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Staircase to sustainable development

Abstract

The aim of this article to provide a theoretical framework on the concepts of sustainable development and the process that companies need to follow in order to ensure the future sustainability of business operations. Various secondary sources and previous literature was reviewed to clearly identify why companies are finding it difficult to conduct their business operations in a sustainable manner. Stricter legislation and regulations, increased competition, depletion of natural resources and market pressures have placed organizations under increased pressure to improve environmental performance and achieve eco-efficiency. This paper provides comprehensive overview of how companies can achieve the 'triple bottom line' by committing to continuous improvement and adhering to the regulations stipulated according to the International Standards of Organizations (ISO14001).

Keywords: sustainable development, strict waste legislation, eco-efficiency, ISO14001, environmental performance, triple bottom line.
JEL Classification: 031.

Introduction

In many developing countries, an increase in industrial activity, electricity demand and transportation results in emissions and poor air quality has become a major issue (Stringer, 2010, pp. 34-35). Higher energy and raw material prices are causing sustainable production to grow in relevance and importance. Hence, the need for Cleaner Production (CP) and eco-efficiency which focuses on improved productivity and reduced impact as the result of design over the life of products, processes and services (National cleaner production strategy, 2004, p. 11; Lakhani, 2007, p. 1391). Since the amount of waste to landfill is increasing steadily, stricter waste legislations have been introduced. It is therefore extremely important for all companies to fully understand the process and procedures necessary to ensure their future sustainability and to commit to continuous improvement processes. Social, economic, and environmental performance are essential for a business to ensure its future sustainability.

1. Material and methods

1.1. Sustainability. *1.1.1. Sustainable development.* Sustainability became a topical issue almost two decades ago. Fore and Mbohwa (2010, pp. 314-333) point out that increased environmental problems, because of increased production and consumption, had contributed to the concept of sustainable development (SD). Early publication focused on the relevance of the environment to business and how this could be relevant for the role of accounting and alternative ways in which data can be processed. As sustainability developed, the question was where and how would companies derive information needed to support the operational issues of various processes to ensure that the necessary data were available when required (Bennett, Schaltegger and Zvezdov, 2013).

This has placed companies under pressure to adopt sustainability due to industry pressure and competition; stricter environmental regulation; pressure from stakeholders to monitor activities and outputs more closely; and increasing shortages of natural resources and higher energy costs. Since sustainability focuses more on non-financial information, there is a demand for companies to adopt new information systems or adapt their existing accounting system.

The international community committed itself to sustainable development at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992. SD is ultimately about development that meets the needs of the present generation without compromising the ability of future generations to meet their needs.

Others had interpreted sustainability as 'environmentalism dressed up for the 21st century.' Sustainability was linked mainly towards creation of jobs and wealth in a fair manner and in ways that protect the environment (Environmental strategies, 2013). Fore and Mbohwa (2010, pp. 314-333) concur that SD is not a business practice but rather a long-term goal of individual companies.

At the 2002 World Summit on Sustainable Development held in Johannesburg, a shift towards sustainable consumption and production was noted. Greater emphasis was placed on inefficient and wasteful use of natural resources (Resource Efficient and Cleaner Production, 2013).

Issues raised at the summit clearly showed that much of the wealth generated in the country was at the expense of natural assets. Therefore, it was emphasized at the forum that businesses need to take an active role in protecting these natural assets and

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reducing the environmental impact of operational activities (Ambe 2007, p. 3). In 2006, a draft Strategic Framework for Sustainable Development in South Africa was used to reaffirm South Africa's commitment to implementing full measures to ensure that businesses cooperate and adopt a sustainable development approach to their business activities (Ambe, 2007, p. 4).

Some researchers have argued that the root cause for environmental problems is the lack of an environmental management policy (Ahmad, Saha, Abbasi and Khan, 2009, p. iv). Environmental and social aspects of business are not adequately recognized by current accounting systems and these issues may not be fully accounted for during decision making. Non-financial information is now being used to supplement the traditional financial information flows for external reporting and internal management needs. Sustainability accounting and production has encouraged companies to review their processes and products to take into account and respond to changing cost structures and risks (Bennett, Schaltegger, and Zvezdov, 2013).

Thereafter, the 'triple bottom line' became widely accepted as a company level approach to sustainability. Hence, businesses had to focus on and manage their environmental, social and financial performance (Schaltegger et al., 2010).

Sustainability, however, continues to pose a challenge to companies that are struggling to design a systematic approach to address all three aspects stated above.

