retrofit (Owen et al., 2014). Therefore, the demand for energetic refurbishment measures is largely driven by the credence attributes. Acknowledging the information asymmetries, it has – to my knowledge – been unexplored how the presence of EECs interacts with the complexity of retrofit. In addition, the uncertainty of homeowners about experts' behaviour has an impact on the EEC market and its demand. Therefore, analysis is needed to explore the mechanism of EECs as economic instruments contribute to the European and national climate goals.

In the following section, I discuss the results of the case studies, concentrating on the effect of credence attributes in expert markets and customers' reactions.

### **Summary of the studies on SME-KIBS demand (Chapters 2 and 3)**

To start with the second chapter, the contribution “Knowledge-intensive business services as credence goods – A demand-side approach” by Daniel Feser and Till Proeger concerns the internal perspective of SMEs' on pre- and post-cooperation effects engaging in business with KIBS. Exploratory interviews with CEOs from SMEs were used to conduct a qualitative content analysis. While the literature focuses on a higher innovativeness of client firms driven by highly specialised knowledge, this analysis emphasises the relevance of information asymmetries occurring ex-ante and ex-post, which influences the outcome of the cooperation with KIBS. Even companies that regularly use KIBS state problems in estimating and evaluating the value of KIBS input due to its credence goods attributes. This can substantially limit the innovative capacity of SMEs. The general avoidance of risk and lacking financial resources of KIBS discussed in literature hold only minor relevance, while trust in the cooperating KIBS influences SMEs' willingness to cooperate. In the pre-cooperation decision-making process, informal networks – which are contacted to overcome the information asymmetries with expert firms – foster the uncertainty. Furthermore, the selection of KIBS depends on the quantity and quality of KIBS firms in the peripheral innovation system. Most of the CEOs described only few contacts with KIBS before initiating new cooperation. Therefore, the CEOs are largely involved in the pre-cooperation initiation, valuing trust as most important factor. Based upon three case studies, the innovative outcome resulting from the cooperation with KIBS is shown. The first case highlights a company using KIBS only for routine outsourcing with a low, indirect innovative impact on the firm. Additionally, the second case exemplifies a disruptive new-to-the-firm innovation influencing the business model of the company and the willingness for further cooperation. In the third case, a company with a routine in using KIBS is analysed. Due to the knowledge-intensive environment, KIBS are used to develop incremental innovation but information asymmetries require the need to analyse the trustworthiness of KIBS, which makes the pre-cooperation phase difficult for the respective firm. The need for regional policy to grant systematic support overcoming the information asymmetries and fostering trust between SMEs and KIBS can be explained by KIBS services as a credence good. Moreover, informal networks function as distributors of negative experiences of SMEs cooperating with KIBS. The authors offer policy implications to support regional policy – in particular, structurally weak areas –

since the density of KIBS is lower in comparison to metropolitan regions. In the policy implications, the authors propose establishing formal network structures with support of local commerce and craft chambers. This could help SMEs to find cooperation partners with the help of a neutral intermediary to advance information about different KIBS. Consequently, the mistrust and informational barriers could be reduced.

The third chapter by Daniel Feser and Till Proeger – entitled “Bad News travels fast. The role of informal networks for SME-KIBS cooperation” – concentrates on SMEs’ perspective deepening the knowledge about communication via family members, friends, acquaintances and business partners concerning the cooperation with KIBS. The lack of information about the quality of KIBS makes informal networks more important as a source of information, particularly in regions with a low density of formal networks offering the platform to contact KIBS on a neutral level. Based upon the same sample of experts as in chapter two, the authors analyse the role of communication, linking the results with insights from Behavioural Economics concerning the perception of negative news. While the literature mostly emphasises the positive impact of KIBS in metropolitan innovation systems, this chapter is concerned with peripheral regions. During the interviews, a general risk aversion and financing problems were attributed minor relevance by the interviewees. As an essential reason to cooperate, the personal attitude of the SME manager was identified as being crucial for cooperating with KIBS. Furthermore, in the pre-cooperation phase, the spread of stories of SME companies as “easy victims” was observable. The selection mostly relied on the CEOs’ trust in the KIBS staff, which choose KIBS based upon recommendations within their informal network. Building upon three short case studies, the authors show in the first two cases how informal network contacts foster a negativity bias, circulating negative examples of SME-KIBS cooperation. By contrast, the final case exemplifies the role of formal networks supporting the cooperation of an inexperienced SME starting an innovative partnership with KIBS, which the CEO of the respective firm met at a sectoral network. The authors interpret the results aligning with research from Psychology and Experimental Economics, emphasising the prevalence of negative information during personal communication supporting the dissemination of worst case examples. Consequently, regional policy in peripheries could support formal network structures in reducing the uncertainty by offering best practice examples and communication platforms with KIBS for SMEs to systematically reduce the information asymmetries.

Taking the first part of this book into consideration, innovative cooperation between KIBS and SMEs is influenced by the information asymmetries ex-ante and ex-post. The description of

KIBS as an important external source to improve SMEs' competitiveness with new knowledge is limited by the credence good. Especially in the case of peripheral regions, SME-KIBS cooperation seems to appear coincidental since the information about KIBS is influenced by negative stories of SMEs' informal networks.

### **Summary of the studies on the EEC market (chapter 4 until chapter 8)**

The fourth chapter – “Energy efficiency consultants as change agents? Examining the reasons for EECs' limited success” – by Daniel Feser and Petrik Runst highlights the role of EECs in improving energy efficiency in the housing sector. Since information policy has been used as an approach to reduce the energy efficiency gap, EECs have gained a prominent role in disseminating information during the retrofit to improve the diffusion of innovation as change agents. The literature points to problems of EECs in fostering energy efficiency in the housing sector, while little explanation has been offered for EECs' low impact. The authors concentrate on the information asymmetries caused by the experts, influencing the willingness of homeowners to conduct energetic refurbishment. The content analysis builds upon a set of 17 expert interviews with stakeholders from the EEC sector. The authors show that the retrofit market is already influenced by information asymmetries. Adding EECs' service contributes to more uncertainty due to the credence attributes, resulting in uncertainty for customers since they cannot observe the price correlating with the quality of the expert service. A state intervention introducing a certification scheme aims to reduce the information asymmetries about EECs' quality. Nevertheless, EECs and homeowners perceive the entry requirements and licensing only as a small step to improve the quality at a minimum standard. This is grounded in the design and implementation of the certification scheme, demanding only minimum prerequisites for EECs to offer the certified service and the monitoring function of EECs, which increases customers' uncertainty about EECs' behaviour. Consequently, there is a mismatch between customers demanding the access to subsidies from EECs and EECs' incentives to follow standard regulation results in a minor role as change agents for EECs. The given policy implications deal with the internal perspective on energy audits to increase the quality of EECs – in particular the knowledge basis – and the external perspective to lower the information asymmetry for homeowners.

In the fifth chapter – “Asymmetric information as a barrier to knowledge spillovers in expert markets” – the authors Daniel Feser and Till Proeger discuss the role of credence goods in the

knowledge spillover theory of entrepreneurship. The thesis that increasing knowledge-intensity promotes the occurrence of knowledge spillover has been unanimously used in the literature. Based upon a set of semi-structured interviews – like in chapter 4 – the authors concentrate on expert services, which characterises a credence good. The EEC sector constitutes a knowledge-intensive sector that has recently emerged and has been influenced by public interventions. The incentives for increasing the knowledge basis in the EEC sector are rather low since the commercialisation of additional knowledge spillover is difficult to signal to homeowners. Furthermore, the implementation of a certification scheme has been described as having a low influence on knowledge spillover due to the minimum standard required from the certificates. By contrast, the impact of the participation in formal professional networks positively contributes to knowledge spillover according to the respondents. In particular, entry barriers for new members guarantee an adequate level of knowledge for participating EECs. Furthermore, the monitoring of every member's knowledge leads to a higher transparency of all members' competences and increases the willingness to cooperate with other members. This is fostered by activities that aim to enlarge the knowledge comprising formal and informal events. The trust in members' knowledge level and knowledge-sharing activities results in a higher willingness to cooperate with other members. This partially leads to a specialisation process due to the high complexity of the retrofit technologies and consequently to a competitive advantage. As the incentives for additional knowledge are low for EECs, the authors recommend improving the public certification scheme to improve the knowledge level and support the network structures in the EEC sector, since only about 25% of the market participants are organised in professional networks.

The chapter 6 – “Heterogeneous professional identities as an intra-sectoral knowledge filter” – by Daniel Feser and Till Proeger highlights the role of heterogeneity as a knowledge filter precluding knowledge spillover. Thus far, literature focuses on geographical, institutional and individual factors to explain difficulties for knowledge spillover, while the influence of heterogeneous professional identities has not been explored. Based upon explorative interviews (see chapter 4), the authors analyse the role of professional identities and their impact on the knowledge exchange process in the EEC sector. Furthermore, the research of Behavioural Economics on cooperation between heterogeneous groups is linked to the discussion on knowledge filters in the EEC sector. The EEC sector is characterised by heterogeneous actors with professional backgrounds in architecture, engineering and crafts business. The professional identity of the EEC profession is created by identities of its sub-sectors implemented during trainings, which are conducted from institutions of the professional

background. While heterogeneity has been suggested as increasing creativity, the authors find that the different sectoral identities lead to distrust between the actors in the EEC sector. The impact of different identities is described in three exemplified cases, resulting in knowledge-creating processes that mostly take place in the sub-group of the own professional background. This can be explained by the behavioural biases of groups, which show that heterogeneity can lead to a low willingness to engage in cooperation to exchange knowledge. The consequence for innovation policy is that a common basis in heterogeneous sectors like the EEC sector is crucial to fostering knowledge spillover. In particular, common training courses and institutional structures could overcome the knowledge filter in the EEC sector.

The chapter 7 – “Energy audits in a private firm environment – Energy efficiency consultants’ cost calculation for innovative technologies in the housing sector” – offers quantitative evidence from the EEC market. While most of the research has offered qualitative and theoretical insights, the authors conducted a large-scale online survey. This paper is a replication of Mahapatra et al. (2011), conducting a survey with Swedish EECs concentrating on personal and contextual factors and recommendations for improved energy audits measured by self-perception. Additionally, the respondents were asked to conduct a case study based upon exemplified energy audits testing to recommend innovative technologies and estimate their cost calculation. The results regarding the personal factors differentiate in comparison to Mahapatra et al. (2011), where only about half of the EECs agreed to fulfil the expectation of the customers in contrast to about 98% in this German survey. This can be explained by the different frameworks used for offering energy audits. In the case of Mahapatra et al. (2011), mostly public servants answered the questionnaire, while in our example the EEC market is dominated by small private firms. The respondents evaluated the contextual factors as being more problematic. Especially the low willingness to pay for energy audits is assessed as puzzling by about half of the respondents. The case study showed that EECs recommend applying innovative technologies aside from disruptive solutions, which were largely excluded. However, the cost calculation demonstrated that EECs estimate the upfront costs as being very optimistically oriented towards the minimum costs and substantially differing from the average upfront costs, which were based on empirical data. The recommendation of the respondents focused on information asymmetries of the customer regarding energy audits and energetic refurbishment, while the calculation of economic efficiency is considered least important. The results show that contextual factors regarding customers’ needs and behaviour are central to foster energy efficiency in the housing sector.

The contribution – “Die Energieberatung als der zentrale Akteur bei der energetischen Gebäudesanierung?” (translated in English: Energy consulting as a central actor in energetic housing modernisation?) – in chapter 8 by Daniel Feser, Till Proeger and Kilian Bizer deals with the question of how EECs are organised in Germany. Grounded on the results of the literature stating a low retrofit rate in the housing sector, a qualitative approach is used to explain the perspectives of EECs in the current political framework in terms of challenges and opportunities. The policy transfer article is based upon ten interviews with stakeholders from the retrofit sector. EECs are implemented to increase the low retrofit rate, which needs to double according to the German federal government to achieve a climate neutral housing stock by 2050. Understanding the decision framework of policy-makers, the current EEC support programmes have been reviewed. The paper points to the challenges due to informational barriers from retrofit and EECs, which can be reduced through careful information policy. However, it must be pointed out that energy audits as a way of increasing the energy efficiency can only be used as an additional instrument due to the uncertainty caused by EECs themselves.

To summarise the second part of this book – comprising case studies based upon the EEC sector – information asymmetries also play a major role for the EEC service in these chapters. In particular, the aim of policy-makers to increase the energy efficiency of the housing stock with public market interventions adds more information asymmetries. Information asymmetries at retrofit and uncertainty about EECs’ behaviour constitute a limited impact for reducing the emission of fossil energy in the residential sector, thus rendering EECs’ function of fostering innovation at energetic refurbishment measures complex.

This book presents insights from KIBS and EEC expert markets. Although the services substantially vary, information asymmetry influences customers’ behaviour. In particular, the uncertainty on the demand side makes the distribution of information by experts complex and partially explains the low acceptance of these services. The customers’ uncertainty and its impact on the market mechanism could provide a fruitful future research agenda on credence goods.

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## **Chapter 2**

# **Knowledge-Intensive Business Services as Credence Goods - a Demand-Side Approach**

**with Till Proeger**

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**Abstract:** Knowledge-intensive business services (KIBS) constitute a major source of innovative knowledge for small- and medium-sized enterprises. In regional innovation systems, KIBS play a crucial role in distributing innovations and improving the region's overall innovative capacities. While the specific properties and effects on client firms and sectors have been comprehensively discussed, the internal perspective of client firms, i.e. the processes and problems in selecting, using, evaluating and recommending KIBS, has been neglected to date. Using a qualitative approach, we describe the internal mechanisms and problems of SMEs cooperating with various KIBS and discuss the implications for regional innovation systems from a policy-making perspective. We find that all stages of cooperation of SMEs and KIBS are characterized by strong information asymmetries, distrust and uncertainty about the effects of using external know-how, which yields the interpretation that SMEs perceive KIBS as credence goods. While informal networks are used to reduce information barriers, they regularly prove counterproductive by disseminating worst-case examples. Regional policy aiming at developing instruments for fostering innovative cooperation could thus strengthen formal networks that primarily create trust between KIBS and SMEs to systematically reduce mutual suspicions and information asymmetries.

**Keywords:** credence goods, knowledge-intensive business services, regional innovation system, small- and medium enterprises

## 1. Introduction

Two major trends have substantially influenced the growth of advanced economies in the recent decades. Firstly, the increasing relevance of information and communication technologies (ICTs) has led to the restructuring of knowledge-based processes in the organization of information (Laursen and Melicani, 2010; Papaconstantinou et al., 1998). In this development, the generation and diffusion of knowledge has become essential to modern economies (Cooke and Leydesdorff, 2006; Lundvall, 1992). Secondly, growing competitive pressure has substantially increased the quantitative and qualitative relevance of the service industry. Therefore, service innovations increasingly affect business processes and the growth dynamics of manufacturing and service sectors (Evangelista et al., 2013; Gallouj and Savona, 2009; Millar and Choi, 2011; Sakata et al., 2013).

In this development, organizations serving as innovation intermediaries have a pivotal role (Howells, 2006), particularly those providing research based-knowledge, such as universities, research institutes (Pinto et al., 2012; Tether and Tajar, 2008) and knowledge-intensive business services (KIBS)<sup>4</sup> (Strambach, 2008). The relevance of KIBS has been emphasized with regard to their positive effects on regional innovation systems (RIS) (Cooke, 1992; Doloreux, 2002), serving as innovative intermediaries with particular relevance for small- and medium-sized enterprises<sup>5</sup> (SMEs) (Muller and Zenker, 2001). Consequently, a large number of studies have provided detailed results regarding KIBS' specific capabilities and their impact on RIS (Muller and Doloreux, 2009), following a supply-side perspective in investigating KIBS' economic functions, their mechanisms of adding value and modes of interaction with client firms (Miles and Boden, 1998; Muller, 2001). While this particular focus has substantially furthered our understanding of innovation intermediaries in RIS, we suggest a demand-side approach investigating KIBS' impact on client firms to identify factors potentially complicating KIBS-client interactions and thus hindering the efficient transmission of innovations. Rather than focusing on the cases of successful cooperation with clear innovation effects, an investigation

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<sup>4</sup> Miles et al. (1995) provided the seminal definition of KIBS as the part of the service sector with a higher share of academic employees (above 11 % of employees with academic degree or more than 4.5 % of employees with academic degrees in Science or Engineering) providing professional business-to-business services. KIBS constitute a rather heterogeneous sector, which can be divided into two subgroups: professional (p-), include marketing, legal and accounting services; and technological; while (t-) KIBS include information and communication technology services (ICT), engineering, architectural and technical consulting services. Both t- and p- KIBS actively influence knowledge-changing processes in client firms by transferring and implementing know-how (Strambach, 2008). KIBS thus play a major role in innovation processes, which has been broadly discussed in the literature, e.g. by Castaldi et al. (2013); Doloreux and Laperrière (2013); Muller and Doloreux (2009); Tödtling et al. (2006).

<sup>5</sup> In the following, we use the Eurostat definition of SMEs, i.e. below 250 employees overall, medium-sized between 50 and 250, small 10 to 49 employees, and micro firms below 10 employees.

of client firms' incentives, motives and experiences in cooperating with KIBS can help to better understand reasons for success or failure of innovative cooperation within RIS. Drawing on firms' issues in cooperating with KIBS thus enables the derivation of policy implications for the crafting of regional innovation systems that foster innovative cooperation between KIBS and firms. In this paper, we present a qualitative approach using in-depth interviews that focus on the demand for KIBS by client firms and their innovative impact within a specific RIS. We use a sample of 19 SMEs that have had business relations with KIBS and investigate their motivation for the cooperation *ex ante*, obstacles during the cooperation and the impact of their cooperation *ex post*. Three case studies highlighting different patterns of cooperation are presented. The results of our investigation are used to derive policy implications for peripheral RIS.

We find that the decision processes leading to KIBS-SME cooperation are driven by a strong uncertainty about the potential outcomes. A general risk aversion or cost concerns hold little relevance to firms; rather, the trustworthiness and reliability of the cooperation partner is the primary concern. In all stages of the cooperation, firms perceive substantial information asymmetries, which limit cooperation *ex ante* as SMEs face uncertainty about the expected return of cooperation. Interestingly, this uncertainty exceeds the cooperation itself as firms are – *ex post* – regularly unclear about the gains of using KIBS. This yields the interpretation that the demand-side perspective for SMEs should be interpreted as a credence good situation, which tends to limit innovative cooperation. The lack or ineffectiveness of formal networks leads firms to resort to informal networks to reduce information barriers: while these reduce search costs, they tend to foster the diffusion of previous negative experiences and skepticism towards KIBS, thus precluding potential cooperation. The problems of credence goods and informal networks highlight the relevance of regional policy to systematically support cooperation structures and build trust between firms and KIBS to foster innovative cooperation. We suggest that formal network structures established, controlled and disseminated by regional public institutions, such as chambers of craft and commerce could best serve as a neutral intermediary fostering cooperation and disseminating information on specific KIBS. Their impartial role could succeed in gaining mutual trust between the actors and reduce the impact of negatively-biased stereotypes of KIBS in informal SME networks.

The remainder of the paper is structured as follows. Section 2 provides a review of the relevant literature. Section 3 introduces our methodology and section 4 presents the results and case

studies. The results are discussed and linked to regional policy in section 5, before section 6 concludes.

## **2. Literature review**

A large body of literature has evolved in recent years highlighting the substantial contribution of KIBS to the innovative capabilities of specific sectors, individual firms and RIS.

Overall, KIBS have been emphasized as one of the most innovative sectors within Europe (Rodriguez, 2013; Tether and Tajar, 2008), fostering development by providing knowledge-intensive inputs to client firms that consequently gain competitive advantages. By transmitting codified and tacit knowledge to their clients, KIBS influence the innovation process by producing, transferring and recombining innovations in cooperation with their client firms (den Hertog, 2000). Therefore, KIBS drive knowledge-changing processes and offer produced knowledge (Strambach, 2008), which is positively affected by customers with a high degree of formalized knowledge in the respective field (Koch and Strotmann, 2008). In comparison to the manufacturing sector, KIBS require networks to disseminate innovation due to the highly immaterial nature of KIBS and the requirement of human-intensive interactions (Koch and Strotmann, 2008; Koschatzky, 1999, p. 752). Potential difficulties in using KIBS involve the complexity of cooperation, caused by the high degree of human interaction and learning process required (Martínez-Argüelles and Rubiera-Morollón, 2006; Wood, 2002). Further, the use of KIBS has been described as problematic due to its credence good properties, particularly in the field of legal services and accounting (Kox and Rubalcaba, 2007a; Satzger et al., 2009; van Cruysen and Hollanders, 2008; Camignani and Giacomelli, 2010; Demski, 2007).

The effects of KIBS on cooperating firms has been consistently described as positive, whereby the use of KIBS results in a higher sectoral productivity (Baker, 2007; Camacho and Rodriguez, 2007; Kox and Rubalcaba, 2007b; Oulton, 2001), as well as innovativeness and growth Evangelista et al. (2013). On a company level, KIBS use results in the direct effects of higher R&D output and human capital stock, as well as indirect effects that include the adaption of new technologies and the diffusion of innovation (Miozzo and Soete, (2001). This effect is higher when KIBS are directly included in a firm's innovation management (Doloreux and Shearmur, 2013). In particular, newly founded innovative companies profit from KIBS due to an increase in innovativeness and the provision of general support during the establishment stages (Mas-Tur and Ribeiro Soriano, 2014).

Different factors fostering a company's willingness to use KIBS in their innovative activities have been discussed. García-Quevedo and Mas-Verdú (2008) state that the use of external knowledge-intensive firms is primarily dependent on the firm's size. Furthermore, the likelihood of external cooperation increases when KIBS are located closer to the client firms (Martínez-Argüelles and Rubiera-Morollón, 2006) and when firms attempt to realize growth (Johnson et al., 2007). Further determinants of different patterns of KIBS use include the ownership structure, the technological complexity of products or services, the human capital stock and the market penetration (Martínez-Argüelles and Rubiera-Morollón, (2006).

Regarding patterns of KIBS use in SME, a positive overall effect has been shown by Muller (2001), who also emphasizes the mutual gains in innovative capacities following an innovative cooperation. For the case of manufacturing SMEs, Shearmur and Doloreux (2013) show the diffusion of technological and managerial innovation through KIBS and the relative independence of KIBS' proximity to the respective firm due to the extensive use of information technology in the course of the cooperation. In an early contribution, (Cohen and Levinthal, 1990) suggest that SMEs have specific barriers to cooperation with KIBS, particularly a lack of resources, the frequent personal adversity of the decision maker and the lack of plans for growth.

Another strand of literature discusses KIBS' vital role in transferring knowledge from an international to a regional level within RIS (Kautonen, 2010). Following the seminal contributions by Cooke (1992) and Cooke et al. (1998) on RIS, KIBS have been shown to lead to competitive regional advantages (Probert et al., 2013; Strambach, 2002); whereby the majority of studies focuses on KIBS' contributions to metropolitan RIS (Aslesen and Isaksen, 2007; Doloreux et al., 2010; Simmie and Strambach, 2006; Wood, 2002), since a lower number of business services are present in peripheral regions (Camacho-Ballesta et al., 2013). Ferreira and Fernandes (2011) emphasize that KIBS spillovers primarily occur in metropolitan RIS. The overall innovative performance of RIS increases with a higher density of KIBS specialized in high-tech services (Rodriguez, 2013) when KIBS are located closer to client firms (Martínez-Argüelles and Rubiera-Morollón, 2006) and with better regional network structures between KIBS (Bettioli and Di Maria, 2013). Disparities between RIS are explained by a lower level of interaction in the generation and diffusion of knowledge between KIBS and firms (Muller and Zenker, 2001).

While few studies have been conducted for peripheral regions, a number of stylized facts have been presented. Peripheral regions are shown to lack the supporting infrastructure and access

to human and social capital to successfully establish cooperation, particularly for SMEs (Shearmur and Doloreux, 2009; Tödting and Trippel, 2005). By contrast, existing KIBS adjust to the regionally predominant industrial sector comprising larger firms (Thomi and Böhn, 2003). Overall, the knowledge transfer and the commercialization of knowledge is considered problematic and ineffective in peripheral RIS (Karlsen et al., 2011). Focusing on structural change in traditional industries, Varis et al. (2012) suggest knowledge-intensive firms as an instrument of regional policy to increase the level of innovativeness in peripheral regions. Thus, KIBS and universities are seen as the most important source of additional know-how in peripheral RIS (Pinto et al., 2012).

We argue that while the literature on KIBS is at a mature state, it should be extended to two important domains. First, the current discussions are primarily focused on the innovation process within KIBS, often using qualitative methods, as well as concerning KIBS' client firms' characteristics and their contribution to subsequent business success, using quantitative measures. However, this emphasis on KIBS' supply side has neglected the effects of KIBS within their client firms, yielding little evidence regarding how and why firms cooperate with KIBS and whether they profit or struggle with the external innovative input. We thus argue that a demand-side perspective can help to understand KIBS' innovative impact by investigating in detail prior decision mechanisms and potential distortions before and after cooperation. While these mechanisms are fairly transparent for large firms with a routine cooperation with external partners, little evidence on the determinants of cooperation has been presented for SMEs. Second, by presenting detailed insight into the *ex ante* and *ex post* mechanisms of cooperation, we are able to comment on another aspect of KIBS' impact with little previous research, namely explaining "*the extent to which KIBS contribute to the success or failure of regional innovation systems*" (Muller and Doloreux, 2009, p. 71). We argue that the capacity of RIS to innovate can be better explained when considering the specific mechanisms through which KIBS and firms cooperate within an RIS. Accordingly, we contribute to the existing literature in two distinct fields. First, we investigate the effect of KIBS on SMEs from a demand-side perspective, before, during and after cooperation. We can thus show the effect of *ex ante* information asymmetries, what obstacles to innovations occur *during* cooperation and the *ex post* effects for innovative activities. Second, we offer implications of our results for the functioning of peripheral RIS, characterized by a small number of KIBS compared to metropolitan areas. This contributes to the discussions aimed at providing policy implications to increase the performance of RIS.

### **3. Data and methodology**

We adopt a qualitative approach to more closely examine SMEs' demand for KIBS and their actual influence during and after the cooperation. This allows us to contribute to theoretical considerations on KIBS and draw inferences regarding the role of KIBS in RIS. Since the response rate is - particularly for SMEs - rather low (Newby et al.,(2003) and CEOs in SMEs prefer human interaction rather than anonymous questionnaires (Bartholomew and Smith, 2006), we use a semi-structured questionnaire answered in personal discussions. Furthermore, we argue that conducting in-depth interviews with experts helps to establish a broader theoretical understanding than comparable quantitative approaches in this area (Eisenhardt, 1989; Eisenhardt and Graebner, 2007). Moreover, it also enables us to discuss theoretical concepts in detail without requiring prior knowledge by the CEOs interviewed. Since little theoretical and empirical research has been presented regarding the specifics of KIBS-SME cooperation (Edmondson and McManus, 2007), we follow an exploratory approach without the explicit testing of hypotheses.

The selection process of companies for the participation in our interview procedure is based upon theoretical sampling to fulfill theoretical saturation (Glaser, 1965; Glaser and Strauss, 2008). Participating SMEs were required to have experience in using KIBS and consider innovation as a relevant driver of their business model. The interviews were conducted from May to September 2014 with a sample size of 19 interviews, each with a length of 45 to 90 minutes. Participants had the option to interrupt the recording. Only in one case did the interviewee refuse to record the interview. To develop a realistic understanding of the cooperation between KIBS and SMEs as well as their obstacles, anonymity was ensured to the interviewees. The interviews were transcribed, coded and combined with additional documents (published official company records, newspaper and online research) as a control for the reliability of the interviewees' statements.

The interviews were structured in three parts: first, some initial open questions were asked regarding the interviewees' perspectives on the topic; second, a number of more specific questions were posed concerning the selection process of KIBS by the respective SME; and third, regarding the perceived innovative influence of KIBS on SMEs.

The results were analyzed with the qualitative content approach of Mayring (2004) by reducing the content to relevant parts and conducting a cross-case analysis with inductive codes for aspects newly brought up by the interviewees and deductive codes derived from the literature.

To ensure a representative sample, a broad spectrum of companies in terms of number of employees, sectors, market penetration and company location in urban or rural setting was chosen (See Table 1). Finally, the respondents received feedback and preliminary results from the survey for further critique and validation of the results.

<b>Company Coding</b>	<b>Classification</b>	<b>Size</b>	<b>Sector</b>	<b>Market</b>	<b>Gate-keeper</b>	<b>Company Location</b>	<b>Ownership structure</b>
A	Service	Small	Crafts	Regional	LCC	Urban	Family
B	Industry	Micro	Manufacturing	Regional	-	Urban	Family
C	Service	Micro	Trade	Germany	-	Urban	Family
D	Service Industry	Small	Biotech	Worldwide	RES	Urban	Family
E	Service	Micro	Health	Regional	LCC	Urban	Family
F	Industry	Medium	Engineering	Regional	LCC	Rural	Family
G	Industry	Medium	Casting	Germany	-	Rural	Local Shareholders
H	Service	Small	Construction	Regional	LCC	Urban	Family
I	Service	Small	IT	Worldwide	RES	Urban	Local Shareholders
J	Service	Small	Biotech	Worldwide	RES	Urban	Local Shareholders
K	Service	Small	Medicine	Worldwide	RES	Urban	Local Shareholders
L	Service	Micro	Publishing	Worldwide	-	Urban	Family
M	Service Industry	Medium	Steel	Worldwide	LCC	Urban	Family
N	Industry	Medium	Engineering	Worldwide	LCC	Rural	Family
O	Service	Micro	Consulting	Germany	RES	Urban	Family
P	Industry	Medium	Car Industry	Worldwide	-	Rural	Local Shareholders
Q	Industry	Medium	Engineering	Worldwide	-	Rural	Family
R	Industry	Medium	Crafts	Worldwide	-	Rural	Local Shareholders
S	Service	Medium	Biotech	Worldwide	RES	Urban	Family

Table 1. Overview of the sample of SMEs

All firms are situated in a southern region of the German federal state of Lower Saxony, which represents a peripheral RIS characterized by SMEs and only few large companies. Small companies across Lower Saxony have been described as the least innovative across all German states (Berthold et al., 2009). However, the respective RIS comprises a considerably high density of research institutions with international reputation conducting basic research and applied research departments, although the network structure between these institutes and SMEs has been described as rather weak. A large share of the students and academic staff leave the region after graduation due to the lack of job opportunities in larger institutions and corporations (Süssberger, 2011). While Goettingen is part of the metropolitan area of Hanover, Brunswick, and Wolfsburg, the respective local RIS only have little contact.

We initially used gatekeepers from the local chamber of crafts (LCC) and regional economic support (RES) to contact CEOs for the interviews. Later on, we continued using the

recommendations of interviewed CEOs to reduce the sampling bias, since the gatekeepers' contact with the SMEs was often based upon publicly supported innovation projects (Probert et al., 2013, p. 1276). Most of the firms are family-owned, while some are owned by local shareholders. All interviewees were CEOs, with the exception of one case, where the chairman of the board was interviewed. The data set includes a broad range of SMEs from a one-man firm to medium-sized companies of 150 employees. Moreover, the level of qualification considerably varies among the companies. While no employee had an academic education in *company H* (crafts), the vast majority of employees in *company D* had academic degrees, since the firm operates in a research-oriented environment. The firms operate on a regional, national and international level, yet the national market remains central for the majority.

