

ENVIRONMENTAL MANAGEMENT ACCOUNTING (EMA) IMPLEMENTATION: MOTIVATION AND EXPECTED RESULTS FROM A BUSINESS PERSPECTIVE

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A *bstract.* Environmental Management Accounting (EMA) is concerned with physical and monetary information, therefore enabling a new type of analysis that supports decision making while considering the environmental dimension. However, for an organization to apply EMA is necessary to meet business requirements and therefore the potential benefits and likely costs of the implementation should be assessed in the first place. The first objective of this paper is to highlight the reasons for implementation of EMA referring to eco-efficiency, cost-effectiveness, investment appraisal, strategic positioning and compliance. The second is to presents a high-level blueprint for EMA implementation for a theoretical company and highlight the factors that influence the success of the implementation. The conclusions suggest that given the multitude of EMA methodologies, comparative studies might shed more light for practitioners.

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1. Aims

In the last years, environmental issues have gained importance due to a number of factors such as: increasing interest of internal and external stakeholders in the environmental performance, environmental pressures on the supply chain, disclosure of various companies of their environmental performance according to Global Reporting Initiative guidelines, increasing interest of investors in socially responsible investments indexes, regulatory pressures, environmental tax pressures and cap and trade pressures, such as the Kyoto Protocol (IFAC 2005 p. 10-11). As there is a growing consensus that traditional accounting practices do not provide sufficient and adequate information for environmental management (IFAC, 2005 p. 3), EMA emerges as a field that aims to provide such information.

The definition of EMA according to the EMA Expert Working Group of the United Nations Division of Sustainable Development (UNSDS) focuses on both the physical and monetary nature of EMA:

“EMA is broadly defined as the identification, collection, estimation, analysis and use of physical flow information (i.e., materials, water, and energy flows), environmental cost information, and other monetary information for both conventional and environmental decision - making within an organization” (UNSD, 2001, p. 4)

EMA is a relatively young discipline; there is no single definition universally accepted and moreover there are several methodologies suggested by different institutions such as IFAC (2005), UNSD (2001), MEJ (2002), and EPA (1995).

The study of the actual implementation is relevant because there is little implementation-related advice. Although several studies such as Munkøe and Jasch (2008), Burritt and Saka (2006) and De Palma and Csutora (2001) present results of EMA implementation and technical recommendations, to the best author's knowledge, there are no studies on EMA implementation from a project management perspective that considers the organizational aspects.

This article briefly presents in section two the categories of benefits of EMA implementation. Section three summaries a high-level blueprint for EMA implementation by a company while highlighting the points that need consideration when customizing the EMA concept for the organization, and factors that impact the outcome of the implementation. Finally, the last section of the articles presents the conclusions and directions for further research.

2. Background: Rationale and benefits of EMA implementation

As the implementation of EMA requires resources (financial, time and people), for an organization to apply EMA is necessary to meet business requirements and therefore the potential benefits and likely costs of the implementation should be assessed in the first place. The literature presents several categories of reasons for implementing EMA such as eco-efficiency, cost-effectiveness, investment appraisal, strategic positioning and compliance. Theoretically, after the EMA implementation an organization becomes more efficient and more environmentally friendly at the same time due to the visibility of environmental costs which leads to identification of areas of improvement.

EMA unites both physical and monetary information, therefore allowing for a new type of analysis based on **eco-efficiency indicators** (ratios between an environmental and a financial variable). The calculation of these indicators should help to simultaneously reduce costs and environmental impacts via more efficient use of resources. According to a study of Burritt and Saka (2006), which reviewed several case studies made in Japan, the potential of this type of indicators is underutilized.

Cost-effectiveness refers to increasing internal efficiency by clearly identifying and allocating environmental costs and implicitly adequate pricing of products. As companies tend to underestimate environmental costs, studies such as De Palma and Csutora (2001; p. 35) show that under a conservative estimation, taking into account only some of the cost categories, the actual environmental costs calculated after the implementation of EMA were two to ten times higher than originally estimated for the four companies included in the study. Moreover, in the same study the environmental costs for all four companies, were 5 to 10% of the total variable production costs. A correct estimation and allocation of the environmental costs enables adequate pricing of final products.