EMA then became recognized as a prioritized intervention that integrates the ecological and economic dimensions necessary for SD (Ambe, 2007, p. 4). EMA and the balance scorecard were introduced to industry as a means to measure sustainability factors to compare and benchmark environmental performance (Lambert, Carter and Burritt).

Figure 1 demonstrates the key concepts aimed at SD.

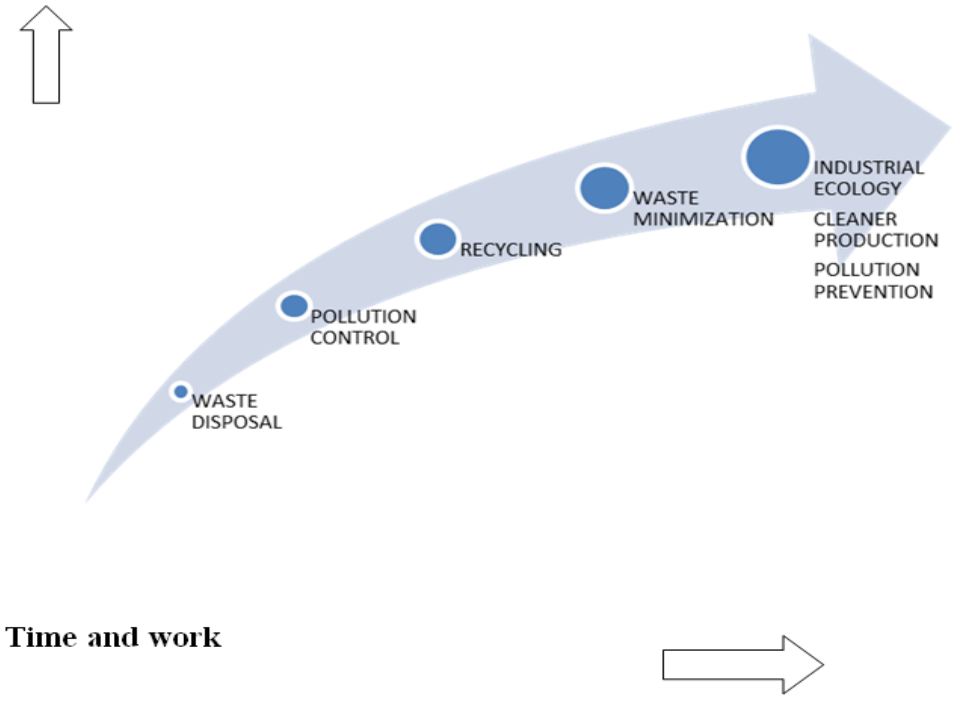


Fig. 1. Staircase of concepts aiming sustainable development

Source: Nabais (2011, p. 4).

Scope and results

Figure 1 highlights key concepts of SD. Each step involves more time and greater effort on the part of organizations aimed at achieving zero emissions. From the above evidence, it is clear that SD is a long-term strategy involving step-by-step processes of development and progress towards achieving the ultimate goal, as depicted in Figure 1.

2.1. Environmental management. *2.1.1 International Standards of Organization (ISO 14001).* Bennett, Schaltegger and Zvezdov (2013) describe environmental standards such as ISO 14001 and Environmental Management Accounting Systems (EMAS) as voluntary standards that act as a form of regulatory governance as they become institutionalized and internationally recognized.

Its aim is to make cost relationships transparent and provide guidance during process and product design decisions by adopting conventional costing systems. They believe the purpose of ISO 14001 is to help

companies implement environmental management systems (EMS) that fulfil certain criteria. Ahmad, Saha, Abbasi and Khan (2009, p. v) concur that the ISO 14001 EMS could be used by managers to assess and measure progress and performance by providing standard auditing, communicational and reporting protocols. Complementary standards such as ISO 9001 have been found to be the most relevant factors for adopting ISO 14001 or EMAS. Li (2004, p. 1) found an enhanced development of EMA among companies that were ISO 14001 certified. This has also encouraged governments to promote EMA implementation within countries.

The availability of win-win possibilities and leadership by individuals in the company management had been reported as the most common internal factors that influence the implementation of standards.

2.1.2. "Best practices" of environmental management. Christmann (2000, pp. 13-17) analyzed three process-focused "best practices" of environmental management during his research to identify their direct effect on cost advantage.