In the following part, we present our findings regarding the specifics of SMEs' demand for KIBS, as well as the influence that KIBS have on the innovative capability of SMEs and RIS.

#### **4. Cooperation between KIBS and SMEs**

The cooperation between KIBS and SME is based upon SMEs' initial demand for external knowledge-intensive expertise, which mostly requires highly specialized service due to a lack of internal capabilities. This affects firms' capabilities to innovate as the decision to cooperate with KIBS implicitly leads towards open or closed innovation models. Most of the cooperation starts project-based and potentially turns into a long-term relation. We focus on the initial phase of the cooperation and describe the ex ante selection and decision process within firms and the outcomes in terms of innovative gains from an ex post perspective. All kinds of cooperation are included, i.e. both t-KIBS and p-KIBS. We focus on the projects achieving outcomes that are new-to-the-firm, following the OECD manual's definition. This excludes the large share of KIBS-SME contacts motivated by legal requirements and efficiency-seeking outsourcing.

##### *4.1 Pre-cooperation decision-making*

The decision to cooperate with KIBS involves substantial uncertainty for SMEs, since the outcomes of innovation processes are driven by external partners, whose contributions and effects cannot be fully anticipated, even if the service demanded closely matches the service offered. This uncertainty is particularly pronounced for knowledge-intensive firms looking for KIBS, as the high complexity of the product makes an ex ante evaluation of quality and impact

very challenging. In turn, KIBS are assumed to have specific information about their product, which firms expect to remain undisclosed to potential cooperation partners.

In the decision-making process, the decision against cooperation with KIBS is often based upon prior stereotypical experiences drawn from the media or informal networks. P-KIBS are particularly shunned due to the conviction that they usually cause detrimental results for SMEs. Consequently, even when firms accept the necessity of using external sources of knowledge, they strongly hesitate to use KIBS due to their concerns about the asymmetric information situation potentially exploited by KIBS. Both non-users and experienced clients of KIBS repeatedly argued that they were “easy targets” due to their lack of know-how in the relevant area of expertise. Furthermore, it can be observed that negative experiences with KIBS of a specific sector quickly lead to the overall rejection of external cooperation. Accordingly, the probability of firms deciding against KIBS for innovative projects is rather high, as the potential risks are perceived as being high.

Particularly for SMEs, the lack of financial resources and risk aversion could be expected to prevent cooperation with KIBS *ex ante*. However, the financial aspect was considered less problematic by firms, as planning was only conducted in the first place if financial gains from the cooperation were expected. Moreover, firms’ financial assets and access to credit were considered unproblematic. SMEs’ risk aversion played a significant role, although no general risk aversion regarding spending resources on external projects was observed. Instead, the risk aversion was high due to the perceived information asymmetries connected to the use of KIBS.

Overall, the decision process by SMEs was primarily driven by strong uncertainty about potential outcomes of cooperation and previous dismal experiences with KIBS spread in informal networks. The general risk aversion and cost considerations were secondary aspects to firms. Firms emphasized that the trustworthiness of KIBS and the expected profit ultimately determined whether cooperation was sought.

#### *4.2 Pre-cooperation selection process*

The selection process of homogenous standard services is largely driven by prices as quality signals, whereby higher prices indicate a higher quality. By contrast, more complex b2b services tend to be experience goods, whose quality can only be assessed with substantial search costs or after the cooperation. The interviewed SMEs cope with the issues of high search costs and quality uncertainty by accessing informal networks. All firms emphasized that their

selection process was primarily influenced by informal contacts ranging from business contacts to close friends. In the SMEs, the responsibility for communication with KIBS mostly relied on few employees and in the small companies regularly on the CEO. Accordingly, the quality of the KIBS selection ultimately depended on the range of the CEO's informal network. Typically, firms initially contact KIBS personally known to the CEO; otherwise, networks partners were asked for a recommendation of a suitable KIBS firm. Firms subsequently compared different recommendations and in some cases asked the respective KIBS' previous customers for their advice. Finally, when meeting the potential cooperation partner, the decision-making was primarily based upon the perceived competence and trustworthiness, as well as personal sympathy for the representative. Ultimately, firms emphasized that the core requirement for a successful cooperation with KIBS was a sense of trust in the business partner due to the high degree of personal interaction required in the process. In the process of selection, the category of trust in the informal network was the core dimension for all interviewees and the information asymmetry connected to the cooperation was seen as the main issue. Thus, all firms attempted to establish personal communication and trust before agreeing to cooperate, whereby often more than one meeting was conducted to build up trust between ranking staff of the respective SMEs and KIBS. This approach was seen as the primary means of reducing the risk of cooperating with an external firm and ensuring a successful outcome. Due to the focus on trust and personal contact, the selection of KIBS is highly dependent on SMEs' ability to establish or access informal networks. For smaller firms, the ability to cooperate with KIBS is thus narrowed to the personality and individual contacts of the CEO.

This emphasis on personal characteristics of CEOs in SMEs is aggravated by the specifics of a peripheral RIS. Due to the lack of formalized support and cooperation within this RIS, more effort has to be devoted to the initiation of novel contacts with KIBS by firms. Therefore, both the initial search costs and the costs of establishing mutual trust to overcome informational asymmetries have to be borne by individual firms. This constitutes a major obstacle to additional innovative cooperation as the costs may be perceived or actually be prohibitively high. By contrast, a well-established formal or informal network reduces these costs and their perception by SMEs. In peripheral RIS, the cost of sharing information within networks is higher due to the lower number of network participants, which substantially reduces the likelihood of cooperation between KIBS and SMEs. Rather, ad hoc networks that depend on the CEO's individual propensity are used to initiate cooperation.

### *4.3 modes of cooperation – case studies*

Our interviews suggest that the strategies of coping with the uncertainties of cooperation with KIBS vary among SMEs, which results in different innovation strategies. We present three distinct cases that illustrate the different approaches to KIBS-SME cooperation. The first case demonstrates the use of KIBS limited to non-innovative purposes, as well as the application of a closed innovation business model to protect innovations. In the second case, a firm with only limited experience with KIBS provides an example of a disruptive innovative influence due to the first external cooperation. The third case describes a SME that frequently cooperates with KIBS and routinely deals with the uncertainty, whereby an incremental innovative influence is observed.

#### 4.3.1 Closed innovation model

*Company A* was founded in 1979 as standard electrical service for households. Within its expansion, it first started providing home security equipment and subsequently extended its activities to renewable energy and energy efficient solutions for housing. The most recent addition to their products has been energy efficient lighting systems for houses. The small-sized firm's new strategy was to focus on dynamic markets and adapt to the swiftly changing market, while their products and services are focused on the needs of demanding technology-friendly customers.

The firm uses external KIBS for tasks related to accounting, legal consultancy and ICT, yet distinctly limits external cooperation to tasks that the CEO considered not to be crucial, i.e. unconnected to the firm's ability to innovate. Furthermore, the use of KIBS is mostly involuntary to conform to external requirements, such as state regulations for legal services and specific demands by customers. The CEO deals with KIBS in person and relays the information to his employees. While he does not have experience with the use of KIBS for innovative purposes, he has a skeptical attitude based upon information provided by business partners, newspapers and friends, which have led to a general avoidance of KIBS. Furthermore, the interviewee emphasizes the fear of unwanted knowledge spillovers and the need to protect the firm's existing innovative capabilities. Information required for innovations is thus obtained through various personal contacts and the internet. Regarding essential cooperation, the CEO underlines that his main goal is not to identify and select the best company with the most innovative ideas, but rather to find the most reliable one that causes the least effort for the SME.

For this reason, long-term relations are maintained, including some for 20 to 25 years. The barriers to changing the KIBS are considered high, and thus even disappointments with established cooperation partners are accepted.

The innovation strategy of *company A* in using KIBS avoids the search costs and potential frustration with KIBS by refusing to open up to external services altogether. KIBS merely fulfil a supporting function for the firm, thus enabling the SME to concentrate on their core competences, which limits the function of KIBS to knowledge transfer. The considerations and strategy of *company A* illustrate the relation to external innovative service providers represented by a relevant share of SMEs in our sample.

#### 4.3.2 Initial experience in using KIBS

The second case involves a family business, *company H*, operating since 1919 in the fourth generation, mainly on regional markets. After being launched as a small-sized low-tech craft and painters company with expertise in the housing sector, it began to look for new markets and ways to acquire new segments of customers around 2000. With competitive pressure increasing from companies in other EU states, its new strategy was to offer additional services to their traditional products and services. Similar to the first case, *company H* initially only used KIBS for outsourcing purposes such as IT services and legal consultancy. The decision to cooperate with KIBS for an innovative project was a consequence of the CEO's goal of acquiring new markets. The cooperation was established with an engineering t-KIBS closely connected to the university, which resulted in a consultancy concept and a related publication serving as an extension to their traditional products.

The impulse of initiating the cooperation has been motivated by the observation of unsecure future markets and the implication that changes in the business model were necessary. The CEO originally attempted to add services with a scientific background, yet soon realized that the firm's level of know-how was insufficient and thus recognized the demand for external expertise. The selection process was based upon an informal network, although the CEO had already become familiar with KIBS through events of a formal network. Thus, prior information obtained through his informal network was the fundamental reason for starting the cooperation. Although the first contact with the KIBS happened within a formal network, the cooperation started on an informal basis after the CEO had already left the respective network. The CEO emphasizes that formal networks were only used to get in contact with potential business

partners, while the actual KIBS-cooperation was initiated on an informal level to reduce the risks associated with the first substantial cooperation with an external service provider. To ensure the cooperation's success, a number of meetings were conducted with the employees engaged in the project, which generated a sufficient degree of trust in the KIBS from the firm's perspective. Nevertheless, the CEO admitted that the cooperation generated risk that was not calculable for the firm due to the lack of experience in these specific forms of cooperation. It was assumed that these uncertainties and information barriers could be eliminated during the course of the cooperation. However, this has only partially fulfilled, as the assessment of the cooperation's quality and success was not entirely possible ex post.

The interviewee emphasized that the first cooperation with KIBS determined his subsequent cooperative behavior and strongly argued that a negative experience would have led to an end of cooperation altogether with this specific KIBS sector. The ex ante and ex post uncertainty and the firm's inability to adequately assess the risks of using KIBS thus makes the results of the initial contacts crucial for the CEO's future decisions. It also fosters a preference for KIBS connected to public institutions rather than fully private firms, in which the risk of knowledge spillovers is considered higher. Thus, while *company H* openly searches for additional contacts that enabled innovative cooperation, risk and uncertainty aversion substantially limits the scope and future potential for KIBS use.

#### 4.3.3 Routine in using KIBS

Founded in 1936, *company P* is an established expert in the metalworking industry as a medium-sized supplier to car manufacturing with a focus on international markets, mostly highly qualified employees and a R&D department. Innovation is mostly driven by the requirements of the car industry and to gain competitive advantages on the process and organizational level.

Since *company P*'s market is highly competitive, it regularly uses all fields of KIBS. The executive board supports the employees in their cooperation with KIBS and all parts of the company are subjects of the resulting optimization processes. The use of external knowledge is considered an inherent part of the routine in the innovation process. In the interview, the CEO wondered about the relevance of the topic, since KIBS were an essential part of the regular development of the firm's products and services.

The primary internal driver for cooperation is the firm's R&D unit. The financing of cooperation projects is regarded as an insignificant factor since it is acknowledged as substantially improving innovative capabilities. Negative experiences resulted in the change of partner KIBS, although this produced no doubts concerning whether cooperation with KIBS should be terminated indefinitely as it was continued to be seen as vital and indispensable. Long-term relations are considered optimal for research cooperation with KIBS, because switching costs are considered high. However, in practice, the cooperation of *company P* with KIBS reflects a mixture between project-based and long-term relations. The selection process of *company P* is strongly influenced by the use of informal networks. Additionally, formal networks are used to obtain additional contacts and extend the informal network. The intensive use of formal networks is explained as resulting from the company's peripheral location. A high degree of external cooperation is thus seen as indispensable since innovation in their sector is driven by the demands of larger automotive firms. This creates another incentive to cooperate in formal networks and apply a cooperative research design.

Intense human interaction is required during the cooperation with KIBS, even involving the CEOs of both project partners. On a technical level, the communication with KIBS is undertaken by the employees who run the respective project with the KIBS firm. The highly specialized knowledge in the firm's field is a preliminary requirement for cooperation, which is only allowed if the KIBS' representatives are considered trustworthy. For example, the cooperation with a private research institute lasted for more than 20 years, yet ended when the professor in charge of the cooperation retired. Due to the lack of trust, *company P* decided not to continue the cooperation, despite facing severe difficulties in finding a similar cooperation partner. Mutual trust is a prerequisite for cooperation and compensated the difficulty in estimating the quality level anticipated by its prospective cooperation with a KIBS. Thus, a general risk aversion does not hinder cooperation, since *company P* is confident that their experience in trust-building procedures ensures a good selection and cooperation, leading to incremental innovative progress.

The case of *company P* demonstrates that frequent users of KIBS are similarly influenced by the difficulties of uncertain information at the different stages of cooperation with KIBS. However, cooperating with KIBS is indispensable to the firm, whereby measures to reduce search costs and uncertainty to build up mutual trust are taken. The respective firm makes extensive use of formal and informal networks to gain pre-cooperation information and distinctly aim at establishing reliable long-terms cooperation characterized by mutual trust. This

strategy results in incremental innovation due to the successful innovation transfer from KIBS and its indirect transformative influences on the firm.

## **5. Discussion**

Our results can provide a better understanding of firms' perceptions of KIBS and the specifics of their demand for cooperation. The role of KIBS differs between the use of KIBS with no innovative effects and those with direct innovative effects. All of the companies interviewed used KIBS for non-innovative purposes, such as the outsourcing of production processes or connected to legal requirements, which can have indirect effects on innovative capacity through a more efficient use of resources (Görg and Hanley, 2011; Martínez-Argüelles and Rubiera-Morollón, 2006). In SMEs cooperating with KIBS for innovative purposes, the transfer of innovation was considered more important compared to the recombination of knowledge by KIBS. Therefore, the innovative influence on regular KIBS users appeared to be incremental and the result of a routine learning process. By contrast, the firms with only little experience in using KIBS perceived the cooperation as rather disruptive.

Despite examples of successful cooperation with little frictions in all stages of the cooperation, our results suggest that the demand side is strongly driven by a credence good situation, particularly for SMEs. Three aspects concerning innovative projects with KIBS point to credence goods characteristics. Firstly, in the cases where cooperation did not yield a profit or even a loss, the respective CEOs were unable to explain why the positive expectation could not be fulfilled after the end of the cooperation. Secondly, the experience of the CEOs reflects that the contracts fail not guarantee control – neither overall nor partial – over the behavior and performance of KIBS during cooperative projects. A particular aspect of this was KIBS' communication, which was criticized as being too theoretical and lacking understanding of the specific practical problems within SMEs. Furthermore, the immediate responsibilities for implementing proposed changes and the complexity of the measures were criticized as being hardly controllable, as was the danger of knowledge spillovers via KIBS. Thirdly, firms emphasized that they were unable to assess the quality of the measures taken and the exact gains from the cooperation ex post. The extensive asymmetry of information observed both before and during the cooperation warrants the interpretation that KIBS are credence goods. SMEs regularly struggle to cope with the situation of asymmetric information and a resulting lack of control when cooperating with KIBS, which has a substantial influence on the decision and

selection process, often leading to a general decision against seeking external innovative cooperation. The credence good situation thus shifts the demand for KIBS to non-innovate purposes or ultimately - in the case of prohibitive information barriers - precludes KIBS use altogether. This characteristic of KIBS use has been suggested theoretically and empirically (Kox and Rubalcaba, 2007a; Satzger et al., 2009; van Cruysen and Hollanders, 2008), with particular emphasis on legal services (Camignani and Giacomelli, 2010) and accounting (Demski, 2007). Our results lend support to these studies, providing qualitative evidence for this interpretation of KIBS-SME relations.

A common reaction to the credence good problem is to resort to informal networks to reduce information barriers. While this reduces search costs and contributes to the effectiveness of the respective RIS, it also leads to the swift diffusion of negative experiences, which precludes future cooperation. Our results illustrate the crucial role of CEOs in smaller companies that often rely on stereotypes and skeptical attitudes regarding external innovation cooperation. Thus, the reliance on informal networks in peripheral regions might ultimately contribute to reduced innovative activities among firms.

Another reaction to the lack of trust in KIBS - particularly for smaller companies - is to resort to public consulting. In the case of Germany, public institutions also offer knowledge-intensive services for SMEs in some KIBS sub-sectors like R&D, consultancy and education services. Djellal et al. (2013) show that public KIBS in fact contribute considerably to the capacity of innovation systems to innovate and act as gatekeepers in networks for private KIBS by promoting contacts. The choice of public or private KIBS is influenced by the credence good situation observed in our sample, since many SMEs place more trust in public services such as regional chambers of commerce or chamber of crafts. Interviewees emphasize that the fear of knowledge spillovers and the expectation of longer, more stable cooperation are the central reasons for the appreciation of public over private KIBS. For instance, *company A* generally refused to cooperate with private R&D consultancies for the fear of losing core innovations to competitors, yet worked with the public chamber of crafts on a regular basis due to its institutional and personal stability, which generated trustworthiness. However, this strong preference for public KIBS is limited to micro and small enterprises in our sample.

These results have consequences for our understanding of the role of KIBS within peripheral RIS. The concept of KIBS in RIS is based upon the idea that an innovative distributor of academic knowledge fosters learning processes and thus provides long-term competitive advantages to client firms. The efficient distribution of knowledge subsequently increases the

innovative performance of all firms within the RIS. However, our results show that this mechanism cannot be universally assumed, particularly in peripheral RIS. Owing to a number of factors concerning increasing uncertainty, the systemic influence of KIBS on the innovative capability of the entire RIS is lower than expected from a theoretical perspective, which has also been suggested by Tether and Tajar (2008). While informal networks are used to gather information more efficiently, the reach of these networks is limited and also regularly works against further cooperation due to the spreading of skeptical attitudes and individual negative experiences. Smaller firms in particular shun the uncertainties of using KIBS and tend to either refuse cooperation altogether or stick to the established public service providers. Thus, the spreading of innovative ideas - particularly from academic sources - is severely limited by firms' inability or unwillingness to cope with the risks and uncertainties of cooperation with KIBS.

This leads to distinct policy implications for the design of regional innovative systems. The core function of regional policy would thus be to reduce the credence good situation for SMEs to foster cooperation with KIBS. The core requirement for reducing the issue of uncertain prospects of cooperation would be the provision of detailed information and best practice examples on available KIBS services to SMEs. This informational networking would need to be undertaken by public institutions, such as chambers of commerce or craft, as they are considered impartial institutions by SMEs. By providing a larger formal networks that aims at integrating SMEs in terms of information on KIBS, a formal approach could somewhat replace the informal networks that are often dominated by negative stereotypes and experiences with KIBS. The establishment and maintenance of a newly fostered formal informational network on KIBS would necessarily be state-funded in the case of peripheral RIS. The resources available for the gathering and provision of information are obviously limited in a business environment dominated by SMEs that are often skeptical of the prospects of innovative cooperation. Particularly when few larger international corporations constitute the center of a RIS, even higher competitive pressure will not lead to stronger innovative cooperation due to problems associated with the credence good situation. Thus, to overcome a cooperative stagnation in peripheral SME networks, the public funding of formal network efforts appears to be a core requirement to initiate a critical mass of successful KIBS-SME cooperation. Once a certain level of cooperation within both formal and informal networks has been achieved, cooperation might become self-supporting, although the initial reduction of uncertainty through extensive information provision justifies state subsidies in peripheral RIS.

## 6. Conclusion

Within the literature discussing the increasing relevance of ICT in the structure of modern economies and the growing relevance of external service industries for firms, KIBS research holds a prominent role. However, while the specifics of KIBS and their effects have been highlighted, the internal perspective of client firms has been neglected to date. This is problematic for policy-makers considering how to improve RIS by fostering innovative cooperation between SMEs and KIBS. We provide an internal perspective on SMEs' decision-making and cooperation patterns to further our understanding of KIBS from the demand side, as well as providing policy implications, particularly for peripheral regions.

We find that cooperation at all stages is characterized by strong information asymmetries between KIBS and SMEs, which leads to the interpretation that KIBS use has credence good properties for SMEs. The uncertainties associated with using external knowledge for innovative purposes often lead to substantial distrust in KIBS, which manifests in informal networks and rather discourages future innovative cooperation. Thus, cooperation within peripheral regions can deteriorate due to the dissemination of worst-case examples and widespread skepticism of SMEs' decision-makers. To alleviate the credence good difficulties for SMEs, regional policy should foster the dissemination of information by regional chambers of craft and commerce. These state institutions are perceived as neutral and disinterested in making a profit by exploiting information asymmetries. Consequently, such chambers should extend their efforts to maintain formal networks including smaller firms and KIBS to provide comprehensive information and experiences of previous cooperation. This could strengthen mutual trust between firms, which is been emphasized as the key prerequisite to successful cooperation with KIBS. Thus, drawing upon the interpretation of KIBS as credence goods to SMEs, policy-makers in peripheral RIS should focus on establishing structures that succeed in the impartial provision of information and the building of trust.

Obviously, there are a number of limitations to our study. Most importantly, our sample suggests fairly unanimously that KIBS are seen as a credence good by SMEs due to their limited experience and reliance on potentially biased informal networks. However, this might be a region-specific effect of the peripheral region that we investigated. Thus, our interpretation of the credence good problem requires additional empirical testing to exceed the exploratory scope presented in this paper. Furthermore, the distinct perception and trust in public and private support appears to be a fruitful field for future research. Given that trust is the core requirement for innovative cooperation and that informational asymmetries discourage the use of external

knowledge, publicly funded innovation support might be a viable alternative for specific RIS. However, other policy instruments that effectively build up trust between KIBS and firms and reduce their reluctance to cooperate should be investigated further.

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## **Chapter 3**

### **Bad News travels fast -**

### **The role of informal networks for SME-KIBS cooperation**

**with Till Proeger**

Accepted chapter: Knowledge Intensive Business Services and Regional Competitiveness,  
Routledge.

**Abstract:** Based upon interviews with SMEs, we analyze the role of informal networks for innovative cooperation with knowledge-intensive business services (KIBS) in a peripheral regional innovation system in Germany. We focus on informal networks disseminating information, which compensate for SMEs' lack of information about KIBS, but also foster the dissemination of worst-case examples. The resulting skepticism within their informal networks reduces SMEs' inclination to conduct innovative cooperation. We argue that this reduces a region's overall innovative capabilities and that, consequently, policy-makers should build trust between SMEs and KIBS by establishing formal networks maintained by institutions considered to be impartial by SMEs.

**Keywords:** informal networks, knowledge-intensive business services, negativity bias, regional innovation system, small and medium-sized enterprises, trust building

**JEL-Codes:** D21, D40, H25, H40 , L23

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## **Chapter 4**

### **Energy efficiency consultants as change agents?**

### **Examining the reasons for EECs' limited success**

**with Petrik Runst**

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Download: <http://www.ifh.wiwi.uni-goettingen.de/sites/default/files/ifh%20wp-1%202015.pdf>.

**Abstract:** Residential energy consumption has been increasingly singled out by public policies as a key area for potential emission reduction. The public implementation of energy efficiency consultants (EECs) as change agents aims at the diffusion of innovation in building efficiency and overcoming information asymmetries in the construction sector. However, the success of these measures has been described as low. We conducted a case study involving 17 in-depth expert interviews to examine the causes of this failure within the German institutional context. This analysis has important implications for EECs in general and other European countries. We show that credence good characteristics in the ECC market led to a low willingness to pay. Certification of EECs does not suffice to overcome information asymmetries. We also identify a mismatch between EECs and customer incentives. As top-down policies have failed to facilitate a viable EEC market, we recommend a greater role for private and private-public networks, the cutting of EEC subsidies and a closer alignment between climate policy goals and home owners' economic efficiency considerations.

**Highlights:**

- Energy Efficiency Consultants have not increased the rate of energetic retrofits in Germany.
- We show that credence good characteristics in the ECC market led to a low willingness to pay.
- Certification of EECs does not suffice to overcome information asymmetries.

**Keywords:** Asymmetric information, Credence goods, labeling, Change agents, Energy audits

## 1. Introduction

One goal of environmental policy is to reduce carbon emissions, which requires an increase in energy efficiency. For example, the residential housing sector in Germany - accounting for 40% final energy consumption - has been targeted by energy policy (Friedrich et al., 2007). The German environmental agency defined the goal of doubling the full retrofit rate from one to two percent (UBA, 2014). In fact, many European countries have put policy measures in place to achieve related goals (see Friedrich, 2013).

Nonetheless, retrofit activities often lag behind expectations (Bürger, 2013; Weiss et al., 2012). The stricter and more expensive energy efficiency criteria of environmental policies do not always translate into actual building-modernization as house owners are primarily motivated by a desire to minimize energy costs (Galvin and Sunikka-Blank, 2013; Kornhardt, 2014; Sunikka-Blank and Galvin, 2012). In response, a variety of subsidies have been put in place across European countries (Friedrich, 2013). On the other hand, there are a number of cases in which building-retrofitting is viable without financial assistance, especially if the building is old or heating and hot water systems are not up-to-date (DENA, 2012).

A second set of obstacles identified by public officials (BMWi, 2014, 4) as well as the academic literature revolves around information diffusion. The market of energetic retrofit displays a high degree of uncertainty due to its complexity and informational barriers. The German Federal Ministry for Economic Affairs and Energy states that home owners are frequently ignorant of the potential savings of retrofitting (BMWi, 2014, 4).

Since innovation and its diffusion play a key for sustainable development, the role of innovation intermediaries has gained attention in recent years (Howells, 2006). In particular, policy instruments regarding the diffusion of innovative solutions in environmental goods markets have been critically discussed and evaluated (Jaffe et al., 2005; Vollebergh and Kemfert, 2005). According to Rogers (2003), 'change agents' foster the diffusion of knowledge.

Construction companies may be providers of relevant information, i.e. serving as change agents. By suggesting and implementing retrofit activities, they diffuse available technological know-how. However, the aforementioned strategy paper by the German government as well as other official documents and regulations indicate that a reliance on market forces (i.e. construction firms) will remain insufficient because the market for retrofit construction displays credence good characteristics, i.e. customers are unable to evaluate the quality characteristics of the obtained good or service (see Akerlof, 1970; Dulleck and Kerschbamer, 2006; Spence, 1973;

Stigler, 1961). Home owners are less knowledgeable than constructors and they may find it difficult to evaluate quality ex-post. The Ministry of Economic Affairs and Energy states that construction mistakes and architectural failures as well as the focus on single efficiency measures (as opposed to longer term road maps) has reduced home owners' confidence in retrofit activities. This line of reasoning reflects the possibility of the misuse of expert knowledge. In the absence of reliable information and quality control, builders may either suggest the implementation of too many efficiency measures or they may provide lower quality than agreed ex-ante. In both cases, home owner trust will deteriorate and demand will decline, thus directly thwarting environmental policy goals.

In order to overcome these problems (and increase transparency, information flows and ex-post quality controls), energy efficiency consultants (EECs)<sup>6</sup> have been promoted as key actors of energy policy in Germany (Feser et al., 2015) and elsewhere (e.g. Sweden: Mahapatra et al., 2011; Finland: Virkki-Hatakka et al., 2013; Belgium and Denmark: Gram-Hanssen et al., 2007; USA: Gillich, 2013; UK: Palmer et al., 2013) for over a decade. EECs in Germany provide energy audits for buildings and suggest possible routes of modernization. These road maps include estimated cost-effectiveness calculations and they are supposed to pay attention to the specific resources and requirements of each household. Audits are required to be independent assessments. As such, an individual who holds an energy consultancy certificate must not work as an EEC if he/she also runs a construction company, to avoid the temptation of biasing reports toward his/her own line of business. In order to be listed as an EEC expert, training at one of several educational institutions (e.g. universities, educational centers of the crafts organization) must be undertaken. Only certain individuals in certain occupations (architects, engineers, master craftsman) are eligible (see Henger et al., 2015).

The role and impact of EECs has been discussed in the literature. Initial results are presented by Bartiaux (2008), Gram-Hanssen et al. (2007), Gillich (2013), Mahapatra et al. (2011), Owen et al. (2014), Palmer et al. (2013) and Virkki-Hatakka et al. (2013). Being in an exploratory phase, the influence of EECs on customers' decisions to implement energy efficiency measures has been described as low.<sup>7</sup> Furthermore, customers' willingness to pay for EEC services is also low (see Feser et al., 2015). The puzzle of why the EEC impact on energy efficiency measures is weak remains unresolved in the literature.

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<sup>6</sup> In the literature, a variety of different names are given to the energy efficiency adviser, e.g. energy adviser (Mahapatra et al., 2011), energy auditor (Palmer et al., 2013), retrofit adviser (Owen et al., 2014).

<sup>7</sup> By contrast, Achtnicht and Madlener (2014) find evidence of a positive association between EECs and implementation. However, their results are based upon hypothetical scenarios.

In this paper, we present evidence from interviews with 17 experts in the residential sector in Germany, whereby we aim to understand why EECs currently fail to play the role of change agents. Our results suggest that the problem of asymmetric information in the market for retrofit construction might have been overemphasized. Residential constructors are mostly small businesses who operate locally. Reputation effects may partially mitigate the temptation to “sell lemons”. As constructors usually provide more than one service (roofers also install PV equipment; carpenters also insulate building envelopes and floors, etc.), they hope to acquire follow-up business by providing acceptable quality.

In addition, the introduction of EECs has de facto replaced one asymmetric information problem with another. We cautiously suggest that the asymmetries in the market for EECs are potentially worse than those in the construction sector that they seek to overcome. The consultant interviewees in our sample complain about competition from construction companies. Home owners prefer unsubsidized advice from local craftsman who they know - at least to some extent - rather than seeking out EEC services. EECs operate in a wider geographical area, which reduces the effectiveness of reputation-building mechanisms. They do not strive to gain follow-up business as retrofit activities will be undertaken in 30 to 50 year intervals at best.

Our interviews suggest that EECs do not succeed in signaling their quality to potential customers, i.e. they cannot overcome information asymmetries regarding quality. Consequently, they face a lack of trust and a low willingness to pay. In fact, most EECs’ income is generated through subsidized audits mandated to receive government funding for retrofit activities. We find that mandatory training does not suffice to overcome information asymmetries.

We also identify a mismatch of incentives between house owners - who are mostly interested in economic efficiency - and EECs, who have an incentive to maximize technological efficiency.

While we focus on the case of Germany in this paper, this analysis has important implications for EECs in general and other European countries with a similar stock of buildings ( Murphy, 2014; Rosenow and Galvin, 2013). In particular, the paper strives to highlight the potential problems regarding the introduction of energy consultants as a potential driver of home energy efficiency measures.

The remainder of the paper is structured as follows. In section two, the literature on credence goods, energy performance certificates (EPCs) and EECs is reviewed, followed by a description of the methodology and the sample. Section four presents the findings of the interviews. We conclude by highlighting policy implications, limitations and future research recommendations in section five.

