

Environmental Management Accounting: A Tool for Better Management Practice

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ABSTRACT

Over the years, there has been a growing emphasis among organisations on the need to address environmental issues and develop management practices and tools that are useful in improving environmental performance of the organisations. The deficiency of conventional accounting practices has spurred the infusion of environmental management accounting (EMA) and its adoption has been promoted at international, national and local government levels. The main purpose of this paper is to provide a general discussion on pertinent characteristics of EMA including its supporting tools to enhance its applicability and potential benefits that could be derived from its adoption. The discussion adds to the existing literature and provides a platform for future research intending to examine the extent of EMA development in an organisation.

Keywords: Environmental Management Accounting, Environmental Accounting, Management Accounting, Material Flow Analysis, Environmental Costs.

INTRODUCTION

The field of accounting, mainly in the area of management accounting (MA) continues to evolve. In the past, MA predominantly involves with routine exercise of planning, budgeting, efficient utilisation of resources, performance assessment, and formulation of strategic business policy and strategy. These MA activities are designed to tackle specific management needs. However, there is an apparent shift of MA functions in recent decades and that MA has gone from providing internal accounting information to focus on resources productivity, value creation activities and including issues on sustainability and eco-efficiency [1]. These emerging concepts and activities require innovative form of MA tool as conventional MA functions are arguably having some apparent limitations. In the context of the role of MA in relation to the environment, the:

“fundamental environmental criticism of conventional management accounting is that it largely ignores separate identification, classification, measurement and reporting of environmental information, especially environmental costs” [2, p. 14]

In further addressing the issue of a lack of recognition on environmental impacts, conventional MA is criticised for treating environmental costs to be immaterial, failing to identify and tracing some of environmental costs, placing indirect costs into overhead accounts, largely ignoring environmental considerations in investment appraisals, and paying little attention on accounting for externalities and sustainability issues [2]. Prior research attests to this contention. For example, a study has discovered that under the conventional MA, certain environmental costs particularly those related to emissions cannot be clearly identified [3]. Moreover, another evidence reports identical findings where it is found that of about one-fold of environmental costs are kept hidden under the overhead accounts [4].

The limitations of conventional MA suggest that a shift to an innovative practice is desired. In recent years, bowing the intense environmentally-linked pressures, an increasing number of organisations are becoming interested in recognising the monetary consequences of organisational environmental impacts to the prosperity of their entities [1, 2]. Though it is not driven by statutory requirements, organisations appear to voluntarily adopt EMA in an attempt to reduce the environmental impacts (such as reducing penalties arising from non-compliance of environmental laws) and lower the production and/or operational costs. The adoption of EMA is further intensified through promotions made by international organisations such as the prominent United Nations Division for Sustainable Development (UNSD), United Nations Environment Programme (UNEP), and Tellus Institute [5, 6] and government supports globally [7].

The aim of this paper is to provide a discussion on a detailed description of EMA including its required tools to enhance its applicability and potential benefits that could be derived from its adoption. The paper intends to argue that the implementation of EMA serves as a better tool for organisation to control the adversely environmental impacts on organisations and society while at the same time bring favourable impacts on the organisations' bottom line. The remaining paper parts of the paper are structured in the following order. In the next section, a detailed description of EMA is presented. This includes the types of information supplied by EMA. Subsequently, a discussion on an array of EMA tools follows. These tools provide operational support for EMA implementation. Then the four major key applications of EMA information are briefly discussed. A conclusion ends the paper.

ENVIRONMENTAL MANAGEMENT ACCOUNTING

EMA is constantly being adopted to significantly improve an organisational environmental performance. Studies have illustrated the potentials that EMA can provide in improving the identification, measurement, and reporting of environmental information [4, 7]. This information forms as a more accurate basis for assessing environmental performance [5]. Not only that, EMA also aids organisations to unveil some costs savings opportunities that could contribute to an increase in the economic performance of an organisation [8, 9]. An empirical study has demonstrated the ability of EMA in helping organisations in terms of reducing operational costs, increasing productivity, building better corporate image, and ameliorating

its position in the marketplace [7]. In the study, a company participated in the project manages to reduce the following activities significantly; water consumption (23.6%), effluents (45%), and energy usage (11.40%) which substantially trim down the production costs after three years of implementing EMA and Cleaner Production programmes.

