

EXPERTS´ VIEW ON LEARNING NETWORKS AS A MEANS TO SUPPORT THE IMPLEMENTATION OF ENERGY MANAGEMENT SYSTEMS

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Abstract

The procedure for introducing an Energy Management System according to ISO 50001 can be freely defined by the implementing organization. External consultancies are often approached to purchase the necessary specialist knowledge individually, thus unburdening internal resources and avoiding errors during implementation. A relatively new option is the introduction of Energy Management Systems accompanied by Energy Efficiency Networks. Two different concepts are presented here as examples: the ISO 50001 Small Group of the Foerderkreis Umweltschutz Unterfranken and the ISO 50001 Convoy of the Modell Hohenlohe.

This paper examines the suitability of these concepts and their limitations by means of an expert survey, a method of qualitative analysis. The results of this research show that the suitability of these concepts has certain limits. In many ways, however, they are not only a substitute for the traditional approach but also offer significant advantages, such as close networking between the organizations involved.

Keywords

Energy, Efficiency, Sustainability, Networking, Management System

JEL Classification

L29, M00, M10, M14, Q40, Q47

Introduction

Energy Efficiency Networks have their origin in Switzerland and serve to improve the energy efficiency of organizations. They consist of participants from various organizations who meet at regular intervals to exchange information on energy efficiency measures and to take part in training courses on energy efficiency topics (Jochem, et al., 2010). LEEN networks (Learning Energy Efficiency Networks) are a standardized and scientifically evaluated form of Energy Efficiency Networks in which usually ten to a maximum of 15 companies participate for a period of 3-4 years (Jacob, 2014).

Energy management can be understood as a sub-area of environmental management. Like this, it is an important component of the strategic management of an organization, not least because of the competitive importance of energy costs. It combines central economic aspects with environmentally relevant goals (Kranert & Cord-Landwehr, 2010). In terms of

content, energy management focuses on the recording and evaluation of an organization's energy consumption and the targeted optimization of its energy efficiency.

The first national standard for an Energy Management System (EnMS) was established in Denmark in 2000. The Danish industry, the Danish medium-sized businesses, various scientific institutes and the Danish Energy Agency were in charge of developing this national standard. This model was followed in 2003 by Sweden, 2005 by Ireland and 2007 by Spain with own national standards.

In all of these standards, attention was paid to the far-reaching involvement of the industry; after all, their success is based on their acceptance in the practical implementation. In all of these standards, attention was paid to the far-reaching involvement of the industry; after all, the standard's success is based on their acceptance in the practical implementation. On this basis, the international standard ISO 50001 was developed and published for the first time on 15 June 2011. Since then, it has evolved internationally into the most important tool for the implementation of EnMSs in medium-sized and large companies (Kahlenborn, et al., 2012).

1. Implementation of Energy Management Systems

An Energy Management System deals with an organization's energy policy, energy planning and the implementation and operation of measures and technologies for energetic optimization. The objective of an EnMS is the continuous improvement of an organization's energy efficiency (International Standards Office, 2011). This is to ensure that the organization burdens the environment as little as possible and that energy costs are minimized. An EnMS can be installed as a stand-alone system or integrated into an overall system of different management systems. As part of the introduction, organizational structures and responsibilities should be reconsidered and processes questioned. Subsequently, appropriate instruments and measures need to be specified and resources need to be allocated (Ernst & Sailer, 2015).

In principle, companies can introduce management systems independently and without external support. In practice, however, organizations usually turn to external consultants who support them in the preparation and implementation of management systems. These consultants use their experience gained in similar tasks with other organizations and transfer it to the new organization (Mann, 2010). In this proven way, attempts are made to prevent typical recurring problems and errors during implementation. In fact, the consultant acts as a knowledge mediator. The companies that the consultant looks after usually do not know each other or do not collaborate and therefore cannot learn directly from each other.

2. A new approach to the implementation of Energy Management Systems

The network for corporate environmental protection, Modell Hohenlohe e.V., and the Foerderkreis Umweltschutz Unterfranken e.V. follow a different path: Instead of imparting the necessary knowledge for the implementation of ISO 50001 Energy Management Systems (EnMS) individually to organizations, several companies are coached together in learning networks.

Modell Hohenlohe e.V. (MoHo) calls its concept ISO 50001 Convoy. The Convoys are structured in such a way that all contents necessary for the successful implementation of an ISO 50001 EnMS are conveyed in the Convoy meetings. However, it is recommended that participants in, parallel or consecutively, take part in the MoHo's Energy Efficiency Network, which is called "EnergieEffizienz-Tisch".