## **2. Asymmetric information in the market for energy-focused home refurbishments**

Credence good characteristics of expert markets - in which customers cannot evaluate the quality of the product or service obtained - is fundamental for the analysis of the EEC market. Based upon Akerlof's (1970) seminal paper about uncertainty in markets and Darby and Karni's (1973) contribution in the classification of search, experience and credence goods, the literature on credence goods has evolved extensively and deals with the fraudulent behavior of experts. Dulleck and Kerschbamer (2006) offer a formalized theoretical framework, emphasizing overcharging, under-treatment and over-treatment as main problems arising from the informational asymmetry between expert and customer. Some empirical evidence has shown a market breakdown or a reduced demand for credence goods driven by experts' fraudulent behavior; for example, in the case of car repairs (Beck et al., 2014; Schneider, 2012), taxi drivers (Balafoutas et al., 2013) and online reviews (Latzy, Shannon et al., 2014). Overcoming these problems with expert services, d'Andria (2013) suggests sharing information on a broader basis, engaging in advertising, building reputation and assuming liability and certification.

The discrepancy between climate policy goals and home owner behavior regarding energetic retrofits fostered the idea of providing additional public information through EPCs. The European parliament implemented the *Directive on end use energy efficiency and energy services* (Directive 2006/32/EC), which requires the member states to provide information on energy efficiency measures and values the role of advice (European Union, 2006).

Current research focuses on the perspective of house owners. EPCs provide information on the energy efficiency level of specific buildings. Ideally, they reduce search costs (Gilmer, 1989). EPCs have been found to produce price premiums (Kahn and Kok, 2014), although a number of downsides have been discussed in the literature. The certificates have been found to weakly affect home owner decisions since the customers failed to remember the EPCs (Amecke, 2011).

In the pre-purchase phase, house owners do not perceive a reduction of informational hurdles (Murphy, 2014).

Effects on the energy efficiency of the housing sector are hardly visible in the short and medium run (Stavins et al., 2013). Furthermore, the lack of customer understanding of EPCs is discussed as a barrier for the establishment of EPCs in the literature. The function and effect of EPCs remain somewhat unclear for the user (Backhaus et al., 2011). Moreover, adding house-specific information is costly but more general information is less useful for home owners (Stavins et al., 2013). In particular, experimental evidence showed that economic information is valued more than information on carbon emission and real energy use (Newell and Siikamäki, 2013). However, the latter information is mostly displayed on European EPCs. Belgian and Danish customers interpreted the additional information of EPCs critically, questioning its content (Gram-Hanssen et al., 2007). Furthermore, Christensen et al. (2014) have found that EPCs hardly offer reliable information for house owners since the majority lack trust in the content of EPCs.

EECs have been implemented as change agents to issue EPCs and advise customers about the possibilities for innovative retrofits. Change agents support the diffusion of innovation and reduce uncertainty in the innovation process. They provide knowledge about the application and implementation of innovative technologies (Rogers, 2003). Change agents may foster technological progress (Backhaus, 2010; van Lente et al., 2003). Implemented as a top-down policy (Backhaus, 2010), EECs are intended to support the technological progress of retrofits in the residential sector.

The literature concludes that the introduction of EECs has yielded mixed results, pointing at various obstacles for change agents, which - according to Owen et al. (2014) - are “beyond the reach of current policy interventions”. The heterogeneity of professional backgrounds leads to uncertainty concerning the outcome of audits (Virkki-Hatakka et al., 2013). The subjectively perceived success of energy consulting depends on the motivation and job satisfaction of the EECs (Mahapatra et al., 2011). While the dependency of EEC markets on public intervention is part of the discussion (Gillich, 2013; Gillingham and Palmer, 2014), the weak effect of EECs on rates of home modernization has been analyzed, referring to credence characteristics of EECs (Owen et al., 2014). Nonetheless, the specific reasons underlying the failure of EECs remain unclear.

The policy intended to reduce information asymmetries concerning the planning, implementation and execution of energetic retrofits by politically implementing a market for EECs (Feser et al., 2015). EECs may support customers in understanding the complexity of the retrofit and apply innovative solutions. Moreover, access to public subsidies is granted via EECs who have to monitor and certify the retrofit, aiming to improve the efficiency of the housing stock.

The regulatory framework permits EECs to offer EPCs. House owners can only receive public retrofit funds if they have hired an EEC. In order to bear the label of an EEC, the individual must complete training provided by a university or an organization in the field of architecture, engineering or crafts, or a host of other institutions (see Henger et al., 2015). The occupation is open to most actors in the building sector, which explains the heterogeneous educational backgrounds of the EEC sector. However, the EEC can only access public retrofit funds if specific certificates are obtained from an educational institution such as a university, architectural or crafts organization.<sup>8</sup>

To increase the visibility of EECs' quality, a web portal with a public EEC list has been established, which is accessible online and registration is administrated from the national energy agency (DENA). DENA grants access to the list and evaluates the prerequisites of being listed by checking the individuals' certification. Most federal subsidy programs demand that house owners hire an EEC who is listed. Currently, there are about 13,000 individuals on that list.<sup>9</sup>

In order to prevent fraudulent EEC behavior, subsidies can only be received if an independent consultant is hired. The EECs are obliged to consult customers without providing specific product recommendations and they are prohibited from profiting from the actual retrofit implementation. The owner of a construction company thus cannot be hired as an EEC and subsequently implement the suggested measures. There is one exception at the federal level, namely the subsidy program for single energy efficiency measures - in contrast to comprehensive measures - of the KfW. Given that this one program already covers 82% of all

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<sup>8</sup> The certificates are structured as follows: According to different building types, different certificates are required to conduct energy efficiency consulting in the specific programmes. For example, in order to apply for public funds for retrofitting historic buildings, courses with specialization in this subject need to be attended. Higher quality retrofits require higher quality standards. The certificates usually cannot be combined, which means that for every certificate a new number of courses needs to be attended. Due to the technological progress and dynamic changes in retrofit, the certificates need to be renewed every two years.

<sup>9</sup> The list is regularly updated and can be found at: <https://www.energie-effizienz-experten.de> (retrieved 07/17/2015).

subsidies (KfW, 2014b), the neutral position of EECs is only effective for a small proportion of all subsidies.

### **3. Methodology and sample**

Case studies and qualitative research is a recognized approach to discover theoretical insights (Edmondson and McManus, 2007; Eisenhardt 1989; Eisenhardt and Graebner, 2007). Case studies support the development of abstract concepts (Ben and Steemers, 2014; Muench et al., 2014; Rogers et al., 2012). Based upon the grounded theory (Glaser 1965; Glaser and Strauss, 2008), our observations are used to develop an understanding about why EECs have such a low impact on the implementation of energetic retrofitting (Edmondson and McManus, 2007).

The selection of experts follows the logic of the theoretical sampling (Glaser and Strauss, 2008). Our sample aims at theoretical saturation, while we are oriented by the different requirements that a certified EEC needs to meet. First, we analyze access paths to becoming a certified EEC, which is limited to architects, civil engineers and craftsmen in the construction sector in the German case. We interviewed stakeholders in all three groups, as well as individuals in related political associations and institutions. An overview of the interviewed experts and their professional background is provided in table 1. All experts were working in Germany at the time of the interview. We refer to the experts in our paper by using IDs - which can be found in the first column of table 1 - to provide anonymity and reduce social desirability biasing when answering. 17 interviews were conducted personally and via phone between February and May, 2015. The interviews lasted between 40 and 70 minutes.

Our semi-structured questionnaire is separated into three sections (see table 1) following the approach of Muench et al. (2014). First, we asked about the role of EECs in home energy refurbishing. Only the legal framework of the certified EECs provided orientation for the definition, while the details about the job description remained unclear. Second, we asked about obstacles that EECs face in their daily work. Finally, recommendations about the consulting process and the policy changes concluded the interviews. Within each section, we began by asking open questions, followed by closed questions derived from the EEC literature. The questionnaire was discussed and reviewed with academics with an economic, legal, architectural or engineering background to assure theoretical fit and comprehension. Finally, the questionnaire was double-checked with a cognitive pre-test using thinking-aloud and comprehension (Collins, 2003).

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**Key questions**

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Describe the activities of energy consulting.

Which are the most important elements of energy consulting?

Characterize barriers for the success of energy consulting.

Which problems arise from the certified energy consulting?

What can you recommend to overcome the mentioned barriers?

Which recommendations can you identify as central?

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Table 1

Based upon Mayring (2004), a qualitative content analysis was conducted focusing on the reduction of content, followed by the analysis of the relevant content. After recording, the interviews were transcribed and cross-checked with press material and online research. Furthermore, the material was first inductively coded (Glaser and Strauss, 2008). Beginning with open coding, we marked the relevant content that was connected to our research question. Subsequently, we created categories and sub-categories, defined by the collection of related codes. Categories were revised with deductive codes from the literature (Mayring, 2004). In the case of misleading categories, categories were adjusted and newly defined. These categories and sub-categories were described in a coding manual to assure the comparison of the codes. For preventing critique of subjective coding - which appears as a major disadvantage (White and Marsh, 2006) - memos for the codes were written and the codes were discussed between the authors.

EEC Coding	Research and Education	EEC	Political and professional Association	Background
#A	X			Architecture
#B	X			Engineering
#C	X			Craft
#D	X			State Regulation
#E		X		Craft
#F		X		Craft
#G		X		Engineering
#H		X		Architecture
#I		X		Architecture
#J			X	Regional Energy Agency
#K			X	National Energy Agency
#L			X	Innovation support coordination
#M			X	Innovation support bank
#N			X	EEC Journal
#O			X	Architect Professional Association
#P			X	EEC Association
#Q			X	EEC Association
<b>Total</b>	<b>4</b>	<b>5</b>	<b>8</b>	

Table 2

The following chapter discusses the results of our interviews in detail concerning the willingness to pay for EEC, the public certification system and a mismatch between customers and EECs owing to the phenomena described above.

#### 4. Results

The analysis of the interviews has revealed a variety of impediments to the smooth functioning of the EEC market. A large number of interviewees criticized the discrepancy between ideal energy efficiency consulting and its practical implementation within a dynamic environment characterized by the heterogeneity of its actors. Another central argument for problems in the EEC market was the long amortization duration of retrofit measures and the low willingness of the polity to pay for increasing the rate for retrofit to fulfill energy-reducing goals. In the following section, we analyze the informational asymmetries of retrofits, whereby our research focuses on the intended role of EECs as change agents.

#### **4.1. Complexity and credence goods characteristics in the market for energy consulting**

Willingness to pay reflects a customer's expectation of benefiting from buying a product. In markets with perfect information, prices signal differences in quality. In particular, the customers' willingness to pay reveals demand for a certain quality level and attributes a subjective value for a good or service. All interviewees aside from one mentioned a low willingness to pay as a barrier for offering high-quality services. Therefore, there is a need to understand the information asymmetries and how they contribute to a lower willingness to pay.

According to the interviewees, the costs of energetic retrofits are too complex for customers to fully understand (#D, #F, #H, #I, #K, #M, #N, #P): Ex-ante, the energy-related costs have not been noticed as relevant; indeed, the energy costs incurred are often unknown (#K, #P). Additionally, the current low energy prices and the uncertainty about the future prices affect customers' decisions to renovate their houses (#A, #B, #G, #L). After the retrofit, the evaluation of outcomes remains difficult due to user-driven rebound effects (#I, #P) and the limited observability of hired companies' behavior, which can lead to lower savings than expected (#D). In addition to the technical complexity, renovation is a once-in-a-lifetime decision for most homeowners (#M) since the retrofit cycle ranges from 30 to 50 years (#A, #P). Thus, owners cannot rely on past experience and knowledge.

Since the future costs of energy use are unknown, the estimation of the additional benefit of using EECs in relation to the outcome of the retrofit appears difficult (#A, #P). The low willingness to pay for EECs is interpreted by the interviewees as a lack of interest in EECs due to the complexity of retrofit (#D, #F, #H, #I, #K, #M, #N, #P). One interviewee described the case of acquaintances who had planned on retrofitting to save energy and reduce their personal emissions. The couple started to obtain information on regulations, subsidies and innovative opportunities for energy efficiency solutions, but ultimately they decided to postpone as the complexity of the retrofit was perceived as too high and the contribution to their environmentally-friendly way of living was only indirectly visible (#N).

In addition to retrofit-related information asymmetries, the EEC service itself suffers from information asymmetries. EECs have more information about their service than the customer. While the majority of the interviewees stated that finding an economically efficient solution is important, information deficiencies regarding economic efficiency were confirmed by all interviewees and represent a main problem for EECs. Interviewee #K characterized the poor

information state as a “key problem” for the low acceptance of retrofit. There are different possibilities for consultants to measure economic efficiency depending on the methodology as well as assumptions about the customers’ consumption and future behavior.

Furthermore, non-monetary arguments - namely providing better living conditions after the retrofit - are promoted by EECs (#B, #J). In part, EECs do not present reduced energy consumption as a main outcome of retrofit, but rather they emphasize better living standards in renovated houses. However, the result can hardly be measured or objectively evaluated ex-ante; rather, this additional factor adds further complexity to customers’ decisions and the visibility of the benefit of using EECs decreases (#A, #M). The use of non-monetary arguments thus creates a higher degree of uncertainty since the ex-post success of a high-cost decision relies on an additional non-monetary aspect.

The information asymmetries between experts and customers lead to the perception of EECs as being prone to fraudulent behavior (#A, #B, #G, #J). In particular, the uncertainty about possible benefits makes customers fearful about paying for a service without receiving tangible benefits in return (#A, #G). This critique has particularly arisen since the experience in using EECs is low (#I, #P): in its current market size, it has only existed for about seven years.

Two other developments in the EEC sector contribute to a lower willingness to pay. The informal supply of low-cost and low-quality EECs is problematic. First, the competition with EECs from non-certified experts was mentioned by 11 interviewees. This means that other companies like construction businesses and craft companies offer informal energy consulting with the goal of selling their product or service and receiving additional contracts from the retrofit. Moreover, due to EU regulation, energy suppliers are obliged to offer a certain number of EECs (Directive 2012/27/EU). The effect of competitive non-certified EECs is described by the interviewees as lowering the general quality level of EECs. In particular, the existence of low-quality offers has increased the difficulties for customers to differentiate them from high-quality EECs (#F, #K, #N). Second, numerous low-cost public EECs have increased the noise to signal ratio in the market. There are a variety of public EECs, often not coordinated between different state authorities (#J, #L, #Q). Public services provide so-called “entry” energy consultancies aiming to lower the level of complexity of retrofit. While the low-price public consulting intends to communicate basic knowledge about the energetic status of a building, it is difficult for the customer to understand whether the entry consulting offers sufficient knowledge for a retrofit (#H, #J, #O, #P). Therefore, it is difficult for the customer to understand

the difference between a public low-cost EEC and a complete high-quality EEC offered on the market.

Dealing with the information asymmetries, customers' trust in the competence of EECs is a prerequisite for a successful relation and the basis for cooperation with EECs (#D, #H, #I, #F, #Q). Since customers can hardly base their judgments on solid facts, a high degree of uncertainty is observable (#D, #F, #H, #K, #P). The complexity of retrofits and the difficulties of EECs in translating the technical circumstances into a language that customers understand fosters problems with EECs (#L, #O, #P). Therefore, potential customers search for EECs via informal networks comprising family, friends and business partners, based upon recommendations (#D, #H). In particular, EECs know about the sensitivity of the relation to the customer and value the success of retrofit as being important for their own reputation. The majority of the interviewees emphasized the negative publicity due to fraudulent experts and its consequence for future demand.

Prices for EEC are not regulated and can be chosen freely by the EEC (#C), in contrast to other consulting services in the building sector (#G). Therefore, price differentiation contingent on quality may ensue (#C, #D, #Q). However, the price for EECs fails to signal quality due to information asymmetries. Even in cases of business customers, it appears difficult to differentiate between different offers (#C). EECs in training courses organized by the craft chamber are often surprised by the variety of the offers, despite having several years of experience in this sector (C#). Specifically, the connection between EECs' quality and the willingness to pay a higher price is questionable due to ex-post difficulties to verify the received quality.

Overall, the market for EEC is characterized by a low willingness to pay. An analysis of information asymmetries has shown that retrofit activities display information asymmetries while energy consulting itself also has credence characteristics. Consequently, a lack of customer trust is observable. Quality signals in the market for energy consulting are hardly credible and the correlation between prices and quality is not inherent.

#### **4.2. Entry requirements and licensing as solutions to information asymmetries**

Regardless of educational background, anybody can offer their services as an EEC (#E, #G, #H, #I, #K, #N). The existence of unqualified EECs creates uncertainty in the EEC market since negative reports have been published in the media, negatively affecting the perception of EEC

markets, which are often described as “lemon” markets (#N). Due to regulatory barriers from the EU and the federal level, entry regulation of the profession is not likely, in contrast to other professions such as car mechanics or medical doctors in Germany (#H, #N). The market is characterized by unrestricted entry and an inability to credibly signal quality.

In order to overcome these problems, the German government has implemented a system of certificates, an online EEC listing for improved transparency and independency regulation for EECs (as described in section two). However, these interventions have only been partially successful. At present, the publicly sponsored EEC market remains sluggish (Henger et al., 2015). As laid out above, the majority of interviewees state that mistrust about the quality of the EEC service has been generated by fraudulent EECs in the market.

The interviewees evaluated the role of the state for the EEC sector critically, but mostly considered it was necessary to assure a quality minimum. The value of the certificates was seen as mixed as they provide little quality information for customers (#A, #G, #P, #Q). In order to receive the certificate, a certain number of course credits have to be obtained. In particular, to become listed in subsidy programs, a minimum of 70 hours of lessons need to be attended. In addition, 16 class hours are required every second year (KfW, 2014a). According to professional EEC associations, this prerequisite is evaluated as too little and they have demanded up to 25% of the working hours being devoted to attending courses to keep up with the technological change (#P, #Q). The EEC associations expect their members to take up additional courses since the public requirements do not guarantee a sufficient quality standard (#P, #Q). Different quality levels can be observed in the courses (#A, #K).

The number of classes attended counts toward receiving the certificates. Qualitative differences in the courses are imperfectly mirrored by the certificates, whereby public authorities rely on the information provided by the educational institutions themselves. Thus, relevant stake holder associations are permitted to evaluate the courses that they offer without external validation (#B, #L).

Educational institutions are somewhat autonomous in creating course content. Some educational institutions have tried to make the courses comfortable for EECs neglecting the quality of the courses (#A, #B, #C, #D). The interviewees confirmed that this situation has improved, although the incentive to attract EECs with easy courses remains present. According to the interviewees, there is an incentive for EECs to participate in low-quality courses (#I, #P).

Interviewee #P described a low-quality course as follows: “I remain seated the whole day, have good food, have good drinks, speak with colleagues and have 8h of certified courses.”

Furthermore, the regulatory system requires home owners to employ EECs as monitors for ongoing construction projects if they receive public retrofit subsidies. Thus, EECs spend a considerable amount of time as monitors rather than consultants (#G, #M). To some extent, EEC courses are designed to teach participants to understand the details of public grant regulations. This necessarily subtracts from the courses’ potential to teach technical and consulting skills (#M, #Q). The ability to explain technical processes to home owners is rarely addressed by the courses. Moreover, relevant skills of the EEC profession are not always considered in certified courses (#G, #M). In particular, marketing and financial issues are neglected (#A, #E, #N).

Interviewees stated that the market intervention has been partially successful since a minimum quality has successfully been established. “It’s an improvement”, stated interviewee #B. The introduction of certificates has been successful to the extent that unqualified consultants can be excluded from receiving grants (#K, #N). Nonetheless, despite the introduction of certificates, signalling high quality still seems impossible.

It should be noted that EEC training only pertains to one aspect of a broader information asymmetry problem. If EECs had the ability to signal high-quality training via certificates, customers would nevertheless remain ignorant about the level of actual consulting effort that they receive, just as a highly qualified doctor may still underprovide screening effort or suggest too many medical interventions. While the current certification scheme assures a minimum quality level, it does not improve the quality (signal) of EECs beyond that standard.

Due to the complexities of the certification system, the information benefit for customers is small, according to the majority of the interviewees. The certificates are not understood as a quality signal for consulting since there are more than 15 different subsidy programs at the federal level requiring different certificates.<sup>10</sup> The programs are only known by a small share of home owners who potentially conduct a retrofit.

Furthermore, reduced awareness of high-quality EECs is also caused by bureaucratic circumstances. New programs lead to further differentiation of certificates, whereby every new subsidy program requires additional certificates with slightly different prerequisite and

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<sup>10</sup> Due to frequent regulatory changes, the federal government has implemented a webpage ([www.foerderdatenbank.de](http://www.foerderdatenbank.de)) to collect all the possible subsidies for retrofit.

monitoring reports (#A, #D, #H, #I, #J, #L, #N, #P). There have been frequent policy changes regarding EEC certificates in recent years, excluding some groups of EECs<sup>11</sup> or demanding extra attendance of additional courses (#A, #B, #C). Due to frequent changes, it is difficult for customers to understand the meaning of certificates. Interviewee #A commented on the visibility: “I am not even sure if the public knows that there are certified EECs.” Consequently, the awareness of certificates as a signal for qualification is low (#E, #F).

The introduction of a public list of approved EECs was evaluated somewhat positively as it enhances transparency for customers. According to the interviewees, the list has made it easier for customers to contact EECs (#D, #H, #N). Nonetheless, other interviewees stated the list is hardly known to homeowners (#A, #C).

The aforementioned emphasis on the monitoring function of EECs affects customers’ trust in the certificates as a quality signal (#M, #G). In addition, negative press about EECs and their monitoring function has created a reserved attitude among customers, as mentioned by the majority of the interviewees. Consequently, home owners discount the informational content of certificates (A, #C). According to the interviewees, trust in certified EECs is perceived as low (#A, #H). In its current design, the certification does not lower information asymmetries (#H, #N, #K). The design of the certification adds little in the way of new information about EECs’ quality for home owners, while retrofit monitoring by EECs lowers the trust in receiving high-quality consulting.

The majority of interviewees valued the independence of EECs and construction companies. Interviewees pointed to fraudulent expert behavior such as heating contractors recommending new heating systems, painters recommending insulation, etc. (#A). However, the alleged problem of information asymmetries in retrofit construction - reflecting one of the reasons for government intervention and support for home energy consulting - starkly contrasts with actual customer behavior and opinions. Since owners deal with construction companies on a somewhat regular basis, they are often contacted first (#B, #F). According to a recent survey, the most trustworthy source of advice - second to acquaintances - is craft companies (Amecke, 2012). Since retrofitting is an uncertain and costly decision for the home owner, trust is important (#D, #H, #I, #Q). Accordingly, home owners consult known and trusted experts, conducting their search via small and informal networks (#C, #D, #F, #H, #N) where reputation

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<sup>11</sup> New regulation excluded EECs with craft companies from the KfW subsidy program in March 2013. From January 2014 onwards, this exception was been removed again following protests of the craft chambers HWK (2014).

mechanisms work well. Interviewee #C describes a typical conversation in his neighborhood: “How was it [the retrofit] for you? Who did you cooperate with? Was he [the expert] competent?”

According to the interviewees, customers find it appealing to deal with construction companies directly as it does not involve the bureaucratic hurdles of applying for public EEC subsidies. In addition, home owners are required to contract with consultants when they apply for publicly subsidized low-interest loans. Due to the availability of low-interest loans in the regular credit market, customers no longer see the need to acquire EEC services (#A, #C, #E, #H). Additionally, larger construction companies employ their own EECs to inform customers and evaluate the outcome of the retrofit (#N).

The intervention’s aim was to guide home owners, diffusing innovative solutions by assuring the quality level of EECs. The low willingness to access EECs is largely caused by the EECs’ function as retrofit monitors, which distracts from their role as advisors. Home owners search for energy consultants via informal networks, whereby they appear to favor local constructors as consultants with whom they more frequently interact compared with EECs.

#### **4.3 Mismatch between user preferences and experts’ incentives**

We have identified a mismatch between EEC incentives and home owner demand. The size of the proposed retrofit project correlates with the consultant’s revenue.<sup>12</sup> Regulation requires that after the project exceeds a specified size, the certified consultant must observe and monitor the construction phase. According to several interviewees, there is an incentive to increase the size of the retrofit project beyond what is economically feasible as the EECs benefit from a more costly planning and implementation phase (#A, #B, #D, #I). Interviewee #A identified a “hardcore” energy-saving attitude among EECs, leaving economic arguments aside, contributing to the mixed reputation of EECs. The customers possibly know about the incentive of EECs to enlarge the project size but they cannot ascertain what amount of consulting and retrofitting would be optimal for them (#A, #G).

EEC subsidies also facilitate an incentive to suggest efficiency measures that are more than optimal (#B, #F, #I). EECs must write a final report. The stated goal is to achieve a high energy

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<sup>12</sup> The size of Kf subsidies depends on the efficiency level of the house achieved after the retrofit. The funds vary from 15,000 Euros for the lowest energy efficiency level up to 30,000 Euros per apartment unit in the highest energy efficiency level. A higher retrofit budget means more EEC involvement. Additional subsidies for EEC are granted up to 8,000 Euros (KfW, 2015).

efficiency level, which only translates into economic efficiency for houses with specific preconditions (old building with few previous renovations) (#Q). Therefore, it is difficult for customers to know whether the suggested measures are economical or if it is aimed at the optimum in energy savings.

The regulatory framework aims at energy saving rather than economic efficiency (#A, #O). The socio-economic circumstances of the home owner are rarely considered, particularly their age, financial situation and the state of the regional economy (#D, #E, #H, #I). There is a tension between everyday behavior and the technological requirements to reach technical efficiency. In an exemplary case described by an interviewee, one homeowner demanded to receive funds for the highest energy efficiency standard. In order to achieve this standard, the EEC had to plan for an automatic ventilation system. However, after the retrofit, the system only worked efficiently if the windows remained closed. Since the home owners were unwilling to change their behavior, this retrofit resulted in a lower de facto efficiency status (#I).

According to all interviewees, the demand for certified EECs is largely driven by public subsidies. Customers only acquire EEC services to receive public subsidies (#A, #D). The available evidence indicates a minor influence of EEC on retrofit decisions. Most customers plan retrofits with the support of non-certified EECs before they access funds through certified EECs. The impact of EECs on the choice of technology and innovative solutions is perceived as low (#B, #E, #H).

EECs only profit from retrofits that fulfill subsidy regulations (#B, #C, #E, #N). EECs' profit maximization depends on the overall retrofit project size. The incentive to enlarge the project size results from the structure of the regulation emphasizing energy saving rather than economic efficiency. The interviewees described EECs as being environmentally-conscious and supportive of energy-saving regulations (#A, #B, #O, #Q). Customers' incentives for economically efficient consulting and the EECs' incentives to enlarge the project size causes a mismatch between demand and supply.

The diffusion of innovative technologies and solutions are hardly observed in EECs' activities. The regulation hinders EECs from selecting economically profitable and innovative solutions (#B, #C, #H, #I, #O). One interviewee described a customer who considered various scenarios for the retrofit. The customer only stayed in his house at night. A particular technology was the economically efficient solution but was not publicly funded, meaning that the EEC could not offer his service (#I). Moreover, unusual solutions are not of interest to EECs, since they are

also responsible for monitoring customers following strict regulations (#B, #P). The consulting report - which is a prerequisite to receive public funds - follows a standardized guideline (#L). Non-mainstream solutions are hardly offered by EECs, given that the monitoring rules are not sufficiently flexible and they preclude some innovative proposals (#I).

In particular, the final EEC evaluation of the finished retrofit project does not examine the achieved efficiency level of the retrofit but rather the formal standards that are often approved by administratively - rather than technically - trained staff (#L, #M). Consequently, the monitoring of retrofits mainly evaluates whether the implemented retrofit fulfils the regulatory standards, while ex-post energy saving is not monitored. The EEC has strong incentives to comply with the regulation since the home owner receives direct feedback about whether he/she will receive public funds. However, the outcome of the retrofit and the EEC cannot be directly evaluated by customers due to its credence characteristics. Additionally, the regulatory framework for obtaining funds for higher energy efficiency levels hardly supports innovative solutions because the regulation prescribes a fixed set of specific technologies (#A, #I).

There is a mismatch between customers' demand and EECs' supply based upon conflicting incentives. Customers' trust in EECs suffers from this mismatch and consequently leads to EECs' low impact on the diffusion of innovative ideas. The customer searches for trusted experts who are recommended by local informal networks. EECs do not act as change agents. Economic policy may have generated an information asymmetry problem in a publicly-created EEC market, intended to solve information asymmetries in retrofit construction. Accordingly, customers appear to partially prefer construction companies over EECs in terms of energy advice.

## **5. Conclusion and Policy Implications**

Public policy has generated a market for home energy efficiency consulting. Consultants were intended to serve as change agents - i.e. to facilitate innovation diffusion - while EECs were also intended to resolve problems of asymmetric information between construction companies and home owners. The former have more technical expertise than the latter and thus they are in a position to suggest too many efficiency measures. However, the success of public policy is - at best - mixed. In this paper, we have identified a number of reasons for the failure of public policy.

Based upon semi-structured expert interviews, we have found that the EEC market is substantially affected by credence goods characteristics, i.e. there is a lack of customer trust as EECs find it difficult to signal their level of quality. Customers' willingness to pay for the service is low. In order to overcome the sluggish market conditions, publicly-introduced educational certificates have led to the establishment of a minimum standard. However, EEC services remain largely driven by the demand for public funds - which cannot be obtained otherwise - rather than a genuine desire to acquire consulting services.

We have also identified a mismatch between EECs' supply and customers' needs. Guided by state regulation, EECs aim at lowering emission and energy use while customers require energy efficient solutions that are also economically efficient.

Our results show that the EEC market is affected by credence characteristics leading to a market with a low quality offered, comparable to results in the literature (Balafoutas et al., 2013; Dulleck et al., 2011). Government intervention has not established a higher quality level, thus supporting the preliminary results discussed in the EPC literature (Amecke, 2012; Gram-Hanssen et al., 2007).

We cautiously suggest the following policy recommendations. First, the current certification scheme is implemented as a top-down regulation, leading to a widespread perception of low-quality certificates. Therefore, we propose strengthening private or public-private networks that benefit from market feedback and associated knowledge signals. A bottom-up certification could be realized by the support of professional organization in formal networks. It would offer incentives for members to upgrade their own knowledge level in a competitive environment and thereby increase the share of high quality in the EEC market. For example, in Spain and Germany, craft and commercial chambers have supported knowledge diffusion for many professions affected by credence characteristics, supporting higher quality levels with their educational institutions. These organizations lower information asymmetries because they support the acquisition of quality signals for their member firms.

Additionally, cutting public EEC funds would lead to a clearer quality signal on the EEC market by reducing low-cost public EEC offers and fostering the acceptance of EEC as market services, as opposed to being entirely subsidy dependent. Consequently, the use of EECs in public support programs should be more strongly focused on economic efficiency criteria rather than the energy-saving paradigm, since the current support of non-efficient solutions has lowered the public's approval of energy efficiency measures in the residential building sector. Our

results exemplify the difficulties of intervening in a market influenced by credence characteristics.

