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Green controlling – concept and practice

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Abstract. *The three-dimensionality of sustainability links the following fundamental areas: ecology, economy and society. Sustainability controlling focuses on a three-dimensional sustainability-oriented system of corporate goals, which equally includes economic, environmental and social goals. Therefore, the objective of sustainability controlling is the comprehensive support of sustainability management, namely formulating and implementing a corporate policy that comprehensively covers all three dimensions of sustainability – people, planet, and profit. One of the pillars in defining sustainability is the environmental pillar. Among the three pillars of sustainability, the environmental dimension is the one that receives constant attention from academia, organizations and policy-makers. Governments, international agreements, society and various stakeholders pressure organizations to improve their behavior towards the natural environment. Thus, authors chose to focus in the present research on green controlling. There is a variety of terms used to name "green controlling" such as environmental controlling, ecologically oriented controlling, ecological controlling, eco-controlling etc. The concept is widely spread and accepted in German-speaking countries, whereas the Anglo-American scholarly community conceptualizes "environmental management control systems" or "environmental management accounting". The authors' objective is first to clearly define the concept of "green controlling" and secondly, to thoroughly state the most relevant instruments of green controlling for each of the following areas of responsibility: supply area, disposal area, environment area, adaptation area and coordination area. The importance of the presented research lies in the need of both controllers and managers for a clear set of easily and efficiently applicable instruments of green controlling, in the lack of which any theoretical debate lacks on relevance.*

Keywords: sustainability, environment, green controlling, management control systems, instruments.

Introduction

The three-dimensionality of sustainability links three fundamental areas: ecology / planet, economy / profit and social / people. Sustainability is an integrative concept, thus only in the case of equal consideration of all three dimensions is the term "sustainability" indeed appropriate. Among the three pillars of sustainability, the environmental dimension stays over time constant regarding the interest given to the topic from academia, organizations and policy-makers. Organizations around the world are facing pressure from governments, international agreements, society and various stakeholders to improve their behavior towards the natural environment. These pressures, due to environmental uncertainties, recent global issues such as climate change, and the scarcity of natural resources all affect the management control system, i.e. the controlling of organizations. Given the importance and relevance of the topic, the present paper focuses on the integration of environmental concerns into the corporate controlling, more precisely on the so-called "green controlling".

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The paper is structured as follows. The first section analyzes the various understandings upon the concept of "green controlling" in the academic literature. Second, the concept of "environmental management accounting" is introduced, as defined in the Anglo-American literature, due to the fact it overlaps with the main concept discussed in the paper, that of "green controlling". The third section provides an overview on the green controlling instruments that are available to practitioners, differentiated in the following categories: instruments in the supply field, instruments in the disposal area, and instruments in the environment field. Last but not least, the conclusions provide a synthesis of the main contributions of the paper and re-emphasize the importance of the authors' work.

The concept of green controlling

There is a wide range of definitions and approaches on the subject of green controlling. The proof of this is the existence of a variety of terms such as environmental controlling, ecologically oriented controlling, ecological controlling, eco-controlling, green controlling, etc. (Schaltegger and Sturm, 1992). Similarly, there is no precise definition of the term "green controlling", similar to the term "controlling", for which there is also no generally accepted definition. Nevertheless, as a starting point for the definition of green controlling, the traditional (non-environmentally oriented) concept of controlling is used in connection with the environment sector. In the present paper, we use the term eco-controlling and green controlling interchangeably.

Thus, Hoitsch and Kals (1993) define eco-controlling as a subsystem of the company's management, which systematically co-ordinates the planning, control and information supply of the company's environmental protection and thus supports the adjustment and coordination of the overall system. In other words, eco-controlling should moderate, formulate, implement, impose, carry out, and control the environmental objectives. From the perspective of Rueck (1993), such controlling serves as guidance assistance by providing information and instruments that are relevant to the environment and relevant to decision-making.

Simply formulated, eco-controlling is the transfer of strategic and operational controlling to environmental management (Schaltegger and Sturm, 1992). Seicht (1994) defines eco-controlling as a tool for the analysis, planning, management and control of all environmental activities of the company. Eco-controlling is primarily an information system for the collection, evaluation and decision-oriented preparation of ecological information. It is suitable both as a strategic radar for anticipating future developments and subsequent strategy derivation as well as for operational management of the company.

According to their basic orientations, the approaches of eco-controlling can be divided into three groups (Schaltegger and Sturm, 1992):

Financially oriented approaches: They support an ecologically-oriented differentiation of financial controlling and accounting and are based on the financial impacts of ecology-induced measures as target and decision-making variables. Valid is the one-dimensional view, or the measurement in monetary units.

Ecologically oriented approaches: They promote the enlargement of financial controlling and accounting by setting up and implementing a controlling that is carried out in parallel. Targeted is the collection and management of environmental impacts of

economic activities. The approach is one-dimensional, namely if focuses on the measures of environmental pollution.

