

Optimalisation of the Performance of the Environmental Management Systems

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Abstract – The increasing global environmental and social problems require the active contribution of firms and other organizations too, regarding environmental efforts. The usage of the environment is mostly caused by their processes (production and service). The problem can be summarized in the question: “How should the organizations work if they want to establish a better world?” We have set ourselves the aim of the uniformly interpretable evaluation of the Hungarian processes, and the creation of an EMS development model concept which aimed the functional utilization of the research results.

Keywords: environmental management / impact assessment / environmental performance index / development model

1. PROBLEM POSING AND OBJECTIVE

Environmental Management System (EMS) is the part of the management system of an organisation with the task to formulate and introduce the organisation’s environmental policy and handle the environmental aspects. The advantage of the systems standardised by international organisations is that they may be certified by specialised bodies of certification (e.g. ISO 14001, EMAS).

Standardized methods covering authoritative (certified) information for competitors and society are being applied worldwide today. At the same time it is observed, probably just on the ground of the market competition, that the processes are often individual, formal and defined by the self-interest of a company.

KEREKES-KINDLER (1997) draws attention to that a company having the certificate according to the standard ISO 14001 does not come definitely within the category of environmentally friendly. According to the standard requirements, improvement of environmental performance can be measured and accepted by auditor professionals, based simply on the adequacy for regulations; hereby the environmental aspects can be overshadowed by the management trend. However, the standard, taking it strictly, does not exclude that the physical environmental performance is going to improve or it is open to improvement.

According to our engineering judgement, namely based on environmental impacts, improvement of environmental performance is socially useful if the efficiency of EMS-s is meant by the effective improvement of physical environmental performance, namely the positive influence of the environmental elements.

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2. MATERIAL AND METHOD

In the interest of the real environmental performance behind the system, during the 'Plan' phase is a high priority to explore and analyse the environmental aspects and impacts and to select the relevant environmental aspects in the course of building of the EMS.

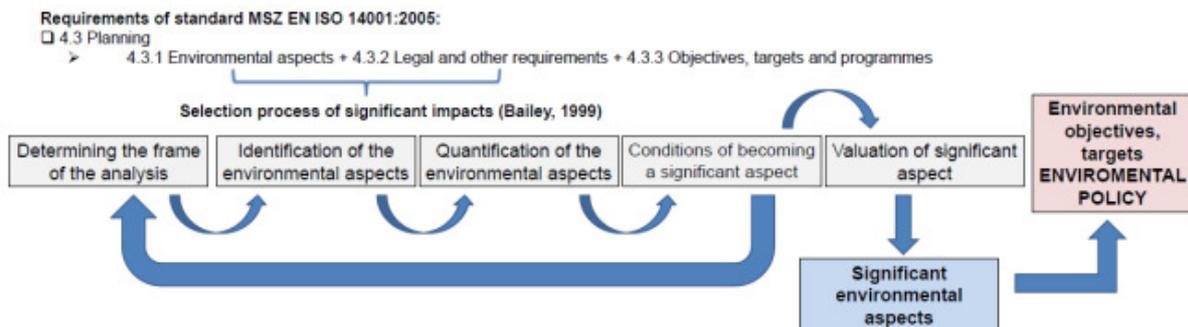


Figure 1. Requirements of the Plan phase and the process of selection of significant impacts (BALEY, 1999) (own construction)

The quantitative empirical research in reference to the 'Plan' phase (2010) has been conducted by using questionnaires within (114 pcs) home companies (sampling ratio: 9,89%) applying EMS according to the standard ISO 14001. The answers were controlled on the base of 10 home certification companies' (sampling ratio: 62,5%) opinion. The objective of the survey was to perform an evaluation of the state of affairs after 14 years of the first EMS certification in the form of descriptive statistics.

In the case of a few main differential factors (customized solutions and purposefulness of EMS, application of EMS in the future, attitude of the senior management, year of initiation etc.) the 'good practices' could be filtered out by the processes given for other parameters by strong organizations. Then besides the descriptive statistics we applied multivariable statistical evaluation (correlation analysis and factor analysis).

3. RESULTS

We analysed the standard and motivations of the companies' general environmental management: home companies stay slightly behind the multinational companies, and the standard of environmental protection management progresses from small companies through medium-sized companies to large companies (based on size). Significant motivations of the environmental protection: the strict regulatory system (74%), opinion of business partners (71%), market and customer demands (67%).

The characteristics of the methodologies applied in environmental impact assessment: in the analysed sample own company methodology (82%) is adopted which means establishing level methodology to a significantly demonstrable extent. In case of the majority (70%) of the organizations the verification of factors was required.

Questions relating EMS application and environmental objectives: respondent organizations (almost 90%) apply integrated management system. Despite of conflicts emerge in the same time and from different objectives the environmental questions arise

appropriately. Conflicts emerge mainly in reference to QMS then EHS. The survey confirmed that applying EMS in integrated system was more favourable in the respect of the environmental performance of an organization (integrated approach) than keeping it as an independent system. Realization effectiveness of objectives brings slightly better results in the long-term (87%) than after the first EMS certification (79%).