Best practice 1: Use of pollution-prevention technologies

Pollution-prevention technology has the potential to increase the efficiency of the production through reduced input costs, substitution of less costly inputs, savings from recycling or reusing materials, and reduction of waste disposal costs.

Best practice 2: Innovation of proprietary pollution-prevention technologies

Internal innovation of pollution-prevention technologies contribute to the firm's cost advantage in many ways. First, managers become aware of inefficiencies in current production processes and products that were not previously recognized, by developing new pollution-prevention technologies. Second, innovation of pollution-prevention technologies has greater potential for cost-saving changes in the production process. Third, the technologies are proprietary to the firm, therefore, the firms are likely to appropriate the rents that are created by these internally developed technologies. Competitors are not easily able to imitate these internally developed pollution-prevention technologies.

Best practice 3: Early timing

Addressing environmental issues earlier than competitors or before environmental regulation is established contributes positively to cost advantage by minimizing disruptions of the production process usually caused by implementing compliance technologies, allowing the firm to gain cost advantage through the learning curve effects, by addressing environmental problems early and influencing regulations can raise their competitors' costs.

Holt (2009) views ISO 14001 as a logical extension of the quality management system ISO 9001. Some researchers advocate that both quality improvement and environmental investments can have positive effects on a firm's competitiveness (Orsato 2006, pp. 129-130).

The King Commission (2002, p. 240) cite the following nine reasons for businesses to improve its environmental performance, as per The United Nations Global Compact, noted by Mohr-Swart (2008, p. 102):

- Implementing CP and eco-efficiency improves resource productivity.
- Clean companies are being rewarded by new economic instruments.
- Stricter environmental regulations.
- Cleaner companies are seen as low risk and also preferred by insurance companies.
- Banks are more willing to provide financial assistance to cleaner companies.
- Positive effect on company's image.
- Health and safety of employees.
- Negative impact of pollution to human health.
- Pressure from customers for cleaner products.

Radonjic and Tominc (2007, pp. 1482-1493) conclude that ISO 14001 certified firms were more productive and achieved better environmental performance.

They also found that the adoption of cleaner technologies were more likely among certified companies as ISO 14001 was considered a useful tool for technology changes in companies which were committed to the IPPC directive. Hence, it can be suggested that being ISO certified means that an organization has committed to ensuring that it complies with the continual improvement policy and, therefore, would be more likely to consider implementing CP techniques and technologies to achieve SD.

Despite emerging best practices, there is still much discrepancy regarding corporate environmental strategies and its impact on environmental performance across many organizations. According to Sinclair-Desgagne (2004, p. 7), the biggest challenge that firms are currently facing is the difficulty in integrating environmental issues into day-to-day business activities. Gil, Andres and Salinas (2007, p. 89) argue that management commitment and awareness of environmental responsibility significantly influence corporate strategy. Sinclair-Desgagne (2004, p. 7) suggests that all business units need to be involved in environmental goal-setting and implementation in order to successfully

achieve environmental objectives. Many of the goals stated in environmental policies have not been achieved due to lack of commitment to move past pollution control and waste disposal strategies. Most companies are just content to satisfy the minimum requirements of an ISO 14001 audit without changing or improving their production processes or technologies.

2.1.3. Environmental management systems. Definition and framework of EMS. Ferenhof, Vignochi, Selig, Guillermo, Lezana, and Campos (2014, pp. 44-53) define EMS as a tool aimed at reconciling economic growth with the environment and is used to support a company with processes for implementing environmental goals, and policies and responsibilities.

They recommended that EMS designed for an organization must take into consideration the operation's activities and how the company's actions impact the environment and an environmental indicator system be used to identify potential opportunities for cost reduction and improve environmental performance. ISO 14001 provides a useful framework for promoting efficient EMS which should be part of an integrated system of management.

Radonjic and Tominc (2007, pp. 1482-1493) added that EMS is an important part of the pollution-prevention approach. Compliance to environmental laws and regulations as well as innovation are also facilitated through EMS adoption.

However, Henriques and Sadorsky (2007, pp. 119-132) found that EMS reduces the likelihood that an organization will implement clean technologies while Total Quality Management (TQM), on the other hand, increases the chances of an organization implementing clean technologies. They do, however, admit that EMS systems provide the platform for promoting innovation in organizations as part of their proactive environmental strategy. In addition, Ahmed et al. (2009, p. iv) advocate that EMS cannot function in isolation and needs to be incorporated into the main corporate agenda.