A similar concept is pursued by Foerderkreis Umweltschutz Unterfranken e.V. (FUU) with its ISO 50001 Small Groups. In contrast to the MoHo ISO 50001 Convoy, however, the concept of the ISO 50001 Small Group requires parallel participation in an Energy Efficiency Network of the FUU.

Table no. 1. Comparison of ISO 50001 Convoy and ISO 50001 Small Group

Convoy for the implementation of an ISO 50001 EnMS	Energy Efficiency Network with accompanying ISO 50001 Small Group
Organizer: Modell Hohenlohe e. V.	Organizer: Foerderkreis Umweltschutz Unterfranken e. V.
Total duration Convoy: ca. 1 year	Total duration Small Group: ca. 1 year
Duration Convoy workshop: approx. 0,5 days each	Duration of Small Group meetings: approx. 0.5 days each
Total: 5 Convoy workshops	Total: 5 Small Group meetings
Optional: Participation in Energieeffizienz-Tisch (= EEN): duration 3 – 5 years	Mandatory: Participation in Energy Efficiency Network (=EEN): 3 – 5 years

Source: Authors' contribution

In principle, the FUU concept offers the advantage that all participants in the 50001 Small Group acquire a broad knowledge of energy efficiency and its operational implementation via the mandatory participation in the Energy Efficiency Network. This knowledge is a valuable basis for the successful implementation and operation of the EnMS.

Both concepts share the goal of networking the participants so that they learn from each other through the exchange of knowledge and experience. And in both cases, valuable training and lectures on energy management, standards, and energy efficiency will be given at the meetings to ensure the successful implementation of the management system. (Hell, et al., 2017)

3. Research Methodology

The aim of this study was not the analysis of the hidden meaning, but the description of certain facts. Therefore, the expert interview was chosen as the suitable survey method. From the multitude of qualitative evaluation methods, the qualitative content analysis was used. (Kuckartz, 2016)

Expert interviews have their origin in empirical social research. They are used to access the knowledge of experts on specific issues. The special knowledge of experts uniquely enables them to recognize problems and develop solutions (Bogner, et al., 2009).

In this case, the expert interviews were used to analyze the suitability and limits of an implementation of DIN EN ISO 50001 EnMSs prepared and accompanied by learning networks.

The challenge was to identify and recruit interview partners with broad knowledge and extensive practical experience in Energy Efficiency Networks, ISO 50001 Energy Management Systems and their operational implementation (Gläser & Laudel, 2010).

Based on recommendations and based on their relevant experience and reputation, 8 interview partners were selected whose exact identity will not be published due to confidentiality requests.

The interviewees were:

- 1 executive of Modell Hohenlohe e. V.
- 1 executive of the Foerderkreis Umweltschutz Unterfranken e. V.
- 1 executive of IREES Institute for Resource Efficiency and Energy Strategies

- 1 key personality of the German LEEN 100 project (LEEN: Learning Energy Efficiency Networks) and employee of Fraunhofer Institute for Systems and Innovation Research ISI
- 1 executive of the LEEN GmbH (a joint venture of the IREES GmbH and Fraunhofer Gesellschaft e. V.) which is responsible for the distribution of the LEEN concept.
- 1 executive of an affiliate of one of the most important German energy companies, which is dealing with energy efficiency and energy efficiency networks
- 1 key personality of the Wuerzburger Umwelt- und Qualitätsmanagement WUQM, responsible for Energy Efficiency Networks and ISO 50001 Small Groups
- 1 engineer, who works as an experienced energy consultant, supporting Energy Efficiency Networks, ISO 50001 Convoys, and ISO 50001 Small Groups

This interviewed group of experts represented approximately 64 man years of professional experience in the field of Energy Efficiency Networks and approximately 32 man-years in the field of Energy Management Systems. Depending on their individual background and profession the interviewees approached the questions more from the economic side, the technical side or also from the scientific side.

Only open questions were used in order not to limit the degree of freedom in answering the questions. Due to the heterogeneous group with different perspectives and experiences the interviews were conducted by means of open one-on-one interviews.

Based on the clearly defined questions, a guideline interview was chosen as a suitable method for the survey (Przyborski & Wohlrab-Sahr, 2009).

The questionnaire itself consisted of firmly pre-formulated questions. Nevertheless, the interview was conducted as a partially standardized one, i.e. neither the wording nor the order of the questions had to be strictly adhered to (Gläser & Laudel, 2010). This allowed the interview to take place in the form of a rather casual conversation and thus made possible more freedom of content.