By analysing the influential factors of the appointed environmental objective systems, we determined the character of the object systems. Organizations appointed their environmental objectives in larger proportion considering dangers coming from environmental impacts, but keeping achievable to the fore regarding the financial burdens of the execution's potentials.

The role of EMS in influencing the state of the elements of environment: to the condition of environmental elements a definite strong positive influence can be noticed among those who are applying EMS.

The environmental arrangements provided varied pictures. Dominant solutions were those, which did not require excessive effort and were obviously applicable, e. g. careful treatment, prevention, disposal of contaminants, recycling and technology development. Further means spread less. For example substitute materials, end-of-pipe techniques, designing environmentally friendly products and influencing customer's attitude.

Main companies' efforts according to operating of EMS: more increased efforts are required in point of environmental aspects, objectives, appropriations and programmes (regarding continuous improvement), legal and other requirements, handling of records, fulfilment of standards requirements.

In order to form factors the reduced database of questionnaire survey was subjected to principal component analysis. The result of factor analysis indicates that the environmental performance of Hungarian industrial companies performing in the survey and the effectiveness of EMSs can be explained and separated characteristically along six dimensions: common principal components: factors of proactivity, verification of environmental impacts, adequate objectives and EMS procedure; specific indexes: factors of exterior motivation (business partners), interior audit.

By simplifying the dimensions of performance I have created a manageable structure eligible for further examinations (dimensions of environmental protection motivation, environmental performance, environmental impact study and environmental management).

4. DEVELOPMENTS

Parameters which are influencing corporate environmental performance demonstrably: 4 corporate performance indexes (environmental motivation (MOT), performance (EPI), impact assessment (EIA) and management (EMI)) have been created on the grounds of the main topics of survey. (Methodology: following PATAKI - TÓTH 1999) Characterization of respondents' contracted performance has been also executed by forming a fifth aggregative index (AGG) (average values). It was made by calculating the average values of the performance indexes. Each index was estimated as equal, which results in the double weight of the EPI and approximately the half weight of the EMI in a sense, because the number of the EPI's components comes out at the half of the other indexes (MOT, EIA), while the EMI's ones come out at twice as the others. However, we have valued this as a positive fact because so thus the variates of the EMS's environmental performance perform with a larger weight; the variates of the EMS's processes performance perform in a smaller weight in the end.

In the certain indexes we have involved those answers being typical of the subject with equal weight, which could definitely be graduated and assigned with point value (self-evaluation: 1-5 points). For those answers which were favourable regarding the optimisation

of EMS we have assigned a higher score. The structure can be seen in the index back-end tables.

The values of the indexes have been resulted by the averages of the values of variates, which meant the record of the variates with equal weight. The certain indexes could take up a value without dimension on a scale ranging from 1,00 to 5,00. Depending on what extent the performance dimension indexes were confirmed by the answers of the certain organisation through the involved variates.

Through the created index values the corporate performance can be specified uniformly, in a relative, numerically definable way. The evaluation after developments and describing the specified level can be executed without intervention in the varied corporate processes.

Following that we revealed each parameter held appropriate for system development.

Performance of organizations has been examined by sensitivity survey and histogram analysis depending on the main parameters (36 pcs) (answers: 'A' – unfavourable and 'B' – favourable group) In case of the created indexes. In the course of implementation and operation of EMS the fields of corporate development can come estimated for the sake of improvement of environmental performance on the grounds of detected effects of parameters and the arrangements made for their improvement. Collective or separate development of background variates which build the indexes gives opportunity conversely for identifying the main improvable factors. From the variates taken into the analysis the followings are the strongest regarding their influence, and expansive to all indexes: holistic variates: importance of applying EMS in the future, purposefulness of EMS, customized solutions of EMS; sorted variates: using impact register; specific variates: applying environmental performance evaluation system, expansion of environmental data to impacts in the resource and energy balance of the organization.

The summary of the influences of the development opportunities (36 pcs) by dimensions can be found in 'Auxiliary Table 1'. Besides the totalized results, the order of influences by dimensions are summarized in 'Auxiliary Table 2'.

Assignment of influences has given the opportunity to the targeted development of performance and effectiveness of EMS's 'Plan' phase along these variates. Indirect development of physical environmental performance is being realized since the appropriated development efforts have affected those planning parameters, which pertained to the treatment of the environmental aspects and impacts.

The method ensures the uniform evaluation of different organisations, which does not require the modification of the varied corporate processes, additionally gives the opportunity to compare them.

Application of the explored results (the use of background and auxiliary tables) are detailed in the EMS development concept based on self-evaluation. We objected the practical utilization of the survey's results by forming the development model concept.

