

## Rating the quality of implementation of environmental management systems

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### Keywords

Environmental Management Systems, Systems Implementation, Quality Evaluation

### Abstract

*A model of the environmental management system implementation is proposed in this paper. For this model the methodology of the quality implementation evaluation with the use of Formalized Scoring has been developed. The verification proves that the evaluation of the quality of the environmental management system implementation is necessary. It also shows, among others, that there is a possibility to identify the areas difficult to realize. Due to this information the organizations preparing for the implementation of the environmental management system will be able to implement it in a better way. Because of this, they will probably gain more benefits for themselves as well as for the natural environment.*

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### 1. Introduction

Nowadays, the dependence of enterprises on natural resources is observable (Arimura, T.H., Hibiki, A., Katayama, H., 2008). This fact results from the process of industrial development which affects the environment in a more and more negative way. In the mid-twentieth century the size of environmental degradation by industry has reached such a scale that it could not be ignored (Pacana A. et al., 2015). This is when the awareness of the relation between the natural environment and the world economic development increased. That is why, attention began to be drawn to the need of restricting economic activity in order to retain the health and recreational qualities of the natural environment.

Both, the European Union as well as the increasing globalization encourage the systems of environmental management (Anderson R., 1998, Barton J.R., 1998). Currently, this is not enough to possess an ISO 14001 certificate but one should apply this norm requirements skillfully in practice. That is why great attention is drawn to the way of Environmental Management System (EMS) implementation.

The growing diversity and quantity of products, shortening of the production time as well as the life cycle of the product guarantee the development. This refers only to these organizations which can meet customers' expectations. A contemporary customer is often ecologically aware. That is why the organizations compete for the market paying more attention, i.e., to environmental issues (Majerník M. et al., 2005). This fact, together with a wish to improve, causes an increase in the number of organizations with ISO 14001 systems every year (Casadesus M., Marimon F., Heras I., 2008). Nowadays, small and medium-sized enterprises which are developing dynamically certify most often. About 2010 organizations in Poland possess certificates of compliance with ISO 14001-June 2015 status (Matuszak-Flejszman A., 2009).

Theoretically, the implementation of Environmental Management System should be common, costs should be minimal and benefits significant. In order to approach this state, the EMS should be implemented skillfully and according to a methodology. (Matuszak- Flejszman A., 2001) It is also worth benefiting from the implementation experience of other organizations (Christini G.; Fetsko M., 2004, Ericson W.B., 1997, Sergio O., 2002, Santos G., Mendes F., Barbosa J, 2011). In order

to be able to compare the EMS implementation quality, it seems justified to develop a method of the evaluation of the quality implementation. In the future, the efficiency of this system implementation will take place.

## 2. The model of the environmental management system implementation

Based on the literature (i.e. Kantardgil., 2003, Boiral O.; Henri J., 2012, Kantardgil., 2003, Seifert B., Mari E., 2008) concerning the implementation of the EMS, a modified methodology of its implementation has been developed. The stages of this modified methodology of the EMS implementation in an organization are as follows:

1. Inspiration.
2. Initial training.
3. Taking the decision about the implementation.
4. Assigning a supervisor of an implementation team and an EMS representative.
5. Assigning an implementation team and the team of internal auditors.
6. Optional employment of an external consultant.
7. Training of representative, implementation team and management staff.
8. An initial environmental review.
9. A system project draft.
10. Drafting and the implementation of the system documentation.
11. Drafting and the implementation of the operational documentation.
12. Refresher training for internal auditors.
13. Internal audits and post-audit activities.
14. Management review.
15. The process of the system certification.

This methodology is prepared mainly for small and medium production enterprises. However, with minor alterations it can also be useful for all of the organizations which wish to implement the environmental management system in compliance with ISO 14001.

Some attention should also be drawn to the fact of the rising importance of stage one (inspiration) as well as the training. In the inspiration stage attention should be paid to the aim of the system implementation. The training, according to the literature (e.g. Farvaque N., Voss E., 2011), in SME should be short and frequent, focused in particular on their practicality. The above has been taken into account in the proposed methodology.

## 3. The evaluation of the environmental management system implementation

The prepared model of the Environmental Management System (EMS) implementation in Small and Medium Enterprise (SME) should guarantee the transformation of an incoming quality  $Q_{in}$  into the appropriate demanded outgoing quality  $Q_{ou}$ . It can be illustrated with the transformation function  $f_{TR}$ . Then, the implementation quality will be as follows:

$$Q_{ou} = f_{TR}(Q_{in}) \quad (1)$$

Considering the components of the system, this formula may be written as follows:

$$Q_{ou} = f_{TR}(Q_1, Q_2, Q_3, Q_4, Q_5, Q_6, Q_7, Q_8, Q_9, Q_{10}, Q_{11}, Q_{12}, Q_{13}, Q_{14}, Q_{15}) \quad (2)$$

where:

$Q_i$  is the quality of subsequent stages of the EMS implementation.