Given its exploratory approach, our study has certain limitations. Further research on economic policy in credence goods markets requires a more in-depth analysis to test our hypotheses with quantitative data. Additionally, while our research was carried out in Germany, analyses of expert markets from different sectors and other countries would offer the opportunity to develop a more diverse picture about the possibilities and limits of public intervention in markets suffering from asymmetric information that are associated with climate and energy policy goals.

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## **Chapter 5**

# **Asymmetric information as a barrier to knowledge spillovers in expert markets**

**with Till Proeger**

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Download: <http://wwwuser.gwdg.de/~cege/Diskussionspapiere/DP259.pdf>.

**Abstract:** This paper investigates barriers to effective knowledge spillovers for markets in which the product can be characterized as a credence good, i.e. its complexity impedes the evaluation of quality by customers both *ex-ante* and *ex-post*. We focus on the German market for energy efficiency consultants, as an emerging and subsidized sector in which the service offered has strong credence good properties. Based upon in-depth interviews with stakeholders, we analyze the determinants and barriers to knowledge spillovers. We find that the incentive to foster spillovers to increase suppliers' knowledge is limited by the difficult commercialization of additional capabilities. The implementation of a public certification scheme has failed to increase the sectoral knowledge spillovers. By contrast, the participation in formal knowledge networks has been more effective in prompting companies to foster knowledge spillovers, which has also led to a higher degree of specialization. We conclude that access to certification schemes should be further restricted to increase market transparency and private networks should be supported to achieve the aim of increasing knowledge spillovers.

**Keywords:** credence goods, knowledge spillover theory of entrepreneurship, network

**JEL-Codes:** D21, D82, H41 , L14, K23

## 1. Introduction

Innovative activities occupy ever-increasing importance for economic growth (Cooke and Leydesdorff, 2006). Knowledge spillovers have been introduced as a core element driving growth within the endogenous growth theory (Romer, 1986, 1994) and subsequently emphasized by countless studies. The development of modern knowledge economies has led to substantial global, national and regional competition for the creation of new knowledge, whereby the use of knowledge has become a crucial aspect of entrepreneurial thinking (Aghion et al., 2005; Tang, 2006). This development has increased the relevance of external sources of knowledge to increase firm-specific knowledge to a central strategic question (Howells, 2006). Various knowledge-intensive institutions such as universities, private research institutions and business services have thus been established as channels for knowledge spillovers, challenging companies to improve their internal innovative capacities (Tether and Tajar, 2008; Thomä and Bizer, 2013). Responding to this trend, researchers have investigated the determinants and optimal management of knowledge integration and spillovers as a strategic element within companies.

Initially, the focus was placed upon large enterprises and their innovative capacities leading to knowledge spillovers (Acs and Audretsch, 1988). However, following the seminal work by Audretsch (1995), the knowledge spillover theory of entrepreneurship (KSTE) has substantially broadened the concept of knowledge spillovers to better explain the contributions made by smaller companies to economic growth (Acs et al., 2012; Braunerhjelm et al., 2010; Huggins and Thompson, 2015). Within the KSTE, knowledge spillovers are considered the central driver for companies' success and thus a core element of strategic entrepreneurship (Acs et al., 2012). Knowledge spillovers have been operationalized using e.g. codified knowledge – which can be easily transferred in written form (Acosta et al., 2011; Audretsch et al., 2005) – or tacit knowledge sources, incorporated in human capital (Klepper, 2007). In particular, the case of innovative knowledge disregarded by incumbent companies and research institutions yet turned into entrepreneurial opportunities for newly established competitors has been emphasized (Acs et al., 2013; Audretsch and Keilbach, 2007).<sup>13</sup> The concept of knowledge spillovers thus helps to better understand the long-term success of companies as entrepreneurial opportunities arise from new knowledge and result in competitive advantages (Agarwal et al., 2007).

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<sup>13</sup> For recent extensive literature reviews on the results of the KSTE, see Acs et al. (2013) and Ghio et al. (2015).

Overall, the KSTE has established that the knowledge intensity in firms and sectors is the central predictor for the likelihood of knowledge spillovers and thus competitiveness in companies and sectors. However, it can be impeded by knowledge filters, a concept introduced by Acs et al. (2004) after observing regional and sectoral differences in spillover effectiveness. These filters constitute barriers to spillovers from established firms and research institutions (Bonaccorsi et al., 2013; De Silva and McComb, 2012). We suggest that the role of knowledge filters in reducing companies' incentives for increasing their knowledge basis has not been sufficiently investigated and that the focus on knowledge intensity in the KSTE should be extended accordingly. In particular, we hypothesize despite high sectoral knowledge intensity, information asymmetries are central knowledge filters preventing an effective transfer of innovative knowledge.

To investigate this hypothesis, we conduct a case study based upon expert interviews within the German energy efficiency consultant (EEC) sector<sup>14</sup>, in which homeowners are offered consulting services towards implementing energy efficiency measures. This expert market has grown substantially after several large government programs – including large subsidies – have been put in place to reduce Germany's energy consumption in private residences. The supply side of this consulting market is very heterogeneous: along with customers' inability to evaluate the service quality both before and after the transaction, this leads to a partial market failure due to distrust in expert services (Beck et al., 2014; Dulleck et al., 2011; Dulleck and Kerschbamer, 2006). The credence good properties of the service impede experts' ability to signal higher service quality and thus they also act as strong knowledge filters precluding spillovers among suppliers. Thus, despite its high sectoral knowledge intensity, the EEC market is rather dysfunctional in terms of an efficient knowledge spillover of new technologies and services. This problem can be traced back to the missing link between suppliers' capabilities and the quality observed by the customer: owing to the complexity of the product, additional firm-specific knowledge in most cases fails to increase revenues. Thus, no structural incentive is provided to actively seek knowledge spillovers within the sector.

We argue that these issues are not limited to the EEC market but rather apply to a large share of service markets to some degree. Thus, understanding the working mechanisms of knowledge filters in markets with information asymmetries can substantially add to our understanding of knowledge spillovers in general, as well as enabling more specific policy measures to foster the

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<sup>14</sup> To our knowledge, EECs have been only analyzed according to their function as an economic policy instrument. The results highlighted the low effectiveness of increasing the rate of retrofit (e.g. Mahapatra et al., 2011; Palmer et al., 2013; Virkki-Hatakka et al., 2013).

intra-sectoral flow of knowledge. In our case study, we focus on two specific policy options aiming to reduce the issues associated with the consulting market: first, the effects and shortcomings of a public certification scheme are described and evaluated; and second, voluntary knowledge networks are investigated, in which the membership itself can be used to signal higher quality. We find that through establishing informal communication among their participants, these specific networks foster knowledge spillovers to a certain degree, with a focus on commercialization. Both certification and network-building are assessed as policy options in terms of their ability to support knowledge spillover and increase sectoral growth. We can thus contribute to the understanding of knowledge spillovers in expert markets and provide policy implications for decision-makers.

The remainder of this paper is structured as follows. In the second chapter, we review the literature on the KSTE concentrating on the operationalization of knowledge spillover, knowledge filter and the role of networks. Furthermore, we describe our methodology and explain our sample in detail. In section four, we present our result, followed by the discussion with economic policy implications in section five. Finally, we conclude in section six.

## **2. Literature review**

The KSTE literature has furthered our understand concerning the role of knowledge for companies (Acs et al., 2009a; Audretsch et al., 2006; Audretsch and Keilbach, 2007). It has primarily focused on testing different aspects of the theory empirically (Acs et al., 2009b; Agarwal and Shah, 2014; Audretsch and Keilbach, 2008; Audretsch and Lehmann, 2005), whereby the effective use of knowledge has been identified as the key determinant for sustaining competitive advantages in companies. Following Arrow's (1962) seminal paper on the allocation of knowledge and its role for companies, several difficulties for the effective entrepreneurial management of knowledge have been identified. Since knowledge has the properties of a public good – i.e. by being non-rivalrous and non-excludable in many cases (Audretsch and Stephan, 1999) - companies are aware that their internal knowledge cannot be completely protected from unwanted spillovers. The uncertainty associated with the potential risks of losing competitive advantages determines several difficulties in estimating the outcome of knowledge commercialization. This “knowledge paradox” (Audretsch and Keilbach, 2008) comprises entrepreneurs deciding to use external knowledge, despite being aware that they will only partially profit from the additional knowledge. Since the value of knowledge is perceived

differently among individuals (Acs et al., 2009a), high transaction costs result when initiating knowledge diffusion due to the heterogeneity of the user of knowledge (Braunerhjelm et al., 2010).

Attempting to operationalize the abstract concept of knowledge spillovers, several empirical measures have been adopted. Initially, spillovers were analyzed using codified knowledge, by counting the number of patents and other forms of registered intellectual property rights between companies and sectors (Acs et al., 2002; Plummer and Acs, 2014). Another measure is the change of employees to explain spillovers of tacit knowledge. This measure can be extended to small and medium-sized companies that refrain from registering patents (Thomä and Bizer, 2013) but still transfer new-to-the-firm knowledge (Klepper, 2007). Karnani (2013) has criticized an overemphasis on codified knowledge in the literature, which disregards tacit knowledge, particularly in the highly relevant sector of university spin-offs. In this domain, the creation of start-ups using knowledge provided by non-commercial institutions such as universities (Acosta et al., 2011; Audretsch et al., 2005) or research institutions (Cappelli et al., 2014) has been identified as an important source of knowledge spillover. As new employees, university graduates often transfer knowledge to spin-offs in the vicinity (Acosta et al., 2011). Especially in peripheral regions, universities have thus been identified as an important source of innovative knowledge (Pinto et al., 2012; Tether and Tajar, 2008). In this regard, the specialization of academic institutions influences the emergence of knowledge spillovers with applied technological sciences fostering the creation of new firms most effectively (Bonaccorsi et al., 2013). Besides knowledge spillovers from universities, the regional level of competitiveness complementarily supports innovative companies (Audretsch et al., 2012). Two new approaches to operationalize knowledge spillovers have recently been introduced that measure entrepreneurial creativity (Audretsch and Belitski, 2013) and the entrepreneurial activities of employees (Stam, 2013), which can help explain the commercialization of new knowledge. Overall, various factors based upon codified and tacit knowledge have been suggested as reasons for knowledge spillovers; however, the quintessential result remains that the degree of knowledge intensity within companies and sectors is the main factor driving the likelihood of knowledge spillovers.

To explain differences in the effectiveness of knowledge spillovers between sectors and companies, Acs et al. (2004) introduced the concept of knowledge filters, thus describing the barriers of transformation from new to commercialized knowledge. The literature builds upon the observation that companies decide not to commercialize their entire knowledge (Hayter,

2013). Most prominently, the transmission channel of knowledge spillovers between incumbent firms or universities and new companies constitutes the decisive factor potentially blocking the commercialization of knowledge (Mueller, 2006). Knowledge filters have been analyzed with respect to geographical characteristics (Acs et al., 2009a; Acs and Plummer, 2005), institutions (Stenholm et al., 2013) and social norms (Guerrero and Urbano, 2014). Concentrating on the regional level, new companies more successfully cope with knowledge filter than incumbent companies (Acs et al., 2009b). Interpreting the age of companies as a knowledge filter, it has been shown that R&D expenses are predominantly conducted by newly established companies (Carlsson et al., 2009), whereby the exploitation of knowledge becomes more difficult for new firms in regions with an already high degree of knowledge commercialization (Acs et al., 2009a). Overall, it has been shown that knowledge filters can explain the regionally and sectorally different exploitation of non-commercialized knowledge.

Knowledge networks can offer an opportunity to reduce the impact of knowledge filter, which has only recently been addressed by a smaller number of studies discussing the role of networks as a transmission channel facilitating knowledge-based entrepreneurship (Hayter, 2013; Huggins et al., 2012; Huggins and Thompson, 2015; Shu et al., 2014). Integrating the role of networks in the KSTE thus offers the opportunity to more comprehensively explain successful entrepreneurial decisions (Hayter, 2013). The initial results are that knowledge spillovers in inter-firm networks improve the overall performance, with mixed effects on the individual firm level (Shu et al., 2014). However, network capital and its spatial distribution – particularly network relations between companies and other knowledge-producing institutions – account for regional differences in innovative capabilities (Huggins and Thompson, 2015). Moreover, a strong positive impact of regional policy has been shown for regions with a low density of networks fostering knowledge spillovers (Huggins et al., 2012).

The literature on KSTE to date has yielded a broad strand of research. In our paper, we add to this literature in two distinct dimensions. First, the KSTE values knowledge and emphasizes its significance for companies' growth. Limitations to the effectiveness of spillovers have been described as resulting from knowledge filters that pose barriers to commercializing. However, markets characteristics – particularly the issue of asymmetric information between buyers and sellers – have not been considered despite their potential role as a filter hindering the commercialization of knowledge from established firms and research institutions. Therefore, we argue that barriers to knowledge spillovers have not been sufficiently investigated, particularly regarding markets for services that rely on tacit knowledge, which reduces

incentives for increasing firms' knowledge basis. We add to the literature by discussing the problems associated with the commercialization of tacit knowledge in markets with asymmetric information. Second, networks and their effect on knowledge spillovers are discussed as an important aspect of the KSTE. Nevertheless, the role of networks as knowledge filters has not been investigated thoroughly in the literature and it has not been shown in detail how knowledge spillovers are affected by different network specifics. Our research can add to this aspect by offering detailed insights into the determinants of and barriers to network-related knowledge spillovers in a market for services with credence good properties. Furthermore, the results from our expert interviews enable us to formulate policy implications for the design of networks that foster knowledge spillovers.

### **3. Data and methodology**

Since the role of knowledge spillovers in markets with credence characteristics has not been explored to date, a qualitative research framework that analyzes a case study is used to obtain initial theoretical insights (Eisenhardt, 1989; Eisenhardt and Graebner, 2007). This extends the methodological choice in prior studies on knowledge spillovers that have frequently been conducted using qualitative research techniques (Schiller and Diez, 2010; Schmidt, 2015; Yang and Steensma, 2014). Due to the lack of prior empirical and theoretical contributions, we apply our exploratory research design without testing an explicit hypothesis (Edmondson and McManus, 2007).

Following the logic of theoretical sampling, we selected our interviewees to reflect various perspectives regarding the EEC sector, thus assuring theoretical saturation for our sample (Glaser, 1965; Glaser and Strauss, 2008). We conducted the interviews between February and June 2015 in person or via phone. The interviews lasted 40-70 minutes. To preclude sociable desirable responding patterns, anonymity was guaranteed to the interviewees. All interviews – except one<sup>15</sup> – were recorded, transcribed and codified. To assure the quality, the content of this interview was summarized in an extended memo with the relevant content. After the interviews, the reliability of the answer was cross-checked with online publications, press articles and published official company records.

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<sup>15</sup> In one case, recording was not possible due to technical problems. Therefore, an extensive memo was written immediately after the interview.

We structured our questionnaire according to common practice in qualitative research, starting with open questions followed by more detailed questions. Our questionnaire comprised three sub-sections. In the first sections, we discussed the definition and characteristics of the EEC market. Subsequently, the interviewees were asked to describe impediments in the EEC market, concentrating on the relevant stakeholder (customer, EECs and policymaker). The interviews concluded with recommendations to overcome barriers in the EEC market.

The interviews were analyzed according to the content analysis proposed by Mayring (2004), which aims at reducing the content to the relevant statements. In the beginning, we used the open coding technique. Collecting the relevant material, we condensed the open codes with similar coding and ordered it according to categories and sub-categories. Assuring the relevance of the categories, we revised the codes with relevant literature and newly defined codes. We wrote memos for the categories and sub-categories and discussed the codes between the authors to assure the reliability of the collected material (White and Marsh, 2006). The interviewed experts received preliminary results and were given the opportunity to discuss critical aspects.

All experts are stakeholders, thus maintaining an internal perspective of the EEC sector. The EEC sector is a dynamic developing sector that is predominantly influenced by public interventions. The German federal government promotes EECs as advisors in the residential sector to save energy and – ultimately – fulfil international climate goals. EECs offer consulting services for homeowners – mostly for private homeowners living in their own houses – and they act as advisors in undertaking building alterations. Homeowners thus receive support from EECs from the beginning of the planning until the end of the retrofit of their residence.

The interviewees were selected according to gatekeepers from the crafts training institution and the EEC associations. Furthermore, we asked for recommendations from the interviewees to sample relevant stakeholders in the field. Additionally, considering the impact of the public intervention, stakeholders from the innovation support and regulatory authorities participated in the interviews. Our sample thus reflects the heterogeneity of the EEC market, with various relevant private, public and public-private institutions. This enables us to take into consideration the existence of diverse actors within the market to gain insights into the different opinions and perspectives on discussions within the field. The experts had a diverse educational background (technical, legal and administrative). To understand the various incentives in the market, we used stakeholders from research and education, EECs and political and professional associations to achieve theoretical saturation of the different perspectives (see Table 1), following a similar approach to Muench et al. (2014). Table 1 provides an overview of our

sample of expert interviewees. In the following section, the results of the expert interviews are discussed.

Stakeholder Code	Research and Education	EEC	Political and Professional Association	Professional Background
#A	X			Architecture
#B	X			Engineering
#C	X			Crafts
#D	X			State Regulator
#E		x		Crafts
#F		x		Crafts
#G		x		Engineering
#H		x		Architecture
#I		x		Architecture
#J			x	Regional Energy Agency
#K			x	National Energy Agency
#L			x	Innovation support coordination
#M			x	Innovation support bank
#N			x	EEC Journal
#O			x	Architect Professional Association
#P			x	EEC Association
#Q			x	EEC Association
<b>Total</b>	<b>4</b>	<b>5</b>	<b>8</b>	<b>17</b>

Table 1. Overview of the sample of experts

## 4. Knowledge spillovers in an expert market

### 4.1 Signaling of knowledge and quality

The German EEC sector has a considerable size – with more than 13,000 publicly listed experts – and it has developed based upon knowledge spillovers through spin-offs originating in the architectural, engineering and crafts sectors. The demand for retrofit in the residential sector

has increased due to the establishment of massive public support programs and the age structure of the German housing stock, a large share of which were built in the 1970s. Thus, the processes of acquiring and implementing knowledge in EEC companies rely on political decisions regarding the specific design of retrofit subsidies. However, compared to other expert markets, the German EEC market has flexible prices and is hardly regulated. Consequently, unlike other expert professions, the profession of EECs is not protected by the German law. The largest shares of EEC are trained in the fields of architecture, engineering and crafts, whereby the knowledge basis significantly varies along the degree of training by EECs. The level of training ranges from a completed traineeship with additional training on energy efficiency to academic degrees. The term “Energy Efficiency Consultant” (EEC) can be freely used, which has led to substantial heterogeneity in the sector, consequently fostering a negative public image due to quality concerns.

The EEC firms are mostly owner-led micro and small-sized companies. EEC companies have often switched their traditional focus from architectural, engineering and crafts business to EEC services. In the interviews, the entrepreneurial decision to use the companies’ knowledge to concentrate on retrofit resulted from the expectation of arbitrage profits. The EECs’ decision to enter the market typically starts as a part-time job and subsequently develops into a full-time position with a complete focus on energetic renovation. Overall, the EECs’ market has experienced a difficult situation, after a promising sectoral growth has slowed down in the past six years.

The interviewees stated that the commercialization of their service is the main problem for EECs, which results from customers’ low willingness to pay. In turn, this is driven by the credence good characteristics of the EEC market, as a company’s knowledge intensity is hardly perceptible for customers. This information asymmetry leads to a strong sentiment of uncertainty among customers regarding the actual quality provided by EECs. According to the respondents, the largest share of customers is private homeowners who have only limited experience with retrofit, which is typically a once-in-a-lifetime decision due to 30-50 year refurbishment cycles. Additionally, the outcome of the retrofit and its monetary benefit for the customer depends on various factors. The implementation of the retrofit involves different companies, including EECs, whose behavior can hardly be monitored by the customer. Furthermore, the reduction in energy usage following the retrofit relies upon the customers’ behavior. Consequently, the EECs’ specific knowledge is hardly perceptible to customers due to the technical complexity and thus it cannot be used as a strong marketing argument.

This issue constitutes a substantial filter for knowledge spillover. Overall, the immediate benefits from creating or acquiring additional knowledge are difficult to evaluate for companies. While up-to-date knowledge is a prerequisite for the technical analysis required for retrofits, the heterogeneity of the market – in combination with the issue of asymmetric information – inhibits the commercialization of knowledge. Therefore, the monetary profits from fostering knowledge spillovers are limited in the EEC sector, since new knowledge cannot be effectively signaled to customers. Thus, the positive correlation between a firm's knowledge intensity and its revenues is weak if non-existent in a service market with credence good properties, as signaling is predominantly dysfunctional.

#### *4.2 Certification and signaling*

To counter the issues of information asymmetries and the resulting low-quality offers on the EEC market, the German federal government introduced a certification system to improve the quality of EECs, which requires attending training courses on EEC-specific knowledge.<sup>16</sup> EECs are required to have this permission to apply for public funds, which account for more than half of transactions in the EEC market (Prognos et al., 2013). All the interviewees highlighted the relevance of the certification scheme due to the financial incentives and an improved visibility of public quality standards for customers cooperating with EECs. Setting a minimum quality standard, the certificate system regulates access to the EEC market.

The certificates are used to verify the acquisition of a minimum standard of codified knowledge with a focus on technical aspects of the EEC services, such as building regulations, energy efficiency standards and calculations of energy usage. By contrast, the interviewees emphasized the relevance of tacit knowledge, highlighting that the translation of expert to customer knowledge is neglected in the courses. The interviewees thus stated that the certification scheme only has a very limited ability to signal quality to customers and other EECs. The low quality of some courses within the EEC sector is widely acknowledged; consequently, the certificates are assumed to be merely a minimal quality standard. Additionally, the inability to efficiently signal quality and knowledge intensity is driven by the complexity of the certification system,

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<sup>16</sup> Upon receipt of the certificate, the access to subsidies is granted via a public web list. To be included in the web list, a minimum of 70 hours of training and 16 hours of additional training every two years is required (KfW, 2014).

with different certificates for each subsidy program and regular changes to the certification scheme.

Consequently, companies have the sole incentive to attend the courses and receive the certificates to participate in the subsidy programs. Addressing the problem of the low dissemination rate of new knowledge, the state intervention has aimed at improving the knowledge basis of EEC companies to ensure a certain level of quality to customers. It was hoped that knowledge-based competition would incentivize companies to create knowledge spillovers, commercialize the newly acquired knowledge and drive the companies with the lowest knowledge basis out of the market. Nevertheless, the certification system has only had a minor impact on the sectoral knowledge level due to its low standards and the focus on codified knowledge. Additionally, the interviewees emphasized that particularly smaller companies have a low willingness to participate in the training courses due to a lack of capacities for extensive training courses. Nevertheless, training courses are appreciated as networking events that enable informal knowledge exchange among colleagues. Especially market information and marketing strategies are highlighted as positive unintended outcomes of the courses, which can be considered knowledge spillovers among the participants. Nevertheless, the systematic organization of knowledge spillovers through public certification schemes can be considered as having failed. Due to the asymmetric information in the relevant market, no strong incentive exists to foster the broad exchange of innovative knowledge; indeed, the policy intervention has been unable to solve this issue.

#### *4.3 The role of knowledge in networks*

EEC companies mostly originate from strictly regulated sectors with existing network structures provided by architectural, engineering and craft chambers. These semi-public organizations assure quality standards for their sector with the training of employees and they define sectoral business rules. Membership is mandatory for all companies in the respective sector and the network structure is partially organized by the members. The EEC sector does not have such developed network structures at present. There are two professional organizations, which together have organized around 25% of the EECs listed online. The German energy consultant network only accepts university graduates as members, while the EEC Engineering Craft Association has organized mostly companies with crafts background. Both professional organizations confirmed in the interviews that they aim to establish a higher

quality standard for their members on a private basis by promoting their members' level of knowledge.

#### 4.3.1 Barriers to entry

Both professional organizations have created barriers to entry for prospective members that assure the quality level of their organization, including a selection process before a prospective company can become a member of the professional organization. In particular, discussions with active members are part of the application process, since other EEC experts are more considered more capable of evaluating the quality of the EECs' services. Thus, a prospective member's knowledge basis with respect to codified and tacit knowledge is checked. According to the interviewees, the barriers to entry limit the network access to EECs with a high-quality knowledge basis. This constitutes the network's attempt to preclude free riding behavior from low-quality experts gaining reputation without contributing to the maintenance of the high quality of the professional organization. The networks aim to establish membership as a quality signal on the EEC market; thus, the barriers to entry are used to level information asymmetries between companies and customers as well as policy-makers.

A strong focus is placed upon learning about a prospective member's qualifications regarding tacit knowledge. Interviewees emphasize that their main concern is the admission of fraudulent experts, which could further worsen the negative public image of EECs and similarly damage the professional organizations' public image. A thorough interview is seen as a partial solution to this issue, whereby the networks try to maintain certain standards since state regulation has not succeeded in ensuring that tacit properties of knowledge are included in the mandatory courses. This barrier to entry ensures the exclusive acceptance of members with a common knowledge basis, which constitutes a prerequisite for a broader exchange of knowledge. Overall, this network structure is considered more stable since low-quality EECs are successfully excluded.

The close monitoring of the knowledge level among participants leads to a higher level of transparency within the organization concerning the variety of competences. A common understanding about the purpose and means of the organization constitutes a strong prerequisite for knowledge spillovers. Members can more easily access certain aspects of the professional sectoral knowledge, which leads to the intended and unintended exchange of knowledge. The members' openness to sharing knowledge is higher, as they can expect a certain level of

competence among newly admitted members. Overall, the networks successfully provide a common professional platform, which enables high-quality signaling to a certain degree and fosters the sharing of tacit and codified knowledge. It can thus be considered a partial remedy to the market failure due to asymmetric information and the regulatory failure of a common level of training among EECs.

#### 4.3.2 Knowledge sharing activities in networks

Upon entering the networks, companies have access to a variety of offers to increase their knowledge basis. This includes formally organized events comprising lectures, conferences and regional meetings. The courses are taught by internal professionals and external experts teaching about new regulations, technical innovations and customer relationship management. Moreover, informal meetings with other EECs are an important incentive for companies to participate in the networks. The formal platforms are often the basis for an informal exchange of knowledge. Participation in the events is not mandatory for the members, although there is an informal expectation to regularly participate at the network meetings.

In contrast to publicly organized training courses to receive the certificates described above, the content of the network events is oriented towards members' demand, which is inevitable given that participation is voluntary. Therefore, the events need to provide knowledge that actually provides additional value to the participants. Receiving updates on close-to-the-market knowledge is important due to the dynamic environment of the EEC sector, with frequent regulatory and technological changes. The courses are thus selected by professionals working in companies in the EEC sector. This internal perspective provided by market participants enables a more accurate anticipation of sectoral problems and future developments than the external perspective provided in the certification courses.

The interviewees attributed a positive impact on the knowledge flow within the EEC sector to the informal contacts established in the networks. Most importantly, the application of technological knowledge concerning retrofit-specific situations is discussed among network members. Additionally, the transmission of tacit knowledge takes place within informal meetings, e.g. detailed market information and prospective developments in the retrofit sector or customer relationships and dealing with problematic customers. The exchange also includes non-public information about future political trends being disseminated by the members, since the networks are involved first-hand as stakeholders in the policy-making processes.

However, despite these distinct advantages, the interviewees involved in the knowledge networks complain about the low participation of members, since active involvement is very time-consuming. The knowledge transfer of tacit knowledge is characterized as an experience good by our interviewees, i.e. members cannot precisely estimate the potential monetary gains from engaging in knowledge exchange. Only after investing time and energy into the exchange can members acknowledge whether the engagement has yielded a benefit. In deciding whether to engage in knowledge exchange processes, members regularly weigh the costs as being higher than the uncertain gains and consequently they decide against the time-consuming engagement in network activities. This issue makes it difficult for network officials to motivate companies to participate in network activities.

Despite these difficulties, participation in networks offers entrepreneurs the opportunity to overcome the low knowledge spillover level on markets with credence good characteristics. It supports members in increasing their knowledge basis with codified and tacit knowledge. Knowledge spillovers are fostered due to a better visibility – experts knowing other experts and a higher degree of trust – due to similar interests within the association’s goals. Knowledge spillovers regularly take place on an informal level at network meetings and the official propagation of knowledge exchanges fosters the mutual willingness to share knowledge. Nevertheless, the experience good character of networking efforts inhibits the acquisition of new active members and thus limits knowledge spillovers.

#### 4.3.3 Effects of knowledge spillover in networks

The entry barriers of admitting only qualified member increase the knowledge intensity of the networks. Moreover, the knowledge activities of the network offer opportunities for the members to increase their knowledge basis with specific expert knowledge. Taking both aspects into consideration, the networks offer more opportunities for knowledge spillovers when compared to EEC market participants without membership. The interviewees confirmed a high willingness to cooperate with member companies due to the familiarity with the knowledge basis of member experts and the reputation of high quality offered by network partners. In particular, the information barriers regarding the knowledge basis of other companies are perceived as being lower in comparison to non-network members. Regardless of existing formal forms of cooperation, informal cooperation is predominant in the networks. In particular,

flexible and time-saving solutions are assumed to be advantages of cooperation within the network.

This enables an increased inter-firm cooperation, largely driven by the sectoral structure of the EEC market, with a large share of micro and small-sized companies. The flexibility of these companies is limited by their low production capacities. Cooperation with other companies is thus used as a means of conducting additional projects without substantially increasing the staff. This reduces the risk of costly overcapacities that cannot be quickly adjusted according to current demand due to the strong employment protection in Germany. In the EEC market, this is particularly important since alternating phases of fast growth and sectoral recessions have occurred in the past decade. This volatility is caused by the uncertainty caused by inconsistent policy-decisions regarding the volume and specifics of subsidies for energetic renovations, which impede an accurate preparation for future sectoral developments. Therefore, inter-firm cooperation replaces short-term hiring of new staff, which is problematic due to the employment protection and the costs of training new employees in EEC services. A prerequisite of the cooperation is the trust in the cooperating partner, which is – to a certain extent – guaranteed by the network. Especially the reputation of EECs plays a predominant role since the credence characteristics of negative results of the customer relationship can have a large impact, given that the customer can hardly ascertain the reasons for failures.

The willingness to cooperate enables companies to specialize since the acquisition of additional technical knowledge is costly and time-consuming. The large number of potential technologies – combined with heterogeneous customers – contributes to the complexity of energy consulting. Cooperating with member companies enables experts to further specialize in specific technologies and services within the market, which reduces competition between EECs and increases profits. The acquisition of specialization knowledge is supported by the network through organizing knowledge transfer meetings and specific courses for niche specialization.

While a higher degree of cooperation has fostered knowledge spillovers thus far, a further specialization could also reduce knowledge spillovers since a higher degree of specialized knowledge makes the commercialization of additional pieces of specialized knowledge more difficult and relevant for fewer companies. Overall, however, the increasing specialization provides a competitive advantage to network members due to the more efficient exploitation of capacities among cooperating companies.

## 5. Discussion

Our findings contribute to the KSTE, providing an additional perspective on knowledge commercialization by describing the problems associated with knowledge spillovers on an expert market. The occurrence of knowledge spillovers in the EEC sector strongly hinges on companies' incentives to increase their knowledge basis, which is difficult as signaling higher quality to customers regularly fails. This dilemma leads to a low demand for training courses and other educational programs despite knowledge-intensive requirements for conducting retrofit. This issue is related to the market structure, with asymmetric information precluding a more effective commercialization of knowledge, thus making the retrofit a credence good. Indeed, this conclusion is supported by previous studies investigating problems associated with credence goods in service markets (Feser and Proeger, 2015; Schmidt, 2015; Howden and Pressey, 2008).