The Diverse Definitions of EMA

Although EMA has received reasonable consideration over the past few years or so, an absence of a commonly accepted definition for EMA is observed in the literature [10, 11]. EMA terminology and practices are relatively differed among organisations and countries, and EMA is often generically referred to other terms such as environmental cost accounting (ECA), full cost accounting (FCA), total cost assessment (TCA), to state some examples [3]. Table 1 shows the different delineations given to EMA. These definitions suggest that as part of MA practice, the core idea of EMA is often associated and directed towards internal costs as external costs, such as costs to society or the environment in which an organisation is not held accountable, are considered out of the scope of legal responsibilities of the organisation [8].

Table 1: Summary of EMA Definitions

Author (s)	Definition
Burritt et al. (2023) [1: p. 337]	"...as a broad set of different accounting tools providing information to support management in improving the environmental and economic performance of the organisation, including its effects beyond organisational boundaries".
Burritt (2004) [2: p.13]	"...is concerned with the accounting information needs of managers in relation to corporate activities that affect the environment as well as environment-related impacts on the corporation".
Bartolomeo et al. (2000) [3: p. 37]	"...the generation, analysis and use of financial and related non-financial in order to integrate corporate environmental and economic policies, and build sustainable business".
Jasch (2006) [5: p. 1194]	"...is management accounting with a focus on physical information on the flow of energy, water, products and materials as well as monetary information on environmental costs and revenues and projects related to environmental protection".
Burritt and Saka (2006) [6: p. 1262]	"...is relatively a new environmental management tool initially designed to trace and track environmental costs and physical environmental flows".

(Source: Compiled by author)

The need for EMA rises as an attempt to overcome the shortcomings of the conventional MA practices particularly in respect of environmental costs and impacts [4, 5]. These shortcomings pose many serious challenges for EMA, for example, the need to accurately disclose hidden environmental costs by revising how costs are identified, measured and reported. Proper scrutiny of environmental costs enables organisation to accurately calculate and manage those costs and subsequently reflects to a better environmental performance [11]. Ideally EMA has a crucial role to play as an effective mechanism to assist an organisation in managing the costs while at the same time minimising the impact of organisational operations on the biological environment.

Types of Information Provided by EMA

Information that falls under the jurisdiction of EMA can be classified into two main categories, physical and financial information. Physical information comprises records on the use, flows and the final disposal of energy, water and materials (including the corresponding waste) as

many environmental impacts are related with these physical substances while monetary information includes environmental costs, earnings and savings [3, 11, 12].

PHYSICAL INFORMATION

Physical information provides assistance to an organisation in assessing and correspondingly reporting on the materials-related aspects of its operations and subsequently its environmental performance [12]. EMA focuses on both physical material inputs and product outputs. The material inputs are represented by two main physical substances. The primary type of material inputs includes materials that are acquired and directly used in the manufacturing of finished products and/or by-products. The second type of material inputs are related to materials that are used in the manufacturing process but do not become part of the final product. Other than water and energy, operating materials are included in this category. The product outputs are also represented by two physical elements, product outputs (such as products, by-products and their packaging) and the non-product outputs of waste and emissions. EMA places strong emphasis on materials and materials-driven costs due to several reasons. Firstly, many environmental implications are the results of the utilisation of resources such as energy, water and physical substances. Secondly, purchase value of materials acquired is considered the major cost driver in many organisations. The material purchase costs is the most important part of environmental cost category, representing some 40% to 70% of total environmental costs [13]. Therefore, it can be reasonably argued that the physical accounting information amassed under EMA is the key to the development of many environment-related costs.

MONETARY/FINANCIAL INFORMATION

Environmental costs are a subset of total costs that is crucial for sound decision-making and the amount, surprisingly, can be substantial [14]. According to [15], environmental costs can be in the forms of internal and external costs that are associated to all costs incurred with relation to environmental damage and protection. However, EMA deals primarily with internal costs and does not typically consider the external costs that are not internalised [5, 15]. Several reasons are found to explain why organisations normally do not consider environmental costs that are external to the organisations [5]. Firstly, by definition, external costs are outside the boundaries of an organisation's accounting systems. Secondly, external costs are normally difficult to be identified and measured. Thirdly, an individual organisation is not the sole cause of specific environmental effects. It is a common-sense observation that organisations, collectively, have some share on the adverse environmental impacts. Hence, to accurately estimate how much is the proportion of the share for each individual organisation is deemed difficult and nearly impossible. To date however, as a standard that defines environmental costs does not exist, it is purely based on one's discretion as to how environmental costs should be defined and classified [8].