EMA can be used for **sound investment project decision making** as it allows for better assessment of the economic impacts of the environmental performance of the business. Therefore, EMA should have a strategic role in policy and planning. De Palma and Csutora (2001, p. 37) shows that managers seem to immediately recognize the benefits of using EMA as a very useful tool for justifying environmental projects within the company and that their bargaining power increased significantly with their capability of showing the economic significance of environmental costs compared to total production costs. Moreover, this study showed first that the allocation of environmental costs to

concrete production steps allowed for the identification of portion environmental costs that could be reduced by implementing a cleaner production option. And secondly, the study identified the portion of the environmental costs that could be avoided if significant investments in BATs were undertaken. On the same line, the study of Sarker and Burritt (2008, p. 473) regarding the offshore petroleum industry in Australia, argues that the information provided by environmental accounting has a significant influence on the investment decisions of managers.

The result of more strict environmental regulation (EU-ETS cap and trade system; the EU Directive Integrated Pollution Prevention and Control, increasing number of specific taxes such as carbon tax; toxic chemicals, environmental fund in Romania) increases environmental reporting by companies. EMA could very well serve as a cost-effective tool to aid in **compliance with the environmental legislation and environmental reporting standards** (IFAC 2005 p. 11). Moreover, EMA could reduce compliance costs as environment-related authorizations will be readily granted to environmentally well-managed companies (Godschalk, 2008).

All of the arguments mentioned above are solid reasons for implementing EMA. However, as studies like De Palma and Csutora (2001, p.37) show, EMA can be applied to any company but the benefits that can be gained may vary considerably depending on their particular conditions.

3. Discussion: EMA implementation from a project management perspective

Several case studies such as those of Munkøe and Jasch (2008), and De Palma and Csutora (2001), which use different methodologies, prove that EMA benefits can be achieved irrespective of the specific methodology. EMA has a great potential that should be reaped by any interested company. To achieve that, a clear methodology of implementation is necessary.

Based on the assumption that the implementation of a specific cost typology is not the most relevant factor for the success or failure of EMA implementation, this section presents a project designed to implement the EMA concepts in a company, irrespective of size and industry.

Kumpulainen and Pohjola (2008 p. 479) describe the steps of EMA implementation as follows: the detailed description of the company's processes, the identification and quantification of the company's environmental impacts and calculation of environmental costs and simulation of potential improvements in

processes. On the other hand, De Palma and Csutora (2001 p. 19-30) mention other steps for their methodology: scoping EMA, calculation of environmental costs (including cost of non-output goods), allocation of environmental cost, building the information system for EMA and finally reviewing EMA.

Implementing EMA is a complex task because it must be integrated with other environmental tools, such Environment Management Systems (for example as defined by the ISO standards), cleaner production assessments, environmental performance and evaluation. The blueprint for implementation presented in this article builds on the methodologies mentioned above but also takes into account the structure of a company and defines the following phases: *Initial Analysis*, *Concept Design*, *First Assessment*, and *Data Analysis*.

3.1. Initial Analysis

Once top management decides to implement EMA, the first step is defining the scope of EMA, i.e. identification of the area of focus and the depth of analysis. First of all, an initial assessment is performed. The objectives of this phase are presented below.

