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Establishing Energy Efficiency—Drivers for Energy Efficiency in German Manufacturing Small- and Medium-Sized Enterprises

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Abstract: Despite strong political efforts in Europe, industrial small- and medium-sized enterprises (SMEs) seem to neglect adopting practices for energy efficiency. By taking a cultural perspective, this study investigated what drives the establishment of energy efficiency and corresponding practices in SMEs. Based on 10 ethnographic case studies and a quantitative survey among 500 manufacturing SMEs, the results indicate the importance of everyday employee behavior in achieving energy savings. The studied enterprises value behavior-related measures as similarly important as technical measures. Raising awareness for energy issues within the organization, therefore, constitutes an essential leadership task that is oftentimes perceived as challenging and frustrating. It was concluded that the embedding of energy efficiency in corporate strategy, the use of a broad spectrum of different practices, and the empowerment and involvement of employees serve as major drivers in establishing energy efficiency within SMEs. Moreover, the findings reveal institutional influences on shaping the meanings of energy efficiency for the SMEs by raising attention for energy efficiency in the enterprises and making energy efficiency decisions more likely. The main contribution of the paper is to offer an alternative perspective on energy efficiency in SMEs beyond the mere adoption of energy-efficient technology.

Keywords: industrial energy efficiency; energy efficiency culture; energy efficiency practices; energy management

1. Introduction

Increased industrial energy efficiency has been a highlighted objective in political agendas in Europe, aiming at productivity gains and ecological sustainability. Small- and medium-sized enterprises (SMEs) hold a special position in this context and they are often considered the backbone of the European industrial structure [1]. In Germany in 2017, 184,667 SMEs represented about 96.9% of industrial enterprises [2]. Despite strong political efforts in Europe, SMEs seem to be neglecting to adopt effective measures for energy saving and efficiency. Thollander et al. [3] estimate the energy efficiency potential of manufacturing SMEs in the European Union at more than 25%. Why this potential remains untapped has kept policy makers and scientists occupied since the notion of the "energy efficiency gap" [4,5] emerged; academia struggles with another empirical phenomenon often referred to as the energy "efficiency-paradox" [6]. Despite high profitability, energy efficiency measures are often not implemented.

The question of what constrains and drives decisions for energy efficiency in industrial organizations represents a vast research field in energy literature [7–10]. Barriers and drivers can be defined as all factors that hamper or foster the adoption of cost-effective, energy-efficient technologies and their diffusion [11,12]. Accounting for the fact that measures representing high rates of return, or requiring no capital investment, are often not undertaken by SMEs [13,14]. A perspective solely focusing on economically rational decisions appears insufficient for a thorough understanding of the situation of SMEs.

Studies on the adoption and implementation of energy-efficient practices represent an overlapping key area of research on industrial energy efficiency [15]. Recent analyses emphasize the benefits and characteristics of measures [16], the potentials of particular technical processes [17], or beneficial intersections to other management aspects such as supply chain management [18]. Despite the theoretical importance and practical value of these approaches, a one-sided view of technical measures has been increasingly criticized in recent publications [19–23] on the barriers and adoption of energy efficiency measures. To date, practices other than technical measures have received inadequate attention in empirical studies [24], neglecting the material, social, cultural, and institutional aspects framing the decision-making processes [25,26].

Rejecting an atomistic perspective on decision making and technology, scholars of sociology, ethnology, and anthropology have drawn increasing attention to the cultural aspects of energy-related behavior in enterprises. By looking at the values, norms, laws, and everyday practices, these approaches emphasize the embeddedness of organizational decisions on energy efficiency in cultural, social, and material contexts [27–31]. Ethnographic case studies have since shown the significance of SME owners' and managers' personal values in terms of environmental decision making [32] and how energy management practices are influenced by organizational cultures, team dynamics, and individual's aspirations [33]. Despite these efforts, Andrews and Johnson [34] call for an increase in studies addressing the rules, norms, beliefs, and logics embedded in the organization's context. Fawcett and Hampton similarly argue that a "more complex understanding of SMEs, as organizations operating in a socio-technical landscape, and with varied capabilities, objectives and values" could provide a more effective policy design [35] (p. 3).

By adopting a cultural perspective [36], this empirical study on German manufacturing SMEs examined the energy efficiency climate, the energy efficiency practices, and the intersections between the enterprises and their members and their institutional environment. The purpose of this study was to investigate the establishment of energy efficiency within the SMEs and identify general drivers in promoting energy efficiency decisions, energy-saving behavior, and the general establishment of energy efficiency in SMEs. The study followed a mixed-methods approach and utilized qualitative (single case studies) and quantitative (survey) data of SMEs situated in the federal state of Baden-Wuerttemberg, southern Germany.

The study indicates the importance of everyday employee behavior in achieving energy savings. The studied enterprises value behavior-related measures as similarly important as technical measures. Raising awareness for energy issues within the organization, therefore, constitutes an essential leadership task, which is oftentimes perceived as challenging and frustrating. The results suggest the embedding of energy efficiency in corporate strategy, the use of a broad spectrum of different practices, and the empowerment and involvement of employees as major drivers in establishing energy efficiency within SMEs. Furthermore, the findings reveal external influences on shaping the meanings of energy efficiency for the SMEs by raising attention for energy efficiency in the enterprises and making energy efficiency decisions more likely.

The remainder of this study is organized as follows: The next section sets out the theoretical background and research focus. Section 3 provides a brief overview of the research strategy and the methods used. Section 4 is devoted to the main results of the study. The following section presents the discussion of the results and Section 6 provides the conclusions and implications of the study.

2. Theoretical Background and Focus

2.1. The Concept of Culture in the Context of Energy Efficiency Research

Culture is frequently explained as a constraining soft factor from an organizational perspective [37,38]. Culture can be roughly defined as the mix of knowledge, ideology, norms, values, laws, and everyday rituals that characterize a social system [39]. Sorrell et al. [40] presume that environmental values embedded in organizational cultures and practices have an essential effect on organizational decisions and behavior. However, they do not view culture to be a barrier, "but an important explanatory variable" [40] (p. 15). Although a cultural perspective on industrial energy efficiency promises useful findings for science and politics, only a few researchers have transferred this complex to a strategy for empirical inquiry. Criticizing that "within the energy literature, the concept of culture has generally been more implied than overt", Stephenson et al. [41] (p. 6123) developed a conceptual framework of energy cultures. The so-called Energy Cultures Framework (EFC) is based on sociological theory [42,43] and represents a heuristic approach to investigate influences on energy-related behaviors in social systems to identify the "levers for change towards more energy-efficient behaviors" [41] (p. 6123). According to the ECF, the energy cultures are constituted via the interactions between material culture, practices, and norms, all of which are affected by external influences and embedded in wider cultural spheres [44]. Since its development, the ECF has been applied to different contexts, ranging from household energy-related behavior [45] to industrial sectors such as the timber processing industry [46].

König [36] introduced a similar framework addressing specifically industrial organizations. Taking a sociological perspective, he views organizations as cultural systems embedded in wider social contexts and he developed a theoretical framework addressing individual organizational and institutional dimensions, shaping decisions on energy efficiency. The framework combines multidisciplinary concepts and theoretical approaches of organizational theory. It integrates concepts of sociological neo-institutional theory [47,48], the translation perspective on diffusion [49], the attention-based view of the firm [50], and organizational [51] and energy culture research [41,44]. The energy efficiency culture of an industrial organization is defined as unconscious, shared understandings, which are mutually dependent from the organizational structures, practices, environment, and individual members. Decisions on energy efficiency in industrial enterprises are, therefore, based on a multilevel process shaped by individuals, organizations, and the environment. Referring to the attention-based view of the firm [50], the organization structures the situational context of, distributes the attention to, and shapes the focus of attention on energy efficiency issues. This framework supports the identification of drivers and served as an anchor in conceptualizing the research design of the study.

2.2. Theoretical Perspective of the Study

The data collection and analysis were structured by the theoretical concept developed by König (Figure 1), which assumes that decisions and actions on energy efficiency emerge at the intersection between three levels.

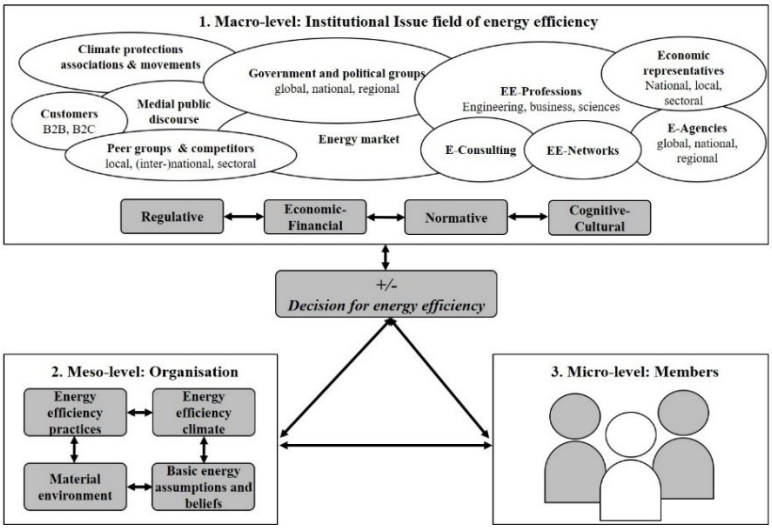

Figure 1. Energy efficiency culture framework following König [36].

1. The Macro level encompasses the institutional issue field of which organizations and actors have emerged around the issue of energy efficiency. This field and its actors exert regulative (e.g., through policies, laws, and discourse), economic–financial (e.g., through prizes, grants, subsidies), normative (e.g., work roles, habits, professional, social, and scientific norms), and cognitive–cultural (e.g., constitutive schemes, values, beliefs, and assumptions) influences on the organization's decisions.
2. The Meso level encompasses the industrial organization with its material environment, energy efficiency climate, energy efficiency practices, and basic energy assumptions and beliefs. The material environment of industrial enterprises has been a focal point of empirical studies on barriers, such as energy intensity [52,53] or firm size [54–56], and must be considered as a crucial factor of decision making. Following Denison's concept of organizational climate [57], the energy efficiency climate represents the interpretation of the situations related to energy efficiency within the organization. The energy efficiency practices are understood as the totality of all practices toward energy efficiency and energy conservation by an enterprise and represent outcomes as well as inputs to decisions on energy efficiency measures. Referring to Fiedler and Mircea [58], who view energy management as "the sum of all measures and activities which are planned or executed in order to minimize the energy consumption of a company", the energy efficiency practices synonymously represent the energy management of an enterprise. Following Schein's concept of organizational culture [51], the basic energy assumptions and beliefs within an industrial organization are mutually dependent from the organizational structures, practices, environment, and individual members.
3. The Micro level incorporates the decision makers and members of the organization with their individual characteristics (e.g., attitudes, interests, competencies). These characteristics are mutually dependent of the positioning and socialization of individuals within the organization.

Decisions on energy efficiency represent processes of theorization and problematization, linking together the issue-field (1. Macro level), the organization (2. Meso level), and the members (3. Micro level). In this sense, decision makers are not considered as atomistic units; they are members of professional groups, work groups, milieus, or families in the case of family businesses [34] (p. 198).

2.3. Research Focus and Research Questions

The research focused on manufacturing SMEs in Baden-Württemberg, Germany. This federal state constitutes the most industrial area in Germany, with about 1.3 million employees in the industry sector and around 7500 manufacturing SMEs with around 505,833 employees [59] representing the industrial backbone. Baden-Württemberg is ahead of all G-10 states (a group of the 11 leading industrial countries) with a share of manufacturing industry in the gross value added and

exceeds the benchmark for industry defined by the EU for 2020 (20% share of industry in gross value added) by around 60% with 32.5% [60,61].

Referring to the framework described above, the research concentrated on four areas that were derived as crucial in answering the overarching research question: What drives the establishment of energy efficiency in SMEs in everyday work life? The study focused on examining the energy efficiency climate, the energy efficiency practices, the intersection between the enterprises and their members, and the intersection to its relevant environment. These four areas were assigned the guiding research questions, which structured the data collection and analysis.

1. Energy efficiency climate:

According to the theoretical perspective taken, the energy efficiency climate reflects the interpretation of the situations related to energy efficiency within the organization, which structure the attention of its members. Correspondingly, the investigation concentrated on the following research questions:

- What importance does energy efficiency have for the SMEs?
- What meanings and importance does energy efficiency have for and within the SMEs?
- How is energy efficiency perceived as being established within the enterprises and what aspects drive the establishment of energy efficiency within the SMEs?

