



How Small and Medium Enterprises (SME) use IT applications for saving environment

Introduction of Environment Protection Maturity Model and Environment Informatics Analysis Model

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Abstract

Level of environment conscious operation can hardly be measured exactly. In order to identify how enterprises think about environment protection and what they do to reduce environment load, we developed Enterprise Protection Maturity Model, a self-assessment tool. It measures the level of maturity on the fields of Human conditions, External relationship, Technology and processes and Technical conditions, which representing the so called soft and hard part, the human and the technical side of an enterprise.

IT support has special importance in operation maturity, so we also developed Environment Informatics Analysis Model, with which we can compare different applications according to enterprises' special requirements. Organizing a survey we can get a detailed view of usage of EI tools supporting EP related processes.

Keywords

Environment Informatics, Maturity Model

1 INTRODUCTION

Due to the communication campaigns and strict regulations, Environment Protection (EP) and related topics became one of the most widely known issues in modern world. After all we cannot be satisfied with activities that companies perform in order to protect their environment. According to our experience the smaller a firm, the less resource it can invest to these processes. If we want them to be more enthusiastic it is not enough to make regulations and campaigns, we should provide them with easy-to-use and cost effective methodologies and software.

Based on the hypothesis described above, our research project has three main achievements:

1. Make a survey to identify what firms (mostly SMEs) think about EP and what they do or plan to do to reduce environment load.
2. Make a detailed list of environment informatics applications and their services and assess them from the view of information gathered with survey.



3. Develop management, process and IT tools to make it easier to monitor, analyze and improve operation.

This publication summarizes the first results and the tasks we are planning to do in the short and long-term future.

2 EXPERIMENT - SEARCHING FOR METHODOLOGY

In the first project phase we were looking for a methodology we can use to make a survey among companies involved. We chose Michael Hammer's Maturity Model (PEMM), which is focused on process management [1]. PEMM includes five process enablers and four enterprise capabilities as the perspectives of analysis. Enterprise maturity depends on the quality level of leadership, culture, expertise and governance. Process enablers are design, performers, owner, infrastructure and metrics. There are 2-4 subcategories under each of the perspectives with sentences on 4 levels representing the maturity of organization. One should find the sentence fitting best to enterprise.

3 RESULTS

3.1 Enterprise Protection Maturity Model

As using PEMM in several projects, we realized that we had to modify the perspectives and the definition of maturity levels, but we could use the structure and the fundamental approach. As a result, we developed the Enterprise Protection Maturity Model (EPMM). It has four upper level perspectives: Human conditions, External relationship, Technology and processes, Technical conditions, representing the so called soft and hard part, the human and the technical side of an enterprise. With each of the perspectives the same system and its effect on environment can be analyzed:

- Human conditions: how human resource, knowledge, communication, culture and related fields are managed to enhance the importance of EP. It is an essential part of considering EP as a common part of daily operation.
- Technical conditions: how infrastructure and hard resource is planned and handled to reduce environment load. It shows the balance between effectiveness and the environment conscious purchasing and maintenance.
- Technology and processes: how everyday operation is organized to maintain low level environment load. This shows the use of regulation tools for putting EP into the processes.
- External relationship: how organizations publish their goals and activities to present their commitment to EP. It is necessary to widely disseminate its importance across economy.

We chose those elements that can have significant impact on EP related operation. Figure 1 shows the whole structure of EPMM, including perspectives and sub-perspectives.

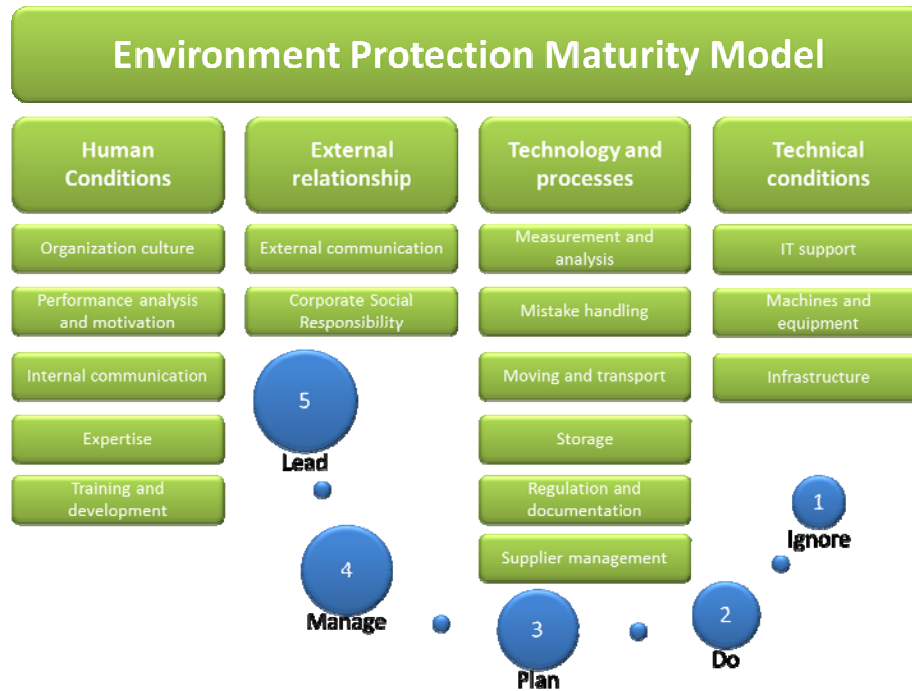


Figure 1. Structure of EPMM

EPMM defines five maturity levels. Their general meanings:

1. Ignore: does not achieve level 2,
2. Do: fits to basic regular, customer and social requirements,
3. Plan: make self-motivated actions, more than required,
4. Manage: continuous development to reduce environment load,
5. Lead: better than level 4.

