

Development of an Implementation Concept for Environmental Information Systems on an Industrial and Intercompany Level

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Abstract

The aim of this paper is on the one hand to identify barriers and obstacles for an implementation of operational environmental information systems in companies, including both technical and organizational aspects. On the other hand this analysis should be the starting point for the development of a solution concept to overcome these barriers. Furthermore, the requirements in the implementation process of operational environmental information systems regarding organizational and technical aspects will be investigated, contributing to a successful implementation concept. Additionally, we will pay attention to the industry wide environmental protection. The second overall goal of the paper will be the expansion of the implementation concept for operational environmental information systems at the intercompany level. For this purpose, basic conditions for the overoperational exchange of environmental information will be investigated. This research builds the basis for an analysis of solutions to strengthen the position of environmental protection in the intercompany exchange of environmental information. Existing cooperation and relationships between companies should be taken into account. From this analysis, starting points and conclusions for a more intensive cooperation and relationship by strengthening environmental communication between companies will be derived, consequently helping to protect the environment on a company as well as on an intercompany level.

1. Introduction

The status quo of theory and science in the field of operational environmental information systems is considered as very sophisticated. The same comes true for practical applications to support the operational communication of environmental information. Nevertheless a gap between the theoretical and practical knowledge and the application in companies can be stated.

If not only the industrial environmental protection with the support of environmental information systems is taken into account but also environmental protection between and upon companies, the same picture can be revealed. An overoperational exchange of environmental information can still be seen as in its infancy. Therefore adequate action has to be taken to promote the usage of environmental information systems thus supporting environmental protection within and between companies.

The bases for this paper builds a survey within the Austrian producing industry to investigate the demands for and the use of specific systems of operational environmental information systems. Additionally, specific examples of recycling networks and value chains will be analyzed to gain information about the communication of environmental related information between companies as well. Out of these investigation results inconsistencies between theoretical and scientific knowledge and practical applications will be investigated. This gap analysis as well as the identification of barriers and demands for the implementation of environmental information systems on both an operational and intercompany level should consequently form the bases for the development of an implementation concept to overcome the previously identified barriers.

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2. Empirical survey

The empirical analyzes was supported by the Austrian Federal ministry for traffic, innovation and Technology in the program "Fabrik der Zukunft". The survey was carried out in spring time 2004, in which 138 companies of the producing industry in Austria with more than 100 employees were investigated (representing nearly 10 %). The goals of these research studies are on the one hand to examine the status quo of operational environmental information systems in the Austrian industry and to analyze their support and usage in the companies. On the other hand barriers in implementing such systems are identified.

Due to the fact that environmental protection must not stop at the borderline of the company, the over-operational aspect of information systems has to be considered. Thus, possibilities to broaden communication of environmental information between companies are investigated. Equally with regard to the above mentioned intercompany environmental information systems, barriers and obstacles for an implementation will be analyzed. For the survey of over operational information systems currently existing cooperation and relationships between companies are analyzed. Thus, value chain networks and recycling networks are included in the survey. Examples for supply chain networks will be the automotive cluster Styria ACstyria (<http://www.acstyria.com>) and the plastic cluster in upper Austria (Bayer; Eder 2001). Recycling networks will be represented by the recycling network Styria (Schwarz; Steininger 1997) and the recycling network Oldenburger Münsterland (Hasler 2002). All in all, an additional 89 companies from the above mentioned recycling networks, clusters and value chains were analyzed, representing between 18 and 95% of the companies in each network.

The aim of this investigation is to find out essentially basic conditions for a successful implementation of environmental information systems in networks and to analyze the general suitability of such networks for an intensive intercompany environmental communication.

As an outstanding result, only 12 companies indicated having a specified environmental information system. Furthermore, databases are neither very well known nor used in the companies. Only programs for spreadsheet analysis such as MS Excel are popular and used by more than 70 % of the companies to handle environmental information. Nevertheless, those companies that admitted using specified environmental information systems also indicated that they predominantly use these systems integrated in other company wide software systems, so isolated environmental software systems hardly exist. What is also remarkable is the fact that the companies already using environmental information systems are conscious about the numerous possibilities and functionalities the software programs offer. Furthermore, they also utilise the functions, mostly the drawing of reports, monitoring legal compliance and analysing material flows. But also functionalities such as indicating environmental indicators and risk analysis are used by the companies. Moreover, companies also see the advantages in using these systems as they point out economic advantages of using such software systems.

On an overoperational level, a nearly similar picture revealed. Hardly any companies use specified environmental software systems for the communication of environmental related information between companies. The transmission of information by mail and telephone represents the standard. The potential for specialised environmental software systems is hardly recognised by the companies. However it is quite clear that on an overoperational level, there are not any significant differences in the answers of the companies in the networks and those companies not identified as network companies. Thus, indicating that also in the networks a change in awareness of the possibilities of appropriate communication instruments for environmental communication is needed.