The questions have been pre-categorised within the questionnaire.

After a pre-test of the questionnaire to determine its usability and minor final optimizations (Raab-Steiner, 2012), the pre-terminated interviews were conducted via Skype (audio).

With the prior consent of the interviewees, the interviews were recorded and then transcribed manually. The transcription, which can be seen as the first step in a content analysis (Fuß & Karbach, 2014), was carried out in a summarised form and the results were categorized in an Excel table. Special care was taken during the transcription to ensure that the meaning was not changed (Dressing & Pehl, 2018).

The subsequent procedure based on the qualitative content analysis according to Mayring was followed and chosen for the second part of the analysis (Mayring, 2015):

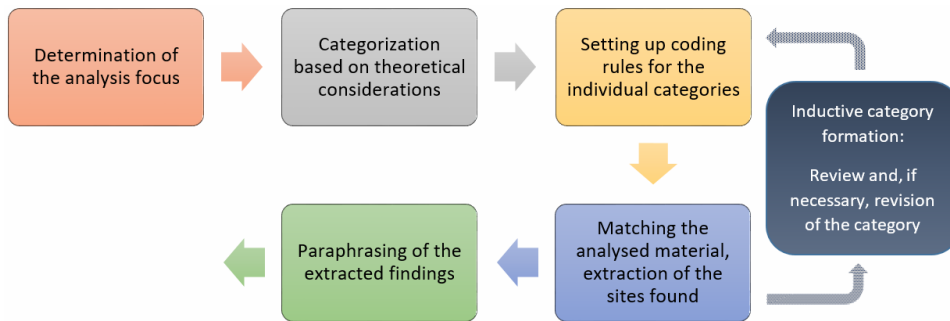


Fig. no. 1 Procedure of Qualitative Content Analysis: Content Structuring

Source: Authors' contribution based on Mayring, 1995

In the third and final phase of the analysis, elements of "Scaling Structuring" were used to obtain a weighting of the categories based on the frequency of naming:

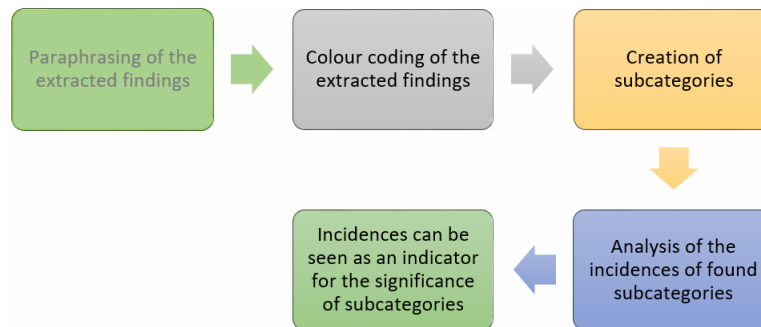


Fig. no. 2 Procedure of Qualitative Analysis: Scaling Structuring

Source: Authors' contribution based on Mayring, 1995

4. Findings/Outcome of the expert interviews

Following are the main results of a qualitative analysis based on expert interviews, conducted with the goal to get a better understanding regarding the usefulness of these concepts.

How can Energy Management Systems support the introduction of ISO 50001 EnMS?

The question of how learning networks can support the introduction of EnMSs according to ISO 50001 was answered by the participating experts as follows:

First of all, it is essential to convey and integrate contents into learning networks that are relevant for the implementation of EnMSs. As a major advantage, networks offer greater efficiency in knowledge transfer compared to individual consultations.

(LEEN stands for Learning Energy Efficiency Networks and is an evaluated network concept promoted by the LEEN GmbH.)

Energy efficiency networks, especially those based on the LEEN concept, impart extensive knowledge in the above-mentioned respect, especially with regard to practical issues (e.g. initial advice, monitoring). They also help to learn the necessary systematics. Operational objectives and measures are also developed within the framework of the Energy Efficiency Network. These are also an important basis and help to integrate the EnMS into day-to-day operations.

Only one of the experts interviewed said that companies had to assess for themselves the usefulness of implementing EnMSs accompanied by Energy Efficiency Networks. All other

experts were convinced that this concept made sense. Particularly the great efficiency and cost efficiency convinced the other experts because after all two things could be done at once. They also said that a better sustainable development of the organizational structure was possible.

