



Material flow cost accounting and existing management perspectives



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ABSTRACT

Material flow cost accounting (MFCA) has been developed worldwide as a major tool in environmental management accounting. The International Standard on MFCA was published as ISO 14051 in 2011. In Japan, the Ministry of Economy, Trade and Industry (METI) has been strongly supporting the promotion of MFCA, and the number of companies introducing this tool has been steadily increasing. However, in order to apply MFCA in companies continuously, it is necessary to overcome conflicts between MFCA and existing management perspectives. This paper argues that such conflicts are likely to be caused by the essential features of MFCA, and indicates some theoretical solutions based on organizational design. Then, by looking at three example cases of companies that have succeeded in the continuous use of MFCA, specific countermeasures for dealing with conflicts are investigated.

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1. Introduction

Environmental management accounting has been rapidly expanding over the last decade. The United Nations Division for Sustainable Development (UNSD) released two workbooks on environmental management accounting (UNSD, 2001; 2002), and the International Federation of Accountants (IFAC) published its *International Guidance on EMA* (IFAC, 2005). Of the various environmental management accounting tools available, material flow cost accounting (MFCA)¹ is one of the most promising. In 2011, the International Organization for Standardization (ISO) published the International Standard on MFCA as ISO 14051. In Japan, the Ministry of Economy, Trade and Industry (METI) launched its environmental management accounting project in 2000, and since then has been strongly supporting the promotion of MFCA (METI, 2002, 2007 and 2011), and the number of companies introducing this method in Japan has been steadily increasing.

ISO 14051 defines MFCA as a “tool for quantifying the flows and stocks of materials in processes or production lines in both physical and monetary units” (p. 3). The costs of material losses calculated by MFCA can act as a motivator for organisations and managers seeking opportunities to simultaneously generate financial benefits

by reducing material costs and reducing adverse environmental impacts by improving material efficiency (ISO 14051, p.1). Although the majority of environmental management tools, including environmental management systems such as ISO 14001, are effective in reducing adverse environmental impacts, their contributions to corporate profits are obscure and tend to generate additional costs for companies, at least in the short term. However, given that MFCA addresses these problems by reconciling the environment and the economy, the number of companies introducing MFCA is increasing throughout the world (see, for example, Kokubu and Nakajima, 2004; Viere et al., 2007 and Jasch, 2009).

However, upon analysing a wide range of examples of the introduction of MFCA, one finds that the skilful application of MFCA has enabled some companies to reduce their adverse environmental impact and increase their productivity at the same time, while others have not managed to achieve such results.² In order to successfully introduce MFCA into a company, it is necessary to adjust MFCA in the management system. Because MFCA provides new ideas to management, conflicts may occur between MFCA and existing management perspectives. These conflicts may be impediments for the practice of MFCA in companies.

The importance of calculating costs associated with material losses (wastes) has also been emphasized in many environmental

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¹ MFCA was developed in Germany around 2000 (Strobel and Redmann, 2001). The German Federal Environmental Ministry and Federal Environmental Agency's EMA guidebook positioned MFCA as the leading method of EMA (FEM/FEA, 2003).

² Kokubu (2008) examined the cases of 12 companies. Of these, five companies continue to apply MFCA into their companies at large, but the rest of the companies introduced MFCA only in their particular process lines and did not apply it to the company as a whole.

management accounting studies (Rooney, 1993; Loew, 2003; Burritt, 2004). However, the conflict between environmental management accounting and existing management perspectives has not been discussed very much. As we discuss in this paper, companies introducing environmental management accounting or MFCA may encounter resistance from existing management. To disseminate MFCA in practice, it is crucially important to overcome these conflicts. Therefore, this study examines theoretical solutions to these conflicts by introducing the perspective of organizational design. In addition, we obtain new insights into the future introduction of MFCA by studying cases in which these conflicts appear to have been overcome.

This paper is structured as follows. First, the basic concepts of MFCA are explained. Second, possible conflicts and solutions between MFCA and conventional management perspectives are examined theoretically. Third, by looking at the cases of three companies that have applied MFCA continuously, countermeasures for resolving such conflicts are examined, and conclusions are drawn.