- Identification and classification of the environmental issues that will be considered under EMA, taking into account the specific features of the company's activities (the processes/products with the most significant environmental aspects such as spill management, bioremediation, products and by-products, abandonment of facilities, etc.);
- Definition of the *EMA reporting unit* (e.g. business entity, business divisions, business unit, production unit, etc.) considering the organizational structure, processes, environmental aspects and their impact distribution, the value chain of products, life-cycle-analysis of the products. At this stage companies can either choose to focus on activities, products or organizational units of the company.
- Analysis of the features of the accounting system and identification of the accounting practices relevant from an environmental perspective (cost centre structure, relevant cost elements and fixed assets, accounting treatments, environmental provisions) with impact on EMA implementation. As the De Palma and Csutora (2001; p. 35) case studies show, EMA must adapt to and integrate with the current accounting practices, as it is unlikely that a company decides to change them (e.g. existing cost centre structure of the company, specific environmental issues related to local fees, etc.);

- Identification of the databases and software resources (e.g. Enterprise Resource Planning (ERP) systems) of the company that will support EMA data gathering and reporting processes and the modification in the company's software systems in order to reflect the EMA targeted activities (e.g. the type of data to be stored, such as quantities of raw materials, operating materials, by-products).
- Identification of existing and potential conflicts with the current setup for integrating the EMA processes requirements with the existing setup of the company (Environmental Management System, Corporate Social Responsibility, internal and external regulations, external reporting methodologies, ISO 14001 requirements, and Romanian authorities such as the environmental protection agencies).

3.2 Concept Design

The initial analysis is followed by the design of the EMA concept that will be implemented in the company. The EMA concept should be designed considering the current company setup and the best way to integrate the EMA methodology into it (e.g. processes involved; company internal regulation to be affected, types of data to be reported).

Designing the EMA concept essentially refers to the definition of the purpose and the boundaries of the EMA process in the company (the environmental costs and revenues). The creation of a custom-made, company specific EMA concept should be the result of the compliance of the opinions of relevant stakeholders (departments) with the approval of the executive board. The objectives of the concept design phase are presented below:

- Choosing the EMA methodology to be used. For example, the one presented in IFAC (2005) implies tools such as Physical Mass Balance (input-output balance), Special environment-related cost categories (end-of-pipe, integrated prevention); Environmental domains to which cost categories are allocated, environmentally relevant technologies/equipment types; and the following cost classification: material costs of products, material costs of non-product outputs; waste and emission control costs; research and development; less tangible costs; environmental related earnings; equipment depreciation.
- Definition of the specific cost centres, cost centre hierarchy, cost elements and secondary cost elements relevant from an environmental perspective. To all the previously mentioned a percentage of relevance

will be applied, as only part of the costs allocated per a cost centre, for example, are relevant from an environmental point of view.

- Definition of the significance threshold for EMA indicators. Generally not all costs are precisely measured, but only those that are higher than a set percentage of the total production or variable costs.
- Definition of the data to be gathered and the sources. Munkøe and Jasch (2008 p. 391) give detailed recommendation regarding data collection, estimation of loss percentages and definition of environmental relevant equipment.
- Drafting of the specific EMA reports for each EMA reporting unit; defining the schedule of the reporting and audits, both internal and external.
- Assessment of the regulations and procedures impacted by EMA implementation and needing to be revised or redesigned (e.g. changes in reporting needs).
- Definition of personnel requirements for the newly defined EMA processes (e.g. number of people, skills required, new responsibilities, etc.).

3.3. First Assessment

The first EMA assessment is the actual first reporting cycle. The data is gathered from the identified sources, the software system is updated, the reporting process and reports and their respective timelines are created; and the responsible personnel and responsibilities are assigned; company regulation is updated, relevant personnel is trained and EMA is communicated. The objectives of this phase are presented below.

- Updating the company regulations (policy/standards/recommendations/work instructions, etc.) to include the necessary changes (e.g. new rules regarding the environmental equipment depreciation based on EMA relevance percentage; the amendment of the procurement process by adding environmental criteria when purchasing new equipment, etc.).
- Communication of all the changes resulted from implementation of EMA to the relevant personnel.
- Identification of personnel to be trained and the assessment of training needs (i.e. training content and frequency).
- Communication of EMA to all relevant (internal and external, if necessary) stakeholders (such as employees, clients, suppliers, authorities, etc.) and the support required from their side (if necessary).