2. Energy efficiency practices:

As outlined in the introduction, the study should not only take technical measures into account. Following the classification of energy efficiency practices by König [36] (p.6), six different forms of energy efficiency practices were investigated: Technology investment-related practices (e.g., the purchase and implementation of energy-efficient technical equipment), technology organization-related practices (e.g., the enhancement and optimization of existing support or process technology), organization-related practices (e.g., corporate energy strategy, the implementation of an energy management system), information-related practices (e.g., energy monitoring, internal technical meetings), competence-related practices (e.g., workshops, trainings), and behavior-related practices (e.g., raising awareness for energy saving by personal encouragement and explicit behavior guidelines). The following research questions were focused on:

- What importance does energy efficiency have for corporate strategy of the SMEs?
- What importance do different energy efficiency practices have for the enterprises?
- What importance does energy management have for the SMEs?

3. Interface between the enterprise and its members:

Organizational procedures and structures potentially regulate the energy-related behavior of their members and subunits [34]. Aiming at everyday work life in the enterprises, the following research questions were targeted:

- What importance does the everyday behavior of the employees have for energy conservation and energy efficiency?
- Who is perceived as responsible for energy efficiency and energy conservation within the enterprises?
- How do the SMEs and their leaders attempt to raise awareness among their workforce?

4. Interface between the enterprise and its environment:

As described above, it was assumed that external actors and organizations potentially exert regulative, economic–financial, normative, and cognitive–cultural influences on the SMEs regarding energy efficiency practices and decisions. Accordingly, the study focused on these questions:

- Regulative: How do the SMEs perceive external imperatives for energy efficiency?
- Economic–financial: To what extent is the financing of measures considered as an obstacle by the SMEs?
- Normative: What information sources do the SMEs use and how actively do they search for information?

- Cultural–cognitive: What importance does energy efficiency have for the environment of the SMEs and to what extent does it influence the decisions of the SMEs?

3. Materials and Methods

The study followed a sequential exploratory mixed-methods approach [62] and combined ethnographic case studies with a subsequent quantitative survey (Figure 2). To gain an understanding of how decisions on energy efficiency are constituted and how the enterprises deal with energy efficiency issues in everyday work life, firstly, ethnographic case studies [63] were carried out on 10 industrial SMEs using qualitative interviews and observations as the main methods. Secondly, and based on their key results and orienting on the discussed framework, the questionnaire was conceptualized, which was addressed to 500 SMEs.(An SME is here intended as an enterprise according to the 2003 recommendation of the European Council [64]).

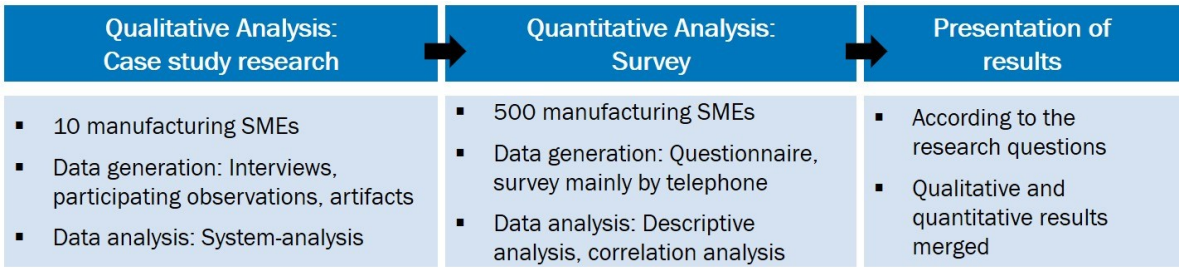

Figure 2. Research design.

3.1. Qualitative Analysis: Case Studies

The ethnographic organizational analyses formed the starting point of the research work, which primarily aimed at the observation and reconstruction of situations in everyday work life in order to find out "how work is organized and how that organizing organizes people". [63] (p. 1). This qualitative approach is particularly suitable for studies of organizational cultures [65] (p. 20). Exploratively designed case studies focused on several basic questions: How do decisions for energy efficiency come about in the SMEs? Which driving (or constraining) processes and aspects can be identified? How are energy efficiency issues treated, organized, and communicated in everyday work life? The sample (Table 1) comprised 10 manufacturing enterprises from different industrial sectors (chemicals, minerals, engineering, and machinery). The cases were selected by theoretical sampling [66] according to the premise of "minimum/maximum contrast", especially with regard to energy intensity, sector, and number of employees of the enterprises. All participating enterprises are family businesses (ownership and/or control). (Ninety-one percent of all enterprises in Baden-Württemberg are family controlled and 88% of all enterprises in the manufacturing sector are family controlled [67].). The data generation was mainly based on qualitative interviews [68] with members from different divisions within the enterprises. Around seven to 10 interviews per SME (one-on-one and multi-person) were carried out in each enterprise. Interviews were conducted with managing directors, owners, and energy managers as well as production workers and controlling, marketing, and human resources staff (Table 2). In addition to the interviews, participating observations [69] and artefacts (e.g., company presentations, homepages, work instructions) were included in the analysis. Depending on what was appropriate from the perspectives of the enterprises and their members, the observations were either performed as fly-on-the-wall (e.g., at meetings of formal or informal energy teams or meetings with external energy efficiency consultants) or following the daily routines throughout the work day. The data (primarily interview text and observation protocols) were analyzed by system analysis [68,69]. This hermeneutic approach focuses on the interpretation of the data in two steps. In the first step, hypotheses are formed, from which subjective and organizational meanings and conditions could lead to a statement (e.g., "Only the boss is responsible for energy.") or observation. In the second step, hypotheses are formed, from which these meanings and conditions could have effects for the organization (e.g., centralization of competences and responsibility for

measures). The field research was carried out by one person of the University of Reutlingen, taking about one year all together and spending around one work week in each SME.

Table 1. List of enterprises participating in the case studies.

Case	Number of Employees	Sector	Energy Intensity *
Enterprise A	110	Surface engineering	Average
Enterprise B	90	Mechanical engineering	Low
Enterprise C	70	Foundry industry	Very high
Enterprise D	135	Manufacture of products of wood, synthetics, and metal	Average
Enterprise E	115	Mineral industry	Very high
Enterprise F	240	Pulp and paper industry	High
Enterprise G	85	Mechanical engineering and service	Average
Enterprise H	45	Surface engineering	High
Enterprise I	20	Mechanical engineering	Low
Enterprise J	85	Manufacture of chemical products	High

* Self-evaluation of the enterprises.

Table 2. Shares on the roles of the interviewed persons of the SMEs.

Director/ Owner	Energy Management	Controlling/ Accounting	Production Workers	Engineering/ Maintenance	Human Resource	Marketing	Trainees
10	4	7	28	14	6	3	3

3.2. Quantitative Analysis: Survey

Based on the case study research, a quantitative survey was conceptualized through a questionnaire comprising questions on topics such as the importance of energy efficiency, measures, support measures, the influence of the business environment, the relevance of employee behavior, financing, and others. The questionnaire consisted of 20 different types of questions including multiple choice questions, Likert scale questions, and matrix questions as well as single-choice questions (see Appendix A). The survey took place from May to June 2018 and around 500 SMEs from the federal state of Baden-Württemberg, Germany, were surveyed. A market research institute was commissioned with the survey itself while the analysis was conducted by the Institute for Energy Efficiency in Production, Universität Stuttgart. On the basis of available data bases and selected by company size (micro-, small-, middle-sized) and sectors, the SMEs were reached by telephone. The energy demand of the surveyed SMEs is shown in Figure 3. The distribution of the responding SMEs with respect to the number of employees is shown in Table 3. Analogous to the sample procedure for the survey of the Energy Efficiency Index of German Industry [10], the distribution of the sample size did not correspond to the real distribution of SMEs by enterprise size in Germany [70]. In order to allow valid results for small- and medium-sized enterprises, the share of micro enterprises was reduced. Furthermore, a thorough coverage of the manufacturing sector including subsectors of particular importance for the state of Baden-Wuerttemberg (such as the manufacturing of metal products and processing, mechanical engineering, and the automotive sector) was targeted. The respondents were either owners, managing directors, technical managers, production managers, energy or environmental managers, controlling, or other persons of the SMEs. Naturally, not all enterprises were open to be interviewed. Therefore, a self-selection bias can be assumed. In addition to descriptive data analysis, a correlation analysis (using SPSS) investigating the factors driving the internal establishment of energy efficiency was conducted. The correlation analysis was performed using ordinally scaled variables, with the Spearman rho rank correlation coefficient as an indicator of correlation.

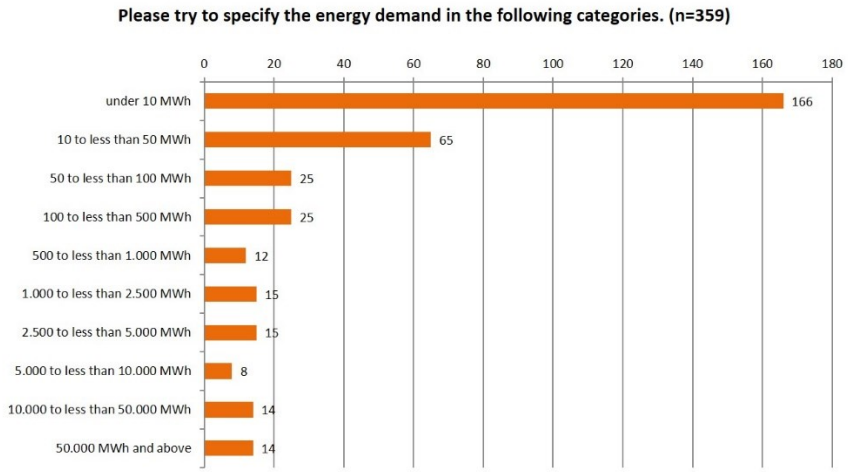

Figure 3. Energy demand of the surveyed SMEs.

Table 3. Sample composition, according to size.

Company Size	Number of Employees	Respondents	Percentage	Distribution of Manufacturing SMEs in Germany
micro	0–9	282	56.7%	62.8%
small	10–49	135	27.2%	27.8%
medium	50–249	80	16.1%	9.3%

4. Results

The presentation of the results concentrates on those four areas that were identified as crucial in constituting decisions on energy efficiency and establishing an effective energy efficiency culture within the SMEs.

4.1. Energy Efficiency Climate

4.1.1. What Importance Does Energy Efficiency Have for the SMEs?

As part of the questionnaire, the SMEs were queried as to how they assess the current meaning of energy efficiency for the enterprise. The results show that energy efficiency is perceived as an important issue for the SMEs, although equally important with other factors. While there were only minor differences between the enterprises when looking at their energy demand, the answers differed considerably according to the size of the enterprise (Figure 4). The analysis suggests that the size of enterprises influences the perceived importance of energy efficiency—the smaller the SMEs are, the less pronounced the importance of energy efficiency seems to be. In this respect, the energy efficiency climate in micro-enterprises appears less positive than in medium-sized enterprises. Almost one-third of micro-enterprises considers the current importance of energy efficiency to be relatively low.

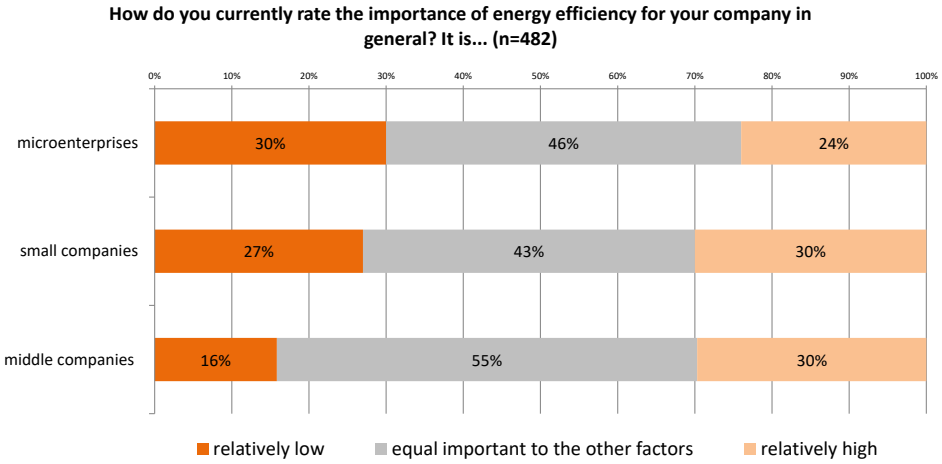

Figure 4. Current importance of energy efficiency by enterprise size.

The SMEs were additionally asked how they assess the importance of energy efficiency and energy saving in day-to-day work for the company's work force. This showed that almost half of the enterprises (46%) rate the meaning of energy saving in everyday working life as high or very high. On the other hand, only 19% rate energy efficiency as low or very low. With regard to the energy demand, hardly any differences were noticeable. However, differences could be observed according to the size of the enterprises. As seen above, a similar pattern was observed, although less pronounced—the larger the enterprises are, the higher the importance of energy efficiency in everyday work life seems to be.