Brent and Premraj (2007, p. 31) found that, although studies show that environmental performance may improve by adopting a formal EMS, there were still unclear guidelines on how to effectively implement an EMS system. However, the argument of whether or not proactive environmental activities increase business performance remained unresolved for many researchers (Darnall, Henriques and Sadorsky 2008, pp. 364-376).

It can, therefore, be concluded that one needs to have a clear definition of sustainability and integrate this as part of the strategic planning process and policy development. It is only then that an EMS could be used as a tool to successfully achieve sustainability targets.

Proactive measures, made possible by adopting an EMS, tend to reduce and control unnecessary losses that would be incurred by companies. Internal audits are carried out to assess the performance of the EMS and the International Standards Organization recognizes the importance of such a system. ISO 14001 has stated the key elements of an EMS and include the following:

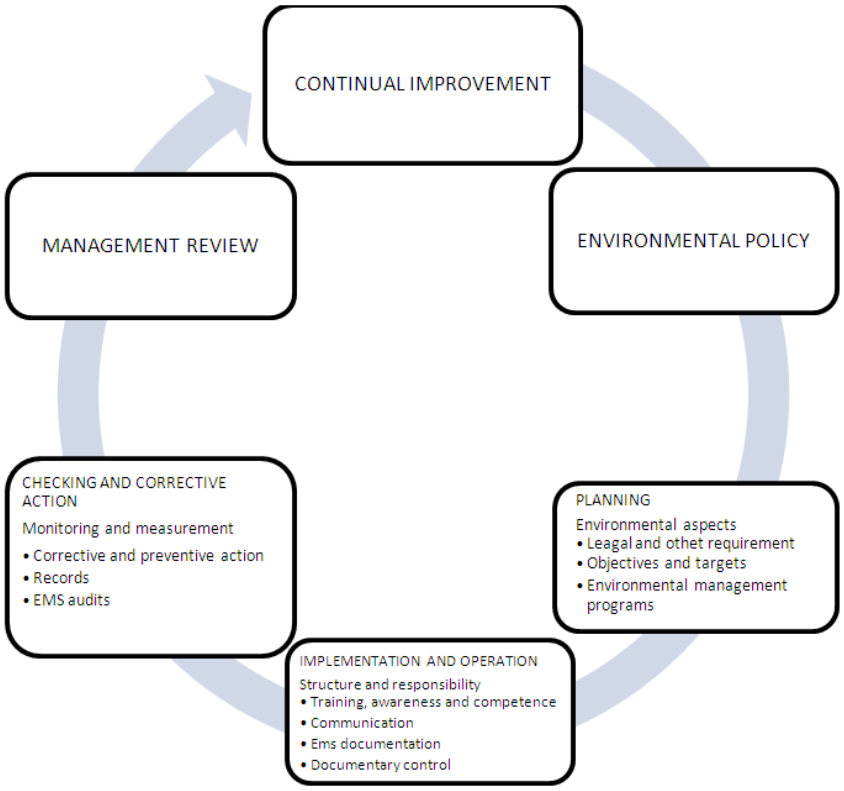
- Vision as defined by the environmental policy.
- Objectives and targets for environmental performance.
- Programmes to achieve those targets.
- Ways to measure and monitor the system's effectiveness.
- Periodic review of the system to improve overall environmental performance.

ISO 14001 focuses on the management process, not on its content and performance. Manufacturers can develop their goals and objectives to achieve continuous environmental improvement (Henriques and Sadorsky, 2007, pp. 119-132).

Holt (2009) highlights the following EMA information that an EMS provides:

- Monitoring, compliance and performance data that are routinely collected.
- Increasing the visibility of cost saving options to managers.
- Inaccuracies in the allocation of environment-related 'overhead' costs are revealed.

Figure 2 indicates elements of an EMS within an organization, which are based on the principle of continual improvement.



Source: Holt (2009).

Fig. 2. The EMS approach: 'embedding' environmental issues

3. Results and discussions

3.1. Environmental management accounting (EMA). *3.1.1. Development and theoretical framework of EMA.* Environmental changes and future threats can generate higher costs to the company. The strategic operational issue is that companies are not aware of the magnitude of these costs as they are generally hidden in overhead accounts.

Greater transparency of these costs ensures that they are being managed in a way that results in environmental and economic benefits (Jonall and Olson, 2008).