2. Basic concepts of MFCA

ISO 14051 provided three objectives of MFCA (p.4):

- increasing the transparency of material flows and energy use, the associated costs and environmental aspects
- supporting organizational decisions in areas such as process engineering, production planning, quality control, product design and supply chain management; and
- improving coordination and communication on material and energy within an organization.

In order to achieve these objectives, MFCA quantifies material flows and stocks in a process or processes in terms of both physical and monetary units. To this end, strict demarcation is required between material that forms part of a product, including an intermediate product, and that portion of materials that ends up as waste to be discarded. In conventional cost accounting, it is of fundamental importance to determine whether the incurred cost in total is recovered from sales, and a strict determination of whether material is transformed into products, or thrown away as waste, is not generally required.³

MFCA is based on the principle of material balance, which implies the amount of input materials could be consistent with the sum of products and material losses (wastes). In order to conduct the MFCA analysis, we first trace the flows of materials in the manufacturing process and clarify where and how much material loss is generated. Then the costs are calculated. In the calculation, not only the cost of the input materials but also processing costs such as labour costs and depreciation costs are allocated to both products and material loss. MFCA assumes that waste materials are produced in the line, and that processing costs need to be involved in the material loss cost. Therefore, waste (material loss) is recognised as “another” product in this calculation (Nakajima and Kokubu, 2008). In addition to material costs and processing costs, waste disposal costs are therefore added to the cost of waste. Therefore, “MFCA can also provide information that allows management to consider options for reducing or substituting product material, for instance reducing weight more systematically, increasing recyclability, and supporting environmental improvements in products and process” (ISO 14051, p. 14).

³ The difference between MFCA and conventional cost accounting is explained by Kokubu et al. (2009) and Annex A of ISO 14051.

As MFCA provides information on the basis of actual measurements, excluding the various premises involved in production processes, it sheds light on aspects that had been ignored by existing management techniques, where the management information provided was based on the premises of standard production processes. In practice, MFCA is expected to be effective in the following respects: investment appraisal of plant and equipment, modifications or substitutions of raw materials, improvements in product design and production planning, and on-site improvement activities (Kokubu and Nakajima, 2004). For example, as MFCA makes it possible to accurately evaluate the cost of material losses generated in manufacturing processes, this information can be used for the evaluation of new equipment or the substituting of new raw materials in order to reduce losses.

3. Essence of MFCA and conflicts with existing management perspectives

In order to introduce MFCA into companies effectively, it is necessary to adjust the tool to existing management perspectives. As it is not the purpose of this paper to explore the nature of existing management perspectives in general, we instead examine examples of these perspectives and compare them with the basic concepts of MFCA. Here, the controllability principle and the primary corporate objectives for profit-seeking are discussed as two distinct examples. The conventional environmental management perspective also requires integration with existing management perspectives. Hence, any conflict between the two stems largely from the conflict between environmental and economic objectives (Gond et al., 2012; Adams and Frost, 2008). However, MFCA has also an economic objective of cost reduction, unlike environmental management tools in general; nevertheless it may conflict with existing management perspectives. This paper focuses on examining this problem. If any conflict or friction is found, it is important to examine how to resolve it in both theoretical and practical ways.

As the essential point of MFCA is located in the newly defined concept of loss, as discussed in the previous section, the analysis starts from this point, and possible conflicts between MFCA and existing management perspectives are examined. The purpose of this section is to examine these issues theoretically, and to offer an analytical viewpoint on actual MFCA practices, which are discussed in the next section.

3.1. Concept of loss in MFCA

The basic idea of MFCA, which is explained in the previous section, is not particularly complicated. However, many leading, highly competitive, Japanese companies have found plenty of room for improvement by using MFCA.⁴ This is because the concept of loss in MFCA is different from the one generally followed in conventional business management. The value of MFCA-derived information is due to this difference in the concept of loss.

Annex C of ISO 14051 provides an interesting case study of Company A, which is a world-class company in lens manufacturing based in Japan. Before introducing MFCA, Company A believed that its existing processes had a very high production yield ratio of 99% (99 out of 100 pieces of raw material input becoming finished products). However, an MFCA calculation indicated that the

⁴ For actual examples of MFCA, many case studies appear in reports of projects commissioned by METI (JMA Consultants, Inc.: <http://www.jmac.jp/mfca/> and the Japan Productivity Center for Socio-Economic Development: http://www.meti.go.jp/policy/eco_business/).

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