The reasons for such a low number of users of environmental information systems can be seen in Figure 1, whereas the left hand side indicates reasons against operational environmental information systems and the right hand side reasons against inter-company environmental information systems.

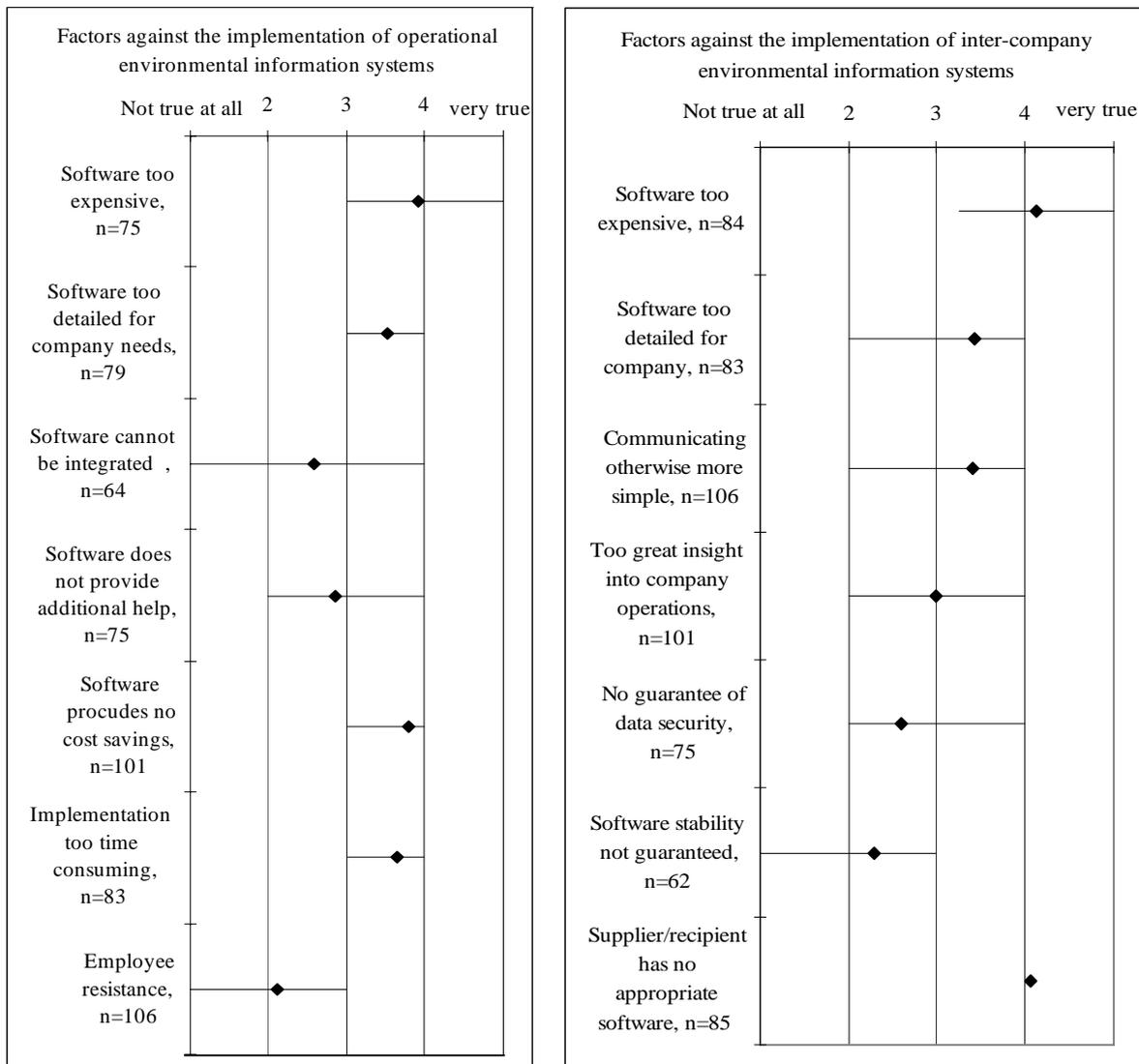


Fig. 1: Factors against environmental information system on an operational and inter-company level

Primarily costs aspects dominate as factors against environmental information systems at both the company and intercompany level. This is remarkable because those companies that have already implemented such systems underline positive effects on cost savings. Furthermore, many companies assume the software as too sophisticated and detailed for their own needs and demands. What is also remarkable is the fact that employees do not have great influence on the decision for or against such systems, although they are important concerning a successful implementation of the software system. In comparison, on the inter-company level the influence of suppliers and recipients is rather big. If they do not have appropriate software standards, the companies see no meaning in implementing environmental information systems in their own company. This brings us to the question how to overcome all these problems when implementing environment information systems both within and between companies. The following chapter will address these issues by presenting an implementation concept for environmental information systems.