Despite positive effects of knowledge spillovers for both older and newly established firms, our case study shows that knowledge spillovers in the EEC sector are principally influenced by the credence characteristics of the service. The difficulties in signaling high quality on the market imply a lower incentive for companies to enlarge their own knowledge basis since more knowledge does not necessarily contribute to a better commercialization. This leads to a situation where prices in the EEC sector are not related to the quality and thus cannot provide a quality signal to customers. Therefore, firms have very little incentives to protect their knowledge basis, which enables knowledge spillovers to a certain degree. Nevertheless, knowledge spillovers rarely result in additional profit for other firms since only a small share of the knowledge transferred – mainly specific aspects of tacit knowledge – is actually of use. Overall, the competition with low-qualified experts was characterized by interviewees as a major factor that strongly influenced EEC firms' strategic decisions. They identified the open access to the EEC market as the core problem precluding innovations and knowledge acquisition due to the credence good characteristics of their service. This result is in line with previous studies pointing to a low demand for expert services and market breakdowns due to customers' fear of fraudulent expert behavior in markets with strongly asymmetric information (e.g. Dulleck et al., 2011; Dulleck and Kerschbamer, 2006).

The regulatory intervention as a reaction to the problem of low quality on the EEC market has added an incentive to acquire additional knowledge. To receive the certification enabling the application for subsidies, firms gain a low standard of knowledge. Apart from this function, the newly acquired knowledge can hardly be commercialized and customers correctly do not

assume that the certification is a quality signal. Thus, overall, the limit to the market through a certification system has only provided a low incentive to improve quality through knowledge spillovers. This result is in line with the literature on certification in the energy sector (Brounen and Kok, 2011; Gram-Hanssen et al., 2007; Stieß and Dunkelberg, 2013). Previous studies have found a low acceptance of certificates among customers due to the complexity caused by the indirect link between quality and the certificates. Therefore, the knowledge level of companies is maintained to merely fulfil the minimum certificate requirements and no additional resources are invested in knowledge acquisition.

The marginal role of knowledge on the EEC market has changed as networks have introduced a signal of high quality through their selection processes. This has the effect that cooperation between member companies can be realized more easily and that specialization through knowledge spillovers makes the enlargement of the firm's knowledge basis a more profitable strategic decision. Networks thus lower the information asymmetries between suppliers and customers, which can make knowledge spillover and specialization profitable. This result resonates with past discussions about networks that foster knowledge exchange and innovation (e.g. Amara and Landry, 2005; Feldman, 1999; Rogers, 2004). This particularly applies regarding companies' ability to exchange internal and external knowledge, which has been characterized as a successful variable to benefit from the use of networks and increase the innovative capability (Vega-Jurado et al., 2008). The mechanism of signaling expert knowledge within an intra-sectoral network produces trust between member companies and is thus a prerequisite for cooperation, which leads to knowledge spillovers.

Overall, we can explain insufficient knowledge spillovers as resulting from information asymmetries in a given market, serving as a substantial knowledge filter. This adds to the KSTE by showing that sectoral differences regarding the market structure and product specifics are a relevant category for the efficient working of knowledge spillovers. We argue that the current focus of the literature – which primarily views knowledge intensity as the exclusive driving force for entrepreneurial activity – is incomplete, given that it neglects market specifics. Rather, firms and products in a market may be knowledge-intensive, yet its properties effectively preclude knowledge spillovers and innovative cooperation. Once the commercialization of new knowledge is complicated by product, customer or market specifics, companies no longer have incentives to conduct knowledge exchange. Accordingly, we would argue that knowledge filters such as the ex-ante and ex-post asymmetric distribution of information can significantly contribute to our understanding of knowledge spillovers within the KSTE.

These results enable us to derive policy implications that can help to improve innovation policy aiming at increasing knowledge spillovers in sectors with credence good characteristics. We have found that the core problem of a low knowledge spillover rate is the lack of an additional competitive advantage and corresponding monetary benefits from gaining additional knowledge. Accordingly, regulators need to establish a situation in which customers demand and perceive higher quality services, which can only be achieved by increasing market transparency. In a more transparent market, companies' investments in knowledge intensity are more likely to lead to increased profits, which in turn would foster the competition for quality among firms. Countering asymmetric information on a regulatory basis can be achieved by intensifying the requirements for the certification of firms. Accordingly, access to the supply side of the market would be strongly restricted, excluding all firms that fail to meet a certain knowledge standard. While this measure would not reduce information asymmetries per se, customers' trust in the quality of the service could be improved. While restricting the market would naturally have a trade-off with higher prices charged by the remaining firms, it would likely stimulate the further specialization and increases in knowledge intensity by the firms remaining on the market. In the specific case of the EEC market in Germany, regulators have avoided this measure thus far, in order to protect smaller companies unable to afford the costs for additional training. Instead, the certification approach is to be extended over a longer period, slowly improving the requirements and quality of mandatory training. From a political perspective, this approach appears reasonable and suitable to – at least slowly – improve knowledge intensity in this sector.

Networks constitute a second-best solution to the issues associated with asymmetrical information. They can establish quality signals on a voluntary basis for knowledge-intensive businesses and thus establish and maintain a certain level of trust among customers and participants. In turn, this increases the incentive to foster knowledge spillovers, specialize and cooperate with other trusted members. While these positive effects are provided by voluntary private cooperation, policy-makers could contribute to these knowledge networks. Potential ways of supporting private networks include providing additional funding for improved training among members or fostering a closer cooperation between the public institutions offering training and know-how and the private networks. Particularly an exchange of training personnel and materials could improve knowledge spillover and thus improve the sectoral knowledge intensity in the medium run. More thorough public support to the private network initiatives could also increase their attractiveness to other firms in the sector by increasing the value of

their quality signal, which might permanently increase incentives for firms with a low knowledge intensity to acquire the network's quality standard.

## **6. Conclusion**

Generating innovations occupies ever-growing importance to maintain national, regional and sectoral competitiveness. In this development, companies are increasingly required to use external knowledge to improve their knowledge intensity and succeed in global markets. The KSTE describes and analyzes the influence of knowledge spillovers, particularly regarding newly established companies using non-commercialized knowledge. While knowledge intensity is generally considered the main determinant of knowledge spillovers between firms, we suggest that properties of the markets should be increasingly drawn upon to explain the lack of spillovers. Understanding market properties as a knowledge filter can explain discrepancies in knowledge spillovers between different sectors. Apart from gaining another perspective of the dynamics and barriers to knowledge spillovers, identifying and analyzing market specifics enables more precise policy implications that can alleviate barriers to knowledge sharing. To illustrate this point, we presented a case study of the German EEC sector, which is a knowledge-intensive expert market with asymmetrical information between customers and firms, in which the services have credence good characteristics. We argue that the specific problems and solutions identified for this sector are applicable to other markets with similar characteristics, in which knowledge spillovers are sub-optimal.

In this regard, we pointed to asymmetrical information as the central problem precluding knowledge spillovers. We showed that companies hesitate to invest in acquiring additional knowledge, since they know that it cannot be commercialized at present. Customers distrust service providers, since they cannot effectively evaluate the quality of the services due to the lack of signals of high quality. Given that customers do not demand higher quality, the existing firms engage little effort to specialize and improve their knowledge basis. Regulators have tried to solve this problem by introducing a mandatory minimum training; however, since the requirements are fairly basic, the ensuing certification does not serve as a quality signal that could foster quality competition. Private knowledge networks with a mandatory testing before granting membership have provided a partial remedy to the problems associated with asymmetric information. Membership in these organizations can be used to signal quality to a certain degree; additionally, knowledge events – both formal and informal – contribute to

additional knowledge spillovers, a higher willingness to cooperate with other member firms and an ensuing specialization. However, despite these positive effects, the general problem of a market with heterogeneous qualities that are non-transparent to customers is not solved by private networks, given that customers' inability to correctly perceive knowledge-intensive providers with high-quality services still precludes strong incentives for knowledge spillovers. We argue that regulatory efforts to increase market transparency and a step-wise increase of mandatory quality standards are indispensable to foster quality competition and knowledge spillovers.

We argue that knowledge spillovers are problematic in non-transparent markets with credence good properties, based upon a case study on a specific German sector. Obviously, while we are convinced that this is a valid point, additional evidence – both qualitative and quantitative – is required to support this result. Further research should thus focus on other expert markets that face similar problems of asymmetrical information hindering the efficient spillover of new information. Furthermore, the sector explored here is rather new and with few formal network structures, when compared to established markets for expert services. For this reason, studies on more traditional sectors with well-established professional networks could further our understanding of barriers to knowledge spillover. For instance, studying the medical sector – which is a classical credence good market run by knowledge-intensive experts - could help us to understand how to better overcome the structural issues in these markets to foster knowledge spillovers most efficiently.

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## **Chapter 6**

# **Heterogeneous professional identities as an intra-sectoral knowledge filter**

**with Till Proeger**

Accepted chapter: Knowledge Spillover-based Strategic Entrepreneurship', Routledge.

**Abstract:** We investigate the relevance of knowledge filters for knowledge spillovers. Our study focuses on the effect of heterogeneous professional training among members of the same sector, which we find precludes knowledge spillovers. Vocational differences lead to different professional identities among entrepreneurs of the same sector, which in turn severely limits cooperation and exchange among firms. Based upon a sample of energy efficiency consultants (EEC) in Germany, we conduct expert interviews providing evidence concerning the role of professional training and the resulting sub-sectoral identities in fostering or impeding knowledge spillovers. We explain our findings using evidence from the field of behavioral economics, which offers insights into the impact of group identities on cooperative norms. Following these findings, we offer policy implications, arguing that policy-makers and professional associations should make efforts to create a “common ground” among firms of the respective sectors. Specifically, common professional associations and training courses should be established that create a sectoral level of knowledge and thus bridge diverging professional identities. In turn, this could foster a common sectoral identity and promote sectoral knowledge spillovers.

**Keywords:** knowledge filter, knowledge spillover theory of entrepreneurship, professional identity, professional training

**JEL-Codes:** D21, D82, H41, K23, L14

## **Chapter 7**

# **Energy audits in a private firm environment - Energy efficiency consultants' cost calculation for innovative technologies in the housing sector**

**with Kilian Bizer, Annette Rudolph-Cleff and Joachim Schulze**

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Download: <http://wwwuser.gwdg.de/~cege/Diskussionspapiere/DP275.pdf>.

**Abstract:**

During recent international climate negotiations like in Paris 2015, the European Union agreed to reduce the emissions of greenhouse gases. Policy-makers target the residential sector as a major user of fossil energy because potential to improve the energy efficiency in existing houses is observable. Energy audits have been implemented to offer information to homeowners within the aim of reducing the complexity and uncertainty concerning energetic refurbishment. Nevertheless, the impact of energy efficiency consultants (EECs) on retrofit measures is described as low in the literature. We conducted an online survey on German EECs, emphasizing their personal attitudes and contextual conditions, analyzing the implementation of an exploratory energy audit and providing recommendations for improving energy audits. The EECs answered the questions regarding the personal factors in a highly confident way. More specifically, almost all respondents agreed to fulfill the customers' expectations. We explain this using the market framework in Germany, which requires a high-level performance due to the competition on the EEC market. The contextual conditions are evaluated more critically, with about 49% expressing concerns about acquiring and managing financial resources for energy audits. The case study showed that EECs only recommend innovative technologies to a limited degree, while the upfront costs are estimated very low. Finally, in the survey, the respondents prioritized an information policy improvement, which could influence the contextual conditions for energetic refurbishment.

**Highlights:**

- Energy Efficiency Consultants are highly satisfied with the personal factors due to the private firm framework.
- We show that EECs assess the contextual conditions critically, particularly customers' willingness-to-pay for energy audits.
- EECs support innovative solution in energetic refurbishment while the cost calculation are very optimistic
- EECs recommend to foster information policy while improvements in economic efficiency is evaluated less important.

**Keywords:** energy audits, change agents, energy policy, diffusion of innovation

## 1. Introduction

In late 2015, the 21st Conference of the Parties (COP 21) for the United Nations Framework Convention on Climate Change took place in Paris, within the aim of discussing effective and best practices policies. One central actor - the European Union - had already agreed beforehand to lower their greenhouse gas emissions to 20% by 2020 based upon 1990 levels, followed by further reductions up to 95% by 2050 (da Graça Carvalho, Maria 2012). Since the housing sector contributes substantially with about 20% to 40% of the end-energy use in the member states, policy-makers agreed to target effective energy efficiency measures to fulfill the agreed goals (Pérez-Lombard et al. 2008). In Germany, with about 40 Mio. residential buildings, the stock of buildings has great potential to reduce energy consumption, since 75% of the buildings that were built before the first heating regulation in 1978 have not been renovated (Diefenbach et al. 2010). Hence, since the rate of complete energetic retrofit currently only constitutes about 1%, German energy policy aims to double the retrofit rate to achieve an almost climate neutral stock of residential buildings by 2050 (UBA 2014).

The energy efficiency gap has been used as an explanation why people invest inefficiently in energy-saving measures due to a lack of complete information (Jaffe and Stavins 1994; Jaffe et al. 2005). While the effect of informational impediments on energy policy has been controversially discussed (Allcott and Greenstone 2012; Gillingham and Palmer 2014), it has had a substantial impact on the design of information policy (Bartiaux 2008; Ek and Söderholm 2010; Ramos et al. 2015). Based upon the Directive on Energy End-Use Efficiency and Energy Services (Directive 2006/32/EC), member states are encouraged to adopt energy audits and energy-related services.<sup>17</sup> In particular, the complexity of retrofit (Galvin and Sunikka-Blank 2013; Owen et al. 2014) combined with uncertainty about the outcome due to customer-related rebound effects (Madlener and Hauertmann 2011) has led to a high degree of informational uncertainty, which attributes a central role for the homeowner's decision (Palm 2010) to energy efficiency consultants (EECs).

The seminal paper on EECs by Gram-Hanssen et al. (2007) analyzed the effectiveness of energy performance certificates (EPCs) for comparative Belgium-Danish cases focusing on the provision of additional information. The authors critically evaluated the benefit of EPCs since the new information transferred with the energy labels led to interpretation and questioning of the additional knowledge. The customers' trust in the EPCs depended on individual everyday

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<sup>17</sup> For further discussion on the naming of EECs, see Feser and Runst (2015).

life situations and the personal attitudes towards the energy advice. Bartiaux (2008) argued that the social norms need to comply with the new information, otherwise the customers do not react to the provision of new information. Additionally, EECs lack information about homeowners' behavior and everyday situations, which influences the success of their service (Palm 2010; Revell and Stanton 2015). The education and profession of EECs has been identified as leading to heterogeneous information for customers (Virkki-Hatakka et al. 2013).

The institutional framework for energy audits and related energy services significantly differs across the EU member states (Mahapatra et al. 2011b). While in Sweden and Finland, EECs are partially employed as public servants (Mahapatra et al. 2011b; Virkki-Hatakka et al. 2013), Germany has established a subsidy scheme organized by mandatory energy audits from certified EECs in private companies (Prognos et al. 2013). For the case of the UK, Owen et al. (2014) emphasized the impact of informal advice given to the customers about retrofit measures by installers. In the US, the EEC market appears separated in two groups: utility companies and construction companies; and independent EECs only focusing on energy audits (Palmer et al. 2013).

To contribute to the international climate goals, policy-makers rely on the quality of EECs (Rosenow and Galvin 2013), since the latter are largely subsidized to act as change agents endorsing a sustainable reduction of energy use in the residential sector. Change agents are those actors in markets who increase the technological progress and offer assistance to customers to limit their uncertainty (Rogers 2003). Implementing a system of experts for guiding homeowners towards energy efficiency measures has been discussed in the literature, finding a low impact of experts on customers' decisions to conduct energetic retrofit (Gram-Hanssen et al. 2007; Palm 2010; Palmer et al. 2013; Mahapatra et al. 2011b; Gillich 2013; Virkki-Hatakka et al. 2013). Especially the low acceptance of EEC services (Gram-Hanssen et al. 2007; Mahapatra et al. 2011b), the public policy orientation as well as the public subsidies of experts (Palmer et al. 2013; Gillich 2013) have been identified as barriers for EECs in terms of substantially increasing the retrofit rate. Nevertheless, given hypothetical choices, customers request support from EECs during the retrofit (Achtnicht and Madlener 2014), while the empirical evidence of using EECs has brought mixed results (Weiss et al. 2012; Gaspar and Antunes 2011; Murphy 2014a). Although the literature is rich with conceptual and qualitative insights, large-scale and quantitative evidence is rare. The literature has insufficiently discussed the impact of EECs on the diffusion of innovative technological solutions and homeowner-friendly solutions. In particular, research on German EECs is relevant, since the German

building renovation program is one of the largest in Europe (Murphy 2014b; Rosenow and Galvin 2013).

Thus, in this paper we analyze the sample of an online survey conducted with German EECs in 2015, analyzing EECs' performance during energy audits. The evaluation of service quality has created a broad strand of literature reflecting upon the impact of the offered service on customers' demand (Wilson and Frimpong 2004). Mahapatra et al. (2011b) offered a first framework measuring the performance of EECs used in different sectors, based upon the assessment of interviewed EECs evaluating their own work (Netemeyer and Maxham 2007; Eva and Regehr 2005; Sarikaya et al. 2010). Mahapatra et al. (2011b) used the perception of EECs about the customer satisfaction as the dependent variable to explain EECs' impact on energy audits. Our approach builds upon the Swedish survey (Mahapatra et al. 2011b) focusing on EECs as private firms. However, the adaptation of innovative technological solutions in its political and social environment is crucial for the acceptance and energy efficiency of retrofit in the housing sector (Ravetz 2008). Therefore, we follow Owen et al.'s (2014) approach to analyze the technical and adaptive skills as a prerequisite for understanding the performance of EECs.

We find that EECs have a positive perception about their own performance, while contextual factors - including the institutional framework - are critically evaluated. Specifically, only about half of the EECs perceive their payment as fair. This perception significantly relates to the contextual factors of workload, subsidies, technical support from public authorities and a clear job description, which affect the EEC's success on markets. The trade-off between positive personal factors and mixed evaluated contextual factors also appears in our case study about the diffusion of innovation at energy audits. The EECs proposed to some extent innovative measures, except disruptive measures, while the respondents systematically underestimate the upfront costs in case of ambitious energy goals.

The remainder of this paper is structured as follows. In section 2, we review the situation of EECs in Germany, including the current situation and the legal framework. Subsequently, we present our theoretical framework in section 3, while in the fourth section the methodology used is explained. We discuss our results in section 5, followed by recommendations for the prospective framework of energy audits in section 6, before concluding with policy implications in section 7.

## 2. Energy efficiency consultants in Germany

The task of EECs is to support homeowners with technical support during the retrofit of their residencies targeting the service to private homeowners, as well as public and private housing companies. This support is mostly focused on scenarios about which customers lack information (Novikova and et al. 2011). Essentially, what is foremost expected from EECs is the distribution of innovative solutions to improve the energy efficiency (Madlener and Hauertmann 2011). Informational barriers before and during the retrofit create uncertainty about the outcome of energy efficiency measures. In particular, the technical complexity, the uncertainty about the quality of the building companies and inhabitant-related rebound effects after the retrofit influence the anticipated benefit through the retrofit (Feser and Runst 2015).

There is no regulation that obliges homeowners to consult EECs for refurbishment measures. Nevertheless, from a public policy perspective, the development of the EEC market is based upon the low energy efficiency of the housing stock. Therefore, publicly supported energy audits attempt to support the diffusion of innovation, which has to be organized by change agents (Rogers 2003; van Lente et al. 2003). The market intervention drives the EEC market in two ways. First, the Energy Saving Regulation (EnEV) organizes the implementation of EPCs and limits its energy audits to consultants with a professional background in the building sector. Customers have to hire certified EECs to receive EPC, which has to be presented in case of selling a residential house or renting a house to new tenants (Amecke 2012). Second, homeowners need to consult an EEC to receive subsidies for energy audits and subsidies for energetic retrofit. Particularly the subsidies from the building rehabilitation program organized by the public KfW bank are an important incentive for homeowners to access EECs (Schroeder et al. 2011). In order to apply for subsidies for retrofit, specific training with a minimum of 70 hours of certified courses is mandatory, in addition to the prior completion of training or studies in engineering, architecture or a craftsmen business (KfW 2014). More than 13,300 publicly listed EECs have the permission to participate in the subsidy programs.<sup>18</sup> The EEC certification scheme has been reformed several times to guarantee the quality of energy audits and increase the demand for EEC services (Feser et al. 2015).

Despite the efforts of the German government, EECs' role for energetic retrofit has been critically evaluated. Galvin and Sunikka-Blank (2013) presented evidence for the urgent need of change in the retrofit market. The ambitious aims for 2050 to reduce the greenhouse gas

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<sup>18</sup> The web list is publicly accessible at <https://www.energie-effizienz-experten.de>.

emissions by 80% can solely be achieved with further improvements. Under the current conditions, the housing sector contributes to a reduction of emissions by only about 25%. In a theoretical choice experiment, German customers revealed the need for support by EECs (Achtnicht and Madlener 2014). Especially the promotion of EECs since 2007 has brought improvements in the quality of retrofit, albeit with no noticeable effect on the retrofit rate (Stieß and Dunkelberg 2013). Moreover, the demand for energy audits has been characterized as low and decreasing in recent years (Prognos et al. 2013). In particular, the variety of actors offer low-quality and low-cost energy audits, leading to little transparency and a low willingness to pay for energy audits (Prognos et al. 2013).

In the following section, we provide our framework to comprehend EECs' impact on retrofit, specifically concerning the diffusion of innovative technologies via energy audits.

### **3. Evaluation framework**

#### *3.1. Influence of personal and contextual factors*

From a public policy perspective, subsidized EECs have to contribute to reduce emissions in the residential housing sector. EECs' impact on diffusion of innovative measures for retrofit depends on the fulfillment of homeowners' expectations (Michelsen and Madlener 2012). Most importantly, the interaction with customers affects the quality of the energy audit and is decisive for the buying decision (Taylor and Baker 1994). Hereby, EECs' performance can be explained by personal and contextual factors (Stern 2000). We look at the personal and contextual factors with the self-perception of EECs. Consequently, this can be highly subjective and may differ from the customers' perspective, thus requiring careful interpretation (Wilson and Frimpong 2004).

Based upon Mahapatra et al. (2011b) seminal approach to conceptualizing the personal factors, we include job satisfaction, attitude towards the job, age, gender, level of education and educational background, perceived level of knowledge and working experience as personal factors. In addition to the Swedish example of Mahapatra et al. (2011b), the active exchange of knowledge in networks has been described as an influencing factor for the performance of services, especially in terms of highly specialized expert services (Muller and Zenker 2001; Probert et al. 2013).

Besides the personal factors, EECs' capability to diffuse innovation can explain the way in which EECs manage the contextual conditions that cannot be immediately influenced by the individual EEC (Backhaus 2010). This includes the form of occupation (conducting part or fulltime energy audits), the clarity of job description, payment for energy audits and the workload, which have proven to have a strong impact on the performance of EECs, measured by the customers' satisfaction with EECs' service (Mahapatra et al. 2011b). In addition, the institutional framework depends on the innovative capability of the regional (Bettiol and Di Maria 2013; Cooke et al. 1998) and national innovation system (Lundvall 1992; Castellacci and Natera 2013). Consequently, energy audits are affected by the legal dimensions, the public subsidizing scheme and the technical know-how provided by the public authority (Weber and Rohrer 2012).

### *3.2. Evaluation of retrofit measures*

The suggestions of technologies during energy audits influence the diffusion of technologies, thus affecting the role of EECs as change agents. The mechanism of selecting the technology for energetic retrofit has been discussed in an acknowledged strand of literature based upon the seminal paper of Jaccard and Dennis (2006). Research has focused on homeowners' decision process about energy efficiency measures in various countries; for example, in Sweden (Nair et al. 2010), Germany (Achtnicht and Madlener 2014) and Switzerland (Banfi et al. 2008). It was proven that energetic refurbishment measures depend on the homeowners' willingness to pay (Grösche and Vance 2009; Kwak et al. 2010). In particular, the willingness to pay for improved energy efficiency concerning investments in insulation, heating and under-floor insulation differs between landlord and tenant (Phillips 2012). While homeowners' intention to conduct retrofit measures has been revealed, the willingness to pay for energy efficiency measures is insufficient to compensate for the higher costs for renewable technologies compared with standard technologies (Scarpa and Willis 2010). Economic efficiency has been identified as key for homeowners to decide in the first place whether to conduct retrofit measures, followed by the volume of the project (Popescu et al. 2012; Achtnicht and Madlener 2014). Besides the economic profits, the customers value any environmental benefits of energy saving (Banfi et al. 2008; Achtnicht and Madlener 2014), regardless of the criticism about the outcome of retrofit measures - especially insulation - in the public discussion in Germany, attributing it to low additional environmental and energy efficiency profits (Holm et al. 2014).

To understand EECs' impact on diffusion of innovative technologies advising homeowners' on retrofit measures, the EECs had to choose for one case study from different insulation material (Phillips 2012; Kwak et al. 2010), heating technologies (Michelsen and Madlener 2012; Madlener and Hauertmann 2011) and renewable energy applications (Scarpa and Willis 2010; Claudy et al. 2011). Mirroring the willingness of homeowners to pay, EECs can have a strong impact on the discussion about the economic efficiency due to the provision of technical knowledge and information regarding the upcoming costs for the customer (Ryghaug and Sørensen 2009). We followed an approach from the literature to estimate the upfront costs of energetic retrofit, including the costs of the suggested measures (Wilson et al. 2015). The information on upfront costs is important for homeowners' perceptions of economic efficiency since the development of prospective energy costs is always based upon risky assumptions (Alberini et al. 2013; Jaccard and Dennis 2006). Due to uncertainty during the construction process, EECs had to estimate for the case study minimum and maximum upfront costs for the measures to create an indicator concerning how innovative technology suggestions affect the retrofits' cost calculation.

The estimated EPC level contributes to demonstrate the influence of energy audits on the general energy efficiency level in the housing sector. The impact of labeling with transparent information has been analyzed using a discrete choice experiment, leading to the preference towards environmental-friendly technologies (van Rijnsoever, Frank J. et al. 2015). We conceptualized the labeling using the energy level for receiving subsidies from the KfW bank, since the EECs' proposal is decisive in terms of making the energy level transparent for homeowners from the legally required minimum standard until the passive house standard, which is the basis for EECs to plan the refurbishment.

## **4. Methodology**

### *4.1. Structure of the questionnaire*

Modeled following Mahapatra et al. (2011b), we developed a questionnaire tailored for energy audits in Germany elaborated based upon 17 expert interviews discussed in detail in Feser and Runst (2015). The questionnaire was structured in four sections as follows. First, general demographic and business-related topics were discussed, including questions about the educational background, participation in public subsidy programs and membership in networks. Second, the respondents received information about a detached house provided with relevant

information to conduct energy audits. The respondents had to select the EPC level, EPC level calculation and decide upon insulation material, heating technology and renewable energy technology (see Table 1). Subsequently, the EECs were asked to estimate the minimum and maximum upfront costs of the proposed measures. The third section asked about attitudes connected to personal and contextual factors influencing the work of EECs. Fourth, recommendations about public interventions in the future were evaluated by the respondent.

EPC level	EPC level calculation	Insulation material	Heating technology	Renewable energy technology	Costs of retrofit
Minimum standard	Component method (standard)	Foamed plastic (e.g. polystyrene)	No change	No renewable energy technology	Minimum costs
KfW 100	Reference building method (flexible)	Mineral (e.g. mineral wool)	Condensing boiler	Photovoltaic system	Maximum costs
KfW 70		Organic (e.g. cellulose)	Pellet boiler	Solar thermal system,	
Passive house standard			Heat pump using geothermal source Heat pump using air as source	Transparent cover for hot air	

Table 1

In sections three and four - as given above - a five-point Likert scale (1=strongly disagree, 5=strongly agree) was used to test EECs’ attitudes regarding the personal and contextual factors as well as the ranking of proposals for prospective energy audits. The questionnaire was created and discussed within an interdisciplinary research group comprising experts from the field of architecture, civil engineering, economics and law. The energy audit case was selected from a team of architects in cooperation with a real estate manager. The questionnaire was pre-tested and reviewed by three experienced EECs.

4.2. The survey

The survey took place on the online platform SurveyMonkey. We followed suggestions of Sauermann and Roach (2013) to increase the response rate combining various activities. For instance, before the opening of the survey and within the aim of making our survey known to the broader public, we contacted the two largest professional EEC organizations, whose members constitute about 25% of the web-listed EECs. The EEC engineering craftsmen association (GIH) mostly comprises members coming from the craftsmen and engineering

sector, while the energy consultants network (DEN) only accepts in its auspices members with a graduate background, specifically architectural and scientist backgrounds. The professional background on the certified EEC market can also be found in both organizations (Prognos et al. 2013). Additionally, we offered a monetary incentive for the respondents to participate by donating 2€ to a charity organization<sup>19</sup> for every completed questionnaire, as suggested by Smith et al. (2015). Based upon the email addresses of GIH and DEN members found in the public domain, we composed two emails addressing the EECs in person. These emails were distributed around as a call to participate and a reminder of our survey. We sent the first email on the third day and the second on the tenth day. Approximately 1,800 personalized emails were sent<sup>20</sup>, which resulted in 459 incomplete and 339 complete responses.

<b>Gender (N=459)</b>		<b>Age (N=454)</b>		<b>Degree of education (N=454)</b>		<b>Educational background (N=451)</b>		<b>Share over energy audits of total turnover (N=320)</b>	
Female	9.59%	<40 years	9.25%	Vocational Training ("Meister")	29.96%	Architecture	18.63%	Less than 30%	44.69%
Male	90.41%	40-49 years	28.64%	Bachelor	3.94%	Engineering	51.22%	Equally distributed	14.38%
		50-59 Years	44.27%	Master	64.54%	Craftsmen	22.39%	More than 70%	40.94%
		>60 years	16.08%	Promotion	1.54%	Others (e.g. general scientist)	7.76%		
	100%		100%		100%		100%		100%

Table 2

The majority of the respondents were male and on average 51 years old, holding a master's degree. Furthermore, the majority were graduates in the field of engineering and the sample is almost equally distributed between EECs with a major focus on energy audits with a share of more than 70% of the turnaround and a minor focus with a share lower than 30% from energy audits (see Table 2).

<sup>19</sup> The participants could choose among three different charity organizations: BUND with 228€ (environmental purpose), Aktion Mensch (general welfare) with 310€ and Aktion Deutschland hilft! (support for refugees) with 140€.

<sup>20</sup> We selected the publicly available email addresses found on the homepages of the DEN and GIH, although not all members could be contacted due to missing email addresses.

### 4.3. Analysis

The respondents agreed with a high degree of uniformity with most of the statements. For example, about 49% fully agreed while the same percentage agreed with the statement “I have state-of-the-art knowledge for conducting energy audits”. In addition, more than 95% of the respondents agreed/fully agreed with the statement “I think that EEC is an interesting profession”. As the analysis of the remarks of the respondents in the open comments section showed, the order of the questionnaire sections influenced the self-perception of EECs. To explain, placing the case study before the self-perception statements framed the answers positively due to the self-affirmation that the respondents felt in the first place after solving the case study (Tversky and Kahneman 1981).