At each sub-perspective level 2, 3 and 4 are defined specifically, e.g. Organization culture, level 3 – EP is a regular part of the way of thinking. Definitions are independent from the industry, so the use of EPMM is not restricted to any specific field. The whole matrix is shown in Table 1.



Table 1. EPMM matrix

Perspective	Sub-perspective	Do (2)	Plan (3)	Manage (4)
<i>Human conditions</i>	<i>Organization culture</i>	EP is not a part of the way of thinking, but sometimes related issues are come to the front	EP is a regular part of the way of thinking	EP is a common value that mostly drives the way of thinking
	<i>Performance analysis and motivation</i>	EP related mistakes is punished	EP related activities are taken into consideration in performance evaluation	There are well defined indicators, measuring the quality of EP related activities
	<i>Internal communication</i>	EP related regulations are communicated to employees	EP conscious operation is communicated to employees	Every formal communication event deals with EP related issues
	<i>Expertise</i>	One member of management has responsibility of EP	There are EP experts who are involved into planning and development activities	Every employee has EP knowledge and they use it in everyday work
	<i>Training and development</i>	Mandatory trainings are taken regularly	Every operational training deals with EP related issues	Every EP related process has owner who is responsible for train employers continuously

Perspective	Sub-perspective	Do (2)	Plan (3)	Manage (4)
<i>External relationship</i>	<i>External communication</i>	Make only mandatory reports	Regularly communicate our commitment to EP	Every formal communication event deals with EP related issues
	<i>Corporate Social Responsibility</i>	EP is taken into consideration while planning charity and sponsorship	Regularly support EP related projects	Initiate EP related projects having effect our external local environment



Perspective	Sub-perspective	Do (2)	Plan (3)	Manage (4)
Technology and processes	<i>Measurement and analysis</i>	Measure and analyse data if and when it is regulated by authorities	Measure and analyse data continuously	Measure and analyse data continuously, compare them with benchmarks and measure the results of corrective actions
	<i>Mistake handling</i>	There are predefined actions for disasters	Monitor processes and take corrective actions if necessary	Every point source is identified, monitored and has predefined preventive and corrective actions
	<i>Moving and transport</i>	Trying to minimize the need of moving and transport	Regularly analyse moving and transport to reduce emission	Every process is planned and managed to minimize environment load
	<i>Storage</i>	Trying to reduce the negative effect of storage	EP is taken into consideration when planning and managing storage processes	Level and method of storage is regulated to minimize the need for place and ensure sustainability
	<i>Regulation and documentation</i>	Preventive and corrective actions are regulated and documented	Every process documentation regulate EP related preventive, monitoring, analysis and corrective functions	EP related preventive, monitoring, analysis and corrective functions are defined for every role and position as well
	<i>Supplier management</i>	Do not cooperate with enterprises with high environment load	EP is taken into consideration when qualifying and selecting partners	Partners are required and regularly assessed to ensure low environment load input



Perspective	Sub-perspective	Do (2)	Plan (3)	Manage (4)
Technical conditions	<i>IT support network</i> -	Computers are not in network	Computers are in network, files can be shared	Computers are in network, team work is supported by special application
	<i>IT support application type</i> -	Only use common office softwares	Some special fields are supported by professional applications	Use integrated software supporting EP processes as well
	<i>IT support purchase type</i> -	Use only from-the-shelf software	Use from-the-shelf software customized by vendors	Use software developed for us to meet our special requirements
	<i>Machines and equipment</i>	Purchase only those equipments whose producer has all of the associated certifications and permissions	Purchase only those equipments that have low environment load during operation	Purchase only those equipments that are produced the way to minimize environment load
	<i>Infrastructure</i>	Operate infrastructure to meet regulatory requirements	Reorganized infrastructure operation to decrease energy necessity	Infrastructure operation is continuously optimized to reduce environment load

3.2 Environment Informatics Analysis Model

IT support in Technical conditions perspective has special importance. There are several applications provided by different vendors that can be used to support EP related functions. We are interested in what software is mostly used by SMEs and what processes are supported by them. We believe that the level of use of special software correlates the importance of that certain function the tool is used for. That is why we developed another model, named Environment Informatics Analysis Model (EIAM).

EIAM includes market leader applications and their main services that help us to compare different tools from the perspective of SMEs. Some services we concentrate on:

- obligatory data provision,
- material movement and balance,
- handling of packaging materials,
- identification of point sources of pollution,
- environment controlling,
- data mining and built-in reports.



Services are divided into groups, e.g. decision support, process visualization etc. The list of services is not finished. Based on the results of survey new elements could be taken into it.

4 PERSPECTIVES FOR THE FUTURE WORK

With applying EPMM and EIAM in survey we will get a detailed view of EP related way of thinking, activities and use of IT tools in SMEs. As the first step, we choose a representative group of enterprises. Then they will be asked to qualify themselves according to EPMM, in the way we described above. In the last step they will choose those software and services they use, and express requirements for applications they should use in the future.

Having analyzed answers we will report

- average maturity level in each sub-perspectives,
- correlation between sub-perspectives,
- connection among enterprise attributes (e.g. number of employees, date of establishment, industry etc.) and maturity level,
- general use of applications and their services,
- connection between use of IT and level of maturity,
- requirements for applications,
- connection between requirements and level of maturity.

Knowing the connection structure we will make a deep software analysis, testing their functions. The output is a report of applications that includes their comparisons according to requirements. After creating reports, we can identify those functions that are not supported appropriately. If it is viable, services will be defined and – with cooperation with developers – we will create a service portal that could be achieved by enterprises wanting to use software supporting their EP operation, in ASP business model.

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