Integrated approaches of economy and ecology: This concept integrates the first-mentioned approaches and has a two-sided objective: on the one hand the measurement and control of the financial effects of ecologically relevant actions and, on the other hand, the measurement and control of the ecological effects of economic actions. There is a two-dimensional view: measurement is made in monetary units per environmental pollution unit and in environmental pollution per monetary unit.

The concept of environmental management accounting

The concept of "green controlling" discussed in the present paper is based on general 'controlling' conceptualizations that are widely spread and accepted in German-speaking countries (Guenther et al., 2016). However, due to different traditions, practices, and language barriers, the Anglo-American scholarly community conceptualizes "environmental management control systems" or "environmental management accounting", concepts which partly overlap with the "green controlling" that builds the focus of our research.

Environmental management accounting is implemented in practice and promoted by the academic literature in order to overcome the limitation in conventional management accounting which cannot provide sufficient information relating to environmental management. The revelation of hidden environmental costs provides organizations with better decision making and improve organizational performance (Ismail et al., 2014). Environmental Management Accounting (EMA) can be defined as "the identification, collection, analysis and use of two types of information for internal decision making: i) physical information on the use, flows and destinies of energy, water and materials (including wastes) and ii) monetary information on environment-related costs, earnings and savings" (Jasch, 2009 in Papaspyropoulos et al., 2012, pp. 133).

In other words, EMA incorporates two types of environmental information, namely, physical and monetary (Mokhtar et al., 2016). Physical environmental information refers to the flow of energy, water, materials and wastes, for instance the total volume of wastes and energy consumed and the total amount of fresh water consumed. Monetary environmental information relates to (1) environmental costs – for instance the material costs of product and non-product output, waste and emission control costs, environmental research and development costs and (2) environmental earnings – such as recycling subsidies and sales from scrap and wastes. The size and effect of companies' environmental impacts can be identified through both physical and monetary environmental information.

This differentiation between physical and monetary environmental information is considered to applicable also to the experts that support the implementation of EMA in the organization. Vasile and Man (2012) name two groups of experts: (1) the accountants whose main tasks are to assess, to monitor, and to book the products sales, the incomes according to cost centers, the acquisition costs etc.; and (2) the technologists whose main responsibility is to elaborate balances for materials, water, energy, waste, emissions etc. expressed both in physical and in monetary units and as costs.

The place of EMA in the environmental management system of a company is a well-defined one, as underlined by Passetti and Tenucci (2016), in accordance with Epstein and Roy (2003, 2007). There are five formal steps to implement environmental management inside a company: (1) formulate an environmental strategy; (2) establish and document

environmental policies; (3) develop a capability building program for environmental management; (4) design supporting management systems and (5) identify appropriate measures. Environmental management accounting is connected to phase (5), while phase (1) corresponds to environmental planning and business strategy, operational practices and environmental management system certification can be mainly linked to the phases (2), (3) and (4).

De Palma and Dobes (2010) considers that EMA has both strengths and weaknesses. First, a positive aspect about EMA is that the performance of the operational level can be monitored and analyzed through it. Moreover, EMA enables accountability for local performance of the processes, and sheds light upon the total environmental costs from the system perspective. In the view of De Palma and Dobes (2010), these are the main strengths of EMA, whereas its central weaknesses are the following: EMA does not take into consideration the dynamic baseline of industrial processes; a tool additional to EMA is needed for identifying improvement measures; and it represents only the "checking part" of the learning cycle, without bringing the desired change of organizational goals or decision-making rules in the light of experience.

Instruments of green controlling

According to Greiling and Ther (2011), the instruments of eco-controlling are differentiated into strategic and operational instruments. From a strategic perspective, relevant instruments are the ecology-oriented analysis of opportunities and challenges, the ecological early warning system, the ecology-oriented portfolio analysis or ecological performance measurement and performance management systems. At the operational level, instruments are the ABC assessment, eco-efficiency indicators, material and energy flow calculations, pollutant-based life-cycle calculations, as well as ecological budgeting.

With respect to environmental management accounting, examples of instruments are (Guenther, Endrikat, and Guenther, 2016): direct costing, break-even-analyses and variance analyses for cost issues or material flow cost accounting (MFCA), life cycle costing (LCC) for environmental issues, carbon accounting, environmental budgeting. Such instruments are all intended to support managerial decision-making. Often, such instruments are applied to both monetary and non-monetary data. In general, corporate impacts on environmental issues can be measured and analyzed with qualitative, quantitative, and monetary data within dedicated accounting systems or with more sophisticated instruments and tools.

