Improving of environmental management accounting system for support the environmental information management

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Abstract

In the last years the environmental awareness has strengthened because of the rareness or destruction of natural resources, increase of the costs as well as environmental problems and environmental impacts. Hence these require constantly environment-relevant control and agreement with enterprise purposes. These tasks assume the application of the environmental information management, which performs various and determining-relevant information. In this contribution the application of the environmental management accounting system in BI landscape is an efficient instrument in relation on effectiveness of the environmental information management.

1. Introduction

The ability to perceive the connection between the mutual effects from economic actions and ecological consequences led to the fact that the corporate management should interest to environmental impacts in the quantifiable dimension. These impacts are classified as following:

- Exploitation of raw materials,
- Interventions in natural control circuits,
- Pollution of the media air, water and ground and
to general impacts like noise and radiation

Because of this situation enterprise management shows interest in resource management and the reduction of emission through the introduction to strategies of environment protection and sustainability. In fact, these require application of the environment management for realization of the social, ecological and economical enterprise purposes.

This contribution motivates the application of the environmental management accounting system with business Intelligence tools which looks at the integration, at analysis and control of the environmental data and then make these data in reports in order to help the environment management in decision making.

2. Concept of the corporate environment management

Environment management means as an extensive and integral concept in the corporate meaning, that it can make a balance with the natural environment\(^1\). It can be defined and specified as a subsystem of the management in an enterprise. ,, Environment management includes the planning, control and improvement of

\(^1\) Steven, 1992, p.35.

\(^2\) see. Müller-Christ, 2001, p.4.
all operational environment protection actions as well as an environment-oriented corporate management and person management. It forms the foundation for a rational evaluation, optimization and decision in the environment protection. Environment management receive a responsibility for tasks of the environment protection by planning, realization and control of enterprise activities to avoid and decrease of environmental impacts as well as the long-term protection of the enterprise purposes. This can be reached only, as figure (1) shows, if the environment management is integrated extendedly into the decision making processes of the production, accountancy, marketing ...etc. Present experiences show clearly that environment management leads in this modern form to the statement „environment management can sink costs and relieve environment”.

For that, this view requires the integrated mutual connection between environment management and the other areas in order to achieve the environmental purposes and environment policy more effective.

![Figure 1: Integrated environment management](image)

For example, the relationship between environment management and production management gives an integrated and entire view about the environment-oriented effects and evaluations of the product (for example Product A has a lot of demand, however more emission (CO2) and more cost for filtering in contrast to product B that produce less emission and less filtering cost with the same demand such as in product A. Therefore it is the suitable decision to change from A to B). Consequently the integrated tasks of the environment management deal with all operational and official environmental aspects and protect the environmental compatibility and sustainability of the environmental resources in enterprise. Hence, it is designed to improve the direct consequences of the enterprise actions on the ecological environment as well as the indirect consequences along the product life cycle. But realization of these tasks requires using an effective environmental information management, because it is the central place in the environment management.

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4Helmut Krcmar, 1999, p.3.
3. **Care of information**

At first it must fulfill the task of the care of information. It includes environmental data and environment-relevant data and classifies it to many viewpoints. In particular this task is a basis for the detection of environmental risk, search for weak points and then support of decision making and measure execution. Therefore this task could be implemented with regard to the sustainability and environment protection strategy in the environment management. For that, the care of information procures the necessary information concerning the enterprise purposes in general and especially environmental management purposes.

3.1 **Coordination task**

It captures all areas in the enterprise. The coordination task fixes and controls the tasks of the environment management. In detail these tasks are: Functional subdivision for the work, development and assessment of ecological-relevant information as well as processing and supply of this information at the right time, at the right place in right aggregation art in enterprise. In addition, the coordination task has to lay the basis of a data processing support and procurement of information for the relationship between environment management and other areas in enterprise.