Following Mahapatra et al. (2011b), we summarized the fully disagree, disagree and the neutral category as a neutral/negative category. Furthermore, the fully agree and agree category were merged into a positive category. In questionnaires without neutral options, respondents tend to answer negatively while positive answers remain clearly positive (Graeff 2002; Mahapatra et al. 2011b). Consequently, we tabulated independent variables with the rest of the variables from sections 1, 2 and 3. This facilitated conducting a chi-square test to analyze correlations of EECs’ personal and contextual factors.

In the case study, we analyzed the coherence between the choice of EPC level and the calculated costs focusing on the selection of different technologies, which varied from standard to innovative technologies. Experts evaluated these beforehand to measure the impact of EECs on the diffusion of innovation. Due to the complexity of retrofit, the data on upfront costs are scarce. In a meta-study, Henger and Voigtländer (2012) showed the range of possible costs for different EPC levels in Germany. The costs are based upon real data after the retrofit comprising a sample with more than 10,000 retrofit projects. A lower bound for the upfront costs is recalled in DENA (2012), which has been criticized for presenting low costs having selected only a profitable lighthouse project and representing minimum costs for energetic retrofit (Simons 2012). Due to increasing costs, the average costs in the building sector have increased by about 7% since 2011, the date when the last costs are estimated.<sup>21</sup> The minimum and maximum upfront costs were compared with retrofit costs described in Henger and Voigtländer (2012)

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<sup>21</sup> Statista (2015): <http://de.statista.com/statistik/daten/studie/70134/umfrage/baupreisindex-fuer-wohngebaeude-in-deutschland/>.

and DENA (2012) using t-statistics to ascertain whether the costs estimated by EECs match the reviewed costs.

## **5. Discussion of results**

### *5.1. EECs' perception of personal and contextual factors*

The customers' acceptance is central for the success of energy audits, which influence the implementation of energetic refurbishment measures (Mahapatra et al. 2011a). About 95% of the respondents agreed/fully agreed with the statement "I fulfil the expectation of the homeowner who is in renovating process", while only 15 of 348 respondents answered neutral or disagreed/fully disagreed. In contrast to our survey, only 52% in the Swedish survey agreed to the latter statement (Mahapatra et al. 2011b). Regardless of the efforts of Germany and Sweden towards energy efficiency in the residential sector, the institutional framework substantially varies between the two countries (Kiss et al. 2013). While the Swedish EECs are mostly employed as public servants offering information for homeowners about energetic retrofit (Mahapatra et al. 2011b), in Germany there are foremost independent energy services offering energy audits. In this case, the satisfaction of customers has a direct impact on EECs' profit. In recent years, a considerable number of EECs have had to leave the EEC market since it has become no longer possible for them to offer energy audits in a sufficient quality (Feser et al. 2015).

The market structure requires that EECs orient themselves carefully to homeowners' demand for energy audits. Consequently, EECs positively evaluate personal factors, since - as it is observed - the respondents believe that they fulfill the quality standards on the EEC market. Especially complaints of EECs about unfair competition indicate the necessity to offer an optimal service to customers (Feser and Runst 2015). About 98% agreed/fully agreed to the statement of having up-to-date knowledge concerning their service, while about 86% confirmed using networks to receive new knowledge. The aforementioned positive answers can explain why 95% of the respondents agreed/fully agreed to the EEC profession being an interesting profession. Additionally, about 81% of the EECs confirmed that being an EEC satisfied them. We thus recognize a positive self-evaluation of knowledge- and personality-based attitudes on the market framework, which means that EECs must adapt to the general quality level to benefit from energy audits. About 47% of the respondents work in micro-sized companies with only

one or two employees, whereby this high degree of personal involvement can justify the positive perception of personal factors.

The answers regarding the contextual factors are assessed more heterogeneously in comparison to the personal factors. Specifically, the consent from the respondents is weaker for the questions regarding the contextual factors, even though about 72% agreed/fully agreed with facing no problem working with the current legal framework. The improvement of the general retrofit level and the support of energy audits can explain the high level of confirmation for the German regulation (Galvin and Sunikka-Blank 2013).

A major barrier for EECs is the low willingness to pay for energy audits, with about 49% of them answering neutral or disagreeing/fully disagreeing to this topic, which is consistent with previous surveys on German EECs (Prognos et al. 2013). Nonetheless, only about 42% fully agreed with the statement “I get a fair compensation for the offered energy audits”, which indicates disparities of payment in the EEC sector. The problems of the low willingness to pay was also emphasized in the open comments, highlighting problems in financing energy audits, which have been discussed in the exploratory interviews (Feser and Runst 2015).

We found significant correlations with the perception of fair payment at  $p < 0.05$  in the chi-squared statistics exclusively in the contextual factors, which is consistent with the description of the German housing sector substantially driven by public interventions (Galvin and Sunikka-Blank 2013). There are the four key variables. First, the workload is significantly correlated with fair payments for the energy audit (approximately 73% of the EECs agreed/fully agreed with having a high workload). This may be especially the case in publicly-promoted energy audits, since the subsidies payments often comprise fixed payment contracts that include only a short time framework to conduct an energy audit. Extra work thus does not result in additionally paid work for EECs (Feser and Runst 2015). Second, the administration of subsidies (about 62% agreed/fully agreed to having problems with the administration of subsidies) has a significant correlation, while the permission to grant subsidies is not significantly correlated, since a vast majority of about 93% of the EECs have it. Especially in recent years, dynamic changes and the low interest rate have reduced the motivation of customers to include EECs in the retrofit measures (Henger et al. 2015). Third, the support from public authorities supplying technical and non-technical expertise significantly correlates with fair compensation. In particular, the regional and national energy agencies appear as major actors to deliver information to customers and EECs (Feser et al. 2015). The quality of information from public institutions has been criticized since the information partially

contradicts EECs' recommendations and is not tailored towards homeowners' needs, which is perceived to hamper the willingness to conduct retrofit measures. The mixed results of general information policy in the residential sector support our results. (Bartiaux 2008; Ramos et al. 2015). Fourth, the job description (about 64% agreed/fully agreed to having a detailed job description) is significantly correlated to the fair compensation for EECs. The quality of descriptions varies depending on the customer and the complexity of the retrofit. The description of the project is decisive for the EEC's outcome since it affects the time of planning and implementing the refurbishment measures. The rest of the contextual factors are not significantly correlated with the payment of EECs.

The customers' satisfaction and personal attitudes sections gather a high degree of agreement from the EECs. We explain this with the confidence of the respondents who survive the competition on the EEC market. The situation in the contextual factors is different, whereby especially the payment for energy audits is an impediment for EECs' work. This could indicate the relevance of the institutional framework, particularly concerning the economic and regional conditions. The requirements from the legal framework are evaluated positively, since it affects the EECs in the same way. However, the customers' individual characteristics, the circumstances of the retrofit project, access to subsidies and support from public institutions influence EECs' profit and can result in a competitive disadvantage.

## *5.2. Case study on energy audits*

The case study illustrates the influence of EECs on energy efficiency in the housing sector during energy audits. Due to the limited choice of technologies, this exemplary energy audit has exploratory character but can offer useful insights into the role of EECs in the diffusion of innovation. The focus is on the suggestion of refurbishment measures and the evaluation of the proposed retrofit. In the following section, we show EECs as partially supporting the diffusion of innovation while the respondents systematically undervalue the costs.

### 5.2.1. Implementation

The selection of the method for the energy calculation determines the choice of the technical solution. The component method approach calculates the energy level based upon the energy use of each component. Only about 27% of the respondents admitted to applying this method

to calculate the energy efficiency from the refurbishment measures, while the rest showed a preference for the reference building method. The reference building method compares the energetic status of the entire house with a reference housing fulfilling the desirable EPC level. This method allows EECs to combine the measures in a more innovative way. By contrast, the component method is a more standardized approach.

Only about 16% selected foamed plastic to insulate the house in the case study. However, about 80% of the insulation in German houses is made from synthetic material. The partially desirable response behavior of the respondents explains the disparity between choice and the use of material in reality. German media has strongly discussed ecological problems and possible security risks in recent years (Sprengard et al. 2012). About 46% suggested using mineral material for the insulation, while approximately 37% selected organic material. The latter offered an innovative and economic alternative, which the description of the case study explained in detail.

Only about 4% proposed maintaining the existing condensing boiler, while about 37% suggested replacing it with a modern condensing boiler. About 29% recommended a pellet-fired system, which has the advantage of being an energetic system with renewable energy. The geothermal energy in combination with a heating pump was only selected by about 14%. However, the preconditions for the implementation of the geothermal technology were described as positive in the case description. About 12% of the respondents advised to install a heat pump using hot air as source, which was ex-ante evaluated as the most innovative technological choice.

Comparable to the heat generation technologies, almost all respondents proposed to integrate renewable energy technologies on the roof. In particular, about 41% consulted to add a photovoltaic system and 54% a solar thermal system. However, the respondents neglected the collector facades (only three proposed it). This option was evaluated in advance as disruptive, when tested in publicly-promoted research projects (Rudolph-Cleff and Pfeifer 2014).

To carefully interpret the results, desirable answering behavior needs to be considered, which cannot be precluded due to the evaluation character of the hypothetical energy audit and missing monetary incentives. Nevertheless, the contribution to the diffusion in retrofit is observable since EECs prioritize innovative measures, while disruptive innovations are scarcely suggested and not recommended for this case study. In particular, according to EECs' comments, energy

audits are oriented intensively towards the socio-economic characteristics of homeowners and regional market conditions.

### 5.2.2. Contribution to the energy efficiency in the residential sector

The majority of the respondents (about 93%) offer certified energy audits where more energy-efficient retrofits receive higher monetary incentives. The energy level of renovated houses determines the energy efficiency of the housing stock in the long-run until 2050, since the renovation cycle is estimated from 30 up to 50 years (Feser et al. 2015). The contribution to the energy efficiency of the retrofit is measured with the EPC level. The homeowners' decision is crucial in the retrofit of residential houses (Stieß and Dunkelberg 2013). For customers, the EECs' calculation of upfront costs forms the basis for assessing the benefit from the energetic retrofit.

The respondents suggested that higher EPC levels require more expenditure (see Table 3). This goes in line with the literature, which claims higher investment costs for more efficient EPC levels (Steinbach and Schultmann 2015; Henger and Voigtländer 2012). This observation shows that the offered exposé included the necessary information to offer a reliable estimation of the upfront costs.

	Minimum standard (SD)	KfW 100 (SD)	KfW 70 (SD)
Henger and Voigtländer (2012)	355.00	630.00	736.00
DENA (2012)	-	400.00	470.00
EEC_minimum	330.17 (38.85)	343.09 <sup>a, b</sup> (15.09)	427.42 <sup>a</sup> (32.16)
EEC_average	418.16 (44.46)	438.53 <sup>a, b</sup> (17.57)	507.91 <sup>a</sup> (24.41)
EEC_maximum	506.13 <sup>a</sup> (51.33)	533.96 <sup>a, b</sup> (21.70)	588.41 <sup>a, b</sup> (25.61)

a) t-test is significant at the 5% level for Henger and Voigtländer (2012).

b) t-test is significant at the 5% level for DENA (2012).

Table 3: Retrofit costs per square meter

The largest group of EECs (about 49%) advised the KfW 100 standard fulfilling the legally required energy standard for new built residences, which is consistent with the statistics on publicly-promoted houses (Diefenbach et al. 2014). The reported maximum costs are significantly lower than the costs described by Henger and Voigtländer (2012). The respondents seem to prefer the lower bound of expenses since the average and minimum costs are closer to

the costs of DENA (2012) than Henger et al. (2015). Interestingly, the minimum costs are even significantly lower than in the case of DENA (2012). Furthermore, we find similar characteristics in the second largest group of EECs (about 35%) proposing the KfW 70 standard (30% less end-energy use in comparison to new residences). The only exception is the maximum estimated upfront costs, which are significantly higher than DENA (2012) and significantly lower than Henger and Voigtländer (2012). In our example, the respondents underestimated the upfront costs by more than 25% in comparison to Henger and Voigtländer (2012) for the KfW 100 and KfW 70 standard.<sup>22</sup>

Only about 13% aimed towards the legally required minimum standard comprising no more than 140% of the end-energy use of new residential houses. One explanation is that certified EECs tend not to aim towards this standard because subsidies for it are only granted for historic buildings and thus they do not reflect the core of EECs' business model (only 16% are registered for this specific renovation program). The reported average costs are slightly higher (not significantly) in comparison to Henger and Voigtländer (2012).

The EECs emphasized the difficulties concerning the calculation of costs, particularly because the energy audit had been conducted virtually. In particular, details about the specification of applied technologies have a considerable impact on the range of retrofit costs. For example, a group of EECs commented that they would decline estimating costs for customers in the first meeting due to the high level of uncertainty. Moreover, both the evaluation and announcement of the costs have been recognized as problematic due to regional and socio-economic differences.

Since about 62% of the respondents selected the minimum and KfW 100 standard, energy audits' contribution to the energy efficiency goals in the housing sector is questionable due to the support of lower energy standards than required to fulfill the energy-related climate goals.

Furthermore, the systematic underestimation of the costs in the KfW 100 and KfW 70 standards is problematic and answered too optimistically, particularly with the recommendation of innovative measures. Due to the increasing general price level in the building sector, the calculation of the prices for the exemplified case appears risky. The lower estimated costs reveal the results from Scarpa and Willis (2010), which found a lower willingness to pay for innovative retrofit measures from the customer side. The uncertainty with reference to the regional and

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<sup>22</sup> We excluded the evaluation of the passive house standard in the analysis since only nine respondents suggested implementing the latter.

social background of the costs is - on average - not translated into higher costs of the retrofit, although the EECs criticized the missing information in their comments. These difficulties in the EECs' cost calculation of the retrofit can partially explain the low willingness to pay for EECs (Feser and Runst 2015).

**6. Recommendation for EECs**

In the following section, we present the results of recommendations that were previously proposed by experts of the retrofit sector (see Figure 1).

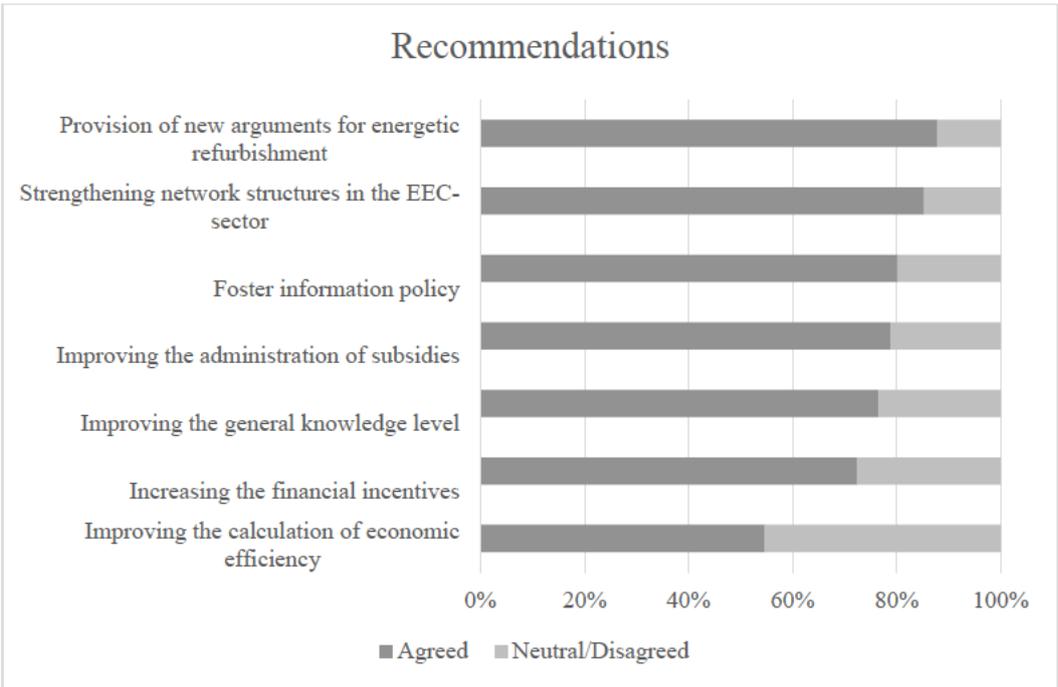


Figure 1

The recommendations generated a high level of support, whereby on average about 76% fully agreed or agreed with all the statements. The low impact of energy audits on the retrofit rate explains the need for improvement (Ramos et al. 2015; Feser and Runst 2015), which consequently requires changes in the German framework, particularly in the subsidy scheme (Stieß and Dunkelberg 2013).

The largest share of respondents agreed/fully agreed to improve the marketing policy, offering new arguments for customers to conduct energetic refurbishment. This could be grounded upon a specific German characteristic, whereby non-professional landlords and owner-occupiers control about 77% of the total number of apartments (Hopfner and Simon-Philipp 2013) and they are described as having a lower interest in profit maximizing (Stieß and Dunkelberg 2013).

For example, changing the focus from the economic benefit to environmental benefits has been discussed as a possible solution based upon environmental-friendly and energy-saving preferences of homeowners (Ek and Söderholm 2010; Zundel and Stieß 2011). However, the provision of additional environmental information has brought mixed results in the literature (Gram-Hanssen et al. 2007; Bartiaux 2008). Closely related to the diffusion of new arguments is the statement of delivering more general information to customers about retrofit measures, to which 80% agreed/fully agreed. In the case of Germany, Galvin and Sunikka-Blank (2013) criticize the missing ex-post information, which can explain both success and barrier factors of retrofit, providing information for prospective customers.

In the second most agreed statement, about 85% recommended strengthening network structures in the EEC sector. Although the EEC sector has only been present for the last ten years, it has considerably grown. Nonetheless, the network structures have developed weakly in comparison to the originating sectors of EECs (Feser and Proeger 2015). Networks can influence the supply side of knowledge diffusion, supporting the EECs' role as change agents (Feser and Runst 2015). From a systemic perspective, intermediate organizations are necessary in the energy transition process to ensure the quality of knowledge processes in return (Hodson et al. 2013). Regardless the positive self-evaluation of the service quality and the personal knowledge basis, about 76% agreed with the need for quality improvement in the EEC sector. Additionally, this was expressed in the comments, complaining about the low level of quality observable during the energy audits. Information asymmetries between EECs and customers make the knowledge diffusion for retrofit rather complex (Feser and Runst 2015).

In the literature, the German subsidy scheme is positively evaluated as a role model for other comparable European states (Murphy 2014b; Rosenow and Galvin 2013). Nevertheless, our survey showed that about 78% demanded improvements in the administration of the programs. These are often influenced by dynamic changes and the variety of programs (Feser and Runst 2015). In the comments, the responsibilities for EECs raised critique since the EECs have to guarantee the quality of the subsidized retrofit while the public administration only monitors the formalities (Feser and Runst 2015).

The two factors characterized by the least agreement are first, the improvement of monetary incentives, and second, dealing with the economic efficiency, both of which affect the customers' monetary decisions. About 71% of EECs agreed/fully agreed with the demand for more financial incentives for customers through public funding. The second lowest degree of agreement can be explained by respondents' experience in recent years with improved

incentives. The demand for subsidies was partially too low to distribute the complete funds while the budget for subsidies has been increased in recent years. Furthermore, a reform with integrating tax incentives in the building rehabilitation program has been proposed (Neuhoff et al. 2011) yet has failed to be implemented due to political controversies in 2015 (Süddeutsche 2015). Therefore, it seems unrealistic to implement this measure in the near future. Consequently, the discussion about the calculation of the economic efficiency was evaluated as least important, with only about 55% agreement. This goes in line with the result of the cost estimation of our case study providing hints about the difficulties in calculating the upfront costs, which results in a very different perception of economic efficiency (DENA 2012; Henger and Voigtländer 2012).

The section with recommendations is consistent with EECs' attitudes towards personal and contextual factors. While the EECs evaluate the contextual conditions critically, the recommendations emphasize the need for institutional changes to conduct energy audits more effectively. In particular, the decision process of customers appears central for EECs since new arguments and information could influence homeowners to conduct energetic refurbishment measures. By contrast, the economic efficiency seems not to positively influence customers to conduct retrofit, as stated by the EECs. This could be explained by the difficulties concerning energy audits to present liable data on the amortization duration of retrofit measures. Nevertheless, homeowners consider the economic efficiency as crucial to estimate the effect of the retrofit measures (Galvin and Sunikka-Blank 2013).

## **7. Conclusion**

Our paper focuses on the contribution of EECs to improving the energy efficiency and diffuse innovative technologies in the residential housing sector. We identify personal and contextual factors influencing EECs' performance and explore the role that EECs play in the diffusion of innovation during retrofit, conducting a choice analysis based upon a hypothetical energy audit. The aim of this analysis is to evaluate the range of selected choices from mainstream to non-standard measures and their costs.

Our results identify differences between EECs' self-evaluation regarding personal and contextual factors. On the one hand, the responding EECs mainly answered positively concerning the ability to fulfill homeowners' expectations at an energetic renovation. Consequently, the knowledge basis and attitudes towards self-perception are also seen

positively. On the other hand, contextual factors were evaluated more critically. Especially the payment for energy audits was perceived as problematic by 49% of the respondents. Further speaking, EECs' financial resources are significantly correlated with factors that offer competitive advantages for only some EECs, including the administration of subsidies, job description, workload and knowledge support from the public sector. The differences in perception between Swedish EECs (Mahapatra et al. 2011b) and our surveyed EECs can be explained by the different institutional frameworks. The competitive structure in Germany creates the positive perception concerning the personal factors since EECs can only operate successfully by fulfilling customers' expectations and adapting to the market conditions.

In our case study, the respondents suggested applying innovative measures aside from the disruptive ones. To evaluate the proposals for energy efficiency measures, the suggested EPC level clearly missed the targeted climate goals. Furthermore, the costs of retrofit were systematically underestimated in the case of higher EPC standards. A gap between intention to implement innovative solutions and to calculate the upfront costs realistically was also revealed by the analysis of Scarpa and Willis (2010), focusing on homeowners' perspective. Consequently, the uncertainty of costs in the retrofit could explain the negative self-evaluation of the fair compensation. EECs attributed their problems to the contextual factors.

The Swedish and German frameworks of conducting energy audits seem to have different effects on the diffusion of innovation. In the Swedish example, the EECs can recommend innovative solutions within the energy efficiency goals set by policy-makers regardless of the realization of retrofit measures by customers, while German EECs have to orient towards the customers' needs.

Since the energy audits still have not led to a substantially higher retrofit rate, we propose three policy implications for reforms in the EEC sector. First, policy needs to focus on the institutional framework for retrofit since the public sector influences the framework for retrofit and particularly innovation. In particular, the subsidy scheme should be changed into targeting to save fossil energy, allowing more flexible innovative solutions that could support the role of EECs as change agents. Second, the information on costs and the reduction of energy consumption needs to be part of an ex-post evaluation. The problem with the payment of EECs could be partially solved since the customers could assess the additional benefit from the retrofit. The forecasts based upon simulation prognosis could be replaced with real data since it has only little value for the concrete energy audit case (Sunikka-Blank and Galvin 2012). The monitoring should ideally be executed not by the EECs but rather by a neutral actor - for

example, the funding authority - to ensure a reliable comparison of ex-ante and ex-post energy consumption from residences. Finally, policy intervention needs to address the entire EEC market. In recent years, interventions have prompted some groups to establish a higher level of quality in the EEC market. This survey showed that EECs have a homogenous attitude towards energy audits, despite the restructuring caused by institutional reforms that required the adaptation of EECs to the market conditions. Respondents seem confident about this adaptation. One suggestion could be to shift from the subsidy scheme to a carbon tax, which would allow more innovative solutions for the customers. Such solutions based upon the aim of reducing the use of fossil energy would make the component specific regulations obsolete, while the emission reduction would be at the center of the regulation.

In our explorative analysis, we focus on energy audits exemplified in only one case study. To deepen the understanding of EEC's impact, a comparison of energy audits could offer new insights into the planning of energy measures in the retrofit sector. In particular, the question of whether EECs offer coherent consulting in terms of the advised technology and the estimated costs requires further research. Therefore, a vignette survey with evaluating different cases would identify key variables based upon a robust dataset. Furthermore, a similar questionnaire could be established as panel survey to show dynamic developments in the EEC sector to support policy-makers in improving the energy efficiency in the residential sector. Last but not least, the certified EECs represent only a small share of experts in the German retrofit market offering energy audits. Therefore, a comparison with other professional EECs and constructing companies offering informal EEC services seems necessary to fully understand the impact of certified EECs on the quality of retrofit.

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## **Chapter 8**

# **Die Energieberatung als der zentrale Akteur bei der energetischen Gebäudesanierung?**

**with Till Proeger and Kilian Bizer**

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## **Zusammenfassung**

Die Sanierungsrate bei energetischen Gebäudesanierungen im Wohnsektor ist mit nur einem Prozent sehr niedrig und stagniert seit einigen Jahren. Um die Ziele der Bundesregierung in Bezug auf die Reduktion des CO<sub>2</sub>-Ausstoßes, zu erreichen, die einen annähernd klimaneutralen Gebäudebestand im Jahr 2050 erfordern, müsste die Sanierungsrate mindestens verdoppelt werden. Für dieses Ziel wird die Energieberatung als möglicher zentraler Akteur angesehen, indem sie Informationshindernisse für potenzielle Sanierer abbauen kann. In diesem Aufsatz wird der Frage nach Chancen und Herausforderungen der Energieberatung im Wohngebäudesektor nachgegangen. Hierbei wird untersucht, wer die relevanten Akteure der Energieberatung sind und welchen Einfluss der Gesetzgeber auf die Entwicklung der Sanierungsrate durch die Energieberatung aktuell nimmt und künftig entwickeln könnte. Die Energieberatung kann dabei durch die Vertrauensgutsituation beschrieben werden, in der es für (potentielle) Sanierer sowohl ex ante, als auch ex post schwierig ist, die Qualität der erhaltenen Beratung zu bewerten. Zwar soll die staatliche Förderung die Informationsbarrieren bei energetischen Gebäudesanierungen ausgleichen, trotzdem haben die Programme teilweise mit einer schwachen Nachfrage zu kämpfen. Als größte Herausforderungen erweisen sich dabei Komplexität und Rentabilität der Energieberatung. Potenziale zur Verbesserung der Wirkung von Energieberatern ergeben sich bei der Ausbildung, insbesondere im Bereich der staatlichen Zertifizierungen. Die wichtigsten Ansatzpunkte für die Entwicklung einer zukunftsfähigen, qualitätsorientierten Energieberatung sind folglich die Verbesserung der staatlichen Zertifizierung und eine stärkere Orientierung an Koordinations- und Netzwerkaufgaben. Nichtsdestotrotz kann die Förderung der Energieberatung immer nur ein unterstützendes Instrument sein, die nicht geeignet ist, allein eine deutliche Erhöhung der energetischen Sanierungsrate zu bewirken.

## ***Schlüsselwörter***

Energetische Gebäudesanierung, Energieberater, Staatliche Zertifizierung, Vertrauensgutsituation

## **Abstract**

The German government's goal of turning the German housing sector almost CO<sub>2</sub> neutral by 2050, requires a twofold increase of the current renovation rate of one percent p.a.. Energy consultants play a major role in this as a policy instrument for increasing the renovation rate. This paper analyses the challenges and opportunities of energy consulting in the housing sector.

Based on expert interviews and literature research, we evaluate the role of energy consultants in the housing sector. Energy consulting can be described as a credence good situation, as potential renovators can rarely evaluate the obtained quality both ex ante and ex post. Since there are information barriers, energy consulting is publicly subsidized, yet the programs struggle with weak demand. The high degree of complexity and low profitability appear to be the biggest challenges for energy consulting. In contrast, the training of energy consultants via certificates required for receiving state subsidies can be used to improve the quality of energy consulting. These should be the starting points of further development of energy consulting, along with an increased awareness of coordination and networking tasks. Overall, state certificated energy consultancy remains a key instrument to increase energy efficient renovations. . Nevertheless, the promotion of energy consulting can only be a supportive tool and needs to be accompanied by other policy instruments.

***Keywords***

credence good situation, energetic renovation, energy consultants, state certificates

## 1. Einleitung

Bei der Erreichung der Ziele der Bundesregierung zur Reduzierung des CO<sub>2</sub>-Ausstoßes spielt der Gebäudesektor eine entscheidende Rolle, da für rund 40 % des Endenergieverbrauchs in Deutschland verantwortlich ist. Der vor der 1. Wärmeschutzverordnung von 1977 errichtete Altbaubestand bietet dabei ein großes Sanierungspotenzial, denn rund drei Viertel dieser Häuser sind unsaniert und -gedämmt. Diese sanierungsbedürftigen Objekte können eine entscheidende Rolle bei der Reduzierung des Endenergieverbrauches spielen. Um im Jahr 2050 einen nahezu klimaneutralen Gebäudebestand in der Bundesrepublik zu erreichen, müsste die Sanierungsrate, die bislang mit ca. einem Prozent ausgesprochen niedrig ist, auf mindestens zwei Prozent gesteigert werden (KfW Research 2011, IW Köln 2012, Adolf und Bräuninger 2012).

Die regulatorische Einflussnahme auf die Sanierung des Gebäudebestandes ist eine komplexe Aufgabe, da die Nachfrage nach Sanierung von Wohngebäuden die Heterogenität im Wohngebäudesektor widerspiegelt. Die Bandbreite reicht von Eigenheimnutzern, privaten Vermietern, Wohneigentumsgesellschaften bis hin zu gewerblich profit-orientierten bzw. genossenschaftlich und öffentlich organisierten Wohnungsunternehmen. Die Nachfrage nach energetischen Gebäudesanierungen ist durch kontinuierliche Verschärfungen in der EnEV (2004, 2009, 2014) in den Fokus von Immobilieneigentümern geraten, sodass in zweierlei Hinsicht ein hoher Informationsbedarf für (potentielle) Sanierer besteht, bei der die Energieberatung den zentralen Intermediär darstellt. Erstens ist mit der energetischen Gebäudesanierung ein hoher Koordinierungsaufwand verbunden, da bei einer Sanierung die unterschiedlichsten Akteure (u.a. Handwerker verschiedener Gewerke, Architekten, Mieter) aufeinandertreffen. Zweitens gibt es, bedingt durch technologischen Fortschritt und die Möglichkeit, herkömmliche Sanierungsmaßnahmen mit erneuerbaren Energien zu kombinieren, eine Vielzahl technischer Lösungen, die selbst bei erfahrenen Fachleuten Beratungsbedarf hervorrufen.