4.1.2. What Meanings Does Energy Efficiency Have for the SMEs?

In the course of the interviews during the ethnographic fieldwork, it became apparent that the associations of the organizational members with energy efficiency issues are manifold. Subjective and manifest assessments on energy efficiency issues and individual experiences may range from "necessity" to "annoyance" within an enterprise or even within a division. As every enterprise has its own "energy efficiency history", the interview partners provided individual experiences as well as shared collective stories, revealing the meanings associated with energy efficiency issues. For example, the interviewed persons reported on the introduction of a management system, reflected on their role in initiating measures, or critically questioned the management's intentions when introducing new work rules. Therefore, personal experiences, corporate values, and motivations as well as realized measures constitute the meaning of energy efficiency. To untangle the bubble of meanings [71], the articulated meanings by the interviewed persons (Table 4) were differentiated by whether they refer to the organizational discourse (meaning for the enterprise) or individual experiences, ideas, and beliefs of individual employees and decision makers (meanings within the enterprise).

Table 4. Meanings of energy efficiency for and within the enterprise (energy efficiency climate).

Meanings of Energy Efficiency *for* the Enterprise	**Meanings of Energy Efficiency *within* the Enterprise**
• Cost reduction and competitiveness • Differentiation from others (peer organizations or competitors) • Securing the long-time future of the enterprise • Aspiration of a positive public image • Conformity to a perceived industrial state of the art (e.g., progressiveness, modernity) • Conformity to local expectations (e.g., engagement in programs or initiatives) • Risk mitigation (e.g., by combined heat and power generation) • Source and symbol of corporate identity • Fulfillment of enforced external expectations	• Accordance with individual interests (e.g., in specific issues or in general) • Increasing complexity of production and auxiliary processes • Addition of troublesome tasks or problems • Normality and everyday routines • Career opportunity within the enterprise • Limiting autonomous behavior • Increasing bureaucracy • Corporate profit seeking (depreciative) • Fulfillment of enforced external expectations

The fieldwork research indicates that the meaning of energy efficiency for the enterprise is not only shaped by internal criteria such as cost reduction, profitability, risk mitigation, and future safety, but also by external criteria. Meanings, such as social or ecological responsibility, modernity, progress, or the desire for a positive external image, are unthinkable without recourse to the expectations of the corporate environment and broader society; the meaning of energy efficiency is a social product. For example, in several cases the general societal discourse on sustainability together with regional energy efficiency programs or initiatives of contractors can have a considerable influence in shaping the attention on energy efficiency issues within an enterprise. On the one hand, this indicates the potential influence of the organizational environment on the enterprises (which will be further elucidated in Section 4.4). Furthermore, those external criteria and expectations represent aspirations for the future and the development of the enterprises.

The meanings for and within the enterprise do not necessarily intersect and have both positive and negative (or rather destructive) connotations. Energy efficiency can, thus, be treated ambivalently by employees despite its positive meanings for an enterprise. Nevertheless, members should not necessarily be accused of lack of understanding, resentment, or bad intentions. On the contrary, the interviews revealed that the employees oftentimes do have much more personal thoughts about issues of increasing energy efficiency than the management staff sometimes expects. Nevertheless, the individual frames of references do differ. The case studies strongly indicate that the positioning within the enterprise, individual attitudes, interests, and experiences shape how energy efficiency issues are perceived and evaluated by the individual members. For instance, in the case of a managing director of one studied enterprise, individual experiences with energy efficiency technology (e.g., in private households) and a strong interest in sustainability proved as a strong driver for the implementation and consideration of any measures. In another case, the energy manager similarly expressed a strong individual interest in sustainability as well as in energy-efficient technology and measures in general. However, feeling under-supported by the top management and decision makers on the shop floor level, he has become more and more frustrated with the role as an energy manager he initially was eager to fill out in the enterprise. In the context of the enterprise, energy efficiency became a burden loaded with negative associations.

4.1.3. How Is Energy Efficiency Perceived as Being Established within the Enterprises and what Aspects Drive the Establishment of Energy Efficiency within the SMEs?

To what extent energy efficiency is established in the SMEs was one of the key questions of the entire study. With regard to the participating enterprises in the case study research, the establishment appears fairly strong. Although in almost all SMEs potentials for improvement were indicated by the management staff, the topic was, nevertheless, considered sufficiently established by most of them.

From a critical perspective, this finding could be attributed to a sampling bias (due to the fact that participating in an extensive case study research requires rather unusual high interest for energy efficiency, in general, and a rather strong establishment, after all). This risk is much lower for the survey in which the companies are asked the same question. However, energy efficiency appears to be fairly well established in the surveyed SMEs as well. Rather surprisingly, the energy demand of the enterprises did not seem to have a particular influence on how energy efficiency is established. Conversely, the size of enterprises appeared to have a more significant influence (Figure 5). In the case of micro-enterprises, around 30% perceive energy efficiency to be strongly to very strongly established, compared with around 50% for medium-sized enterprises.

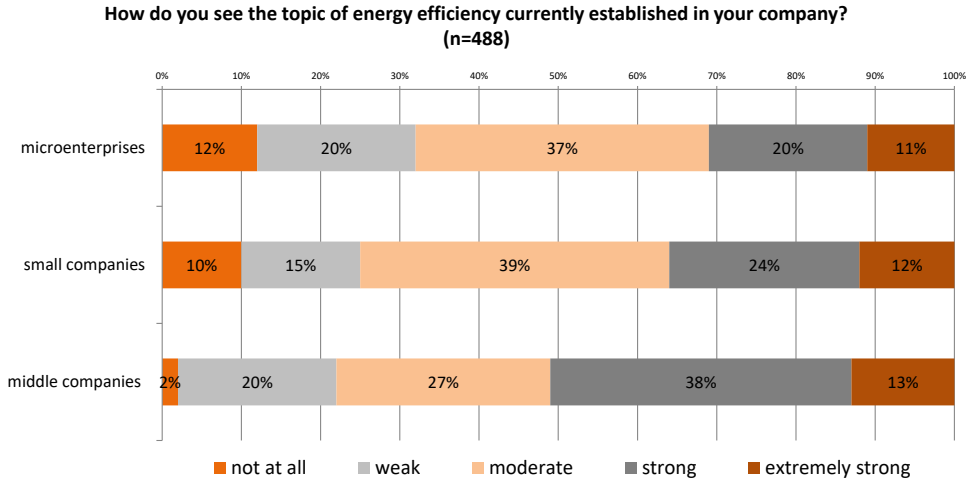

Figure 5. Establishment of energy efficiency in the SMEs.

To further validate the interpretation of the descriptive analysis and to investigate potential positive factors, a correlation analysis was carried out (Table 5). Although energy efficiency seems less established in smaller enterprises, the analysis showed only a minor correlation with regard to firm size. The size of the enterprise as well as the energy demand hardly seemed to determine the extent to which energy efficiency was established in the enterprises. In contrast, the embeddedness of energy efficiency in the corporate strategy and the variety of past measures appeared to have a considerably stronger correlation.

Table 5. Factors correlating with the establishment of energy efficiency within the SMEs.

	Variables	1	2	3	4	5	6	7
1.	Establishment of energy efficiency	1.000						
2.	Importance for corporate strategy	0.475 **	1.000					
3.	Variety past energy efficiency practices	0.328 **	0.295 **	1.000				
4.	Importance of employee behavior for energy savings	0.226 **	0.338 **	0.124 **	1.000			
5.	Importance of energy efficiency for the environment	0.204 **	0.223 **	0.290 **	0.216 **	1.000		
6.	Energy demand	0.116 *	0.119 **	0.218 **	0.071	0.161 **	1.000	
7.	Firm size	0.140 **	0.094 *	0.137 **	0.232	0.116	−0.140 **	1.000

Note: N = 488; Spearman correlation. * Correlation significant at $p < 0.05$ (two sided). ** Correlation significant at $p < 0.01$ (two sided).

4.2. Energy Efficiency Practices

4.2.1. What Importance Does Energy Efficiency Have for Corporate Strategy of the SMEs?

As indicated above, the environment of an enterprise represents important frame of reference, which appears to be particularly crucial in terms of the strategic approach on energy efficiency. The

case study research showed a clear link between the meanings of energy efficiency for an enterprise and the strategic approaches an enterprise makes in this respect. In one studied SME, for example, it became apparent that a positive external image, in particular, was interpreted as the most important function of all undertaken and planned efforts. Accordingly, the enterprise concentrates particularly on measures that are salient and can be distinctively presented to the outside world (e.g., photovoltaic system, e-mobility).

Nevertheless, the case study research indicated that embedding energy efficiency into corporate strategy has a positive effect on implementing technology and practices regardless of the dominant orientation. In the course of the survey, the SMEs were, therefore, asked about the importance of energy efficiency for their corporate strategy. For almost half of the surveyed SMEs, energy efficiency occupies a high (33%) or very high priority (16%) for the corporate strategy. On the other hand, only 13% of the enterprises surveyed consider energy efficiency having a low priority for their general corporate strategy, whereas 6% assume a very low priority. Considerable differences were observed regarding the enterprise size and energy demand. Both appear to have a positive effect on the embedding of energy efficiency in the corporate strategy. This result can certainly be explained by the prevalence of energy management systems according to the international standard ISO 50001, which are quite common, especially in larger or more energy-intensive enterprises in Germany [72], and explicitly require the definition of explicit strategic energy goals and policy.

4.2.2. What Importance Do Different Energy Efficiency Practices Have for the Enterprises?

The case study research indicates that the implementation of a broad range of practices—ranging from technical investments to raising awareness measures—proved to be particularly effective in establishing energy efficiency within the enterprises and tapping the energy efficiency potentials adequately. The fieldwork revealed that the enterprises undertake a variety of measures in different contexts: Simultaneously, sequentially, and sometimes even unintentionally. In the course of the specific "energy efficiency history" of the enterprises, the focus on particular practices necessarily changes over time. Thus, an issue can be treated in different contexts with different measures. The interplay of different practices that may emerge over time can be well illustrated by an example of the case study research.

A medium-sized engineering company draws its attention to its compressed air supply and starts problematizing the technical equipment. The enterprise first turns to compressed air generation, invests in new compressors, and starts monitoring energy consumption. After attending a regional information event, a maintenance employee suggests that the piping system should be checked for leakages and optimized. Top management decides to redesign the compressed air system and commissions a service provider. Although the enterprise can report a significant reduction in energy consumption, the management is not sufficiently satisfied. At a production meeting, the records of savings and energy consumption of the compressed air supply are discussed. The practical use of compressed air becomes a focal point, and the enterprise begins to inform production employees about the sensitive use of compressed air. Half a year later, the results of energy consumption show hardly any differences, and top management wonders why the measures for raising awareness have little effect and what further measures are appropriate. Under the impression that the employees are ignoring the previous measures, the company changes its approach. The quality manager is instructed to formulate working rules for the use of compressed air. At the same time, the technical team is instructed to look for ways to automate the use of air-operated machines.
As the example above indicates, the exploitation of energy efficiency potentials requires a broad spectrum of energy efficiency measures over time. Within the scope of the survey, the SMEs were asked what type of energy efficiency practices they implemented in the last three years, what measures they were currently focusing on, what measures they plan for the future (in the following three years), and which ones they do not plan to carry out at all. In the past, the SMEs mostly focused on technical-investment measures, and in the future the focus will also be placed on technical measures. Measures for raising awareness have had a high priority for SMEs and will also be held as

important in the near future. Furthermore, the current focus was mostly drawn to such measures, and all other types seemed to have considerably less importance for the enterprise (Figure 6).

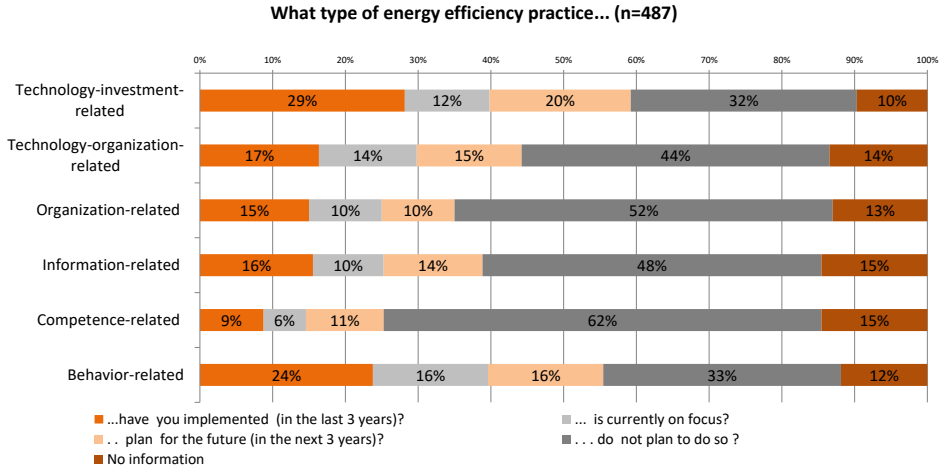

Figure 6. Importance of different types of practices.