Bleis (2005) classifies the entire range of eco-controlling instruments according to its specific areas of responsibility, respectively: supply area, disposal area, environment area, adaptation area and coordination area. The present section describes the eco-controlling tools that are appropriate for each area.

Instruments in the supply field

A key instrument in the supply sector is the eco-account framework proposed by IÖW. Its use is the preparation of all raw materials and consumables used in the company, as well as the goods for sale. The advantage of this eco-account framework is the systematic provision of information on the various objects of collection and analysis and their grouping. The information to be collected on these materials is: exact description, use quantity,

composition, function, as well as their place of use (product / production step) for the purpose of easier allocation in case of a product- or production-specific investigation (according to Lehmann, 1993).

As a second instrument, Bleis (1995) mentions the cost overview, which includes the costs that arise in the procurement and storage sector and are due to environmental aspects. Such a cost overview plays the role of a business-oriented orientation, which shows the company in which cost centers and which costs types have to deal with ecological aspects. Therefore, this cost overview can be created independently of the actual cost calculation.

Thirdly, the so-called environmental dictionary is to be mentioned as a tool for eco-controlling in the supply area of companies. Bleis (1995) proposes the handbook for environmentally friendly procurement, published by the German Federal Environmental Agency (*Umweltbundesamt*) in Germany, as the basis for the development of an environmental trading book. This manual contains important tips on the environmental problems of products and provides an overview of the market development, the environmental pollution relief effect and the possibilities of applying environmentally friendly products and measures. The annex of the manual contains a list of institutions which can provide further product- and environmental-related information.

Instruments in the disposal area

Similar to the supply area, an eco-account framework must also be created in the disposal area. At the forefront of the eco-account framework is the company's output, waste, sewage and waste gases, as well as the products and their packaging. The following information about the output elements is important for the preparation of the eco-account framework: the exact description, the quantity, the composition and the place of origin (product / production step). Another instrument is the cost overview, which captures and systematizes the costs arising in the area of waste resulting from environmental aspects.

Environmental cost accounting is often used within the framework of eco-controlling, as described by Michel et al. (2014). These include instruments such as material flow calculation, product lifecycle calculation or carbon management accounting. Such instruments are also suitable in the field of disposal. The main issue in environmental cost calculations is to select a suitable measure unit: either monetary values (e.g., Euros) or the original physical-quantitative unit (e.g., tons of CO2 emissions). The monetary values are suitable for costs which are already referred to as "environmental costs" in conventional accounting. Such costs are directly linked to the environmental impact, such as costs for an air filter system, costs for the consumption of gasoline, gas or coal, or even internalized costs of external environmental effects such as the costs for the purchase of CO2 certificates. The original physical-quantitative units are, for example, the volume of toxic waste or CO2 emissions in tons.

Instruments in the environment field

The environmental context of the company must be precisely defined and as complete as possible. Bleis (1995) cites as the main instrument of controlling the relevance group scanning. By using this tool, the company gains an overview of its market and legal situation, identifies the weaknesses of the product range and the production facilities, separates those raw materials, products or technologies that are constantly under

environmental pressure and increases their awareness of the ecologically relevant requirements and games of power. The implementation of relevance group scanning is periodically recommended.

An instrument for visualizing the results of an environmental analysis is the eco-portfolio as described by Bleis (1995). Figure 1 illustrates the so-called "ecological print / turnover portfolio". The purpose of the study on the basis of an eco-portfolio is the derivation of a coherent strategic direction, whereby the ecological pressure is not necessarily understood as already existing pressure, but also as a future or potential pressure.

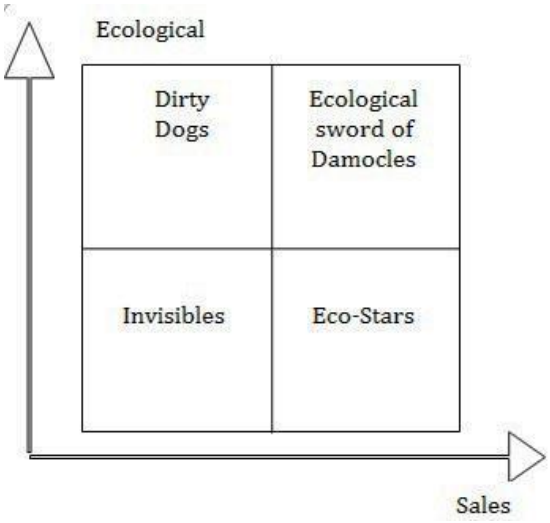

Figure 1. **„Ecological sales portfolio“**

Source: Bleis (1995).