Initially, the reaction to environmental challenges was to disperse pollutants better to reduce their harmful impact on communities. Thereafter, the environmental management paradigm was to implement measures to control pollution and treat wastes after they have been created. Examples include effluent treatment plants, catalytic converters and waste incineration, also referred to as end-of-pipe technologies (Environmental strategies, 2013).

However, the current management accounting systems were inadequate to provide the information on monetary and physical environmental impacts.

Therefore, EMA was introduced. EMA has been developed and applied for nearly two decades and has now emerged from a "twenty year niche issue" to a globally popular topic in academia and industry. Abdel-Kader (2011, p. 63) asserts that the first publications on EMA were the World Resources Institute's 'Green Ledgers' in which it had been argued that environment-related costs were significantly underestimated and frequently accounted for as general overheads. Conventional income statements created a perception that environmental costs are limited to separately identified items such as fines and penalties, 'end-of-pipe' pollution control equipment and expenditure to remediate past environmental damage, all of which are defensive expenditures. Therefore any potential to improve environmental and economic performance by cost reductions, developing new revenues and managing risks are ignored, was clearly pointed out by Abdel-Kader (2011, p. 64).

Benette, Schaltegger and Zvezdov (2013) developed a working definition for EMA as 'a tool for transforming physical and financial measures of environmental data into information for decision making to judge environmental performance.'

Physical information comprises of data on use and flows of energy, water, and materials including waste, whereas monetary information is based on environment-related costs, savings and earnings, and environmental costs that are generally hidden under overheads (Schaltegger et al., 2010). Fur-

thermore, EMA is an approach that involves the application of accounting tools and practices to assist managers in decision making on environmental and economic performance (Schaltegger, Gibassier and Zvezdov, 2011, p. 2).

Li (2004, p. 1) suggests that, in a contemporary world, EMA should be used to create a balancing interaction between economic, social and technological factors to ensure a sustainable environment. In all of the definitions of EMA stated above, the types of information that should be considered by organizations and analysis techniques adopted for internal decision making to maximize profitability are highlighted.

However, the main objective of an EMA system, as suggested by Scavone (2006, pp. 1276-1285), is the introduction of ongoing environmental preservation activities and disclosure of the company's environmental position internally and to its stakeholders. EMA adoption makes it possible for an organization to be able to generate high quality informational reports containing both monetary and non-monetary data. Monetary data are extracted from the data base that supports financial reports and is used by management to make informed business decisions.

The United Nations Development Program as part of the Department of Sustainable Development reports EMA as an important management tool that is of benefit to both industry and government. They (UNEP) have embarked on several activities to educate and encourage companies of the benefits of using EMA.

One of the activities was being part of the expert working group on EMA which introduced the international guidance and also developing training course in EMA. This publication offered a set of principles and procedures for EMA based on that which was commonly used in Financial Accounting methods with the intention of reducing the cost of adopting an EMA system (Jasch, 2003, pp. 667-676). Following these international developments, South African companies have considered environmental issues in their decision-making processes regarding products and processes. It has been suggested that EMA is a valuable tool for businesses to adopt whilst responding to environmental challenges and still focusing on the triple bottom line (Ambe, 2007, p. 7). At the time of the study, there was an apparent lack of awareness and understanding of the significance of the environmental costs and their impact on the overall performance of the organization. What had been brought to the forefront was the potential savings to South African companies by implementing good environmental management by using EMA to accurately trace and identify environmental costs (Ambe, 2007, pp. 11-12). It can, therefore, be concluded that Environmental Accounting can be used to demonstrate the potential for environmental investment to yield financial benefits to an organization.

Recent developments in EMA emphasize the greater need for accounting information when making decisions regarding environmental projects (Qian and Burritt, 2008, p. 244).

Hence, communication between the accounting department and the environmental management department is crucial if an organization wishes to succeed in EMA implementation. Accountants play an important role as they are expected to access the data and analyze variables associated with various environmental costs.

In addition, there is also need to assess whether or not costs have been allocated and handled correctly and in accordance to environmental policies and guidelines. Therefore, in order to gain maximum benefits of EMA, an integrated system that provides comprehensive information is thus needed.

Scavone (2006, pp. 1276-1285) states that, by adopting an EMA system, a company can develop proactive environmental programs which, in turn, improve profitability and competitiveness, reduce business costs, increase worker productivity and morale, enhance brand image, and improve relations with regulators and local communities. She believes that companies that adopt proactive measures to address environmental issues are in an excellent position to identify problems and opportunities to introduce innovative solutions. Godschalk (2008, p. 259) explains that a company can reduce its exposure to environmental risks and liabilities by being proactive and being aware of possible environmental costs and savings available during their strategic planning phase. Hence, there is an increased need for systems that can provide reliable, accurate physical and monetary environmental information.