The relatively low importance of organizational, information-, and competence-related practices becomes even more distinct when considering the size of the enterprises. The smaller the enterprises are, the less they seem to value these measures. Additionally, the percentage of measures being not planned is noticeably higher the smaller the enterprises are. Fewer measures were implemented and will not likely be carried out in the future, particularly in micro-enterprises A similar picture appears when looking at the energy demand of the SMEs. The more energy-intensive the enterprises are, the more important the measures, other than technical investments and awareness measures, are. Organizational measures have particularly been a focal point of more energy-intensive enterprises in the past. Financial incentives by the government for the implementation of an energy audit or an energy management system (such as ISO 50001) might be a plausible explanation for this peculiarity.

4.2.3. What Importance Does Energy Management Have for the SMEs?

Energy management is often regarded as synonymous with the norm ISO 50001. The case studies showed that such a classification is not necessarily tenable. Although five of the 10 enterprises investigated within the case study research operated an energy management system according to the standard ISO 50001, this does not mean that the remaining enterprises did not practice energy management. On the contrary, the case studies show that those enterprises successfully conduct energy management without committing themselves to a standardized system. They embed energy efficiency issues in their corporate strategy, set up energy efficiency goals, appoint energy managers, digitize and monitor their energy consumption, plan and implement measures, train their employees, and research possible technical measures and their financing. The difference only lies in the formal structure. For example, in one case, a company did not appoint a formal energy team in the enterprise, yet an informal network of people regularly meets to discuss energy efficiency issues. In another case, employees are aware of general premises regarding energy efficiency decisions or energy saving behavior, and yet no energy policy has ever been documented. It is also noteworthy that those SMEs do not aspire to implement a standard energy management system in the future at all. Due to a lack of personnel resources and administrative and certification costs, an implementation is not a goal or viable option, especially for small SMEs.

The analysis of the individual cases indicates that the implementation of a formal management system does not necessarily guarantee effectiveness. For example, in one case, the enterprise has established formal responsibilities and an explicit energy policy, although a lack of authority to take action and employees who are unfamiliar with energy issues constrain the implementation of measures. In addition, the implementation of an energy management system can cause unintended effects. In one case, energy efficiency was mostly perceived by members of the enterprise as a forced

external expectation due to the implementation process of ISO 50001. During the interviews the respondents either directly ("our management/competitors'/the customers' expectations forced us to implement…") or rather vaguely ("we had to do it") referred to strong expectations instead of providing hardly any other motivation. This finding allows the interpretation that complying with the paragraphs of the norm and pleasing the auditors became the dominant frame of reference for interpreting energy efficiency issues, despite diametrical intentions of the top management. Additionally, and despite the rational intent of top management to institutionalize energy efficiency within the enterprise, another unintended issue became apparent in the same case. When asked about energy efficiency issues or measures, almost all interviewed persons referred to the designated energy manager, while the interviewed energy manager complained about the lacking support, especially of the production personnel, despite the establishment of an energy team consisting of such members. Roughly speaking, energy management became reduced to the face of the energy manager, who, in turn, got overwhelmed by the responsibility of managing everything on his own. The observations and interviews within the scope of the case study research indicate that those enterprises without formal energy management sometimes take much more effective measures and establish energy management effectively within the organization.

4.3. Interface between the Enterprise and Its Members

4.3.1. What Importance Does the Everyday Behavior of the Employees Have for Energy Conservation and Energy Efficiency?

The case studies showed that the everyday behavior of the employees is perceived as an important influencing factor for improving energy efficiency. Throughout every interview with management staff and personnel charged with energy efficiency tasks, the impact of everyday behavior was valued as a vital factor in achieving energy savings. In one extreme case, the energy savings were even almost exclusively attributed to changes in employee behavior. Accordingly, within the scope of the survey, the SMEs were asked how they consider the behavior of the employees in the enterprise to contribute to the success of energy savings. Almost two-thirds of SMEs (63%) consider the importance of energy-saving behavior to be important. On the other hand, only 13% of the SMEs surveyed rate the importance of employee behavior as rather or completely unimportant. No considerable differences regarding enterprise size and energy demand could be observed.

4.3.2. Who Is Perceived as Responsible for Energy Efficiency and Energy Conservation within the SMEs?

As part of the questionnaire survey, the enterprises were queried as to which organizational actors in the enterprise are responsible for energy saving and energy efficiency. Throughout the entire sample, owners and management are seen to be most responsible (Figure 7). Differences could be observed according to enterprise size and energy demand. Both factors seem to have a positive effect on the perceived distribution of responsibility. This circumstance might be attributed to the fact that larger and more energy-intensive SMEs more likely employ dedicated personnel (e.g., energy manage or environmental manager). However, the data give evidence that the lower the energy demand and the size of the SMEs are, the greater the centralization of responsibility is perceived to be.

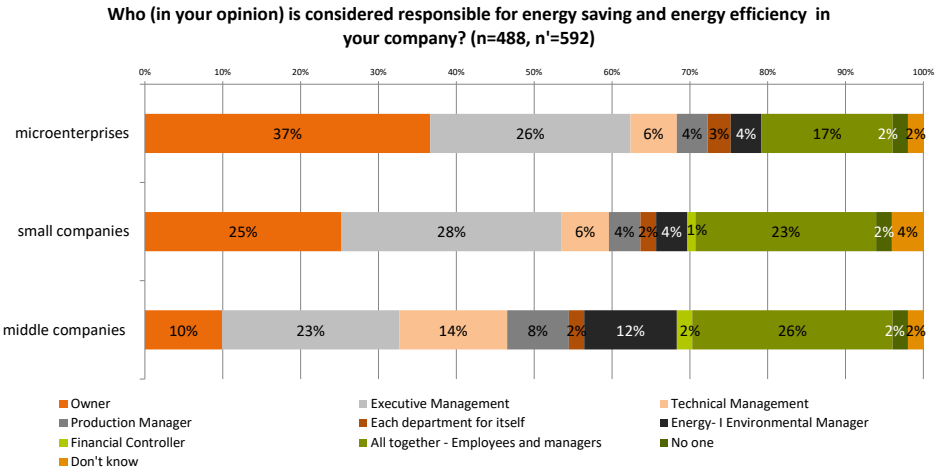

Figure 7. Responsibility for energy saving and energy efficiency in the SMEs.

4.3.3. How Do the SMEs and Their Leaders Attempt to Raise Awareness among Their Workforce?

As the case study research shows, the top management of the enterprises oftentimes puts a lot of effort into defining energy efficiency goals, structures, and processes as well as narratives as to why investments, changes, and new practices are necessary. Energy efficiency, therefore, proves to be a demanding management task from the perspective of top management. Hence, top management usually either tries to outsource this task (e.g., to a designated energy manager) or to involve key persons in support. These key persons act as energy efficiency agents within the organization and oftentimes play an important role to the organizational institution of energy efficiency. These agents do not necessarily have to be explicitly appointed energy managers. The case studies showed that the top management of the SMEs usually searches for individual personnel aware and interested in mediating, communicating, and spreading energy efficiency issues within the enterprise. Oftentimes, these persons act only informally—as informal energy managers or as an energy team.

However, both formally and informally appointed energy efficiency personnel usually require a wide set of skills and knowledge, ranging from technical, economic, and social skills as well as to knowledge about legal requirements and external actors. Considering the complexity of energy efficiency in the context of industrial organizations, this finding seems rather obvious. Less obvious seems another aspect, which was frequently expressed by the interviewed members of the investigated SMEs. From their points of view, the integrity of those in charge with managing and spreading energy efficiency within the enterprise is valued even more highly than their competences. In other words: Whoever is in place has to walk the talk.

In the context of the case study research, it was investigated which strategies the SMEs pursue in order to promote and enforce energy-saving behavior within the enterprise. Four different strategic approaches were identified: (1) Raising awareness (e.g., creation of consciousness by trainings, empowerment, or speech); (2) motivation (e.g., promotion of self-interest by sanctions, incentives, or job roles); (3) regulation (e.g., establishment of conformity by formal or informal work rules); and (4) automation (e.g., avoidance of human risks by technical measures). These approaches represent "ideal types" [73], which do not occur in pure form in the enterprises. Rather, the enterprises mix and complement, for example, raising awareness practices with formal rules or automation measures. In addition, it was not necessarily possible to determine which typical approach would be the most effective—the individual competencies, qualifications, and corporate cultures (meaning general norms, beliefs, ideas, and routines) considerably shape what is feasible.

However, the case studies showed that raising awareness among the employees is the most important strategic approach to foster energy efficiency decisions and energy-saving behavior. Actions for raising awareness usually mark the starting point for actions in the enterprises to address energy efficiency issues. The focus of how the enterprises attempt to shape the individual behavior and decision making of its members might shift over time. For example, an enterprise perceives the

undertaken raising of awareness measures as ineffective and decides to set up rigorous work rules instead. In another case, formal work rules seem not to work sufficiently and the company theorizes that monetary incentives might generate more self-interest and motivation among its employees to save energy. In a rather extreme cases, the focus shifts solely to the automation of processes, as no other strategy has proven effective in the past. Mainly relying on automation, therefore, represents an avoidance strategy.

Top management and key personnel often spend a lot of time and effort situating attention on energy issues among the workforce. Occasionally, they feel themselves becoming "energy educators" within the enterprise. At the same time, top management often experiences encouraging energy saving among the employees to be a daunting task. Actions for raising awareness are sometimes perceived as "Sisyphus work", as one managing director described it graphically. Similarly, many of the interviewed top management personnel or energy managers (formal and informal) complained of the challenging nature of raising awareness for energy-saving behavior. From their points of view, those tasks are frequently associated with high affectivity (e.g., incomprehension, frustration, annoyance). Through formal speech, discussion, and storytelling, they facilitate knowledge, values, and beliefs about energy efficiency issues. Drawing attention to energy issues in everyday interactions proves to be particularly important to establish an alert energy efficiency climate. However, not every enterprise or manager is willing or able (e.g., due to lack of time, competence, or patience) to perform these educational tasks. In their defense, the enterprises often claim the lack of competent personnel as an obstacle to raising awareness ambitions. Additionally, the extent to which raising awareness measures might succeed depends strongly on the individual characteristics attributed to the "energy educators" in charge. As mentioned above, not only do they have to demonstrate sufficient knowledge (e.g., technical, practical, social knowledge), but the employees' perception of integrity seems to be equally important.

4.4. Interface between the Enterprise and the Environment

4.4.1. Regulative: How Do the SMEs Perceive External Imperatives for Energy Efficiency?

Undoubtedly, increasing energy efficiency represents a rising political and social expectation, which is an expectation that can be perceived by enterprises as a manifest regulative demand (such as large enterprises by statutory energy audits) or rather latent imperative (such as political or medial discourse by spreading values, ideas, and beliefs). While practical or legal imperatives were hardly mentioned, more diffuse imperatives became particularly evident during the interviews in the course of the field research. The need for increased energy efficiency was frequently expressed as a rather vague expectation an industrial organization has to live up to nowadays. More concrete, the interview partners referred to the expectations of customers, national policies, or the local communities as reasons for an increased attention on energy efficiency issues.

As part of the questionnaire survey, the enterprises were asked to which external actors they attribute the demand for energy efficiency. As Figure 8 shows, the SMEs largely attribute the demand for energy efficiency to national and global political actors, followed by the society as a whole and industry associations at a distance. Hardly any noticeable differences in answering could be identified regarding the size of the enterprises or their energy demand.

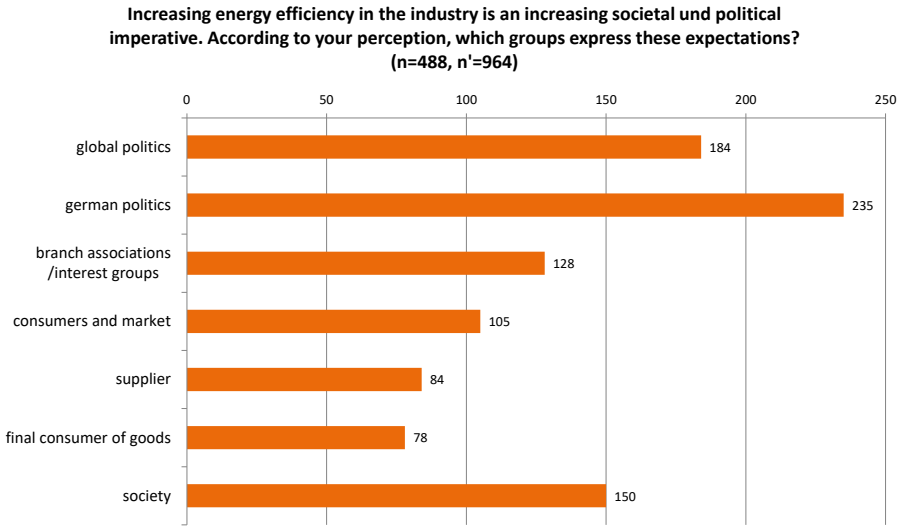

Figure 8. The attribution of the external imperative for energy efficiency.