Eine ökonomische Perspektive auf diese Koordinations- und Beratungsfunktion ist es dabei, energetische Gebäudesanierungen als Erfahrungsgut bzw. als Vertrauensgut zu interpretieren. Das heißt, dass die Qualität der energetischen Sanierung sowohl vor (ex ante), als auch nach der Sanierung (ex post) nur mit hohem Informationsaufwand zu bewerten ist, was ein Erklärungsansatz für die niedrige Sanierungsrate sein kann. Wenn diese Informationsprobleme in Bezug auf energetische Gebäudesanierungen abgebaut werden sollen, kommt der Energieberatung als unabhängigem Intermediär zwischen Anbieter und Nachfrager eine zentrale Rolle zu. Die niedrige Sanierungsrate könnte folglich erhöht werden, wenn es der

Energieberatung gelingt, Unsicherheiten, die während der energetischen Sanierungsmaßnahmen auftreten und die zur Entscheidung gegen die Sanierung oder sogar zum Abbruch der Sanierungsarbeiten führen können, beseitigen kann. Neben Informationskampagnen für die Nutzung von Energieberatung und der direkten finanziellen Förderung der Energieberatung stellt die Qualitätssicherung der Förderung durch Energieberater eine wichtige Rolle im Förderregime.

Das Konzept der Energieberatung als neutrale Instanz wurde in der Vergangenheit kontrovers diskutiert, wobei deutlich wurde, dass der Energieberater als „innovationsoffener Energieeffizienzerhöher“ lediglich ein Idealbild darstellt. Schon aus der Komplexität der Materie ergibt sich, dass jeder Energieberater einen eigenen fachlichen Schwerpunkt setzt, wobei die Berufsgruppe, aus welcher der Berater stammt, diesen Schwerpunkt entscheidend prägt. Die meisten Energieberater kommen dabei (Stand: BAFA-Liste: 31.12.2011) aus dem Handwerk (ca. 30 %) bzw. sind Architekten (ca. 30 %) oder (Bau)ingenieure (ca. 40 %) (Deutscher Bundestag 2012).

Die vorliegenden Ergebnisse basieren auf explorativen Experteninterviews<sup>23</sup> und Literaturlauswertungen und zeigen die Rahmenbedingungen für die Energieberatung auf. Die Rolle der Energieberatung bei der Erhöhung der Sanierungsrate und aktuelle und künftige Herausforderungen für die Gebäudeenergieberatung standen dabei im Zentrum der Gespräche.<sup>24</sup>

## **2. Energieberatung bei energetischen Gebäudesanierungen – Ausgangslage und Charakteristika**

Die Berufsbezeichnung des Energieberaters ist nicht geschützt, sodass sich in Deutschland jeder als Energieberater bezeichnen kann. Um jedoch eine Förderung für die Tätigkeit als Energieberater zu erhalten, muss man (abgesehen von der BAFA „Vor-Ort-Beratung“) auf einer

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<sup>23</sup> Es wurden 10 Experteninterviews mit Energieberatern, Finanzintermediären, Unternehmen aus dem Baugewerbe, Handwerkskammern, einer kommunalen Energieagentur, Wissenschaftlern und Sachverständigen von Haus und Grund e.V. geführt.

<sup>24</sup> Der vorliegende Aufsatz basiert auf den Ergebnissen des Verbundprojektes „iENG – intelligente Energienutzung in der Gebäudewirtschaft“ im Rahmen der BMBF-Fördermaßnahme „Umwelt- und gesellschaftsverträgliche Transformation des Energiesystems“. Innerhalb des Projektes werden die beteiligten Akteure der energetischen Gebäudesanierung und die Bedingungen, unter denen die Akteure handeln, untersucht. Dabei wird der Schwerpunkt auf die technischen, ökonomischen, organisatorischen und rechtlichen Strukturen bei energetischen Gebäudesanierungen gelegt.

von der deutschen Energieagentur geführten Energieeffizienz-Expertenliste stehen. Im Januar 2015 standen ca. 12.500 Experten auf der Liste.<sup>25</sup>

Die Beratungstätigkeit eines Energieberater lässt sich in vier Phasen einteilen: Sie beginnt mit der Diagnose und der Analyse des Objekts. Danach kann die Erstellung von Konzepten einen Bestandteil der Beratung ausmachen. Es folgen die Initiation der Maßnahmen und die Baubegleitung. Schließlich können noch die Erfolgskontrolle und das Management der Inbetriebnahme zur Energieberatung gehören (Brunk et al. 2010). Daraus ergibt sich, dass die Dienstleistung der Energieberatung sehr stark von der Interaktion zwischen Energieberater und Kunden geprägt ist, sodass die Realisation der Energieberatung stark durch die Interessen des Kunden definiert und an seinen Bedürfnissen ausgerichtet wird (Frenz et al. 2011).

### *2.1 Markt der Energieberatung*

Zielgruppe der Energieberatung sind alle potenziellen Sanierer. Dies sind nach dem aktuellen Zensus ca. 40 Mio. private Haushalte in über 18 Mio. Wohngebäuden (Statistisches Bundesamt 2014). In Deutschland wurden nach Schätzung von Prognos et al. (2013) 2011 zwischen 370.000 und 410.000 Energieberatungen (ausgenommen die Energieberatungen von Energieunternehmen) durchgeführt, wobei die Autoren davon ausgehen, dass über die Hälfte der Beratungen bei privaten Haushalten durchgeführt wurden, wovon bei Ein-/Zweifamilienhausbesitzern ca. 60 % direkt vor Ort am Sanierungsobjekt stattfinden.

Der Markt der Gebäudeenergieberatungen ist ein relativ neuer Markt, der erst seit Anfang der 90er Jahre in relevanter Größe existiert und einen stetigen Aufschwung mit zahlreichen Markteintritten bis 2007 erlebt hat. Seitdem sinkt die Zahl der Anbieter von Energieberatungen stetig. Die Autoren der Studie von Prognos et al. (2013) begründen dies mit der Schwierigkeit, kostendeckende Energieberatungen anzubieten, da die Nachfrage dafür zu niedrig sei.

### *2.2 Charakteristika der Energieberatung*

Die Hauptmotivation, einen Energieberater zu Rate zu ziehen ist der Wunsch, die Energiekosten zu senken bei fehlenden eigenen Informationen über energetische Gebäudesanierung (Schüle

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<sup>25</sup> Die Energieeffizienz-Expertenliste ist über <https://www.energie-effizienz-experten.de> abrufbar. Eingetragen werden können Energieberater für 150 Euro Jahresgebühr mit entsprechender Qualifikation. Dieser Eintrag muss alle zwei Jahre verlängert werden mit Praxismachweis und gegebenenfalls besuchten Weiterbildungsmaßnahmen.

et al. 2011). Eine sehr niederschwellige Begegnung mit einem Energieberater ergibt sich für potentielle Sanierer bei der Erstellung eines Energieausweises. Die Pflicht zur Vorlage eines Energieausweises gilt mittlerweile bei Neubau, umfassender energetischer Sanierung sowie Verkauf einer Immobilie und kann bei jeder Neuvermietung vom Mieter eingefordert werden. Ziel dieser Maßnahme ist es, die energetische Qualität der Gebäude transparenter zu machen und möglicherweise Immobilienbesitzer zur energetischen Gebäudesanierung zu motivieren.

Die Wirtschaftlichkeit von energetischen Gebäudesanierungen ist das Kernthema für die Steigerung der Energieeffizienz des Gebäudesektors. An der Amortisationszeit der jeweiligen Maßnahmen entscheidet sich, ob Sanierungen als sinnvoll akzeptiert oder als unrentabel abgelehnt werden. Vor allem bei Sanierungsmaßnahmen, die in Zeiträumen von über 10 Jahren amortisiert werden, nimmt die Neigung potenzieller Sanierer, entsprechende Maßnahmen durchzuführen, stark ab. So können sich nach einer Studie vom BMVBS (2007, S. 36) beispielsweise nur drei Prozent der Befragten vorstellen, eine Heizungsinvestition vorzunehmen, die sich erst nach 12 Jahren amortisiert. Insbesondere in diesem Fall können unabhängige Energieberater nicht nur die Amortisationszeiten von Sanierungsmaßnahmen offenlegen, sondern auch auf eine sinnvolle Kopplung verschiedener rentabler Maßnahmen hinweisen.

Der Beitrag der Energieberatung zu einer Erhöhung der Sanierungsrate ist bis jetzt in der Literatur noch nicht erschöpfend behandelt worden. Ein Ergebnis ist jedoch, dass sich der Erfolg von Energieberatung empirisch nur eingeschränkt belegen lässt. Frondel et al. (2008) zeigen, dass kein erheblicher Unterschied bei den Energieeinsparungen nach Sanierungen festzustellen zwischen Haushalten die Energieberatung nutzen, und solchen, keine Energieberatung durchführen. Die Autoren begründen diesen Effekte zum einen mit hohen Mitnahmeeffekten – die Anreize Energieberatung in Anspruch zu nehmen, wird nur von Haushalten wahrgenommen, die auch ohne Förderung mit Energieberatern zusammenarbeiten würden – und Rebound-Effekten. Demnach ändern Haushalte nach Sanierungen ihr Verhalten und weisen somit einen höheren Energieverbrauch auf trotz der Nutzung eines Energieberaters. Diese Ergebnisse zeigen, dass der Nutzen der Inanspruchnahme der Energieberatung evaluiert werden sollte. Dabei sollte insbesondere die Qualität und Effektivität der Energieberatung für die Weiterentwicklung dieses Politikinstrumentes im Mittelpunkt stehen.

### *2.3 Rolle der Energieberatung*

Der Erfolg der Energieberatung bemisst sich hauptsächlich an der realisierten monetären Einsparung durch energetische Gebäudesanierung, bei der mit möglichst geringen Investitionen hohe Einsparungen erzielt werden sollen. Energieberater können dabei helfen, das finanzielle Risiko bei energetischen Sanierungsmaßnahmen abzusenken, wodurch die professionelle Beratung und die daraufhin schnellere Amortisation von Investitionen zu einer höheren Akzeptanz in der Bevölkerung führen können. Insbesondere in einer aktuellen Situation, in der die Erhöhung der Sanierungsmaßnahmen in der Öffentlichkeit unter kritischer Beobachtung stehen, haben Intermediäre mit einem hohen Maß an Sachverständnis und Beratungskompetenz eine zentrale Rolle für den weiteren Erfolg der energetischen Gebäudesanierung in Deutschland. Der Einfluss der Energieberater als Intermediäre ist jedoch insofern begrenzt, als die gesamte Nachfrage nach energetischen Gebäudesanierungen nur in geringem Maße durch die Energieberater selbst beeinflusst werden kann.

### **3. Förderrahmen und bisherige Bilanz**

Bei der Betrachtung des Förderrahmens beschränken wir uns auf Förderprogramme der Bundesebene, wohlwissend, dass es auf Länder- und kommunaler Ebene ebenfalls zahlreiche Programme zur Förderung von Energieberatung gibt. Den größten Bekanntheitsgrad haben dennoch die drei unten beschriebenen Förderinstrumente der Bundesregierung erlangt, die zum Teil als Impulsgeber und Vorbild für andere Förderprogramme wirken.

#### *3.1 Informationskampagnen durch die Deutsche Energieagentur (DENA)*

Das Interesse an energetischen Gebäudesanierungen, vor allem im privaten Bereich, ist laut Stieß et al. (2010) nach wie vor als gering einzuschätzen. Informationskampagnen stellen einen Versuch der Bundesregierung dar, die Thematik für einen größeren Adressatenkreis zugänglich zu machen.

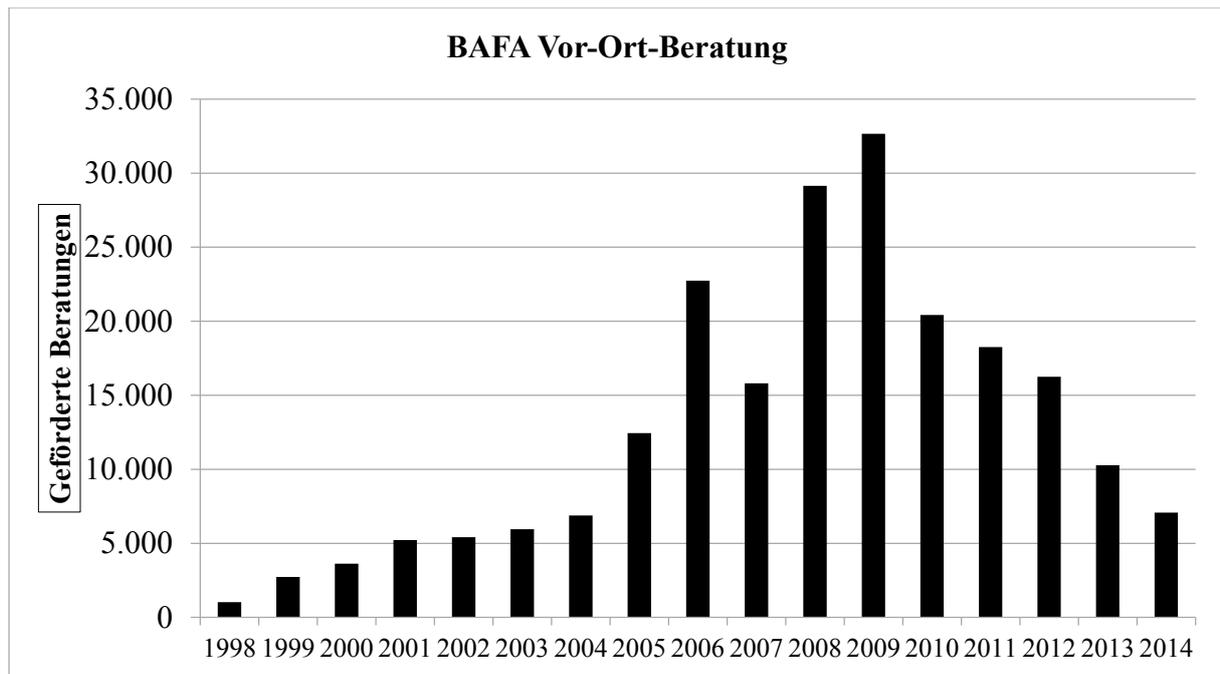
Die Förderung der Informationen über Energieeffizienzmaßnahmen bei Wohngebäuden wird auf Bundesebene überwiegend durch die DENA gesteuert. Die DENA ist durch die Bundesrepublik Deutschland und die KfW zu 76 % in öffentlicher Hand und betrachtet die Vernetzung der Akteure der Energiesystemtransformation als ihre zentrale Aufgabe. Durch die DENA soll Unabhängigkeit von der öffentlichen Hand signalisiert und sichergestellt werden,

dass kontinuierlich und über Wahlperioden hinaus Informationen bereit gestellt werden, die nicht durch kurzfristige politische Einflüsse beeinflusst werden. Die DENA geht davon aus, dass es vor allem im privaten Bereich mit Schwerpunkt bei Ein- und Zweifamilienhausbesitzern einen erhöhten Informationsbedarf gibt; entsprechend ist ihr Ziel, die Informationsasymmetrien durch die breite Verteilung von Information an Haushalte abzubauen. Hierfür werden besonders Energieberater als Intermediäre in das Zentrum der Bemühungen der diversen Informationskampagnen gerückt. Durch sie soll die Nachfrage nach energetischen Sanierungsmaßnahmen erhöht werden.

Aktuell koordiniert die DENA das Projekt „Die Hauswende“, bei dem in einer gewerkeübergreifenden Kampagne ca. 100 Informationsveranstaltungen in verschiedenen Städten mit parallel laufenden Anzeigenkampagnen abgehalten werden. Informationen werden angeboten, die für das Thema der energetischen Gebäudesanierungen sensibilisieren und auf Energieberater verweisen sollen, die unsichere Sanierer unterstützen können. Die Förderung solcher Informationskampagnen kann dazu beitragen, dass die Möglichkeit, Energieberater in Anspruch zu nehmen, einem größeren Adressatenkreis bekannt wird. Allerdings existieren ähnliche Informationskampagnen seit der 1. Wärmeschutzverordnung und scheinen – einzeln betrachtet – kein hinreichendes Mittel zur nachhaltigen Erhöhung der Sanierungsquoten zu sein, insbesondere bedingt durch die hohe Komplexität des Themas der energetischen Gebäudesanierungen.

### *3.2 BAFA Vor-Ort-Förderung*

Von der Bundesebene ausgehend, wird Energieberatung für Wohnhäuser durch die BAFA „Vor-Ort-Beratung“ gefördert. Die Vor-Ort-Beratung wird von zertifizierten Energieberatern durchgeführt, die bei der BAFA registriert sein müssen und größtenteils auf der Energieeffizienz-Expertenliste der DENA zu finden sind. Gefördert werden bis zu 60 % der Förderkosten mit max. 800 Euro bei Ein- und Zweifamilienhäusern und max. 1.100 Euro bei Wohnhäusern mit mindestens drei Wohneinheiten. Bei der Erstellung eines Sanierungskonzeptes durch einen Energieberater haben die Eigentümer die Auswahl zwischen einem Plan für eine Komplettsanierung zum KfW-Effizienzhaus mit zusammenhängend durchgeführten Sanierungsmaßnahmen, und einem „Sanierungsfahrplan“ mit empfohlenen abgestimmten Einzelmaßnahmen über einen längeren Zeitraum.



Quelle: eigene Darstellung, nach BAFA (2015)

Abbildung 1

Abbildung 1 zeigt, dass die Anzahl der Anträge für die BAFA „Vor-Ort-Beratung“ nach einem kontinuierlichen Anstieg bis 2009 bis 2014 einen drastischen Rückgang erlebt haben. Gründe hierfür sind etwa der erhebliche administrative Aufwand, wegen dem nur 9 % der zertifizierten BAFA Energieberater die Förderung in Anspruch nehmen. Zudem wurde kritisiert, dass Handwerker und Verbraucherzentralen günstiger beraten, Beratungen kaum oder nicht kostendeckend vergütet werden und die Vorgaben für die Berichte, auf Grundlage derer die Förderung ausgezahlt wird, zu starr sind (Großmann 2014). Diese Kritik führte zu einer Reform der Förderrichtlinie mit einer Erhöhung der Förderhöhe und der Vereinfachung des Berichtwesens zum 01. März 2015. Es bleibt abzuwarten, ob der Trend der abnehmenden Inanspruchnahme der Vor-Ort-Beratung dadurch umgekehrt werden kann.

### 3.3 KfW-Förderung

Für die finanzielle Unterstützung energetischer Sanierungsmaßnahmen ist das „Energieeffizient Sanieren“-Programm der KfW relevant. Zuschüsse und Darlehen werden nur ausgezahlt, wenn ein KfW-zertifizierter Energieberater, der auf der Energieeffizienz-Expertenliste stehen muss, die Maßnahme geplant und formell geprüft hat. Zusätzlich ist es möglich, einen Zuschuss für einen Energieberater als Baubegleiter zu erhalten, wobei 50 % der Kosten bis 4000 Euro übernommen werden. Die Energieberater sollen einen technischen

Mindeststandard bei den von der KfW geförderten und sanierten Wohnobjekten sicherstellen. Zudem kann die BAFA „Vor-Ort-Beratung“ in Kombination mit der KfW-Förderung in Anspruch genommen werden, um so die Qualität der energetischen Sanierung über den vollständigen Zeitraum der Planung und Durchführung hinaus sicherzustellen. Abgesehen von den geförderten Einzelmaßnahmen wird bei allen anderen Förderprodukten die wirtschaftliche Unabhängigkeit der Energieberatung gefordert. Die Energieberater dürfen also nicht unmittelbar finanziell von der Ausführung der vorgeschlagenen und später geprüften Maßnahmen profitieren. Ausnahme hierbei bilden die, von der KfW geförderten, Einzelmaßnahmen.

2012 wurden fast 88.000 Förderzusagen für mehr als 242.000 Wohneinheiten erteilt, wobei die Anforderungen der EnEV 2009 teilweise deutlich übererfüllt wurden. In 84 % der Förderzusagen bzw. bei 78 % der Wohneinheiten handelte es sich um Einzelmaßnahmen und nur in 16 % der Förderzusagen bzw. 22 % der geförderten Wohneinheiten wurden zum Effizienzhaus vollsaniert (IWU und Fraunhofer IFAM 2014). Laut IWU und Fraunhofer IFAM (2014) ist zu erwarten, dass für 2013 durch das „Effizient Sanieren“-Programm der KfW 4,75 t CO<sub>2</sub> eingespart werden.

Das KfW „Energieeffizient Sanieren“-Programm ist somit eines der wichtigsten Förderprogramme für energetische Gebäudesanierung in Deutschland, mit großer Relevanz für die Energieberatung. Allerdings hat die Bedeutung der Energieberatung durch die Abschaffung der wirtschaftlichen Unabhängigkeit der Energieberater bei Einzelmaßnahmen 2014 abgenommen. Es ist nun möglich die Prüfung als Energieberater bei gleichzeitiger Ausführung von KfW-geförderten Einzelmaßnahmen durchzuführen (NDR 2014). Dies hat entscheidende Auswirkungen auf die Energieberatung, weil der größte Teil der Fördermaßnahmen als Einzelmaßnahmen gefördert wird. Die Neutralität der Energieberater wurde dadurch reduziert.

### *3.4 Bewertung des Förderrahmens*

Die Förderung der Energieberatung im Gebäudesektor ist von zentraler Bedeutung für den Erfolg bei der Steigerung der Sanierungsrate. Wie oben dargelegt setzt die Bundesregierung dabei auf dreierlei Instrumente: Information, direkte Förderung, sowie Energieberatung zur Qualitätssicherung der geförderten Maßnahmen. Die Annahme, dass ein Großteil der Wohneigentümer unzureichend informiert sind und Energieberater als Intermediäre die Komplexität für Nachfrager reduzieren können, ist das Motiv der Bundesregierung, die Anreize

für die Inanspruchnahme der Energieberatung zu steigern. Dabei kommt der öffentlichen Förderung eine erhebliche Rolle zu, denn rund ein Drittel der stattfindenden Energieberatungen wird staatlich gefördert (Prognos et al. 2013).

Aus Perspektive der Förderer soll die Energieberatung einen entscheidenden Beitrag zur Erhöhung der Sanierungsrate bei energetischen Gebäudesanierungen leisten. Die Komplexität der Thematik und die Vielzahl der betroffenen Akteure machen dabei Intermediären nötig, die relevante Informationen bereitstellen und beratend zur Verfügung stehen. Die niedrige Sanierungsrate zeigt gleichzeitig an, dass die Förderung weiterhin notwendig bleibt, obwohl durchaus im qualitativen Bereich Erfolge erzielt wurden - so steigt etwa die Zahl der Förderungen für die Sanierung zu den energetisch anspruchsvollen Effizienzhäusern an. Allerdings konnte bislang keine signifikante Steigerung der Sanierungsrate insgesamt bewirkt werden. Das kontrafaktische Szenario ohne jede staatliche Förderung lässt eine noch niedrigere Sanierungsrate erwarten, da rund ein Drittel der stattfindenden energetischen Sanierungen im Wohngebäudebereich mit öffentlichen Mitteln unterstützt wird (IWU und Fraunhofer IFAM 2014). Insofern erscheint der aktuelle Förderrahmen nötig, wenn auch nicht ausreichend, um die Ziele der Bundesregierung zu erreichen.

#### **4. Chancen und Herausforderungen für die Energieberatung**

Energieberater als Intermediäre sollen Unsicherheiten im Prozess der energetischen Gebäudesanierungen abmildern. Auch wenn aktuell die BAFA „Vor-Ort-Beratung“ modifiziert wird und die daraus folgenden Effekte für die Energieberatung noch nicht absehbar sind, lassen sich zukünftige Herausforderungen, aber auch Chancen für Energieberatung identifizieren. Im Folgenden werden die Ergebnisse von Interviews mit Experten aus dem Energieberatersektor diskutiert.

##### *4.1 Komplexität der Energieberatung*

Die Energieberatung bei energetischen Sanierungen greift in einen komplexen Prozess ein. Die Qualität der Beratung hängt neben der Kompetenz des Beratenden stark vom Verhalten der Kunden und dem Sanierungsobjekt ab.

Die Übersetzungsfunktion für Energieberatung erfordert einen „Spagat“ in der Kommunikation zwischen Reduktion der Komplexität und Detailtreue bei der Planung und Umsetzung der

Sanierung. Vor allem wenn sich im Nachhinein zeigt, dass die gewünschten Erfolge nicht erzielt wurden, kann sich eine zu starke Vereinfachung der komplexen Zusammenhänge, die bei einer Sanierung wirksam werden, negativ bemerkbar machen. Um die Kommunikation zwischen den Akteuren erfolgreich zu gewährleisten und so die relevanten energetischen Wirkungsketten verständlich zu machen, ist entsprechend ein hohes Maß an Fachkompetenz nötig. Für die Akzeptanz und den Erfolg der Energieberatung ist es daher unabdingbar, dass die Komplexität der Materie durch Energieberater treffend „übersetzt“ wird. Hierbei liegt der Fokus nicht alleine auf dem notwendigen technischen Sachverstand. Gleichzeitig ist eine genaue Kenntnis der rechtlichen Rahmenbedingungen, insbesondere der häufig geänderten EnEV und die Kenntnis über die jeweils aktuelle Förderlandschaft und -möglichkeiten die Grundlage für eine erfolgreiche Energieberatung. Schließlich sollten auch die Verhaltensweisen der Bewohner des Sanierungsobjektes bei der Energieberatung berücksichtigt werden und in die Planung der Maßnahmen einfließen, was ebenfalls ein hohes Maß an Fachkompetenz und Kommunikationsfähigkeit erfordert.

#### *4.2 Rentabilität*

Auf Nachfragerseite wird Energieberatung als zusätzlicher Kostenfaktor gesehen. Verdeutlichen lässt sich dies durch die geringe Zahlungsbereitschaft der Kunden, die einen hohen Preisdruck bei Energieberatern erzeugt. 2011 gaben bei einer Umfrage der Fachzeitschrift „Gebäudeenergieberater“ mit 436 Energieberatern 57 % an, dass es für sie nicht möglich sei, kostendeckend Energieberatungen anzubieten (Prognos et al. 2013, S. 43). Nur die Minderheit der Unternehmen ist ausschließlich auf Energieberatung konzentriert. Die Mehrheit bietet Energieberatung nur zusätzlich zu anderen Dienstleistungen an, denn nur 10 % der Unternehmen, die Energieberatung anbieten, erzielen mit dieser mehr als 90 % ihres Umsatzes (Prognos et al. 2013, S. 44). Den Preisdruck beeinflusst ebenfalls die staatliche Konkurrenz durch die sehr günstige oder kostenfreie öffentlich finanzierte Energieberatung, die vor allem bei Initiativberatungen häufig genutzt wird (Dunkelberg und Stieß 2011, S. 16).

Langfristig gesehen sollte es möglich werden, kostendeckende Energieberatungen anzubieten und am Markt durchzusetzen, da sonst professionelle Energieberatungen nur durch öffentliche Finanzierung überlebensfähig sein werden oder aber allein die Erwartung ertragsreicher Folgeaufträge die Motivation für Energieberatungen bleiben. Die aktuelle Form des Preiswettbewerbs zeigt auch, dass es teilweise Energieberatern nicht gelingt, den Kunden eine

potentiell höhere Qualität ihres Produkts zu signalisieren. Durch diese Marktintransparenz lassen sich häufig keine höheren Preise für höhere Qualität der Energieberatung durchsetzen, sodass kein Wettbewerb um höhere Qualität erreicht wird.

#### *4.3 Energieberater als Förderer*

Das Berufsbild des Energieberaters ist relativ jung und existiert erst seit Anfang der 90er Jahre in relevanter Größe. Daher setzt sich die Branche aus den unterschiedlichsten beruflichen Hintergründen zusammen, wie z.B. Architekten, Bauingenieure und Fachhandwerker. Die Ursprungsidee der Förderung von Energieberatern als zentralem Akteur bei der energetischen Gebäudesanierung, war es, einen Berufszweig aufzubauen, der eigenständig am Markt überleben kann, was sich nur unzureichend erfüllt hat. Nach Berechnungen von Prognos et al. (2013) werden fast 40 % der Energieberatungen öffentlich gefördert. Dies führt zu einer deutlich negativen Wahrnehmung in fachlichen Kreisen, da sie häufig nur als Mittel zur Erlangung von Fördermitteln und nicht als einflussreiche Berater bei der Umsetzung von Sanierungsmaßnahmen angesehen werden.

Vor allem im gewerblichen Bereich werden die Energieberater häufig nur als „Mittel zum Zweck“ wahrgenommen, um öffentliche Fördermittel zu erhalten. Dabei wird die Energieberatung nicht tatsächlich zur Unterstützung der eigentlichen Sanierung in Anspruch genommen. Auch wenn bei professionellen Vermietern (Wohnungsbaugesellschaften, Baugenossenschaften etc.) angenommen werden kann, dass ein höheres Maß an Wissen über energetische Sanierungen existiert, weil durch ein größeren Gebäudebestand die Frage nach der Notwendigkeit von energetischen Sanierungen häufiger aufkommt, könnten hierdurch Chancen, durch den Energieberater über technische Alternativen informiert zu werden, verloren gehen. Ähnliche Bewertungen des Energieberaters lassen sich auch im privaten Bereich finden, wo die Beobachtung gemacht wird, dass der Anreiz Energieberatung in Anspruch zu nehmen, zu einem nicht unerheblichen Teil motiviert ist, staatliche Förderung zu erhalten.

Für eine positive Zukunftsperspektive muss es der Energieberatung gelingen, den Nutzen einer Energieberatung umfassender darzustellen. Es sollte der Fokus auf die höhere Qualität der Sanierung gelegt werden anstelle der reinen Erlangung von Fördermitteln. Dieser Zustand ist zurzeit offensichtlich nicht erreicht, da der Energieberater nur eine inhaltlich begrenzte Bedeutung für die Planung und Umsetzung der energetischen Gebäudesanierung hat.

#### *4.4 Ausbildung der Energieberater*

Der Begriff des Energieberaters ist nicht geschützt und kann somit in Deutschland von jeder Person ohne besondere Prüfung getragen werden. Stiftung Warentest hat bei der Überprüfung von Energieberatern durchschnittlich sieben von neun mit „mangelhaft“ bewertet, weil sie keine seriöse Energieberatung angeboten und nur ungenügende energetische Konzepte erstellen konnten (Stiftung Warentest 2012). Dieses Ergebnis zeigt einen deutlichen Mangel im Ausbildungsstand der Energieberater auf.

Die bekannteste Weiterbildung ist die zum „Gebäudeenergieberater im Handwerk“, die von den Handwerkskammern angeboten wird. Der Weiterbildungsgang umfasst meistens 240 Stunden und steht Handwerksmeistern bzw. vergleichbar Qualifizierten aus dem Bau- und Ausbaugewerbe, sowie Ingenieuren und Architekten offen. Die Gebäudeenergieberater sind nach bestandener Ausbildung berechtigt, die BAFA „Vor-Ort-Beratung“ durchzuführen. Für die Zulassung zur eigenen Zertifizierung im Rahmen der anderen KfW-Programme müssen zusätzliche Weiterbildungskurse absolviert werden.

Die Bundesregierung versucht über Setzung der Standards ihrer Förderprogramme Qualitätsstandards für Energieberater zu etablieren, um das Image der Energieberatung vor allem im privaten Bereich zu verbessern. So werden die Anforderungen an die Energieberatung im Rahmen der BAFA „Vor-Ort-Beratung“ und der KfW-Förderprogramme in den letzten Jahren anspruchsvoller gestaltet. Eine höhere Transparenz in der Ausbildung der Energieberater soll über die „Energieeffizienz-Expertenliste“ der DENA erreicht werden. Der Eintrag auf der Liste muss durch einen Nachweis von Fortbildungen und durchgeführten Praxisbeispielen alle zwei Jahre erneuert werden. Bei den professionellen Energieberatern wird das Verfahren als schwer verständlich wahrgenommen (GEB 2014). Laut Nationalem Aktionsplan Energieeffizienz (NAPE) der Bundesregierung, in dem u.a. auch energetische Gebäudesanierungen diskutiert werden, sollen daher die Qualitätsstandards weiter systematisiert und detailliertere Kriterien für einzelne Maßnahmen definiert werden (BMWi 2014, S. 2).