This, in turn, would assist in meeting the needs of customers and other stakeholders that have a vested interest in the company's operational activities. Qian, Burritt and Monroe (2011, pp. 93-128) emphasize that decisions based on conventional accounting practices only take into consideration the operational costs of waste management as compared to EMA, which generates both financial and non-financial information that is used by managers to support internal environmental management processes.

They pointed out that companies do not consider alternatives such as resource recovery and material recycling as disposal to landfill is considered as the most feasible and competitively attractive option

because of the low operation costs of landfill disposal. This is caused by incorrect calculation of actual environment cost by current management accounting systems. As a rule in environmental management, 80 percent of environmental costs are caused by 20 percent of production activities undertaken by an organization. Under traditional accounting, these costs are blocked under overhead accounts and thus shared by all product lines, thus, leading to incorrect estimation of product prices and reduced profitability of the organization (Bennett, Rikhardsson, and Schaltegger, 2003). According to Jasch (2008), during decision making, the cost of wasted materials, capital and labor need to be added to assess the value of total corporate environmental costs.

Table 1 shows the internal calculation of environmental costs by a company.

Table 1. Environmental costs of a company

	Environmental protection costs (emission treatment and pollution prevention)
+	Costs of wasted material
+	Costs of wasted capital and labor
=	Total corporate environmental costs

Source: Jasch (2009).

Table 1 indicates that, when calculating environmental costs, the purchase value of wasted material and the production costs of waste and emissions must be considered.

Ambe (2007, p. 6) clarifies the following shortcomings of conventional management accounting practices in environmental cost consideration during internal decision making:

- Many environmental costs were 'hidden' in overhead accounts.
- The allocation of environmental costs from the overhead accounts were thereafter incorrectly allocated to processes and products.
- Some environmental costs were incorrectly considered 'fixed' instead of 'variable'.
- Volume and cost of wasted raw materials were incorrectly calculated.
- Relevant and significant environmental costs were excluded completely from accounting records resulting in environmental costs being understated.
- EMA information is not considered during investment appraisal.

EMA was suggested as a valuable business tool for implementation by organizations to create a better link between environmental and economic performance (Ambe, 2007, p. 6). This made it possible for businesses to achieve the triple bottom line without compromising the environment. Godschalk (2008, p. 262) concluded that, ultimately, the internally-orientated benefits of adopting EMA are as follows: assist organizations in achieving competitive advantage, greater cost-efficiency, and improved image and customer relations. Olson and Jonall (2008, p. 8) stress the importance of having a more structured accounting system in increasing cost efficiency and improving environmental performance. Incorrect cost allocation leads to incorrect decision making. Therefore, tracing cost to the actual cause of it, either a process or product rather than reflecting it under overhead accounts, is extremely important, especially in strategic decision making.

Olson and Jonall (2008, p. 8) illustrate the principle of cost allocation in Table 2 by demonstrating the impact of incorrect environmental cost allocation.

Table 2. Impact of environmental cost allocation

Examples: 1) without, 2) with environmental overhead cost	'Clean' process A	'Dirty' process B
Correct environmental cost allocation		
Revenues	$200	$200
Production costs	$100	$100
True environmental costs	$0	$50
True profit	$100	$50
Incorrect environmental cost allocation		
Revenues	$200	$200
Production costs	$100	$100
If environmental costs are overhead	$25	$25
Illusory profit	$75	$75
The latter (2) is incorrect by	-25%	+50%

Source: Olson and Jonall (2008, p. 8).

Table 2 shows that if environmental costs were shared equally between both processes, an incorrect profit amount would be generated which, in turn, will impact on future investment decisions. Hence, process A would not have been given preference over project B. Therefore, in order to ensure that transparent, accurate environmental costs are allocated to the actual process or pro-duct, an EMA system would be most appropriate to be implemented in the future.

Various reports, including guidelines and recommendations for implementing EMA, have been published by the United Nations Division on Sustainable Development (UNDSD) and the International Federation of Accountants (IFAC) (Schaltegger, Gibassier, and Zvezdov, 2011, p. 1). However, every company would have a different goal and vision according to its needs and available resources for environment-related activities. Hence, EMA should be customized to suit the needs and requirements of individual organizations. It is, therefore, suggested that the current management accounting system of a company be adapted to include environmental cost information. Table 3 represents a summary of the main environmental cost categories found in businesses.