Even more important than finding out to which actors the expectations are attributed is the question of their acceptance. As far as the participating SMEs of the case study research is concerned, the acceptance was usually positively rated. Nevertheless, in such a face-to-face setting the risk of a socially desirable response is certainly significantly higher than in anonymized questionnaire survey. As part of the questionnaire survey, the SMEs were further asked how the expectation for energy efficiency is perceived by the enterprises. Most enterprises perceive the general imperative for energy efficiency positively (39.2%) or rather positively (30.6%). Only about 4% of the SMEs perceive this imperative as negative. In terms of enterprise size or energy demand, no significant differences between the enterprises could be observed.

4.4.2. Economic–Financial: To What Extent Is the Financing of Measures Considered as an Obstacle by the SMEs?

As discussed above, technical measures have a high priority for the SMEs in general. At the same time, especially investment in capital–intensive technical measures (e.g., combined heating and power station) can mean a considerable financial outlay for small enterprises. In the course of the ethnographic field research, the financing of energy-efficient technology was a broadly discussed topic on many occasions. Either in interviews with decision makers, controlling staff, or even in meetings with consultants, which could be observed, the financing of measures was surprisingly never articulated as an obstacle. Although the decision makers usually pointed out that investments must pay off, mostly between a range of two to five years, the financing was presented as an uncritical endeavor.

In the survey, the enterprises were accordingly asked if the financing of energy efficiency measures is an obstacle. From the points of view of the SMEs surveyed, the financing of energy efficiency measures is not a clear obstacle. While about 28% agree that it is, about 35% of the interviewees do not perceive the financing as an obstacle and 37% neither agree nor disagree. No considerable differences could be observed regarding the size of the enterprises or the energy demand.

4.4.3. Normative: What Information Sources Do the SMEs Use and How Actively Do They Search for Information?

In the context of the field research, the question of how the participating SMEs obtain information for measures and to which actors and normative guidelines they orient themselves was investigated. From their perspectives, at least basic information on energy efficiency measures are rather easily available from various sources. On the contrary, the perception of an inflation of information and consulting services prevails among the enterprises. In every SME at least one person

reported of being literally bombarded, usually several times a week, with inquiries or advertising, especially from consultancy firms. This abundance oftentimes leads to the fact that most of it is ignored (and must be ignored) and a skeptical view of the trustworthiness of the entire field develops overall. This aspect is closely related to previous experiences with consultants. A wide spread of experiences can be stated – from very good to especially bad experiences. From the points of view of the enterprises, "black sheep" affect the general trustworthiness in the consulting and service industry. Hence, in addition to general qualifications and skills, it is above all the trustworthiness of the actors that the enterprises question and expect. As part of the questionnaire, SMEs were surveyed as to where they gain information on energy efficiency measures (Figure 9). The professional journals are clearly the most important sources of information for SMEs. Information by consultancy firms is more valued by medium-sized enterprises than by smaller enterprises. Subsequently, the enterprises were queried about their research behavior on measures. About one-third search actively, one-third search moderately, and one-third search only rarely. Differences with regard to energy demand were hardly noticeable, but clear differences regarding the size of the enterprises were. The larger the enterprises are, the more actively information on measures seems to be sought. Around 15% of micro-enterprises do not even look for information on energy efficiency measures. This result can most likely be explained by lack of human resources in smaller enterprises.

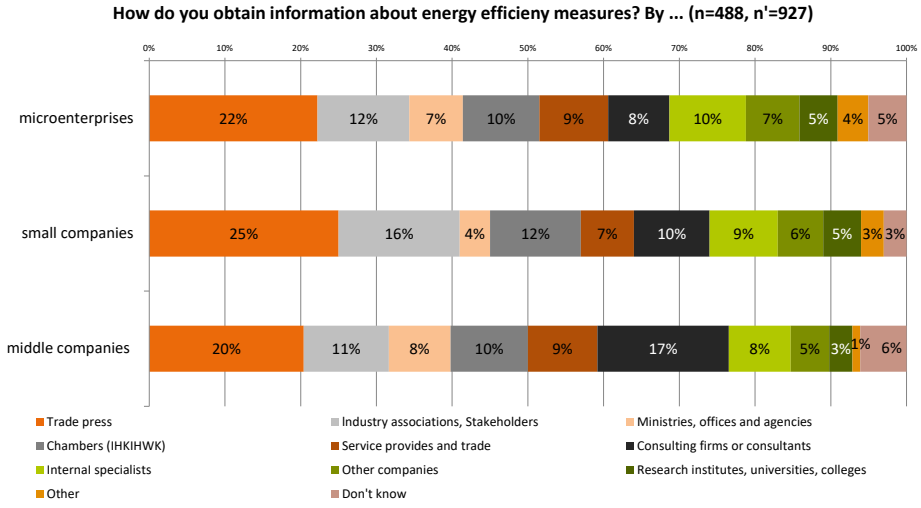

Figure 9. Information sources about energy efficiency measures.

4.4.4. Cultural–Cognitive: What Importance Does Energy Efficiency Have for the Environment of the SMEs and to What Extent Does it Influence the Decisions of the SMEs?

In order to capture the influence of external expectations on energy efficiency decisions, the SMEs were confronted with a two-step question. First, the companies were queried as to how they perceive the importance of energy efficiency for their business environment. As Figure 10 shows, customers are most likely attributed to valuing energy efficiency as very important by the enterprises. The importance for the local environment, competitors, owners, and professional groups is perceived considerably lower, but at a similar level.

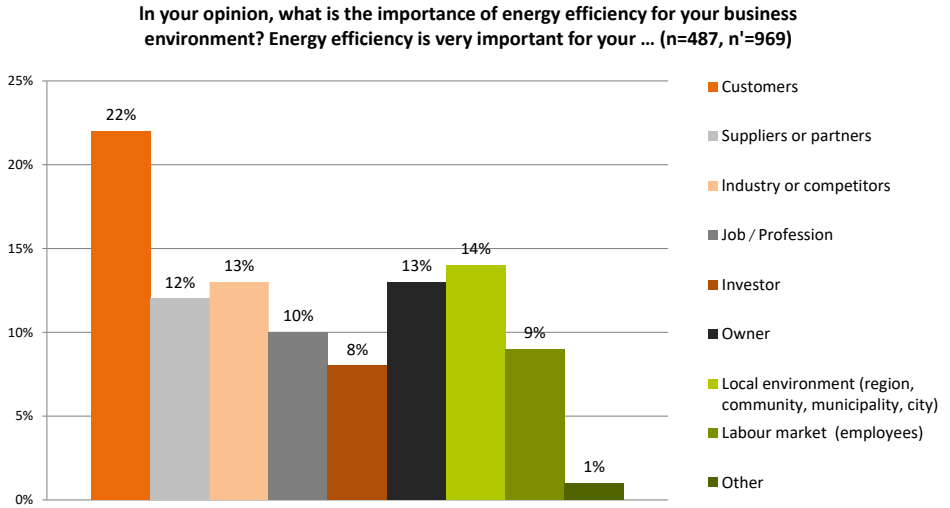

Figure 10. The perception of the importance of energy efficiency for the environment of the SMEs.

Subsequently, the SMEs were asked what influence these external groups and actors would have on the decisions about energy efficiency measures (Figure 11). Customers appear to have the greatest influence on energy efficiency decisions, followed at a clear distance by the local environment, competitors, and the owners.

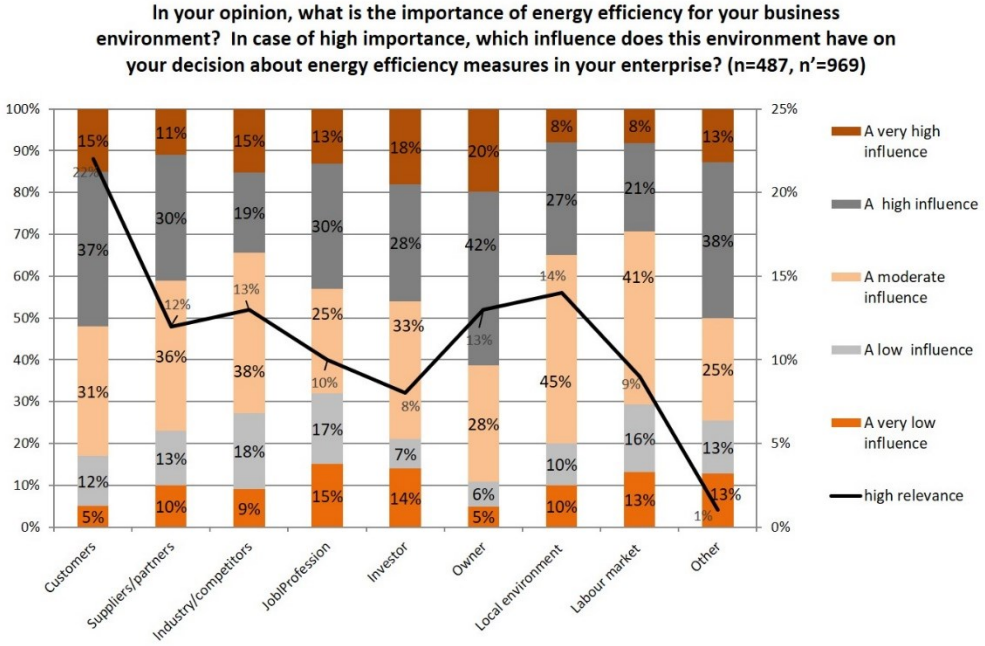

Figure 11. The perception of the importance of energy efficiency for the environment of the SMEs.

5. Discussion

Overall, this study shows that energy efficiency seems fairly well established among the surveyed SMEs. The descriptive survey data and correlation analysis indicate no considerable driving influence of the energy demand of the SMEs. Regarding firm size, the descriptive analysis signifies a lesser importance of energy efficiency, less establishment within the enterprises, a higher centralization of responsibility, and less usage of organizational energy efficiency practices among smaller SMEs. However, the correlation analysis indicates only a minor influence on the establishment of energy efficiency within the enterprises and rather the embedding of energy efficiency in corporate strategy, the usage of a broad spectrum of practices, and the strong importance

of employee behavior for energy conservation appear as crucial aspects. One possible interpretation of this result is a higher energy demand or a larger firm size do not guarantee these aspects. It seems more likely that the social and cultural contexts shape how the SMEs and their decision makers approach energy efficiency issues. In this sense, the individual results can be read as a description of this contexts.

Starting by analyzing the energy efficiency climate, the meanings of energy efficiency for and within the SMEs were elucidated. Energy efficiency is first and foremost associated with cost reduction—undoubtedly this serves as a major motivator for enterprises to draw attention to energy efficiency. However, energy efficiency can have much broader meanings for the enterprises and their members. Meanings such as differentiation from competitors, conformity to a perceived industrial state of the art, or the aspiration of a positive public image are crucial aspects on how energy efficiency issues are treated by the enterprises, especially with regards to internal competition against other issues, and project a dense web of meanings of energy efficiency that seems vital to generate attention and decisions for measures and new practices. Those additional meanings of energy efficiency refer to four aspects.

First, it indicates that meanings of energy efficiency do not solely depend on internal criteria such as cost reduction or profitability, but also on external criteria. Meanings, such as social or ecological responsibility, modernity, and progressiveness, or the desire for a positive external image are implausible without recourse to expectations of society and the corporate environment. Similarly, an increasing number of studies have already shown that issues such as climate change, energy conservation, and environmental pollution more and more influence practices in SMEs. [14,33,74,75]. Second, it indicates that energy efficiency is perceived as an increasing social obligation – an obligation endorsed by the majority of the surveyed SMEs. Third, the meanings of energy efficiency can sometimes have destructive connotations for individual members of the enterprises due to negative experiences. Fourth, the meanings reflect the benefits of energy efficiency practices, oftentimes distinguished between energy and non-energy benefits [76,77]. As these benefits constitute the source of strategic decisions on energy efficiency [78], their consideration is particularly important for practitioners as well as future research. Overall, the results from fieldwork and survey data indicate that the denser and broader the (positive) meanings for energy efficiency are, the more likely an enterprise will embed energy efficiency in its strategy and the more likely decision makers will opt for energy efficiency measures. In other words: Energy efficiency must accommodate multifunctional meanings for the enterprises [79] to generate attention.