- Implementation of the adjustments in the software system to include EMA necessary conditions by: determining the modifications in cost centres hierarchy (adding, deleting, etc.); installing new accounts, changes in the depreciation procedures of fixed assets, creating cost objects for environmental data gathering purposes; changing the accounting treatment for certain environmental expenses, taxes, fines; recording measurement units for all materials included in EMA reports; implementation and testing of software modifications.

After all the above points are in place and the data gathering is finished, the next step is the calculation of all EMA indicators, cost and revenues for the first reporting period.

3.4. Data Analysis & Measures Design

The analysis of the data for the reporting period is prepared in order to identify improvement measures for the environmental and economic performance and to support the decision making process. The following types of analysis are recommended: statistical analysis of EMA data evolution, qualitative analysis of the causes of the out-of-range indicators, comparison of the achievement of the set objectives and targets and the determination of the trends of significant indicators.

3.5. Critical factors for the success of EMA implementation

The factors that impact the success of the implementation of EMA in a company refer to support of top management, strategic management, group regulations and policies, input prices and environmental regulation.

According to De Palma and Csutora (2001, p. 36), the support of top management is a crucial issue in applying EMA. Without this support, EMA risks to be a one-time exercise rather than everyday practice. Kumpulainen and Pohjola (2008 p. 487) show that without management support due to lack of interest from external stakeholders, the resources allocated to EMA were limited.

Taking into account the corporate group internal regulations, management is sometimes restricted as the management accounting system is usually standardised at group level. Therefore EMA is easier to introduce in a company in which the group wide policies are concerned with the environmental aspect and very difficult in those that are not. However, if the whole group adopts EMA, it can be used as a benchmarking tool (Munkøe and Jasch, 2008 p. 389).

According to De Palma and Dobes (2010, p. 1812), the absence of strategic management and existence of a “intuitive strategy” which lacks structure and an excessive attachment to the current strategy resulting in resistance to change are factors that acted as barriers to the implementation of their sustainable enterprise strategy that included EMA.

Other factors that influence the adoption of EMA on a wide scale refer to input materials, regulatory regimes and enforcement, stability of business environment (De Palma and Csutora, 2001, p. 37). High input prices encourages the use of EMA since significant savings opportunities can be revealed. On the other hand, low input prices are small and often insignificant. In addition, strict environmental regulation and enforcement encourages the use of EMA, due to potential savings from reduced environmental fines, fees, and liabilities. De Palma and Csutora (2001, p. 37) show that a relaxed environmental legislation constitutes a demotivating factor for EMA implementation.

Another significant issue is the coherence of the methodology over time especially when aggregating data at company level. Special attention must be paid to the comparability of data over time, as organisations change, merging, splitting or reorganising. Keeping a coherent methodology and creating a baseline are essential for the long-term analysis of the overall environmental performance of a company.

4. Conclusions

An analysis based on the EMA data provides information and influences significantly the decision making. Nevertheless, EMA can be valuable for a company only if some conditions such as: support and commitment of top management, the use of a coherent methodology, good communication and involvement of stakeholders.

More and more companies report environmental data and because EMA allows for a lot of customization at the moment, the creation of a standardized methodology would help to better understand the indicators. It would also allow for a better comparison among companies while better concepts might emerge from the collaboration of EMA “experts” working together. The main idea that this study tries to advance is that in order to use EMA at full potential, first of all it must be clear what EMA is, how it can be implemented and used. In order to achieve this, further comparative studies are necessary to bring forth what is working and what isn't; a coherent methodology is needed to be able to compare different types of implementation.

Further studies could attempt to produce an ontology and, maybe, aid to create international standards for EMA such as the International Financial Reporting Standards. Such standardization would significantly aid environmental audits and would make easier the knowledge transfer between companies. Therefore, the first step is a common understanding of the objectives and aims of EMA.

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