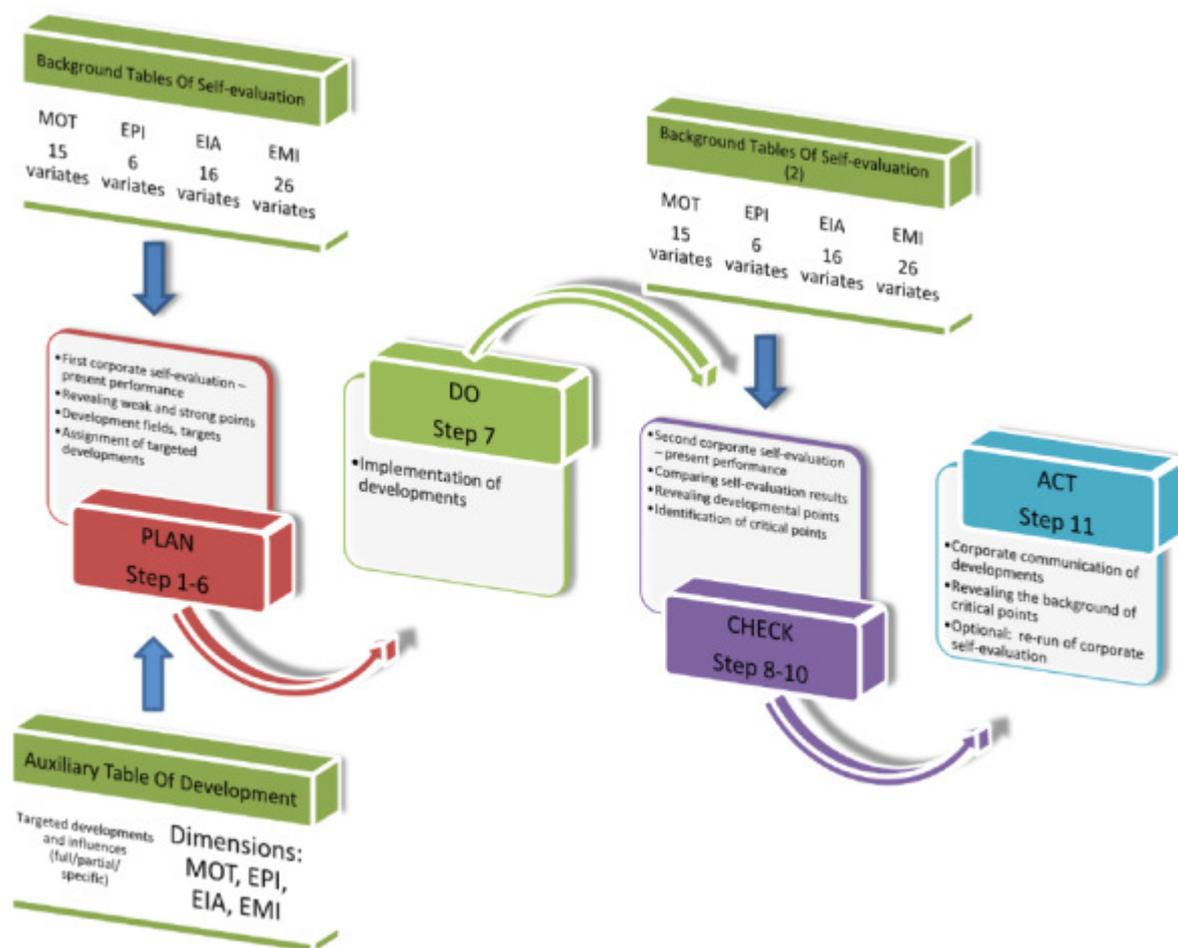


Figure 2. Model flowchart: Display of the EMS development model concept based on self-evaluation for the EMS's 'Plan' phase accordingly to the principle PDCA

By applying the model, among the development proposals according to the meaning of variates in some cases the development policy can be set, in other cases exact actions can be taken.

5. SUMMARY

In the interest of the real environmental performance behind the environmental management system, in the course of 'Plan' phase it is a high priority to explore and analyse the environmental aspects and impacts and to select the relevant environmental aspects in the course of the implementation of the EMS.

We have set ourselves the aim of the uniformly interpretable evaluation of the Hungarian processes, and the creation of an EMS development model concept which aimed the functional utilization of the research results.

The quantitative empirical research (2010) has been conducted by using questionnaires within home companies (114 pcs) applying EMS according to the standard ISO 14001.

By descriptive and multivariate statistical survey we have determined the relevant variates, correlations of variate pairs and the variate groups meaning the main performance dimensions of the topic. I have revealed the output of the 'Plan' phase and the characteristics of the environmental objectives which mean the main subject of the operation of the 'Plan' phase.

Through the created performance index values the corporate performance can be specified uniformly, in a relative, numerically definable way. The evaluation after developments and describing the specified level can be executed without intervention in the varied corporate processes.

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The method ensures the uniform evaluation of different organisations, which does not require the modification of the varied corporate processes, additionally gives opportunity for comparing them.

By the developed model, a usable development and decision support tool falls into the hand of those who adopt it so that on the surveyed field they will be able to improve the efficiency of the 'Plan' phase directly and of their environmental management system indirectly.

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