EMA TOOLS

According to [5], EMA is about doing better and comprehensive MA practices. To ensure a successful implementation, EMA needs various supporting tools to help organisations in allocating internal and external costs.

Material Flow Analysis (MFA)

Many environmental impacts are related to the flows of physical substances, for example, materials and energy [3]. This suggests that environmental costs associated to the flow of these

substances could be substantial. Hence, a proper way in which the costs can be reduced is required. According to [7], MFA or simply known as flow cost accounting can lead not only to lower costs in the actual materials but also to reduce costs in materials handling and waste disposal. Not only that, it makes the flow of materials more transparent as it uses various data such as physical data, monetary data, and values. This information helps organisations identify actions to prevent environmental damage and to improve efficiency. A case study attempted by [21] involving the city of Vienna, Austria is an example of MFA tool used in environmental protection and resource conservation decision making. The results show the effectiveness of MFA that can be used as a precautionary approach to anticipate future environmental problems. For example, it is found that 90% of Vienna's metal stocks are located in buildings and infrastructure with only 10% can be found in the landfills. However, rather than focussing on the toxic metals produced in buildings and infrastructure projects, the current environmental policy focuses heavily on landfill stock emissions. This shows how MFA helps the city of Vienna to take corrective actions to the real environmental problem's producers. The findings suggest that MFA, being an accounting instrument, can provide important information for an effective policy making.

Life Cycle Assessment (LCA)

LCA is increasingly becoming a common tool in EMA [9]. The tool can be used to assess the physical environmental impacts of different steps of a product's life cycle, also known as from cradle to grave. A case study by [9] in a refining and exporting coffee company in Vietnam demonstrates the importance of LCA in EMA. The application of LCA assists the company examined by [9] to identify the production chains that bring hazardous environmental impact. Not only that, LCA also supplies potential cost savings information to the company. In cultivation phase, for example, the LCA reveals that the company is found to use excessive fertilisers beyond what is normally required. This information enables the company to make remedial action and utilise the fertilisers more efficiently, hence, reducing the overall production costs. LCA comes with a costing technique known as life-cycle costing (LCC) that adds monetary components to each environmental impact throughout a product's life cycle. According to [20], LCC helps organisations to identify relevant cost components in products that may have negative effects on the environment and society that are needed to be eliminated in future product design processes before the cost transferred into production.

Activity Based Costing (ABC)

Traditional cost accounting allocates costs to products based on the attributes of a single unit such as direct labour hour while in contrast ABC directs costs to the products and services that require the costs to be incurred [16]. An array of published literature indicates large support for ABC to be the best tool in environmental costing and such is evident by a research conducted by [3]. Although only 18% of the surveyed companies implement ABC, the results suggest that the costing approach is successful in unveiling environmental costs which are secretly hidden in the overhead costs. In relation to this, [3: p. 46] conclude that "*ABC is likely to be only one of the means by which environmental management accounting is introduced*". According to [18], integrating environmental information with the ABC method can help businesses to estimate the emissions of waste and measure the environmental costs of final product with some degree of accuracy. On top of that, by tracing costs through business activities, the ABC manages to produce specific environmental cost structure that can assist businesses in measuring the environmental performance of their organisations.

Total Cost Assessment (TCA)

As an investment appraisal technique, TCA generally facilitates in the identification and evaluation of internal project costs and savings in determining which investments are economically favourable. A case study by [17] provides an example of TCA application. The case involves Oliver Enterprises, a rice milling company in the Philippines. The rice industry in the country is facing severe environmental impacts due to the traditional way of disposing of rice husk, which is through dumping in open fields and burning. Being committed to reducing the environmental impacts, the company is considering two investment alternatives, namely automated carbonisation of rice husk and husk-fired cogeneration. These two options are evaluated through various capital budgeting techniques such as payback ratio and discounted cash flow analyses to determine financial benefits. The use of such techniques allows Oliver Enterprises to gain valuable investment information. Costs such as capital expenditures and financial benefits generated through costs savings and the sales of by-products are considered. In the end, although both options yield positive returns, the second option is selected as it helps reduce unwanted emissions and generate additional revenues. The case study by [17] shows how costs and potential revenues are identified and measured to help organisations making better investment decisions based on information provided by TCA, an investment appraisal tool under EMA.

