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Environmental Decision Support System for Environmental Performance Evaluation

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Abstract

There is described an environmental decision support information system for the environmental performance evaluation, called ISEPE, in the paper. The goal of this decision support system is to evaluate whether an organisation's environmental performance is meeting the criteria set by the management of an organisation. ISEPE also helps to organisation's top management to monitor and check the efficiency of its environmental management system and to assess the status of its environmental performance and identify areas for improvement as needed.

1. Introduction

Progressive organisations in the world are now seeking ways to understand, demonstrate and improve their environmental performance (i.e. results[2] of management of environmental aspects). Environmental performance evaluation (EPE) is defined as the process, in which is necessary to select environmental indicators and to measure, analyse, assess, report and communicate an organisation's environmental performance against its environmental performance criteria.

An organisation with an environmental management system[3] (EMS) may evaluate its environmental performance against its environmental policy, objectives, targets and other environmental performance criteria. An organisation without such an environmental management system may use EPE to assist in identifying its environmental aspects, determining which aspects be treated as significant, setting crite-

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[2] In the context of environmental management, results can be measured against the organization's environmental policy, objectives, and targets.

[3] EMS means the part of the overall management system that includes the organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy.

ria for its environmental performance, and evaluating its environmental performance against these criteria.

The environmental performance evaluation is an internal process and the organisation's management tool designed to provide top management reliable and verifiable environmental information, see Figure 1. It was suitable to use current information and communication technology (ICT) to support EPE and develop an environmental decision support information system. This information system, called ISEPE in the paper, belongs to the class of manager environmental information systems (Hřebíček/Pitner/Jančárik 1998).

On an ongoing basis information system ISEPE evaluates whether an organisation's environmental performance is meeting the proposed criteria set by the top management. The ISEPE together with environmental audits helps to the top management in monitoring and checking efficiency of EMS and in assessing the status of its environmental performance to identify areas for improvement as needed.

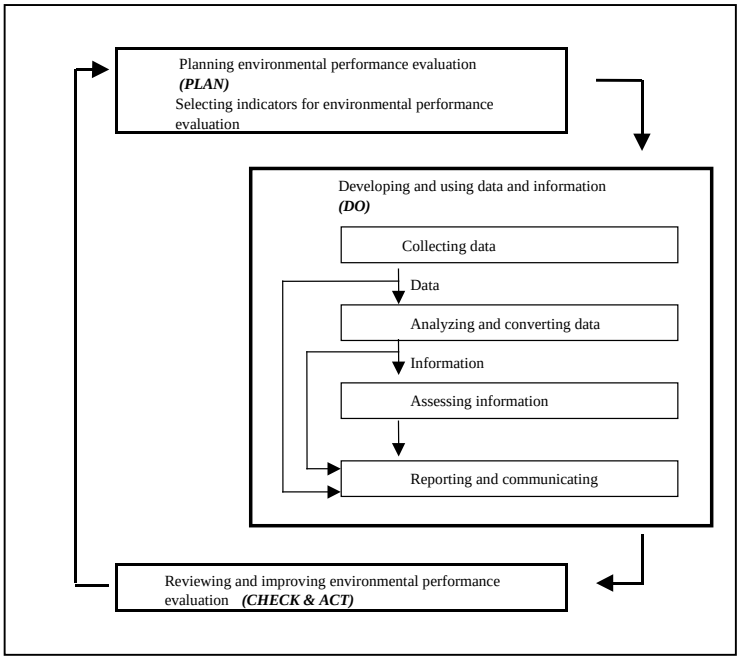

Figure 1
Process of Environmental Performance Evaluation

The above Figure 1 provides an outline of the EPE process, as the known Deming's „*PLAN – DO – CHECK – ACT*“ management model. This is also the basic model

for the analysis, design and implementation of ISEPE, which has been developed since 1996 (Hřebíček/Pitner 1996, 1998, 1999), (Hřebíček 1999, 2000).

Using current ICT (e.g. groupware and workflow technologies, Apache, XML, PHP language, etc.), ISEPE is able to simplify internal and external reporting and communication in the evaluation of the organisation's environmental performance (Hřebíček 1999). It assists as managers, as employees in fulfilling their environmental responsibilities, thereby enabling the organisation to achieve its environmental performance criteria. The organisation's EPE and the information system ISEPE should be periodically reviewed to continually improve the EMS processes. There will be described important part of ISEPE in following chapters, where an organisation is understood as company, corporation, firm, enterprise, authority or institution, or a part or a combination thereof, whether incorporated or not, public or private, that has its own functions and administration. For organisations with more than one operating unit, a single operating unit may be defined as an organisation.