Dirty dogs represent a considerable risk for the company's image and at the same time have a lower turnover. For their correct treatment, their removal or their ecological reorientation must be taken into account. An "ecological sword of Damocles" is a product with a high contribution to operating revenues, but which is in constant danger or already involved in a public debate. In this case the causes of the ecological pressure should be investigated and as far as possible eliminated, so that these products can be categorized as "eco-stars". "Eco-Stars" are the company’s most powerful and environmentally-friendly products, and their environmental advantages are to be investigated against the competition products and actively displayed on the market. The "invisibles" are ecological marginal groups for which no further direct investigations are necessary.

Bleis (1995) speaks in favor of the presented portfolio only in the sense of its support in the clear visualization of the classification of products in relation to the ecological pressure and turnover. Otherwise, the above-mentioned derived strategies should be specifically addressed in specific cases of applying this framework.

Instruments in the adaption area

This area is concerned with the early recognition of ecological trends, which are or can become significant for the company. Not only possible risks and threats, but also potential opportunities are identified. For the instrumental design of the adaptation area, prognosis instruments are set up, whereby the scenario technique is very widespread. This method is intuitive and according to Götze (1991) has the following positive features:

- the scenario technique creates several consistent future perspectives and helps the company deal with the uncertainty of the future;
- it includes not only quantitative but also qualitative information;
- it provides the opportunity for studies of comprehensive environmental systems as well as the interrelationships of the elements involved;
- further planning and forecasting tools can be used starting with the application of the scenario technique;
- their use is flexible, in particular with regard to the corresponding costs, the investigated items and the methods used.

The scenario technique consists in creating scenarios. Geschka and von Reibnitz (1986) define the scenario as "the description of a possible future situation" and "the development process that leads to this future situation". According to Götze (1991), the scenario technique has two types of approaches: deductive and inductive. In the case of deductive approaches, a framework is defined for each scenario to be created. On the contrary, there is no framework for the inductive approaches, but the raw scenarios are formed as mutually consistent sets of the possible evolution of the factors considered.

According to Götze (1991), there are six phases for the inclusion of the inductive scenario technique in the strategic planning as follows:

- Formulate the topic and define or analyze the field of investigation;
- Identify and classify the environmental factors, analyze their impact and interaction and forecast their future evolution;
- Consistent and plausible scenarios are developed, their probability of occurrence is determined and the selection is limited to a few scenarios;
- A sensitivity analysis is carried out, whereby firstly extreme events or disturbances are identified and evaluated, and later their effect on the scenarios selected so far are investigated;
- The fifth step is the preparation of scenarios (as an end result of this stage) that are assessed against criteria such as information content, comprehensibility, plausibility or relevance;
- The final phase consists in the evaluation of the designed scenarios. It is determined here to what extent these scenarios can be exploited in planning or strategy formation.

Bleis (1995) emphasizes the functions of scenario technology, namely the fact that it reveals opportunities and risks for the handling of the uncertain future, which is the basis for the establishment of early detection systems and, in particular, provides prognostic information. The results of the scenario technique can be successfully used in the corporate strategic planning and also provide suggestions for the operational and tactical side of the planning in the company.

Instruments in the coordination area

As an important instrument of the field of coordination, Bleis (1995) mentions the use of computer-assisted methods for information acquisition and management. Eco-controlling requires the existence of a corresponding information system for the environmentally relevant data, as claimed by Dyllik-Brenzinger (1989). Such a system not only serves to internally supply and control ecologically important information, but also to facilitate access to and connection to external online databases. Helling (1992) describes the range of

available online databases with environmentally relevant content as follows: literature databases, technology databases, environmental databases, product databases, waste databases, databases on pollutants, databases with addresses of environmental consultants, research facilities, engineering offices and authorities.

Conclusion

Nowadays, sustainability is understood three-dimensionally. According to this view, sustainability consists of linking three areas: ecology/environment, economy/profit and social/people. It is only in the case of equal consideration of all three dimensions that sustainability is mentioned. It is an integrative concept, which is characterized by holism, interactions and three-dimensionality. In line with Pufé (2012), the concept of three-dimensionality is widely accepted and is regarded as the current model of sustainability.

Ecological sustainability refers to the use of a system so that it is permanently preserved in its essential properties and its continued existence is thus ensured. The primacy of ecology is the design of environmental protection. The aim of ecological sustainability is to maintain the social productive potential by using renewable and non-renewable resources and the environment as a sink in a sustainable way, avoiding technical risks and sustainably developing material, human and knowledge capital (Kopfmüller, 2001).

The present research focused on the ecological side of sustainability, namely on aspects that deal with environmental protection. First, authors have formulated a definition of green controlling, whereas eco-controlling is understood as a tool for the analysis, planning, management and control of all environmental activities of the company. Being at a cross-road with the concept of "green controlling", environmental management accounting has also been analyzed by the authors. Moreover, a detailed presentation of all relevant green controlling instruments has been carried out, by analyzing the pluses and minuses of instruments from various areas of the enterprise, such as: supply area, disposal area, environment area, adaptation area and coordination area.

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