3.2 **Information and communication channel**

As already mentioned environment management should be integrated in enterprise. This is realized by EIM, so it is an interface between environment management and other areas for taking into account functionality and achievement optimization in enterprise. And through this interface information and communications are integrated in the enterprise guidance. But EIM still has the problem that they don’t measure and control the environmental data from business processes specifically and extensively. The capture, management, processing and evaluation of environment-relevant data can be reached by the application of an integrating model between environmental management accounting and BI tools on the basis of an economical-ecological target system.

4. **Environmental management accounting system in BI landscape**

Enterprises are confronted with the steady increase of data sources and data volumes. The data are not only stored but they must be collected, administered, filtered, analyzed and controlled to allow the best possible image of the situation. From the current data the knowledge must be derived or gained to be able to make on time strategic and operative decisions. These challenges have led to the set up of an environmental management accounting (EMA). A definition of environmental management accounting reads as follows: "Environmental management accounting is an additional subsystem that extends the overall controlling consisting of each planning, management, controlling and information supply components by both system building and system coupling coordination. These additional features support the system by means of an increased adaptability". 

It should release the environment-oriented purposes with regard to environmental laws /imposition, material property, material consumption, energy application as well as environmental characterization. The environmental management accounting supports the following concrete tasks:

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6 Martin Tschandl/Alfred Posch. 2003, p.11.
• Representation of the ecological situation (analysis)
• Construction of an early warning system (to the detection of chances and risks)
• Development of planning instruments and controlling instruments (input output calculations)
• Preparation of management decisions
• Derivation of aims and measures (control)
• Coordination of the environment protection
• A list of environment protection measures
• Supply of data for the external reporting.

Hence, the EMA considers an interrelationship between current data analysis results and the restrictions, which are often derived from ordinance and laws that are based on environment protection. Consequently it identifies and avoids probably environment-related problems and dangers on time through the connection with Is-analysis in comparison to different restrictions. Then this will initiate the activity planning and control and afterward create a report for ecological and economical evaluation. Therefore, the EMAs must provide the necessary information in structured form. For the effective functionality of this system environmental data can be integrated in the form of environmental data marts in BI landscape. Therefore this system can profit from the available BI tools. This increases the transparency of the environmental information management in the enterprise and supports the environment-related decision making. In addition, this model can answer the following questions:

• Which raw materials must be used to maintain low production costs?
• How much costs disposal of product?
• If enterprise has recycling activity, does that sink the current costs?

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7 Uwe Stoltenberg/ Michael Funke, 1996, p.35.
4.1 Principles of the integration model

Figure 2: Integration model Business Intelligence and environmental management accounting functions

4.1.1 Environmental Data Warehouse

Data is stored both in environmental and economical data warehouses (DWH). It is worthy of note, however, that an integration of both data pools has not yet been attempted. As usual, the environmental data may be loaded into the company’s data warehouse by means of the normal ETL process. The environmental indicators can be grouped into a data mart and are available to users relative to the further compartment-specific data marts. Thus, they are available for analysis.

4.1.2 Environmental management accounting

Current state analysis: The determination of the actual state is particularly important for the environmental accounting process. By accessing the data directly in the BI landscape it is completely irrelevant where the required data for Analysis is located. Thanks to the ETL process the environmental indicators need to be defined only once and are automatically kept up to date. Every time they are available for being used in reports. The complex analysis of data to identify structures and patterns automatically is performed by using the integrated data mining tools in the framework of data analysis as well as in the presentation layer of the BI architecture.

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8 It will be published in 2010.
Operational planning: To define the complex planning process of the economic and environmental policy options an effective software support is necessary. To do so, BI tools may be used to support all phases of an integrated and flexible environmental planning. Despite of the decentralization of planning activities, the consistency of all data required by the data warehouse environment is guaranteed. Features supporting the planning activities can be defined already during the early stages of the ETL process. As a consequence they are available to the planner immediately after entering the budget figures and key figures in a graphically-processed form.