Table 3. Environmental cost categories

1 Waste and emission treatment	2 Prevention and environmental management	3 Material purchase value of non-product output	4 Processing cost of non-product output	5 Environmental revenues
1.1 Depreciation for related equipment	2.1 External services for environmental management	3.1 Raw materials	4.1 Labor costs	5.1 Subsidies, awards
1.2 Maintenance and operating materials and services	2.2 Personnel for general environmental management activities	3.2 Packaging	4.2 Energy costs	5.2 Other earnings
1.3 Related personnel	2.3 Research and development	3.3 Auxiliary materials		
1.4 Fees, taxes and charges	2.4 Extra expenditure for cleaner technologies	3.4 Operating materials		
1.5 Fines and penalties	2.5 Other environmental cost management	3.5 Energy		
1.6 Insurance for environmental liabilities		3.6 Water		
1.7 Provision for clean-up costs remediation				

Source: Introducing environmental management accounting at enterprise level (2001, p. 9).

Table 3 was developed by the UNDSD in 2001 and provides a framework and guidelines on environmental cost categorization. Hence, this information could be useful to companies that want to implement EMA as part of their continuous improvement policy. Jasch (2003, pp. 667-676) claims that this comprehensive framework for EMA ensures that all relevant and significant costs are considered during decision making.

The framework for EMA proposed is by Burritt, Haun, and Schaltegger (2002) on categories of different EMA methods based on the attributes of the information and the uses to which the information is to be applied. The 16 categories in which different EMA methods can be positioned and understood in terms of their purpose and data source are demonstrated in Table 4 (Bennett, Schaltegger, Zvezdov, 2013).

Table 4. EMA methods

Time	Type of report	Physical short-term	Physical long-term	Monetary short-term	Monetary long-term
Past-oriented	Routinely generated	X	X	X	X
	Ad hoc	X	X	X	X
Future-oriented	Routinely generated	X	X	X	X
	Ad hoc	X	X	X	X

Source: Burritt, Haun and Schaltegger (2002, p. 43).

Table 4 explains the categories of EMA information generated as follows:

- Information is monetary and non-monetary (physical).
- Measure past performance or to make decisions for the future.
- Distinguished between decision involving strategic information over several years and more operational information covering shorter time periods.
- How routinely the information is provided regularly for a recurring purpose or basis for a specific non-recurring need.

This type of information can provide managers with an overview of inefficiencies in material and energy usage which is useful in identifying and analyzing potential improvement opportunities.

Hyrslova (2011, p. 47) states that, within the EMA framework, it is necessary to analyze the individual activities and processes to prepare material and energy balances in order to understand waste flows and express these flows in monetary units to ensure that all significant costs are considered when making business decisions. According to Jasch (2008), any waste generated is a sign of inefficient production based on the underlying assumption that all purchased materials must leave the company either as a product or waste and emission.

The concept of EMA is not clear to many individuals in an organization and is conceived as a system that merely monitors and reports environmental costs. Jasch (2008, p. 4) argues that "Doing environmental management accounting is simply doing better, more comprehensive management accounting, while wearing an 'environmental' hat that opens the eyes for hidden costs." It should be noted that management of environment-related costs is important even before reporting them. Hence, environmental and financial performance is managed and improved by adopting an EMA system (Schaltegger et al., 2010, p. 47).

Although environmental accounting forms an important part of industrial decision making in first

world countries, there is however a lack of commitment to the environment in South Africa (De Beer and Friend, 2006). Environmental Assessment (EA) is an integral component of environmental regulatory systems in developing countries like South Africa. It is one of the most important emerging trends in national environmental legislation. The EA process can contribute to effectiveness of the environmental regulatory system by integrating environmental considerations into the planning and appraisal of development activities.

Following great developments internationally, South Africa began to place emphasis on environmental impact during decision making on processes and products, more especially in the context of energy and raw material consumption and the resulting waste of production processes. Despite commitment from government and many organizations, the level of EMA application still remains low. Ambe (2007, p. 11) concluded that EMA implementation in developing countries was still at its infancy stage. Conventional cost accounting systems are still used by the majority of organizations in South Africa as managers do not actually see benefits of detailed environmental costing. Company managers believe that developing new systems are expensive and traditional systems are perceived as adequate for reporting purposes.