3. Implementation concept for operational and intercompany environmental information systems

As an implementation concept a modular model was chosen to guide in 4 steps up to environmental information systems, as can be seen in Figure 2. Upper levels are necessary to fulfil the requirements of more advanced levels. For example the willingness of the company to organizational learning is necessary for further steps, especially concerning the awareness building towards sustainable development and environmental protection (Wiegand 1996). Additionally, the concept is divided into two parts.

The first one deals with the implementation of environmental information systems on the company level. Thus, organisational level represents the first and upper level. If an organization is open minded enough, the building of an appropriate environmental awareness can start. This is an essential key aspect, because without the necessary consciousness about sustainable development no further measurements will be taken (Steinle, Reiter 2002). Furthermore, in level three the companies have to become familiar with tools and methods for environmental protection. This ranges from simple energy and mass balances up to product life cycles and environmental indicator systems (Lang 2000 indicates this as the methodical potential of a company). Last but not least, when fulfilling these three steps the prerequisites for a successful implementation of environmental information systems are met. Nevertheless, the implementation itself additionally demands much competence and of course resources within the company.

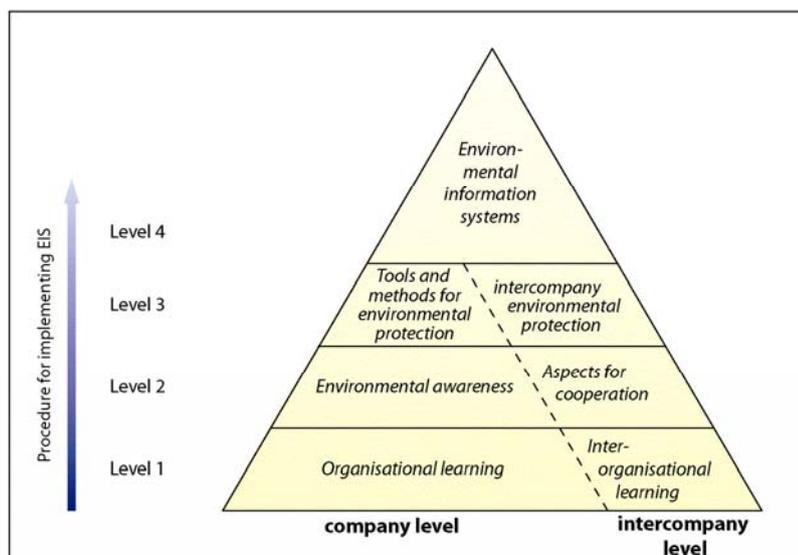


Fig. 2: Implementation concepts for environmental information systems on a company and intercompany level

For the intercompany level, this implementation concept will be broadened by specific aspects. On the first level the interorganizational learning becomes important as the knowledge sharing and the learning aspects from each other offer great potential of the cooperation between the companies. Concerning the network as a whole, specific cooperation aspects have to be dealt with, such as coordinating the activities within the network, creating shared visions and strategies and the aspect of trust in the network partners and the network itself (see for example Picot et. al. 2003). The third level deals with tools and methods as well as with activities for environmental protection between companies. Examples for such activities can be cooperation in recycling materials and cascading energy, the networking to improve and integrate production processes to improve a sustainable development and co-operating in the development of sustain-

able products. Finally, to ensure these cooperation activities, environmental information is needed and has to be communicated. Therefore, intercompany environmental information systems are necessary. To implement such systems, technical (e.g. which standard to use) organizational (e.g. which partner will get the information and in which form) and economic aspects (cost-benefit analysis) have to be taken into account to ensure a successful implementation for all network partners.

4. Concluding remarks

To realise environmental protection in companies, information is an essential and vital factor to ensure the measurements and activities needed for a sustainable development. This is particularly true when cooperation between companies is taken into account. Thus, a structured and systematic process for the gathering, preparation and saving of the information is required. Although specialised environmental software systems exist, the companies hardly utilise these systems, based on different reasons identified in the empirical survey. To overcome these gaps between the supply of practical applications of environmental information systems and the sparse practical application of these systems, an implementation concept was developed. This concept for implementing environmental information systems can be a flexible framework for organizational as well as inter-organizational cooperation efforts aimed at achieving sustainable development. In a four step model different levels describing a continuous path up to environmental information systems for both a company and intercompany use are described and thus should help companies to improve their environmental information systems.

Nevertheless, the implementation of such environmental information systems is a very strenuous process for companies that require a lot of resources. And from the current situation, many small steps are essential to finally realise a better sustainable performance of the companies supported by appropriate information.

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