A further essential advantage results from the network idea itself. The network supports individuals and enables them to learn from each other's experiences. In order for this to work, care must be taken at an early stage to ensure that all participants are interested in the topics of the group and are willing to study together and to learn from each other. Therefore it makes sense if not all participants of an Energy Efficiency Network want to introduce an Energy Management System, to treat the corresponding specific contents in separate accompanying Small Groups.

Comparison of Convoy and Small Group concept:

In a direct comparison of the two concepts, ISO 50001 Convoy and ISO 50001 Small Group, the answers of the interviewed experts were inconsistent. While one group could see no advantages or disadvantages when comparing the two concepts, others saw differences in the starting point and the focal points. As the Small Group is a supplement to the Energy Efficiency Network and thus expands its offering, the Convoy focuses exclusively on the goal of setting up and certifying an EnMS.

The Convoy can, therefore, be seen as the faster and leaner concept that appeals to another group of participants. One expert puts it this way: The accompanying Small Group is more complex but more effective. The ISO 50001 Convoy, on the other hand, is often faster but not quite as individual.

From the perspective of those interested in introducing an EnMS, the aim of both concepts should be to have the management system certifiable within twelve months.

(Annotation: Recent research (Hell, et al., 2017) shows that monetary motives, such as tax relief, subsidies or savings, seem to be among the key drivers for the introduction of an EnMS. For financial reasons, these usually require rapid implementation. The total duration of an Energy Efficiency Network (approx. 3 to 4 years) would be much too long.)

Basically, only those who wish to introduce an Energy Management System should participate in the Convoy or Small Group. Otherwise, there is a danger of groups splitting off within the network and thus hindering the idea of learning together and from each other.

Advantages (for participants) of introducing EnMS accompanied by EENs:

Frequently mentioned in this context were in particular:

- Exchange of experience with regard to implementation
- The mutual motivation of participants working on the same topics
- Mutual support that goes beyond the actual network phase,
- Time savings and avoidance of redundant work, as the contents of EEN and EnMS overlap to some extent
- Systematics of the Energy Management System supports the identification of potentials for increasing energy efficiency
- Compared to pure Energy Efficiency Networks, accompanying ISO 50001 Small Groups offer the advantage of continuous, recurring integration of the company management, which usually entails better support.
- The introduction and official appointment of an energy manager with the appropriate tasks and powers associated with the EnMS generally increases internal visibility and attention to the topic of energy efficiency.

Disadvantages (for participants) of introducing Energy Management Systems accompanied by Energy Efficiency Networks

- Especially in small companies without a full-time energy management officer, personnel overload or dissipation of their energies can occur.

- The introduction of an EnMS accompanied by Energy Efficiency Networks generally requires more time.
- Different starting conditions of the enterprises and different goals, as well as implementation speeds, can lead to conflicts
- Although overall costs can be saved through synergy effects, it is certainly cheaper for companies that only need an Energy Efficiency Network or an EnMS to implement what is needed.
- A network may not be as individual as an individual consultation

Do the advantages of introducing Energy Management Systems accompanied by Energy Efficiency Networks outweigh the disadvantages for the participants?

Once again, the picture is relatively heterogeneous. Two of the respondents said that this depends on the company and its size. The combination of EnMS and Energy Efficiency Network makes sense in principle, in practice, however, it is difficult due to lacking personnel resources. Therefore, this combination is usually something for larger companies. But, it is precisely these large companies that often carry out internal company networks anyway and therefore have little external demand.

The vast majority of respondents, on the other hand, are convinced of the advantages and justify this with lower overall costs, knowledge transfer and the associated reduction of errors in implementation. Energy efficiency network and EnMS support each other. A skillful moderation can compensate for differences between companies, so that ultimately the advantages outweigh the disadvantages.

5. Summary of the results

All in all, most of the experts surveyed agree that the introduction of EnMSs accompanied by Energy Efficiency Networks offers many advantages. Above all, these can be found in places where economies of scale due to the number of participants or synergy effects due to the simultaneousness of network participation and the implementation of the EnMS can be realized. Probably the most important effect of the concept results from learning from each other and with each other. Because one learns from the mistakes but also from the successes of others, one's own mistakes are avoided and potential for success is recognized more quickly. The foregoing can improve successes and reduce project times and costs.

Conclusions

The predominantly very positive experiences from the introduction of an EnMS according to ISO 50001, supported by learning networks, suggests that such networks could also be helpful for accompanying other operational change processes. It is advisable to carry out further examinations. Particular attention should be paid to standardized processes that promise economies of scale and synergy effects. The introduction and operation of management systems appear to be particularly suitable for this purpose.

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