2. Developing and using data and information in ISEPE

The ISEPE was developed as an object oriented open environmental information system, (Coad 1997), with five layers. The ISEPE consists of the set of modules: data collecting modules, data analysis and assessment modules and environmental reporting and communicating modules. All modules share one common database with prescribed data interface which enable to mine appropriate distributed data in the main organisation information systems (Bednář 2000).

2.1 Collecting data

Data collecting modules of ISEPE ensure data reliability; this depends on factors such as availability, adequacy, scientific and statistical validity and verifiability. Data collection of ISEPE is supported by quality control and quality assurance practices, (Hřebíček/Pitner 1998), which ensure that data obtained, are of the type and quality needed for the EPE use. Data collection modules in ISEPE generate input forms with function including the appropriate identification, filling, storage, retrieval, and disposition of data and information. These modules store data into database depending on the organisation's integrated information system. Such provisions help to ensure the credibility and relevance of EPE to operations.

2.2 Analysing and converting data

Data analysis modules of ISEPE converts collected data into information describing the organisation's environmental performance, expressed as environmental indica-

tors for EPE, which are useful for the organisation's intended purpose (Hřebíček 1999). To avoid bias in the results, all relevant and reliable data that have been collected by ISEPE and store in databases can be considered.

Data analysis modules of ISEPE include analytical and heuristic methods for analysis of the data quality, validity, adequacy, and completeness necessary to produce reliable information.

The information describing organisation's environmental performance are developed using scientific calculations, best estimates, statistical methods, graphical techniques, or by indexing, aggregating or weighting in ISEPE.

2.3 Assessing information

These modules of ISEPE are intended to provide useful information on the management efforts of the organisation and its operations as a basis for appropriate management actions. The information expressed in terms of environmental performance indicators (Hřebíček 1997), are compared with the organisation's environmental performance criteria. This comparison indicates progress or deficiencies in environmental performance to the top management.

The results of this comparison modules may be useful in understanding why the environmental performance criteria have, or have not, been met. These information describing the organisation's environmental performance and the results of the comparison are reported by ISEPE to top and executive management, to support appropriate management decision and actions to improve environmental performance (Hřebíček 1997, 2000).

2.4 Reporting and communicating ISEPE

Environmental reporting modules of ISEPE are the efficient tool that providing information describing the organisation's environmental performance to external as well as internal interested parties, based on management's assessment of needs and its audiences.

2.4.1 Internal reporting and communication

Management should ensure that appropriate and necessary information describing organisation's environmental performance is communicated throughout the organisation on a timely basis. This may assist employees, contractors, and others related to the organisation to fulfil their responsibilities, and the organisation to meet its environmental performance criteria.

Information describing organisation's environmental performance presented in the form of text documents, tables, graphs and maps can include (Hřebíček 1999):

1. status of and trends in the organisation's environmental performance;
2. status of legislative and regulatory compliance;
3. status of the organisation's conformance with other requirements to which it subscribes;
4. cost savings or other financial results with respect to environmental accounting;
5. opportunities or recommendations which improve an organisation's environmental performance.

2.4.2 External reporting and communication

An organisation may choose or may be required to issue environmental reports or statements providing information describing its environmental performance to external interested parties. ISEPE provides standard forms of environmental reporting prescribed by international and national standards:

1. Regulation (EC) No 761/2001 of the European parliament and of the council of 19 March 2001 allowing voluntary participation by organisations in a Community eco-management and audit scheme (EMAS);
2. the family of ISO 14000 standards and
3. relevant Czech and Slovak national laws.

Examples of reporting that organisation may choose in ISEPE (Hřebíček 1998):

1. mandatory annual environmental statement and statistics (waste, water, air, etc.);
2. a statement of commitment to environmental performance evaluation as a part of responsible environmental management;
3. a description of its activities, products and services with respect to integrated prevention pollution and control;
4. a statement of its significant environmental aspects and related indicators for EPE;
5. information on performance relative to its environmental performance criteria;

3. Conclusion

The transition of enterprise information systems towards current ICT has recently become the key issue for reengineering their information systems based on principles of modern integrated management systems. Current ICT, especially intranet technologies, bring not only a unified access to both local and global information resources, but they create a very flexible platform for developing application software. Therefore, this very flexible network infrastructure is an ideal platform for the ISEPE.

Several large and also small and medium-sized enterprises, which participate in the Czech national EMAS program, are promoted by ISEPE to facilitate them efficient access to EPE information. These organisations were encouraged by ISEPE to produce and make publicly available periodic environmental statements providing the public and other interested parties with information on their environmental performance.

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