Die öffentliche Wahrnehmung der Energieberater wird insbesondere durch die Heterogenität ihrer beruflichen Hintergründe beeinträchtigt. Die ungeschützte Berufsbezeichnung führt zu Verwirrungen, da nicht zu erkennen ist, welche Ausbildung der jeweilige Energieberater besitzt. Dieses hohe Maß an Intransparenz auf dem Markt der Energieberater macht es schwerer, den Energieberater als Qualitätsmarke zu etablieren. Eine verbesserte und

vereinheitlichte Ausbildung kann somit eine entscheidende Stellschraube für eine höhere Akzeptanz von Energieberatung darstellen.

#### *4.5 BAFA Vor-Ort-Beratung und KfW-Zertifizierung als Qualitätskennzeichen*

Die Berechtigung eines Energieberaters, BAFA „Vor-Ort-Beratungen“ durchzuführen bzw. KfW-Produkte zu prüfen oder als Baubegleiter zu fungieren, garantiert nicht nur ein Mindestmaß an Qualität der Energieberatung, sondern wird auch als staatlich anerkannte Marke wahrgenommen. Nach eigener Auskunft wird das Zertifikat des BAFA-Beraters überwiegend als Marketing- und Qualitätslabel von den Energieberatern genutzt (Großmann 2014). Im Gebäudesektor sind staatliche Qualitätslabel und deren Nutzung wichtig und vereinfachen die Vermarktung von Sanierungsobjekten und die Finanzierung von energetischen Gebäudesanierungen.

Mittlerweile hat sich das KfW-Effizienzhaus mit den entsprechenden Effizienzklassen als Marke auf dem Immobilienmarkt etabliert und Effizienzhäuser weisen höhere Absatzzahlen auf als vergleichbare Häuser ohne KfW-Siegel. Der gleiche Effekt durch staatliche Label wird bei der Finanzierung erreicht: Häuser, die durch Energieberater einen Effizienzstandard bestätigt bekommen haben, profitieren bei der Finanzierung der Sanierung, da die Zertifizierung von Banken als positives Signal in Bezug auf das Qualitätsniveau wahrgenommen wird. Laut der befragten Experten aus dem Finanzbereich werden teilweise bessere Kreditkonditionen angeboten,<sup>26</sup> da die Werterhaltung bzw. -steigerung der Sanierungsobjekte durch die Label sichergestellt ist. Umgekehrt werden von Bankenseite Energieberater weiterempfohlen, die BAFA- und KfW-zertifiziert sind.

Die Bedeutung der staatlichen Förderung als Qualitätslabel führt dazu, dass der Staat die Qualität der Energieberatung durch die Erhöhung der Anforderungen an die BAFA „Vor-Ort-Beratung“ und die Zertifizierung der KfW-Effizienzhäuser steigern kann. Dass dies nur eingeschränkt funktioniert, zeigt die Einführung des „KfW-Effizienzhaus Denkmals“. Energieberater müssen spezielle weitergehende Schulungen durchführen, um dieses Programm zertifizieren zu können. Da dieses Programm erst im Jahre 2010 eingeführt wurde und nur 916 Personen bundesweit nach Energieeffizienz-Expertenliste (Stand: 22.01.2015) berechtigt sind, den Nachweis dafür zu erbringen, gibt es in gewissen Regionen keinen einzigen Energieberater, der die entsprechende Berechtigung besitzt. Es scheint hierbei ein, aus heutiger Perspektive, zu

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<sup>26</sup> Deffner et al. (2012) verweisen auf die Effekte solcher Markenbildung im Baubereich hin.

hoher Standard gesetzt worden zu sein, dass das „KfW-Effizienzhaus Denkmal“ für Energieberater als nicht lohnenswert genug erscheint, um die notwendigen Fortbildungen hierfür zu besuchen.

#### *4.6 Die Koordination unterschiedlicher Akteure*

Die Energieberatung muss sich mit den an der energetischen Gebäudesanierung beteiligten Akteuren auseinandersetzen. Dabei müssen stets die Partikularinteressen von mehrerer Akteursgruppen berücksichtigt werden. Fast jede der beteiligten Akteursgruppe bietet ihre eigene Energieberatung an, um Sanierungsmaßnahmen, die für die jeweilige Bezugsgruppe interessante Lösungen in den Fokus potentieller Sanierer zu rücken. So ist die Energieberatung auch in den Verbänden der Akteure organisiert, die Energieberatung für Eigennutzer und privaten Vermieter etwa durch Haus und Grund e.V..

Bei einer energetischen Gebäudesanierung treffen u.a. die Eigeninteressen der Eigentümer, Mieter, Planer, Handwerker und technische Gebäudeausrüster aufeinander. Die Energieberatung soll im Zusammenwirken mit dem jeweiligen Eigentümer diese Eigeninteressen beachten und in technischer und wirtschaftlicher Hinsicht aufeinander abzustimmen. Die Rolle der Hausbewohner und ihr Einfluss auf den Erfolg der Sanierung muss bei der Energieberatung einkalkuliert werden, da nicht alle technisch machbaren Lösungen mit jedem Mieter zum Erfolg führen. So muss die Auswahl der technologischen Umsetzung der Sanierung sich auch nach dem Verhalten der Bewohner richten, wie etwa die korrekte Ausführung bestimmter Lüftungsanforderungen nicht von jedem Bewohner erwartet werden kann. Fehlverhalten kann hierbei z.B. zu Schimmelbildung führen, was zu einer mittelfristigen Wertminderung des sanierten Objektes führen kann.

Von Bedeutung für erfolgreichen Verlauf von Sanierungen ist zudem die Verfügbarkeit von Firmen, welche die gewünschte Qualität der Sanierung gewährleisten können. Die Energieberatung sollte daher mit dem entsprechenden Netzwerk dafür sorgen, dass zuverlässige Partner bei der energetischen Sanierung ausgewählt werden. Diese Koordinationsfunktion wird erfolgreich erfüllt, wenn die Berater Beziehungsgeflechte zwischen den verschiedenen Akteuren verstehen und einen Ausgleich der jeweiligen Interessen erreichen.

Bei der Akquise, zumeist von öffentlicher Energieberatung ist zu beobachten, dass überwiegend Eigennutzer als potenzielle Kunden angesprochen werden. Die Interessenslagen der restlichen Eigentümergruppen erscheinen im Vergleich zu den Eigennutzern als zu komplex, da das

„Vermieter-Mieter-Dilemma“ bei der Energieberatung von Eigentümern, die das Sanierungsobjekt nicht selber nutzen, oftmals eine zentrale Rolle spielt. Zwar sollte das Resultat der Sanierung die Minderung des Energieverbrauches und somit die Reduzierung der Ausgaben für Energie sein, jedoch profitiert hiervon nur der Mieter. Der Vermieter kann über die Modernisierungumlage 11 % nach § 559 ff. BGB seiner Ausgaben auf die Miete umlegen.<sup>27</sup> Ob somit Kosten der Sanierung auf den Mieter umgelegt werden können, entscheidet weniger die Höhe der Sanierungsausgaben, als vielmehr in welcher Höhe auf dem spezifischen Wohnungsmarkt Mietsteigerung realisiert werden können.

Die wirtschaftliche Unabhängigkeit als Garant für Neutralität wird in allen Bundesprogrammen, außer den KfW-Einzelmaßnahmen, gefordert. Wirtschaftliche Unabhängigkeit bedeutet dabei, dass der Energieberater nicht an den Ausführungen selbst, sowie der Planung und Baubegleitung der Vorhaben beteiligt sein dürfen. Der „neutrale“ Energieberater stellt somit ein zentrales Qualitätsmerkmal für eine gute Beratung dar. Da jedoch im heterogenen Umfeld der Energieberater jede Beratung durch die Perspektive des jeweiligen Akteurs geprägt ist, ist es schwer eine wirklich unabhängige Energieberatung auszumachen. So profitieren z.B. selbst bei formeller wirtschaftlicher Unabhängigkeit Energieberater von der Höhe der Planungssumme. Die Spannung zwischen der Idealvorstellung von einem neutralen, technologieoffenen Energieberater und der Realität führt zu einer negativen medialen Außenwahrnehmung.

Die Energieberatung als Vertrauensgut hat insgesamt einen schweren Stand im Umfeld der energetischen Gebäudesanierung. Das hängt damit zusammen, dass das Qualitätsniveau der Energieberatung sowohl im Vorfeld schwer feststellbar ist, als auch im Nachhinein der Anteil der Beratung an der eigentlichen Sanierung unzureichend zu rekonstruieren ist. Sobald die eigene Unsicherheit der Beratung auf die Akteure der energetischen Gebäudesanierung trifft, entsteht daher ein hohes Streitpotential. Energieberater reagieren auf die Vertrauensgutsituation und ihrer inhärenten Unsicherheiten oftmals mit brancheninterne Schuldzuweisungen. Die heterogenen beruflichen Hintergründe werden als ursächlich für Qualitätsprobleme bei Energieberatern gesehen. Dabei wurden in den Experteninterviews immer wieder auf folgende Stereotypen verwiesen: Architekten legen den Schwerpunkt auf die Gestaltung der Sanierungsobjekte, während bei den Bauingenieuren technische Lösungen im Mittelpunkt stehen und bei den Handwerkern die Expertise bei Fragen der Ausführung im Vordergrund der

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<sup>27</sup> Instandhaltungskosten und Fördermittel können dabei nicht auf die Modernisierungumlage angerechnet werden.

Beratung steht. Hierbei bleibt freilich außer Acht, dass jede dieser Berufsgruppen sich an unterschiedliche Bedürfnisse der Nachfrager richtet und die verschiedenen Schwerpunktsetzungen somit durchaus eine Berechtigung in der Energieberatung für unterschiedliche Sanierungsmaßnahmen haben.

Die Beteiligung von Akteuren mit unterschiedlichen Interessen bei energetischer Gebäudesanierung und die Tatsache, dass Energieberater verschiedene Ausbildungen genossen haben, werden sich kurz- bis mittelfristig nicht ändern lassen. Umso wichtiger ist es, sich bei der Erstellung neuer Ansätze für verbesserte Energieberatung möglicher Konfliktpotentiale bewusst zu sein.

#### *4.7 Zusammenfassung: Treibende und hemmende Einflussfaktoren in der Energieberatung*

In Tabelle 1 werden die oben diskutierten Aspekte zusammengefasst. Die Einflussfaktoren werden danach bewertet, wie sich die einzelnen Komponenten auf die Sanierungsrate auswirken. Bei (+) kann von einem positiven und bei (-) von einem negativen Einfluss ausgegangen werden. Die mit (+) und (-) markierten Faktoren lassen es nicht zu, einen eindeutigen Effekt auf die Sanierungsrate zuzuordnen bzw. sie vereinen gleichermaßen treibende und hemmende Teilaspekte.

<b>Einflussfaktoren</b>	<b>Wirkung auf Sanierungsrate</b>
Energieberater als Förderer	(+)
Komplexität der Energieberatung	(-)
Rentabilität der Energieberatung	(-)
Ausbildung der Energieberater	(+) & (-)
Staatliches Label der Energieberatung	(+)
Interessenskonflikte bei energetischen Gebäudesanierungen	(-)
Energieberatung als Vertrauensgut	(+) & (-)

Tabelle 1. Einflussfaktoren und Wirkung auf die Sanierungsrate

Die hier aufgeführten Einflussfaktoren werden insgesamt erheblich durch die konkrete Ausgestaltung der Energieberatung durch die staatliche Rahmensetzung und Förderung beeinflusst. Somit ist es durchaus denkbar, dass sich künftig Chancen in Herausforderungen wandeln. Externe Faktoren wie die Änderung der EnEV können hierbei große Auswirkungen auf das Gesamtumfeld der Regulierung haben.

## **5. Ansätze für eine bessere Energieberatung bei energetischer Gebäudesanierung**

Die folgenden Ansätze werden unter Berücksichtigung der Umsetzungswahrscheinlichkeit und ihrer Auswirkungen auf die Sanierungsrate diskutiert. Die Weiterentwicklung der staatlich zertifizierten BAFA- und KfW-Energieberater zu höheren Qualitätsstandards wird dabei vorausgesetzt.

### *5.1 Wertschätzung der Energieberatung*

Der Erfolg der Energieberater jenseits der öffentlichen Förderung hängt vom in der Öffentlichkeit wahrgenommenen Nutzen der Energieberatung ab. Solange Energieberater nur zum Zweck der Erhaltung der Förderung oder als kostenfreies Zusatzangebot eingesetzt werden, bleibt der Einfluss durch Energieberater auf die Sanierungsrate marginal. Eine konkrete Handlungsempfehlung jenseits moralischer Appelle, die nur einen geringen, zeitlich begrenzten Einfluss haben, lässt sich aus heutiger Perspektive nicht geben. Nichts desto trotz ist die Basis einer guten Energieberatung, dass die Nutzung der Energieberatung bei energetischen Sanierungen einen zusätzlichen positiven Effekt hat.

### *5.2 Vereinheitlichung der Ausbildung?*

Für die Zukunftsperspektiven der Energieberatung sind der Zugang zum Beruf des Energieberaters und die inhaltliche Ausrichtung der Ausbildung von maßgeblicher Bedeutung. Langfristig entscheidet sich an der Frage, welche Kompetenzen Energieberater haben sollten, ob die Energieberatung insgesamt in die Lage versetzt wird, substantiell Einfluss auf die Sanierungstiefe und Sanierungshäufigkeit im Wohngebäudesektor zu erreichen.

In den Expertengesprächen wurde die Forderung geäußert, dass die Ausbildung des Energieberaters vereinheitlicht werden solle. Dies könnte den Effekt haben, dass jeder Energieberater am Ende der Ausbildung, unabhängig vom beruflichen Werdegang, annähernd die gleiche Qualität der Energieberatung anbieten könnte.

Hierzu wäre die Einrichtung interdisziplinärer Studiengänge sinnvoll, die wesentliche Kompetenzen aus Architektur und Bauingenieurwesen und das Fachwissen aus den entsprechenden Gewerken vermitteln. Somit könnte Energieberater als Studienberuf qualifiziert werden. Einen ersten Versuch, einen solchen Studiengang zu etablieren, gibt es an der FH Rosenheim mit dem Studiengang *Energie- und Gebäudetechnologie*, welcher der

Studienrichtung *Gebäudehülle* zugeordnet ist. Ob auf diesem Weg die Energieberatung eine höhere Akzeptanz erfahren wird, bleibt noch offen. Allerdings ist an dieser Stelle darauf hinzuweisen, dass sich weiterhin die Frage nach der Rentabilität des Berufsbildes des Energieberaters stellt. Nach dem Evaluationsbericht von Prognos et al. (2013) hat die Attraktivität des Berufes des Energieberaters im Gebäudesektor stark nachgelassen, sodass es fraglich ist, ob es momentan für zusätzliche Studiengänge Interessenten gäbe.

Zudem würde de facto ein Hochschulstudium als Zugangsvoraussetzung das Handwerk vom Beruf des Energieberaters ausschließen. Schon heutzutage führen die sich immer weiter verschärfenden Anforderungen für Energieberater dazu, dass die Bereitschaft der Handwerker, sich als Gebäudeenergieberater weiterzubilden, nachlässt, obwohl Bestandteile der Energieberatung ursprünglich genau für diese mittlere Qualifikationsebene konzipiert wurden (Heinen et al. 2010). Letztendlich muss für die Weiterentwicklung der Energieberatung entschieden werden, ob die Perspektivvielfalt beibehalten werden soll oder ob eine Akademisierung zu favorisieren ist, da sie förderlich für die Akzeptanz der Energieberatung ist.

Von der Bundesregierung wird in dieser Frage momentan eine Zwischenlösung präferiert. Die Qualitätsanforderungen an die Energieberater, die an der BAFA- und KfW-Förderung partizipieren wollen, werden kontinuierlich erhöht, allerdings bleibt der Zugang weiterhin für alle oben genannte Berufsgruppen offen. Ziel ist es dabei, ein bestimmtes Minimum an Ausbildungsinhalten von öffentlich geförderten Energieberatern zu garantieren.

Die Orientierung an den öffentlichen Anforderungen erscheint zurzeit als die effektivste Stellschraube, um die Qualität der Energieberatung zu erhöhen. Das zeigt sich auch daran, dass die Berechtigung, BAFA „Vor-Ort-Beratung“ und KfW-zertifizierte Energieberatung anzubieten, weithin als Qualitätsmerkmal wahrgenommen wird.

Die Technologieoffenheit der Energieberatung sollte stärker als bislang ein zentraler Gegenstand der Ausbildung werden, um so die fachliche Unabhängigkeit der Energieberater zu garantieren, da diese eine zentrale Anforderung für eine größere Wirksamkeit der Energieberatung ist. Unsicherheit bei der Auswahl der besten Technologie für das Sanierungsobjekt ist ein zentraler Einflussfaktor der Energieberatung für alle potentiellen Sanierer – vom Eigenheimnutzer bis zum gewerblichen Vermieter. Zwar kann vollständige Technologieoffenheit aufgrund der unterschiedlichen Perspektiven der Energieberater nie erreicht werden, aber dennoch würde sie die Wahrnehmung als unabhängige Instanz unterstützen. Vor allem die Bereiche der Komplexität von Gebäuden und der

Beratungsdienstleistungen der Energieberater können hierbei in der Weiterbildung als Ansatzpunkt Berücksichtigung für eine Weiterentwicklung der Energieberatung dienen.

Die Ausbildung der Energieberater kann bei der Formulierung öffentlicher Standards für Energieberatung eine zentrale Rolle einnehmen. Allerdings lassen sich Änderungen bei der Ausbildung nur über einen langen Zeitraum realisieren, sodass potentielle positive Effekte erst zeitverzögert eintreten.

### *5.3 Nachkontrolle von energetischen Gebäudesanierungen?*

Energieberatung beschränkt sich zumeist auf die Phasen der Informationsbereitstellung vor der Sanierung und der Baubegleitung. Der Nachkontrolle hingegen wird von staatlicher Seite keine große Rolle beigemessen. Dabei ist der Nachweis über Erfolg oder Misserfolg der Sanierung von zentraler Bedeutung für die qualitative und die quantitative Weiterentwicklung der Energieeffizienz im Gebäudesektor. Vor allem in Fällen, in denen sich die gewünschten Ersparnisse nicht realisieren ließen, könnte eine anschließende Analyse deutlicher die Gründe und Optimierungsmöglichkeiten aufzeigen.

Die öffentliche Wahrnehmung des Erfolgs der energetischen Gebäudesanierung ist ein zentraler Einflussfaktor für die Erhöhung der gesamten Sanierungsrate. Der Nachweis über Qualität lässt sich, wenn überhaupt, erst durch nachträgliche Kontrollen erbringen. Um das Bewusstsein in der Bevölkerung für die Bedeutung energetischer Sanierungen zu schärfen ist es zentral, die Energie- und Kosteneinsparungen aufzeigen zu können. Allerdings sind Nachkontrollen, wenn überhaupt möglich, aufwendig und kostenintensiv, sodass Angebote für kostenpflichtige Nachkontrollen von Seiten des Handwerks laut Auskunft der Handwerkskammer nur unzureichend wahrgenommen werden. Der Nachweis für die Zertifizierung der KfW-Förderung zum Effizienzhaus orientiert sich an einer formalen Prüfung der durchgeführten Maßnahmen, enthält aber keine praktische Prüfung am Sanierungsobjekt, um herauszufinden, ob die technische Realisierung wie geplant durchgeführt wurde. Von der KfW koordinierte Stichproben sollen eine detaillierte Nachprüfung enthalten, allerdings ist man hier noch in der Planungsphase (Deutsche Energie-Agentur 2013). Prinzipiell würde auch die Akzeptanz für Energieberatung steigen, wenn der Beitrag der Beratung zur energetischen Sanierung transparenter würde.

#### *5.4 Koordination in der Planung und Ausführung*

Die herkömmliche Energieberatung fokussiert in erster Hinsicht auf die Nachfragerseite. Entsprechend sind Ausbildungsinhalte primär auf die Frage ausgerichtet, wie die Beratung von potenziellen Sanierern ausgestaltet werden und funktionieren sollte. Die Koordination der Planung und Ausführung einer energetischen Gebäudesanierung werden dabei nur in geringem Maße berücksichtigt. Eine stärker akteursübergreifende Denkweise könnte hierbei zu einer qualitativ hochwertigeren Sanierung und zu Effizienzsteigerung führen. Ebenso könnten Fehler, die bei der Ausführung der Sanierung vorkommen, durch die Schulung in Richtung einer gewerkeübergreifender Zusammenarbeit reduziert werden. In zweierlei Hinsicht ist Energieberatung ein entscheidender Faktor bei der Koordination der Planung und Ausführung der Sanierungsmaßnahmen. Zum einen kann der Energieberater verstärkt Aufgaben der Koordinierung der ausführenden Akteure übernehmen, was vielerorts schon passiert. Zum anderen bietet die Weiterbildung zum Energieberater Architekten, Bauingenieuren und Handwerkern die Möglichkeit, die Prozesse der energetischen Gebäudesanierung insgesamt besser zu verstehen und Abläufe effizienter zu strukturieren und mögliche Fehlerquellen frühzeitig zu erkennen. Dies gilt gleichermaßen wenn der Energieberater nicht selbst an der Durchführung der Sanierung beteiligt ist.

#### *5.5 Kommunikatoren bei energetischen Sanierungen in Siedlungen und Quartieren*

Bei energetischen Gebäudesanierungen kann der Trend beobachtet werden, dass neben den Maßnahmen für Einzelgebäude auch großflächigere Sanierungen auf Siedlungs- und Quartiersebene in den Fokus geraten. Die Grundidee hierbei ist es, Technologien anzuwenden, die in Quartieren zu effizienteren Ergebnissen führen können. Als Beispiel hierzu kann das Blockheizkraftwerk herangezogen werden, welches nur bei einem Mindestgrundumsatz effizient betrieben werden kann (Pielke und Kurrat 2009, S. 3). Je mehr Wohngebäude jedoch einbezogen sind, desto höher wird der Koordinierungsaufwand für die beteiligten Akteure und desto wahrscheinlicher wird das Auftreten gegenläufiger Interessen, welche die Kooperation gefährden. Energieberater könnten die Rolle eines Vermittlers und Förderers der energetischen Gebäudesanierung einnehmen. Dies würde bedeuten, dass nicht nur die technologische Beratung einen wichtigen Teil einnimmt, sondern Energieberater das soziale Gefüge der Siedlung oder des Quartiers und die jeweiligen Einzelinteressen im Auge behalten müssen und ausgleichen.

Die Anforderungen an den Gebäudeenergieberater steigen durch den Einbezug und die Koordination großflächigere Sanierungen. Die Möglichkeit des Einsatzes von Technologien, die erst auf Siedlungs- und Quartiersebene gewinnbringend sind, macht die Beratung komplexer und kann die Unsicherheit der Sanierungsnachfrager steigern. Außerdem muss bei heterogenen Besitzstrukturen sichergestellt werden, dass die beteiligten Akteure eine gemeinsame energetische Gebäudesanierung für sinnvoll erachten und langfristig unterstützen.

### *5.6 Regionale und kommunale „Kümmerer“*

Der Erfolg der energetischen Gebäudesanierung hängt stark vom Engagement und der Zusammenarbeit von Akteuren in der jeweiligen Region ab und wird stark von regionalen Gegebenheiten geprägt. Energieberater könnten daher entscheidende Akteure sein, die auf regional- und kommunalpolitischer Ebene Aufmerksamkeit für diese Thematik erzeugen und etwaige Kooperationen zwischen den Beteiligten initiieren.

Die Konzentration auf regionaler Ebene ist durch die großen Unterschiede regionaler Wohnungsmärkte begründet. Die Sanierungsraten schwanken von Region zu Region sehr stark und können sich selbst in unterschiedlichen Vierteln einer Stadt stark unterscheiden. Gründe hierfür liegen u.a. im Zusammenspiel verschiedener Faktoren wie der Lage des Sanierungsobjektes, dem regionalen Arbeitsmarkt, dem Wert der Immobilie und der Altersstruktur der Besitzer. Außerdem variiert die Anbieterstruktur für energetische Gebäudesanierungen. Alle Faktoren erzeugen einen hohen Grad an Unsicherheit. So gibt es nur für wenige Regionen umfassende Daten und Statistiken, die genügend Ansatzpunkte für eine Strategie zur Erstellung von umfassenden „Sanierungsfahrplänen“ enthalten.

Energieberater mit hoher Netzwerkkaffinität können durch eine gute Kenntnis der Spezifika der heimischen Region Impulsgeber für Ansätze zur Erhöhung der Sanierungsrate sein. Dies ist schon im Berufsbild des Energieberaters angelegt, bei dem der Umgang mit verschiedenen Akteursgruppen und deren Koordination im Zentrum der alltäglichen Arbeit stehen.

Ein Beispiel für die Energieberatung als „Kümmerer“ sind die regionalen Energieagenturen. Sie wirken als Kompetenzzentren der Energieeffizienz im Gebäudesektor und nehmen eine Mittlerrolle zwischen Kommunalpolitik, regionaler Wirtschaft und potenziellen Sanierern ein. Die regionalen Energieagenturen betrachten es als ihre Hauptaufgabe, bei allen Akteuren das Interesse am Thema zu wecken und dabei die Einstiegshürden für die komplexe Thematik mit Berücksichtigung auf die regionalen Gegebenheiten zu senken.

Die Stärkung der Energieberatung auf regionaler Ebene ist daher sinnvoll, da Energieberater mit staatlichen Zertifikaten ein Mindestqualitätsstandard vorweisen können, der bundesweit anerkannt ist, und auf der anderen Seite den Bedarf für energetische Sanierungen auf regionaler Ebene gut einschätzen können. Die möglichen Ansätze, um den Gebäudebestand zu modernisieren, allerdings unterscheiden sich von Region zu Region, was aber durch das spezifische Wissen durch kommunal verankerte Energieberater kompensiert werden kann. Beispielhaft sind die Energiekarawane im Rhein-Main-Gebiet<sup>28</sup> und die Innovationscity Bottrop<sup>29</sup>. Dabei handelt es sich um Ansätze mit Energieberatung als zentralem Bestandteil in einem begrenzten Einzugsbereich, in dem Energieberater es schaffen, gezielt potentielle Sanierer anzusprechen und die Sanierungsrate dadurch anzuheben.

Die Bedeutung der Energieberater auf regionaler Ebene zeigt sich nicht nur im Wohngebäudesektor. Die Bundesregierung hat im NAPE auch die Förderung von Energieeffizienznetzwerken in ihre strategischen Planungen aufgenommen. Bis 2020 sollen mehr als 500 Netzwerke entstehen, die sich mit Fragen der Energieeffizienz auf betrieblicher Ebene beschäftigen. Der Energieberatung kommt hierbei erneut eine wichtige Rolle zu, vor allem um eine höhere Akzeptanz für das Thema der Energieeffizienz bei den beteiligten Akteuren zu schaffen (BMWi 2014).

Ob es zu einer Erhöhung der Sanierungsrate kommt entscheidet sich auf regionaler Ebene. In Zukunft wird daher der Vernetzung der Energieberater auf regionaler Ebene größere Bedeutung zukommen. Auch wenn auf kommunaler Ebene agiert wird, bedeutet dies nicht, dass der Bund sich aus der Förderung herausziehen kann, da für viele Kommunen die nötigen Mittel zur Finanzierung der Programme zur Energieberatung nicht aufbringen können.

## **6. Perspektiven für Gebäudeenergieberatung**

In Bezug auf die Energieeffizienz im Gebäudesektor kann die Energieberatung eine zentrale Rolle spielen. Die Zukunft der Energieberatung hängt davon ab, ob die Sichtbarkeit der Qualität der Energieberatung im komplexen Umfeld der energetischen Gebäudesanierungen erhöht wird und bei großflächigeren Sanierungen auf Siedlungs- und Quartierebene Energieberater relevante Akteure als Netzwerker sein werden.

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<sup>28</sup> Das Projekt ist von der Initiative Energieeffizienz Metropolregion Rhein-Neckar initiiert und vom BMU gefördert worden (<http://www.mehr-aus-energie.de/wohngebaeude/energiekarawane/>).

<sup>29</sup> Das Projekt wurde vom Initiativkreis Ruhr ins Leben gerufen und vom Land Nordrhein-Westfalen gefördert (<http://www.icruhr.de>).

Die Förderung der Energieberatung kann nur im Zusammenhang mit den anderen existierenden Instrumenten des CO<sub>2</sub>-Gebäudesanierungsprogramms der KfW funktionieren; Die Energieberatung nimmt in diesem Zusammenspiel eine wichtige Rolle ein, muss aber immer als zusätzliches Instrument verstanden werden, da das zusätzliche Angebot von Informationen allein die Sanierungsrate nicht substantiell erhöhen kann.

Thematisch kann es für eine wirkungsvolle Energieberatung sinnvoll sein, neben dem Kernkompetenzbereich der energetischen Sanierung einen umfassenderen Blick auf Modernisierungsaktivitäten im Baubereich für Kunden zu richten. Hierbei bietet sich vor allem in Verknüpfung mit dem Thema des Bauens im Alter in Anbetracht des demographischen Wandels ein zukunftsträchtiges Betätigungsfeld für Energieberater an. Zukunftsfähiges Wohnen und energetische Effizienz sollten hierfür zusammen gedacht werden, da durch die Kopplung von altersgerechten und energetischen Maßnahmen Sanierungen zielgruppengerecht zum Erfolg geführt werden können. Eine aktive Ansprache an die Zielgruppen durch Energieberater kann in diesem Fall dazu führen, dass die Aufmerksamkeit der Zielgruppe zum richtigen Zeitpunkt für eine Umbaumaßnahme (Instandhaltung, Immobilienerwerb, etc.) hergestellt wird.

Es ist davon auszugehen, dass die Energieberatung einen erheblichen Beitrag zur Erhöhung der Sanierungsrate leisten kann, vor allem vor dem Hintergrund, dass die Modernisierung des Gebäudebestands sich nur sehr langsam entwickelt und bei gleichbleibender Sanierungsrate das Ziel des nahezu klimaneutralen Gebäudesektor bis 2020 nicht erfüllt werden kann. Das Konzept eines vertrauenswürdigen und fachkompetenten Energieberaters als Intermediär in einer von Unsicherheit geprägten Situation kann in der Öffentlichkeit die Akzeptanz für energetische Gebäudesanierung steigern. Ebenso wichtig ist es, dass durch zielgerichtete Beratung die Wirtschaftlichkeit der Sanierungsmaßnahmen, bzw. deren Amortisation nachhaltig verbessert wird. Mehr als alle anderen Maßnahmen würde dies zu einer stärkeren Nachfrage nach Sanierungen führen, was eine Erreichung des politisch gewünschten Sanierungsziels möglich machen würde.

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