$f_{TR}$  is the transformation function.

Starting the calculation of the quality of the environmental management system implementation, based on the expert's or experts' evaluation, the quality of fifteen stages of

implementation (Q1÷Q15) may be determined. Next, using the methods of the quality evaluation, the quality of the EMS implementation process may be calculated. Subjectivity of the evaluation of the implementation stages may be problematic here. It seems advisable to use a commonly available methodology of the quality evaluation for assessing the implementation process quality e.g. Formalized Scoring method (FS). Thus, the criteria used in this method would correspond to the stages (15) of the EMS implementation. It is possible to replace these criteria with questions. The quality of particular stages (criteria) may be determined with the scoring method with the five-step gradation and scores from 1 (the worst) to 5 (the best). The formula for calculating the level of the EMS implementation quality in the Formalized Scoring (FS) presents as follows (Kolman R., 1992, Pacana A., 2000):

$$H = G + K - C \quad (3)$$

where: H - Quality Level, G - Main element, K - correcting element, C - constant for standard recipients/customers.

The main element is calculated as follows:

$$G = \frac{R}{8 \cdot n} \quad (4)$$

where:

$$R = (9 \cdot a + 7 \cdot b + 4 \cdot c + 2 \cdot d + e - n) \quad (5)$$

n - number of the considered criteria, a - number of 5-point grades given, b - number of 4-point grades given, c - number of 3-point grades given, d - number of 2-point grades given, e - number of 1-point grade given.

The correcting element is calculated as follows:

$$K = \frac{c + 5d + 10e}{200n} \quad (6)$$

The constant C is 0.05 for standard requirements, and c = 0.01 for stringent requirements.

The enterprise, where the evaluation of the ISO 14001 system implementation quality has been tested, is the biggest producer of stretch foil in Poland and one of the biggest in Europe. It specializes in the production of foil of different types and of different characteristics. The enterprise has the ISO 14001 system of environmental management implemented and it has the certificate issued by SGS unit – certificate number HU12/6232. The quality evaluation of the particular stages of the implementation presents as follows: 5-4-5-3-3-4-3-2-3-5-3-1-2-2-4.

The data for the calculation:

$$a=3, b=3, c=5, d=3, e=1, n=15, C=0.05 \quad (7)$$

allowed us, based on the formulas (3) - (6), for calculating the quality of the EMS implementation in the analyzed enterprise:

$$H = ((27+21+20+6+1-15)/120) + ((5+15+10)/3000) - 0.05 = 0.46 \text{ (46\%)} \quad (8)$$

The obtained result indicates that the environmental management system was not properly implemented. It should not be surprising as enterprises which start to implement the EMS are often not experienced in this field. Presenting the implementation quality of other organizations and indicating the places where this quality is the lowest may help in a better preparation for the implementation. Furthermore, this may help in the skillful implementation. That is a huge step

towards the benefits deriving from the implementation both for the enterprises and for the natural environment.

#### 4. Conclusions

The modified methodology of the EMS implementation as well as the developed methodology of the implementation quality evaluation showed that it is appropriate to evaluate particular implementation stages. Thanks to this, it is possible to distinguish the stages which are the most problematic during the implementation process. Knowing which stages are evaluated the lowest, one can prepare their implementation more accurately, and thus implement the system better. Introducing the presented solutions may cause the emergence of multiple benefits. Well assessed implementation supported by skillful functioning of EMS allows us, among others, to achieve benefits connected with: fulfilling legal regulations, limiting harmful emission, rational use of natural resources, cost reduction resulting from penalties as well as effective use of media and lowering charges for them. This way we create an image of a well ecologically run organization. However implementation of EMS requires additional investments, often followed by changes in organization structure - those create additional cost.

The implementation of this system will allow the modern goals of production engineering to be realized, namely: production optimization concerning the ideas of sustainable development and social responsibility of industry. It is particularly important for SMEs whose production affects the natural environment significantly and which often have limited possibilities or no capability to counteract their destructive impact.

In the future, it will be appropriate to perform expert verifications of the proposed model of the skillful and ecologically consistent implementation of the EMS.

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