By focusing on the practices, it was shown that the SMEs consider, plan, and carry out a variety of energy efficiency practices in everyday work life. Although the majority of the surveyed enterprises concentrate primarily on technical measures, behavioral measures are rated as equally important. In comparison, organizational measures are perceived to be substantially less relevant according to the survey results, even though the case-study research indicated the driving aspects of organizational practices in establishing energy efficiency within the enterprises. The underestimation of organizational practices by the SMEs might be explained by the informal way the enterprises oftentimes manage their staff and energy use. This might also explain the remarkably high importance of behaviorally related practices.

Energy management is often considered a vital means for enterprises to overcome barriers and to improve energy efficiency [80,81]. According to Thollander and Palm, industrial enterprises that adopt energy management practices may reduce their energy use by up to 40 % [82] (p. 102). Similarly, the results indicate that the embedding of energy efficiency in corporate strategy combined with a broad spectrum of different practices and the distribution of attention by organizational measures considerably drive the establishment of energy efficiency within enterprises and foster the improvement of energy savings. From this point of view, energy management is the key factor in the institutionalization of energy efficiency within enterprises. Yet, the implementation of an energy management system (ISO 50001) is oftentimes not a viable option or aspiration, especially for small SMEs. However, as the case studies have shown, SMEs can operate effective energy management without being bound to a norm, as long as they follow basic principles.

According to the analysis, the existence of an energy efficiency strategy appears more effective than typical structural characteristics, which are identified in other studies as major influencing variables in raising attention for energy efficiency issues. This includes firm size [38,56] or the energy demand [52]. The finding of the importance of an energy efficiency strategy essentially coincides with the investigations of industrial enterprises (SMEs and large enterprises) in Sweden [83,84]. According to the authors, the existence of a "long-term strategy" in the enterprises is a key driver for energy efficiency measures. Similarly, the analysis underlines the importance of developing and embedding an energy efficiency strategy in SMEs. Additionally, the results indicate the importance of embedding energy efficiency in corporate strategy for establishing energy efficiency within enterprises—not only by structuring goals and measures, but also by providing symbolic and cognitive frames of references.

The interviews with top management personnel and the informal or formal members of the energy teams in the context of the case study research showed one thing very clearly: Establishing energy efficiency within the enterprise is by no means a trivial task and usually means initiating a permanent change process, which is a process particularly challenging to the top management and responsible personnel. Due to their decisions, actions, and interactions, they inevitably convey the meanings of energy efficiency for the enterprise, thus providing a frame of reference for the organizational members. If, like in one studied case, energy efficiency is framed by the top management only as the fulfilment of an external and unpleasant requirement, it is highly probable that the employees will also interpret corresponding tasks as an annoying duty. This aspect represents the symbolic aspect of leadership, which should not be underestimated.

Looking at the intersection between the enterprise and its members, the study first and foremost shows how important most of the investigated SMEs value the everyday efforts of the employees to increase the energy savings in the SMEs. The results show that raising awareness among the employees is an important issue for the surveyed SMEs. Raising awareness is the first and most relevant strategy of the SMEs to create energy savings. On the other hand, it is also oftentimes perceived as a frustrating task by the management personnel. Nevertheless, it is considered as a necessary task to put energy issues on broad shoulders. In virtually all cases the top management of the SMEs at least tried to establish a broad attention for energy efficiency among their staff. Either via the installation of formal energy teams or the involvement and empowerment of informal key personnel, the enterprises distribute attention for energy issues. It seems essentially irrelevant whether these networks of responsibilities exist formally or informally. For instance, and with regard to the case study research, informal energy teams can be equally effective as formal energy teams in driving energy efficiency measures or energy-saving behavior. Similarly, the empowerment of the production personnel by granting authorities (e.g., for internal trainings) and responsibilities (e.g., for the implementation of measures or monitoring tasks) can sometimes be far more effective than leaving all issues to a single explicit energy manager. From the perspectives of the studied enterprises and their top management, practices to stem energy efficiency issues on broad shoulders are a necessity to make the increasing complexity of energy efficiency manageable.

Energy efficiency as leadership process must, therefore, not be characterized by the centralization of decisions. On the contrary, the general complexity of industrial energy efficiency requires the decentralization of attention, responsibility, and authority. The involvement of key persons ("energy efficiency agents") is, therefore, of particular importance. Thollander and Palm have already pointed out that a "strong leadership in combination with delegated authority is crucial" [82] (p. 102) for effective energy management. The distribution of attention and responsibility is also significant for another reason: Exploiting energy efficiency potentials will not necessarily become less complex in the long term, for example, due to new technologies, legal frameworks, or energy market dynamics. The general complexity of industrial energy efficiency requires a decentralization of attention, responsibility, and authority in SMEs. The involvement of key personnel ("energy efficiency agents") and organizational measures, therefore, holds particular importance and will likely become an increasing necessity for SMEs in the long run.

Financial aspects are often cited as key barriers to the adoption of energy efficient technology, particularly the access to capital [54]. An extensive study from Anderson and Newell among manufacturing SMEs participating on a volunteer assessment program in the US frequently mentioned an insufficient cash flow as a barrier [85]. Similarly, a survey among 50 Greek industrial firms shows that two-thirds of the respondents stated no access to capital and the high cost of implementation as a barrier [86]. However, the results indicate that the financing of energy efficiency measures is not a considerable obstacle by a majority of the SMEs studied. This finding raises the question of whether financial incentives are an effective policy instrument for the promotion of energy-efficient technologies in the case of SMEs in Germany.

Although SMEs in Germany are not (yet) politically forced to implement energy efficiency practices, they nevertheless perceive a discursive imperative to do so. The analysis shows that SMEs attribute this imperative to national and global political discourse and societal expectations in general. Furthermore, the results show that the majority of the SMEs accept this political and societal imperative. Looking at recent movements, such as Fridays for Future, the expectations on industrial enterprises will likely increase in the future. Fawcett and Hampton assume that the increase in public concern and discourse related to environmental issues becomes more salient for SMEs [35] (p.4). Drawing on interviews with 20 SME owners in Liverpool, UK, North and Nurse identified morality—meaning social and pro-environmental values in line with regional cultural mores—as a key driver for the engagement in efforts to reduce carbon emissions [74].

The lack of information on technology, costs, and benefits as well as the trustworthiness of the information sources are frequently identified as barriers to energy efficiency measures [87,56]. According to the presented results, two aspects seem particularly relevant with regard to informational issues. First, information sources close to the core operations of the enterprises (such as trade press and industrial associations) are more likely to be listened to than professional groups such as service providers. Second, the analysis indicates that SMEs perceive an inflation of consulting services, which seems to compromise the trustworthiness of external service providers.

6. Conclusions and Future Research

The main contribution of this research article is to offer a perspective on energy efficiency in industrial SMEs beyond the mere adoption of energy-efficient technology. With this study, light was shed on how energy efficiency is established within SMEs in the context of their organizational context and institutional environment. Furthermore, it was presented which practices the enterprises undertake, how energy efficiency is managed, how the SMEs are challenged to raise awareness for energy savings among their members, and how institutional expectations are perceived.

This study points out the meanings of energy efficiency as being socially produced by the industrial organizations, its members, and environment. According to sociological neo-institutionalism theory, organizations adopt practices and structures that are perceived as desirable or appropriate within some socially constructed systems of norms, values, beliefs, and definitions [88,47]. Hence, organizational decisions are considered legitimate if they appear desirable and appropriate when measured against the social values, norms, and beliefs of their environment. Apparently, as energy efficiency is perceived as holding strong importance for the environment of the enterprises, decisions on energy efficiency practices are more likely to be constituted. This result can be interpreted as an opportunity for policy making toward developing more value-driven narratives of energy efficiency, emphasizing the moral obligation equivalent to the economic benefits. Particularly in the context of the recent rise in public concern about climate change, a stronger political debate on energy efficiency issues would increase the moral imperatives the SMEs are open to oblige, as the results indicate.

In addition, this article shows how important the everyday actions of employees in the SMEs are considered for increasing energy efficiency. On the other hand, the sometimes frustratingly perceived efforts to raise awareness within the enterprises were also highlighted. Nevertheless, these practices point to the importance of SMEs and their decision makers as change agents. Their everyday efforts in establishing energy efficiency constitute important "institutional work" [89]. A strengthening of

the social and political discourse would, therefore, also strengthen the legitimacy of the efforts of change agents within the enterprises.

Considering the increasing complexity of energy efficiency issues and the conclusion about the driving effects of using a broad repertoire of practices, the institutional facilitation of knowledge seems crucial to us in the long run. The situation of SMEs, in particular, requires attention because, as Cagno et al. state, around two-thirds of the SMEs in Europe "do not implement even simple rules to manage the energy use" [90] (p. 1256). The establishment of basic knowledge and awareness for energy efficiency issues should become a mandatory part of professional education (e.g., industrial job profiles, trainings). Considering that the financing of measures does not present a difficult obstacle for the surveyed SMEs, this approach would possibly be more effective than financial incentives in the long run. The support of chambers and industry associations that work directly with SMEs could prove beneficial in spreading information and knowledge, as Fresner et al. [91] showed in terms of engaging SMEs in energy efficiency audits.

It is in the nature of scientific studies that their results reveal limitations or open up new questions. The present study is no exception in this respect. A larger sample size could be the subject of further research to validate and enrich the results. For instance, we were unable to make sufficient comparisons of different sectors. The focus on individual sectors could bring interesting questions to light. Additionally, a comparison between large enterprises and SMEs could reveal considerable differences in practices, motivations, or needs. Furthermore, in-depth comparisons between federal or national states could provide insights into how different institutional contexts shape the focus on different energy practices and the establishment of energy efficiency within industrial enterprises. However, a methodological prerequisite for this would be a parallel analysis of the specific institutional conditions and the specific discourse around energy efficiency.

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Appendix A

Questionnaire of the Study

1. What position do you have in the company? (if you have several positions please list the highest ranking, (Single selection)

   - ☐ Managing Director
   - ☐ Owner
   - ☐ Energy Manager or Energy Officer
   - ☐ Technical Manager
   - ☐ Production Manager
   - ☐ Controlling
   - ☐ Other

2. How many employees does your company have? (Single selection)

   - ☐ 1–9
   - ☐ 10–49

- ☐ 50–249

3. What was the turnover in your company in the last financial year (million EUR)? If you are not sure, please estimate it.

If you cannot estimate it, please try to indicate the turnover by selecting below. (Single selection)

- ☐ under 250.000 Euros
- ☐ 250.000 to less than 500.000 Euros
- ☐ 500.000 to less than 1 million Euros
- ☐ 1 million to less than 2 millions Euros
- ☐ 2 million to less than 5 millions Euros
- ☐ 5 millions to less than 10 millions Euros
- ☐ 10 millions to less than 25 millions Euros
- ☐ 25 millions to less than 50 millions Euros
- ☐ 50 millions to less than 100 millions Euros
- ☐ 100 millions to less than 500 millions Euros
- ☐ 500 millions Euros and above

4. What was the energy demand (all energy sources such as electricity, gas, oil, etc.) in your company in the last 12 months in megawatt hours (MWh)? If you are not sure, you can estimate it or give the composition of your energy needs.

_____ MWh

If you cannot estimate the energy demand, please try to specify the energy demand in the following categories. (Single selection)

- ☐ under 10 MWh
- ☐ 10 to less than 50 MWh
- ☐ 50 to less than 100 MWh
- ☐ 100 to less than 500 MWh
- ☐ 500 to less than 1.000 MWh
- ☐ Less than 2.500 MWh
- ☐ 2.500 to less than 5.000 MWh
- ☐ 5.000 to less than 10.000 MWh
- ☐ 10.000 to less than 50.000 MWh
- ☐ 50.000 MWh and above

or give the composition of your energy needs.