KEY APPLICATION FIELDS OF EMA INFORMATION

Organisations, either from private or public sectors, are constantly being pressured to integrate the issues concerning the environmental within the organisations' policies, strategy and decisions [1, 10, 11, 21]. Demand for information related to environmental performance has proliferated in recent years bowing to the increased level of awareness of a multitude of stakeholders [11]. All these, of course, require a tool such as EMA to fulfil such information needs. The key applications of EMA information have been highlighted and discussed by many researchers [see, for example, 5, 8] and can be grouped into the following four main areas.

Decision Support

EMA serves as an important mechanism in integrating information on environmental costs and benefits into the decision-making process [7]. As EMA can potentially identify costs that are hidden in overhead accounts, it then has the ability to produce more accurate cost information, hence enables organisation to make appropriate organisational decisions based on the information. A few examples which have been provided earlier illustrate the ability of EMA in helping organisations in arriving to better decision making [see, for example, 4, 17]. In some instances, the information provided by EMA can beneficially help organisations to discover some potential avenues for reducing operational costs through costs savings opportunities [9] and also helping organisations to accurately identify the actual problems in organisational functions [22]. Proper identification of the real problems facilitates organisations in deciding the appropriate corrective actions to counter measure the apparent shortcomings.

Performance Measurement

In addition to supporting decision, EMA is also applied to measure the extent to which decisions that have been made affect the organisations. This can be done as, according to [1], EMA improves the information systems that enable the measurement of performance. In addition, EMA can as well be implemented in the attempt to measure an organisational corporate environmental performance by way of combining both financial and non-financial elements in

the assessment technique [1]. Moreover, [7] further argues that the use of benchmarking tool such as environmental balanced scorecard (EBS) with acceptable sets of environmental indicators can allow managers to appraise the extent to which targets have met the actual outcomes. The EBS that integrates four dimensional perspectives, namely financial, customer, internal, and learning and development, provides managers a fast but comprehensive view of the organisation operations and in turns, EBS helps managers to transform actions related strategies into tangible indicators that can be used to evaluate the extent of the environmental performance [7].

Support System for Environmental Management System (EMS)

EMS is a management tool that is intended to encourage an organisation to control and continuously reduce its environmental impacts. To ensure the success of an EMS, as highlighted by [14] following their experience in EMS implementation in Lithuanian industry, organisations need to estimate the relevant environmental costs that affect the bottom line. Since EMA is introduced for the purpose of identifying the hidden environmental costs, it is therefore contended that EMA is considered crucial in the development of an EMS. Moreover, having an EMA integrated within the management system helps organisations to improve their economic performance as EMS is arguably having the ability to improve competitive advantage including for small and medium enterprises and also public sector organisations [14]. Furthermore, findings from a survey of 659 manufacturing companies indicates strong evidence suggesting that EMA provides support in EMS and ultimately contributes to better organisational environmental performance [19].

Basis for External Reporting System

According to [23], organisations that do not have a performance-based reporting system are unable to provide evidence of performance improvements which can be crucial information to various decision makers. This is arguably similar in the context of environmental performance. As the demand for such information is growing, organisations are continuously under severe pressure to reduce the information gap. To assist organisations in supplying the required information, an effective reporting tool is therefore needed. In order to be effective, a reporting system *“requires a suite of environmental and other performance measures, and one would expect the development of internal EMA system”* [23, p. 1234].

Similar opinion has been raised by [5] and [8]. This however poses serious challenge to accountants as well as the auditors. Accountants within the organisations have a critical role in preparing the information and to work with the non-accounting staff in the effort to ensure that the organisations' information systems are intact and effective in communicating environmental-related information. Auditors, especially the external auditors, on the other hand, have even bigger role in designing an approach that can verify the accuracy of the information reported and check the verifiability of the information systems from which the information is obtained.

CONCLUSION

In general, the paper has discussed the emergence of EMA that extends the role of accountants in providing environmental-related information as a means of improving environmental performance and decisions. Since conventional MA practices are flawed in a number of ways, EMA emerges and continues to be promoted for appropriate adoption at the international,

regional, national and also local level. Prior research has highlighted the significant improvement that EMA offers in the production of environmental-related information that better reflects the stage of organisational environmental performance. However, for EMA to bring potential benefits at a desired level, it needs an array of supporting tools. The tools can assist EMA in producing more accurate information on environmental costs and benefits for organisations. The information can then be used to support various organisational decisions.

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