Management of actions and Controlling: There are clear improvements in the management process as soon as BI is used. The major benefits of using business intelligence tools consist of advantages of faster analysis, better handling of large data volumes, higher automation and improved decision making. A periodical, automated analysis of variance (plan versus is) by means of standard reports allows conclusions to which extent the original objectives have been met. Deviations will be detected earlier, without any extra effort. Thanks to the BI alerting function one will be able to take corrective decisions in time. The search for economic and ecological alternatives will be simplified by the general view on the current situation in the environmental dashboard/cockpit.

4.1.3 Reporting

Finally, the results of the ecological analysis should be reported and visualized in an intelligible way. By setting up a well-defined business intelligence platform suited to the needs of EMAs the quality of the reporting process (in terms of relevance, plausibility, coherence ...) will be considerably improved. Such a platform may be organized in the form of current day, month or annual reports. For both the preparation and presentation of reports a large number of software solutions are available. To improve the user’s performance, many of these BI tools offer a graphical interface and drag-and-drop techniques for creating ad-hoc reports. Those tools are particularly suitable for employees being in lack of profound IR knowledge, thus enabling them to perform evaluations without needing to forward their requests to IT specialists. Standard reports and dashboard are prebuilt reports which contain recalculated ecological indicators and which may serve as a basis for decision making. BI portals also offer the usual list export in standardized formats such as csv, pdf, xml, which can be used in other applications.

4.2 Functions of the environmental management accounting system for support of the environmental information management tasks

The EIM plays the central role in various tasks in environment management: the care of information, the integration of the targets and strategies of environment management on operative, tactic and strategic levels as well as an interface for information and communication. For this, it needs to receive constantly and at an early stage the recent and integrated information from the EMAs. Hence, EMAs receive responsibility for the support of EIM tasks through the following tasks:

4.2.1 Decision support system

EMA functions with BI tools support the decision making in environment management, because the task of business Intelligence tools is the collection, processing and representation of information for the decision support. For example, OLAP processes fix in figure (3) the weak point about environment protection measures and analyze its reasons and then creating Ad-hoc-Reporting. Through the internal reports

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9 Carsten Bange, 2009, p.158.
the environment management manages and controls the operative measures in relation on reduction of the environmental impacts and the material and energy efficiency.

4.2.2 Early warning system:
The application of the BI tools makes the execution of the EMA functions of analysis, planning and control easier. Such a system informs the EIM with in time warnings and gives remarks for the present situation. **Performance Dashboard (cockpit)** is, as in figure (4), a tool in BI and serves the clear and easy representation of aggregated information\(^\text{10}\). It generates either positive or negative signals that help the environment management in the control of environment-related processes.

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\(^{10}\) see. Carsten Bange, 2009, p.162.
In addition there is **Balance Scorecard** (BSC). It creates other functions from key performance indicators. BSC as a management method of the strategic enterprise guidance propagates an integral and comprehensive look at the Key performance Indicators (KPIs) in an enterprise as well as a conversion of visions and strategies in concrete KPIs and actions\(^\text{11}\). Therefore it can be profited from these tools in the environment protection strategy as Figure (5) shows. BSC describes an varied tasks of the activity planning, communication and inspection of KPIs and contains typical possibilities for the data analysis and report.

\(^{\text{11}}\) Carsten Bange, 2009, p.162.
Conclusion

The implementation and realization of the enterprise guidance targets require as a general cross section function the development of suitable instruments which support the integration of the environment protection in every unit in the enterprise. The environmental management accounting system in BI landscape is a suitable control instrument for the constant improvement of the operational environmental achievement. And it is used for the improvement of the effectiveness of environmental information management, because the optimization of the organizational structures contributes essential to the improvement of the corporate environmental consequences. The purposes of such system are the identification and control of the environmental risks, the coordination of all environment-related tasks as well as the definition of personnel responsibilities for the actual implementation.

5. Literature