- ☐ Electricity approx._____(in MWh)
- ☐ Coal approx._____(stating an unit_____)
- ☐ Oil approx._____(stating an unit_____)
- ☐ Gas approx._____(stating an unit_____)
- ☐ District heating approx._____(stating an unit_____)
- ☐ Biomass approx._____(stating an unit_____)
- ☐ Other approx._____(stating an unit)_____)

5. In which year was your company founded?

____ (Year)

6. What type of energy efficiency measures have you "implemented" (in the last 3 years), „is currently on focus", „plan for the future"(in the next 3 years) and „do not plan to do so" (in the next 3 years? (please mark one answer per question)

	… „Have You Implemented ?“ ***(Multiple Selection)***	**… „Is Currently on Focus ?“** ***(Multiple Selection)***	**… „Plan for the Future ?“** ***(Multiple Selection)***	**… „Do not Plan to Do so ?“** ***(Multiple Selection)***
Technical investment *(e.g. procurement of energy-efficient technology)*	☐	☐	☐	☐
Technical and organizational *(e.g. energetic optimized process control)*	☐	☐	☐	☐
Organizational *(e.g. energy audit, energy team)*	☐	☐	☐	☐
Information-related *(e.g. energy monitoring, energy consulting)*	☐	☐	☐	☐
Competence-related *(e.g. workshops, training courses)*	☐	☐	☐	☐
Awareness and behavior related *(e.g. employee sensibilities, rules of conduct)*	☐	☐	☐	☐

7. How do you see the subject of energy efficiency currently being established in your company? (Single selection)

(1 = Very strong, 3 = moderate, 5 = not all)

☐1 ☐2 ☐3 ☐4 ☐5 ☐ Don’t know

8. How do you estimate the importance of energy efficiency and energy saving in everyday work for the workforce in the company? (Single selection)

(1 = Very high, 3 = moderate, 5 = very low)

☐1 ☐2 ☐3 ☐4 ☐5 ☐ Don’t know

9. How important is energy efficiency currently for the general corporate strategy? (Single selection)

(1 = Very high priority, 3=a moderate priority, 5=a very low priority)

☐1 ☐2 ☐3 ☐4 ☐5 ☐ Don’t know

10. How important do you rate the behavior of employees in the company as a contribution to the achievement of energy savings? (Single selection)

(1 = Very important, 3 = moderate, 5 = unimportant)

☐1 ☐2 ☐3 ☐4 ☐5 ☐ Don’t know

11. Who (in your opinion) is responsible for energy saving and energy efficiency in your company? (Multiple selection)

- ☐ Managing director or owner
- ☐ Energy manager or energy officer
- ☐ Technical management or single department
- ☐ Everyone—Employees and directors
- ☐ No one
- ☐ Don’t know

12. Increasing energy efficiency in industry represents an increasing social and political demand. Which groups or actors do you attribute to these demands? (Multiple selection)

- ☐ Global politics/world politics
- ☐ National/German politics
- ☐ Industry associations and stakeholders
- ☐ Customers and sales market
- ☐ Suppliers
- ☐ End customers
- ☐ Society
- ☐ Don’t know

13. How is this demand for energy efficiency perceived in your company? (Single selection)

(1 = Positive, 3 = indifferent, 5 = negative)

☐1 ☐2 ☐3 ☐4 ☐5 ☐ Don’t know

14. Energy efficiency measures often require investment. Which economic possibilities of the realization of measures are suitable for your enterprise? (Multiple selection)

- ☐ Equity capital
- ☐ Bank credit
- ☐ Sponsored loan and credit
- ☐ Funding and subsidies
- ☐ Contracting
- ☐ Other
- ☐ Don't know

15. The financing of energy efficiency measures is an obstacle for my company. (Single selection)
(1 = Strongly agree, 3 = partly agree, 5 = strongly disagree)

☐1 ☐2 ☐3 ☐4 ☐5 ☐ Don't know

16. How do you obtain information about energy efficiency measures? (Multiple selection)

- ☐ Trade press
- ☐ Industry associations, stakeholders
- ☐ Ministries, offices and agencies
- ☐ Commerce Chambers (IHK/HWK)
- ☐ Service providers and trade
- ☐ Consulting firms or consultants
- ☐ Internal specialists
- ☐ Other companies
- ☐ Research institutes, universities, colleges
- ☐ Other
- ☐ Don't know

17. How active is your company looking for information about energy efficiency measures? *(Single selection)*
(1 = Very active, 3 = moderate, 5 = inactive)

☐1 ☐2 ☐3 ☐4 ☐5 ☐ Don't know

18. Importance of your environment: (1) „How do you rate the importance of energy efficiency for your x(see below)-environment?" (2) „Which influence does this setting have on your decision on energy efficiency measures in your company?" (Matrix question)

	(1) „How Do You Rate the Importance of Energy Efficiency for Your Environment? " Energy Efficiency Is Very Important for Your *(Multiple Selection)*	**(2) „Which Influence Does This Environment Have on Your Decision on Energy Efficiency Measures in Your Company?" (1 = A Very High Influence, 3 = a Moderate Influence, 5 = a Very Low Influence) *(Selection Only For Those Mentioned in (1))***					
Customers	☐	☐1	☐2	☐3	☐4	☐5	☐Don't know
Suppliers or partners	☐	☐1	☐2	☐3	☐4	☐5	☐Don't know
Industry or competitors	☐	☐1	☐2	☐3	☐4	☐5	☐Don't know
Job / Profession	☐	☐1	☐2	☐3	☐4	☐5	☐Don't know
Investor	☐	☐1	☐2	☐3	☐4	☐5	☐Don't know
Owner	☐	☐1	☐2	☐3	☐4	☐5	☐Don't know
Local environment (region, com- munity, municipality, city)	☐	☐1	☐2	☐3	☐4	☐5	☐Don't know
Labor market (employees)	☐	☐1	☐2	☐3	☐4	☐5	☐Don't know
Other	☐	☐1	☐2	☐3	☐4	☐5	☐Don't know
Don't know	☐	☐1	☐2	☐3	☐4	☐5	☐Don't know

19. How important is energy saving to you personally? (Single selection)
(1 = Very important, 3 = moderate, 5 = unimportant)

☐1 ☐2 ☐3 ☐4 ☐5 ☐ Don't know

20. To which extension does the topic of energy efficiency affect you in your everyday life in the company? (Multiple selection)

    - ☐ I decide on measures and actions
    - ☐ I am involved in decisions
    - ☐ I am looking for information about energy efficiency
    - ☐ I measure and monitor energy flows or consumption
    - ☐ I try to save energy personally
    - ☐ I'm hardly or not affected by the topic
    - ☐ I am affected in a different way
    - ☐ Don't know

References

1. Trianni, A.; Cagno, E.; Farne, S. Barriers, drivers and decision-making process for industrial energy efficiency: A broad study among manufacturing small and medium-sized enterprises. *Appl. Energy* **2016**, *162*, 1537–1551.
2. Destatis, 2019. Statista Dossier on Small and Medium-Sized Enterprises (SMEs) in Germany. Available online: https://de.statista.com/statistik/studie/id/46952/dokument/kleine-und-mittlere-unternehmen-kmu-in-deutschland (accessed on 28 February 2020).
3. Thollander, P.; Backlund, S.; Trianni, A.; Cagno, E. Beyond barriers—A case study on driving forces for improved energy efficiency in the foundry industries in Finland, France, Germany, Italy, Poland, Spain, and Sweden. *Appl. Energy* **2013**, *111*, 636–643.
4. Jaffe, A.B.; Stavins, R.N. The energy-efficiency gab. What does it mean? *Energy Policy* **1994**, *22*, 804–810.
5. Gerarden, T.G.; Newell, R.G.; Stavins, R. *Addressing the Energy-Efficiency Gap*; Harvard Environmental Economics Program: Cambridge, MA, USA, 2015.
6. DeCanio, S.; Dibble, C.; Amir-Atefi, K. The importance of organizational structures for the adoption of innovations. *Manag. Sci*. **1998**, *46*, 1285–1299.
7. Weber, L Some reflections on barriers to the efficient use of energy. *Energy Policy* **1997**, *25*, 833–835.
8. Cagno, E.; Worrell, E.; Trianni, A.; Pugliese, G. A novel approach for barriers to industrial energy efficiency. *Renew. Sustain. Energy Rev*. **2013**, *19*, 290–308.
9. Sudhakara Reddy, B. Barriers and drivers to energy efficiency—A new taxonomical approach. *Energy Convers. Manag*. **2013**, *74*, 403–416.
10. Buettner, S.M.; Bottner, F.; Sauer, A.; Koenig, W.; Loebbe, S. Barriers to and decisions for energy efficiency: What do we know so far? A theoretical and empirical overview. In Proceedings of the 2018 Eceee Industrial Summer Study Proceedings, Berlin, Germany, 10–13 June 2018.
11. Sorrell, S.; O'Malley, E.; Schleich, J.; Scott, S. *The Economics of Energy Efficiency*; Edward Elgar Publishing: Cheltenham, UK, 2004.
12. Fleiter, T.; Worrell, E.; Eichhammer, W. Barriers to energy efficiency in industrial bottom-up energy demand models—A review. *Renew. Sustain. Energy Rev.* **2011**, *15*, 3099–3111.
13. Parker, C.M.; Redmond, J.; Simpson, M. A review of interventions to encourage SMEs to make environmental improvements. *Environ. Plan. C Gov. Policy* **2009**, *27*, 279–301, doi:10.1068/c0859b.
14. Revell, A.; Stokes, D.; Chen, H. Small businesses and the environment: Turning over a new leaf? *Bus. Strategy Environ.* **2010**, *19*, 273–288, doi:10.1002/bse.628.
15. Wilhite, H. Energy Consumptions as Cultural Practice: Implications for the Theory and Policy of Sustainable Energy Use. In *Cultures of Energy: Power, Practices, Technologies*; Strauss, S., Rupp, S., Love, T., Eds.; Routledge, Taylor & Francis Group: London, UK; New York, NY, USA, 2013; pp. 60–72.
16. Trianni, A.; Cagno, E.; De Donatis, A. A framework to characterize energy efficiency measures. *Appl. Energy* **2014**, *118*, 207–220, doi:10.1016/j.apenergy.2013.12.042.
17. Marchi, B.; Zanoni, S.; Zavanella, Z.E. Energy efficiency measures for refrigeration systems in the cold chain. In Proceedings of the XXIV Summer School "Francesco Turco"—Industrial Systems Engineering, Brescia, Italy, 11–13 September 2019, doi:10.1016/j.jclepro.2014.06.057.
18. Marchi, B.; Zanoni, S. Supply Chain Management for Improved Energy Efficiency: Review and Opportunities. *Energies* **2017**, *10*, 1618, doi:10.3390/en10101618.

19. Perroni, M.G.; Gouvea da Costa, S.E.; Pinheiro de lima, E.; Vieira da Silva, W. The relationship between enterprise efficiency in resource use and energy efficiency practices adoption. *Int. J. Prod. Econ*. **2017**, *190*, 108–119.
20. McCardell, S. *Energy Effectiveness: Strategic Objectives, Energy and Water at the Heart of the Enterprise*; Springer International Publishing AG: Cham, Switzerland, 2018.
21. Palm, J.; Thollander, P. An interdisciplinary perspective on industrial energy efficiency. *Appl. Energy* **2010**, *87*, 3255–3261.
22. Backlund, S.; Thollander, P.; Palm, J.; Ottosson, M. Extending the energy efficiency gap. *Energy Policy* **2012**, *51*, 392–396.
23. Brunke, J.-C.; Johannsson, M.; Thollander, P. Empirical investigation of barriers and drivers to the adoption of energy conservation measures, energy management practices and energy services in the Swedish iron and steel industry. *J. Clean. Prod*. **2014**, *84*, 509–525.
24. Sa, A.; Paramonova, S.; Thollander, P.; Cagno, E. Classification of Industrial Energy Management Practices—A case study of a Swedish foundry. *Energy Procedia* **2015**, *75*, 2581–2588.
25. Banks, N.; Fawcett, T.; Redgrove, Z. *What Are the Factors Influencing Energy Behaviours and Decision-Making in the Non-Domestic Sector? A Rapid Evidence Assessment*; CSE: Bristol, UK, 2012.
26. Cooremans, C. Investment in energy efficiency: Do the characteristics of investments matter? *Energy Effic*. **2012**, *5*, 497–518, doi:10.1007/s12053-012-9154-x.
27. Perrow, C. Organizing for environmental destruction. *Organ. Environ.* **1997**, *10*, 66–72.
28. Palm, J. Placing barriers to industrial energy efficiency in a social context: A discussion of lifestyle categorization. *Energy Effic*. **2009**, *2*, 263–270.
29. Shwom, R. Strengthening Sociological Perspectives on Organizations and the Environment. *Organ*. *Environ*. **2009**, *22*, 271–292.
30. Shwom, R. A middle range theorization of energy politics: The struggle for energy efficient appliances. *Environ. Polit.* **2011**, *22*, 705–726.
31. Zierler, R.; Wehrmayer, W.; Murphy, R. The energy efficiency behaviour of individuals in large organisations: A case study of a major UK infrastructure operator. *Energy Policy* **2017**, *104*, 38–49.
32. Williams, S.; Schaefer, A. Small and medium-sized enterprises and sustainability: Managers' values and engagement with environmental and climate change issues. *Bus. Strategy Environ*. **2013**, *22*, 173–186, doi:10.1002/bse.1740.
33. Hampton, S. Making Sense of Energy Management Practice: Reflections on Providing Low Carbon Support to Three SMEs in the UK. *Energy Effic.* **2018**, doi:10.1007/s12053-018-9750-5.
34. Andrews, R.N.L.; Johnson, E. Energy use, behavioral change, and business organizations: Reviewing recent findings and proposing a future research agenda. *Energy Res. Soc. Sci*. **2016**, *11*, 195–208.
35. Fawcett, T.; HamptonS. Why & how energy efficiency policy should address SMEs. *Energy Policy* **2020**, *140*, 111337, doi:10.1016/j.enpol.2020.111337.
36. König, W. Energy efficiency in industrial organizations—A cultural-institutional framework of decision-making. *Energy Res. Soc. Sci*. **2020**, *60*, 101314, doi:10.1016/j.erss.2019.101314.
37. O'Malley, E.; Scott, S.; Sorrell, S. *Barriers to Energy Efficiency: Evidence from Selected Sectors*; Policy Research Series 47; The Economic and Social Research Institute: Dublin, Ireland, 2003.
38. Trianni, A.; Cagno, E. Dealing with barriers to energy efficiency and SMEs: Some empirical evidences. *Energy* **2012**, *37*, 494–504.
39. Hatch, M.J. *Organization Theory: Modern, Symbolic, and Postmodern Perspectives*; Oxford University Press: Oxford, UK, 1997.
40. Sorrell, S.; Schleich, J.; Scott, S.; O'Malley, E.; Trace, F.; Boede, U.; Ostertag, K.; Radgen, P. *Reducing Barriers to Energy Efficiency in Public and Private Organizations*; Final Report to the European Commission; University of Brighton: Brighton, UK, 2000.
41. Stephenson, J.; Barton, B.; Carrington, G.; Gnoth, D.; Lawson, R.; Thorsnes, P. Energy cultures: A framework for understanding energy behaviours. *Energy Policy* **2010**, *38*, 6120–6129.
42. Bourdieu, P. *Le Sens Pratique*; Polity Press: Cambridge, UK, 1992.
43. Giddens, A. *Central Problems in Social Theory: Action, Structure and Contradiction in Social Analysis*; University of California Press: Berkeley, CA, USA; Los Angeles, CA, USA, 1979.

