Preface

TOWARDS THE NEXT GENERATION OF CORPORATE ENVIRONMENTAL MANAGEMENT INFORMATION SYSTEMS: WHAT IS THERE AND WHAT IS MISSING?

Today, environmental issues are frequently dealt with at corporate management level. The roots of this relatively new development can be traced back to the late 1980s. At that time, companies felt increasing pressure from international politics to internalize their impacts on the environment, drawing on the increasingly popular idea of sustainability which encompassed ecological, social, and economic aspects. The emergence of systems for voluntary eco-management, as e.g. EMAS or ISO 14001, further shifted the focus of environmental responsibility towards the companies, whereas the increasing number of environmental considerations that they had to face generally originated from company-external sources. In order to comply with environmental goals, a special category of information systems (IS) was created which is generally known as Corporate Environmental Management Information Systems (CEMIS). These systems were originally developed to meet a fairly restricted number of external environmental requirements. Nowadays, a large variety of highly specific, heterogeneous solutions for different environmental issues exists on the market. In spite of that, no truly integrative approach to the topic has been taken to date. In almost all cases where CEMIS contribute to the solution of large-scale problems, this happens at an operational level only.

Although there are external factors that can make the introduction of environmental management financially beneficial (e.g. marketing, reduction of resource consumption), it is questionable whether individual CEMIS that exist only at operational level are able to meet complex environmental goals. Additionally, such isolated solutions usually come with all the problems that business informatics experts try to prevent by constructing integrated systems, as e.g. data redundancy, heterogeneous user interfaces, inefficient communication etc. Bearing this in mind, it is even more surprising to see that the mistakes of the early 1960s and 1970s are still being repeated, leaving companies with the high costs of integrating separate, outdated legacy systems.

Considering the increasing public debate about a sustainable society, there is a growing demand on companies to go beyond a strict adherence to legal requirements. Instead of a mere response to external legislative demands, there is a clear call for companies to embrace active environmental protection. This does not only involve reducing unnecessary waste, but also improving the general efficiency of production processes in terms of production-integrated environmental protection, while at the same time satisfying the various stakeholders’ needs. To achieve this, a more holistic approach to CEMIS needs to be developed in order to support the production chain as a whole.
First steps have been taken towards the integration of corporate environmental protection into the goals of business practice. Also, there is a growing insight that emission and waste reduction holds some economic advantages, too. Based on frameworks set by relevant environmental laws, companies can reduce resource consumption and improve risk assessment.

Environmental management has to become an integral part of the companies’ long-term strategic goals to be effectively beneficial. Therefore, only roughly defined goals will not be sufficient. Ecological goals need to be specific and, where possible, quantifiable in order to set up means of evaluation and clear criteria for success or failure.

In the past, corporate environmental protection was regarded by many as causing nothing but costs. Since this image has been refuted, future research should highlight the cost-cutting aspects of CEMIS by demonstrating the synergies between economic and ecological goals. Researchers should strive for an integrated approach that supports both dimensions of sustainability in the form of a single information system.

In the light of the ongoing sustainability debate and the research results of the last years, the traditional definition of CEMIS has become largely obsolete. Former systems mainly supported operational goals, providing individual solutions for different, isolated problems without showing any integrative features. Nevertheless, the same is true for the majority of CEMIS that companies are working with today, i.e. CEMIS are still struggling with problems already known from the seventies and eighties.

The concepts and methods of EAI (Enterprise Application Integration) and information management should be applied to the field of CEMIS as well in order to provide an integrated view of environmental and economic problems, leaving behind the exclusive focus on operative management.

Based on the insights mentioned above, the following new definition of CEMIS can be suggested: CEMIS 2.0 are information systems that support the idea of sustainable development in a company and take a holistic and strategic approach towards material and energy efficiency, emission and waste reduction, recycling, stakeholder engagement, and legal compliance.

This volume includes contributions by researchers from Canada, China, Poland, Germany, Italy, Australia, Sweden, Denmark, Brazil, Switzerland, New Zealand, and the USA.

**Section One** of this book provides an introduction to fundamental aspects in the research area of CEMIS. It presents the new requirements and demands on CEMIS and discusses the goals that need to be addressed by CEMIS in the context of the sustainability debate. In his contribution, Möller outlines the guiding principles of CEMIS systems and basic methods, as, for example, life cycle assessment.

**Section Two** encompasses 9 contributions that are concerned with theoretical and empirical approaches to the topic of CEMIS. The article by Chen explains how Green IT – along with the concepts of virtualization – can improve organizational, operational, and environmental results. Von Hauff and Jörg discuss from a business perspective how to establish eco-innovation as an integral component of environmental management information systems, and hence as a major contribution to environmental protection. In the next chapter, Kamal et al. describe a process enabling micro-entrepreneurs with limited resources to enlarge their business by means of IT. This so-called IT therapy involves diagnosis, interventions and an assessment of IT for development outcomes. Based on the example of food industry companies, Antoni-Komar et al. examine how CEMIS could be enhanced to tackle the impacts of climate change. The following contribution by Rapp and Bremer explores the possibilities of existing approaches, including a detailed description of an advanced biomass procurement system. The chapter by Golinska addresses issues related to materials management for closed-loop manufacturing, based on the integration of material flows management systems with production planning and control systems (PPC) or business systems (like ERP) which are applicable in a remanufacturing environment. Subsequently,
the contribution by Ramos et al. shows in how far IT governance positively influences the achievement of strategic goals, especially in view of the controlling and correct management of investments. Erechchoukova et al. describe the assessment of an organization’s environmental impact, exemplified by the impact on a water resource. The authors also examine formal approaches to the development of temporal monitoring designs that serve to produce sufficient data to perform the assessment. Finally, the chapter by Gadatsch introduces the reader to the field of Green IT and presents an IT management and controlling concept which has been modified on the basis of current survey results.

The six chapters of Section Three are dedicated to frameworks, reference models and methodologies for CEMIS. The section starts with the contribution by Minke and Lessing, who describe an implementation concept based on mobile sensors and its evaluation within a pilot scheme. Subsequently, the article by Carlson provides an introduction to the structure of a well-functioning environmental information system. The contribution by Shakir introduces a framework for eco-efficiency implementation suitable for a particular eco-efficiency strategy. The purpose of the chapter by Akkaya et al. is to outline fundamentals of environmental reporting based on a comprehensive literature review and a recent project in Germany. The contribution by Bevilacqua et al. proposes a multi-agent approach supporting the inter-municipal infrastructure in order to achieve an optimal management of the waste collection service. Finally, the research of Erek et al. applies the concept of sustainability to the field of IS management, using practical concepts such as the procedural model, the balanced scorecard and a maturity model.

Section Four consists of six contributions dealing with the area of CEMIS applications. Firstly, Grünewald illustrates the integration of environmental information into a tool for planning production processes, aiming at including environmental considerations into the detailed planning of techniques and processes. In the next chapter, Isenmann proposes a standardized reference architecture for sustainability reports based on the eXtensible Business Reporting Language (XBRL), followed by a discussion of the resulting benefits. The contribution by Schmehl et al. focuses on the sustainability assessment of concepts of energetic biomass use. In this way, the authors provide decision support with regard to the different existing options of biomass use. Konstantinidis et al. describe the technology of the German Environmental Information Portal “PortalU” and present the content of the portal. In the following chapter, Michelini and Razzoli analyze some technologically-driven solutions for companies within networks which can be divided into three different levels of integration. Part Four closes with the chapter by Arndt and Graubitz who, by following the idea of providing special information to special interest groups, present a possible way of converting sustainability reports into topic maps by means of the eXtensible Business Reporting Language (XBRL).

Section Five rounds off this volume with three articles on case studies and pilot projects. Dukovska-Popovska et al. analyze current debates on the state of the art of sustainable supply chain management and green logistics. They present a case study from the Fujitsu Corporation in Japan and explore models of information systems and RFID use in green logistics in order to develop a combined model. Juan Wen and Xueqiang Lu describe eco-industrial parks (EIP) in China and the application of CEMIS for EIPs in accordance with the Chinese legal system. Finally, Pozzebon et al. investigate how corporate sustainable practices can be supported by information management models as well as information and communication technology applications. Their article is based on a case study in a Brazilian company that implemented a sustainability balanced scorecard (SBSC).