44. Stephenson, J.; Barton, B.; Carrington, G.; Doering, A.; Ford, R.; Hopkins, D.; Lawson, R.; MacCarthy, A.; Rees, D.; Scott, M.; et al. The energy cultures framework: Exploring the role of norms, practices and material culture in shaping energy behaviour in New Zealand. Energy *Energy Res. Soc. Sci*. **2015**, *7*, 117–123.
45. Mirosa, M.; Lawson, R.; Gnoth, D. Linking personal values to energy-efficient behaviors in the home. *Environ. Behav*. **2011**, *27*, 1–21.
46. Bell, M.; Carrington, G.; Lawson, R.; Stephenson, J. Socio-technical barriers to the use of low-emission timber drying in New Zealand. *Energy Policy* **2014**, *67*, 747–755.
47. Scott, R.W. *Institutions and Organizations: Ideas and Interests*, 3rd ed.; SAGE Publ.: Thousand Oaks, CA, USA, 2008.
48. Hoffman, A. Institutional evolution and change: Environmentalism and the US chemical industry. *Acad. Manag. J*. **1999**, *42*, 351–371.
49. Wæraas, A.; Nielsen, J.A. Translation Theory "Translated": Three Perspectives on Translation in Organizational Research. *Int. J. Manag. Rev*. **2016**, *18*, 236–270.
50. Ocasio, W. Towards an attention-based view of the firm. *Strateg. Manag. J*. **1997**, *18*, 187–206.
51. Schein, E.H. *Organizational Culture and Leadership*, 3rd ed.; Jossey-Bass: San Francisco, CA, USA, 2004.
52. Phylipsen, G.J.M.; Blok, K.; Worrell, E. International comparisons of energy efficiency—Methodologies for the manufacturing industry. *Energy Policy* **1997**, *25*, 715–725.
53. Trianni, A.; Cagno, E.; Farné, S. An empirical investigation of barriers, drivers and practices for energy efficiency in primary metals manufacturing SMEs. *Energy Procedia* **2014**, *61*, 1252–1255.
54. Fleiter, T.; Hirzel, S.; Worrell, E. The characteristics of energy-efficiency measures–a neglected dimension. *Energy Policy* **2012**, *51*, 502–513.
55. Costa-Campi, M.T.; García-Quevedo, J.; Segerra, A. Energy efficiency determinants: An empirical analysis of Spanish innovative firms. *Energy Policy* **2015**, *83*, 229–239.
56. Cagno, E.; Trianni, A. Exploring drivers for energy efficiency within small- and medium-sized enterprises: First evidences from Italian manufacturing enterprises. *Appl. Energy* **2013**, *104*, 276–285.
57. Denison, D.R. What is the difference between organizational culture and organizational climate? A native's point of view on a decade of paradigm wars. *Acad. Manag. Rev*. **1996**, *21*, 619–654.
58. Fiedler, T.; Mircea, P.M. Energy management systems according to the ISO 50001 standard—Challenges and benefits. In Proceedings of the International Conference on Applied and Theoretical Electricity (ICATE), Craiova, Romania, 25–27 October 2012, doi:10.1109/ICATE.2012.6403411.
59. Federal Statistical Office Baden-Württemberg. Structural Data Industry by Employee Size Classes. 2019. Available online: https://www.statistik-bw.de/Industrie/Struktur/VG-GK-BBEU.jsp (accessed on 28 February 2020).
60. European Commission. *Industrial Revolution Brings Industry Back to Europe*; Press Release Database; European Commission: Brussels, Belgium, 2012. Available online: http://europa.eu/rapid/press-release_IP-12-1085_en.htm?locale=en (accessed on 1 August 2020).
61. Ministry of Economics and Finance Baden-Württemberg. Industry Perspective Baden-Württemberg 2025. Available online: http://www.kmu-digital.eu/de/publikationen/tags/fuehrung-management/15-gemeinsam-in-die-zukunft-industrieland-baden-wuerttemberg/file (accessed on 1 August 2020).
62. Creswell, J.W. *Research Design—Qualitative, Quantitative, and Mixed Methods Approaches*, 3rd ed.; SAGE Publ.: Thousand Oaks, CA, USA, 2009.
63. Ybema, S.; Yanow, D.; Wels, H.; Kamsteeg, F. *Organizational Ethnography: Studying the Complexities of Everyday Life*; SAGE Publications Ltd.: Thousand Oaks, CA, USA, 2009.
64. European Council. Commission recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises. *Off. J. Eur. Union* **2003**, *46*, 36–41.
65. Kühl, S.; Strodtholz, P.; Teffertshofer, A. *Handbuch Methoden der Organisationsforschung*; VS Verlag für Sozialwissenschaften; Wiesbaden, Germany, 2009.
66. Glaser, B.G.; Strauss, A.L. *Grounded Theory: Strategien Qualitativer Forschung*; H. Huber: Göttingen, Germany, 1998; pp. 51–83.
67. Mannheimer Company Panel. The Economical Importance of Family Businesses in Germany. 2019. Available online: https://www.familienunternehmen.de/media/public/pdf/publikationen-studien/studien/Die-volkswirtschaftliche-Bedeutung-der-Familienunternehmen-2019_Stiftung_Familienunternehmen.pdf (accessed on 20 February 2018).

68. Froschauer, U.; Lueger, M. *Das Qualitative Interview: Zur Praxis Interpretativer Analyse Sozialer Systeme*; Facultas Verlags- und Buchhandels AG: Wien, Austria, 2003.
69. Froschauer, U.; Lueger, M. *Interpretative Sozialforschung: Der Prozess*; Facultas Verlags- und Buchhandelshandels AG: Wien, Austria, 2009.
70. Statista. Number of Companies in Germany by Company Size and Economic Sector in 2017. 2018. Available online: https://de.statista.com/statistik/daten/studie/731993/umfrage/unternehmen-in-deutschland-nach-unternehmensgroesse-und-wirtschaftszweigen/ (accessed on 10 August 2018).
71. Czarniawska, B. Culture is the Medium of Life. In *Reframing Organizational Culture*; Frost, P.J., Ed.; SAGE Publ.: Thousand Oaks, CA, USA, 1992; pp. 285–297.
72. FEA—Federal Environment Agency. Data on Environmental and Energy Management Systems in Germany. 2019. Available online: https://www.umweltbundesamt.de/daten/umwelt-wirtschaft/umwelt-energiemanagementsysteme (accessed on 22 March 2019).
73. Weber, M. *Gesammelte Aufsätze zur Wissenschaftslehre*, 6th ed.; Winckelmann, J. (Hrsg.); Mohr Verlag: Tübingen, Germany, 1985.
74. North, P. The business of the Anthropocene? Substantivist and diverse economies perspectives on SME engagement in local low carbon transitions. *Prog. Hum. Geogr*. **2016**, *40*, 437–454, doi:10.1177/0309132515585049.
75. North, P.; Nurse, A. 'War Stories': Morality, curiosity, enthusiasm and commitment as facilitators of SME owners' engagement in low carbon transitions. *Geoforum* **2014**, *52*, 32–41, doi:10.1016/j.geoforum.2013.12.007.
76. Pye, M.; McKane, A. Making a stronger case for industrial energy efficiency by quantifying non-energy benefits. *Resour. Conserv. Recycl*. **2000**, *28*, 171–183.
77. Cagno, E.; Moschetta, D.; Trianni, A. Only non-energy benefits from the adoption of energy efficiency measures? A novel framework. *J. Clean. Prod*. **2019**, *212*, 1319–1333.
78. Finster, M.P.; Hernke, M.T. Benefits organizations pursue when seeking competitive advantage by improving environmental performance. *J. Ind. Ecol*. **2014**, *18*, 652–662.
79. Trianni, A.; Cagno, E.; Marchesani, F.; Spallina, G. Classification of drivers for industrial energy efficiency and their effect on the barriers affecting the investment decision –making process. *Energy Effic*. **2017**, *10*, 199–215, doi:10.1007/s12053-016-9455-6.
80. Caffal, C. *Learning from Experiences with Energy Management in Industry*; Analysis Series 17; Centre for the Analysis and Dissemination of Demonstrated Energy Technologies: Sittard, The Netherlands, 1995.
81. Thollander, P.; Palm, J.; Rohdin, P. Categorizing Barriers to Energy Efficiency—An Interdisciplinary Perspective. In *Energy Efficiency*; Palm, J., Ed.; InTechOpen: London, UK, 2010. Available online: https://www.intechopen.com/books/energy-efficiency/categorizing-barriers-to-energy-efficiency-an-interdisciplinary-perspective (accessed on 28 February 2020).
82. Thollander, P.; Palm, J. *Improving Energy Efficiency in Industrial Energy Systems: An Interdisciplinary Perspective on Barriers, Energy Audits, Energy Management, Policies, and Programs*; Springer: London, UK, 2013.
83. Thollander, P.; Ottosson, M. An energy efficient Swedish pulp and paper industry: Exploring barriers to and driving forces for cost-effective energy efficiency investments. *Energy Effic*. **2008**, *1*, 21–34.
84. Thollander, P.; Solding, P.; Söderström, M. Energy management in industrial SMEs. In Proceedings of the 5th European Conference on Economics and Management of Energy in Industry (ECEMEI-5), Vilamoura, Portugal, 14–17 April 2009; pp. 1–9.
85. Anderson, S.T.; Newell, R.G. Information programs for technology adoption: The case of energy efficiency audits. *Resour. Energy Econ*. **2004**, *26*, 27–50.
86. Sardianou, E. Barriers to industrial energy efficiency investments in Greece. *J. Clean. Prod*. **2008**, *16*, 1416–1423.
87. Sanstad, A.; Howarth, R. 'Normal' markets, market imperfections and energy efficiency. *Energy Policy* **1994**, *10*, 811–818.
88. Suchmann, M.C. Managing legitimacy: Strategic and institutional approaches. *Acad. Manag. Rev*. **1995**, *20*, 571–610.
89. Hwang, H.; Colyvas, J.A. Problematizing actors and institutions in Institutional Work. *J. Manag. Inq*. **2011**, *20*, 62–66.

90. Cagno, E.; Trianni, A.; Worrell, E.; Miggiano, F. Barriers and drivers for energy efficiency: Different perspectives from an exploratory study in the Netherlands. *Energy Procedia* **2014**, *61*, 1256–1260.
91. Fresner, J.; Morea, F.; Krenn, C.; Uson, J.A.; Tomasi, F. Energy efficiency in small and medium enterprises: Lessons learned from 280 energy audits across Europe. *J. Clean. Prod*. **2017**, *142*, 1650–1660.