3.1.2. Theoretical perspectives of EMA. There are various theories that researchers have studied to identify the motivational reasons for EMA adoptions. The two categories most commonly researched are the social theory and the organizational theoretical perspectives. Both these theoretical perspectives are explained briefly below.

Environmental reporting and environmental audit research are sometimes based on the 'stakeholder theory'. The stakeholder theory implies that organizations need to place greater emphasis on stakeholders and ensure that a two-way communication is facilitated as stakeholder interest is considered critical to a firm's success (Godschalk, 2008, p. 250). Some researchers argue that, in order to ensure sustainability of the company, the legitimacy theory must be applied. This implies that a company needs to conduct their business operations in a way that is socially acceptable by the community. Schaltegger et al. (2010, p. 262) believe that stakeholder relations can be improved by enhancing benefits they receive from improved environmental performance. The company needs to disclose its activities to ensure continuity. The stakeholder theory and legitimacy theory are similar in that they both take an open system's view of organizations (Qian, Burritt and Monroe 2011, pp. 93-128). These theoretical perspectives relate specifically to corporate environmental accounting.

On the other hand, a contrasting view to both theories mentioned above is the institutional theory that views the organization as part of the larger system in which it operates. Qian, Burritt and Monroe (2011, pp. 93-128) argue that the institutional theory is more applicable to explaining motivations for adopting environmental management accounting in organizations. Jalaludin, Sulaiman and Ahmad (2011, pp. 540-557) conducted a study aimed at understanding the relationship between EMA adoption and institutional pressure using multiple regression analysis. They reported that institutional pressure in terms of training and education did, to some extent, influence EMA adoption in organizations.

Bennette, Schaltegger and Zvezdov (2013) discussed the impact of the contingency theory on environmental accounting. They stated that there is no single best approach to sustainability in a company. Instead, the optimal course of action is dependent (contingent) upon the circumstances in each case and upon relevant factors such as the company's environment, technology and culture.

Qian, Burritt and Manroe (2011, pp. 93-128) argue that an organization's contextual dynamics are just as important and need to be considered when analyzing environmental changes in organizations.

Since the external business environment is characterised by uncertainty, the contingency theory seems most appropriate during analysis of environment performance of an organization. It is, therefore, evident from the above review that there is no set theory to explain EMA implementation.

3.1.3. Challenges of EMA implementation. Several factors make it difficult for the implementation of EMA in an organization. Poor adoption of EMA in many industries increased the need to investigate some of the challenges experienced by companies. Ferenhof et al. (2014) mention some challenges to adopting EMA that they discovered during research: implementation of EMA has a lack of organization incentives as some companies perceive disclosure of accounting information as risky. Accountants are usually unaware of information improvements that could be obtained by using EMA methodology when they design an accounting system, making it difficult for effective collection and evaluation of environment-related information. De Beer and Friend (2006) added that deficiencies in institutional capacities, untrained staff, shortages of resources as well as inadequate base-line data and

environmental monitoring have been identified as some of the shortcomings in current regulatory systems in middle-income countries. Furthermore, research shows that there are poor communication links between accounting and other departments in an organization. Inconsistencies in the type of information system used by the accounting and technical departments also make it difficult to track and trace certain environmental costs accurately (Shcaltegger et al., 2010).

During a study done in China, Li (2004, p. 1) claimed that problems related to EMA were the poor specification of environmental accounting information, allocation of environmental costs, legislation issues, and lack of environmental accounting standards. Hence, stricter regulatory compliance is necessary for companies to implement EMA systems and procedures because, if this is optional, many organizations would not likely want to make the change even though they may be aware of the potential benefits of the systems. They view such changes as 'not worth their while'. Conversely, Ahmed et al. (2009, p. 14) point out that "Environmental considerations are considered to be accompanied only by costs or as counter productive to economic growth".

Some barriers that EMA helps to overcome, as mentioned by Olson and Jonall (2008, p. 40), are management commitment by making managers aware of actual environmental costs, information inconsistency, becoming more efficient and focused, thus resulting in improved environmental and economic performance, and promoting better quality of products through reducing the amount of defective products. In conventional cost accounting, both environmental and non-environmental costs are included under overhead accounts and hidden from management, resulting in incorrect decision making. Figure 3 clearly demonstrates the four approaches to environmental accounting (Olson and Jonall, 2008, p. 19).

Fig. 3. Internal and external reporting of financial and non-financial data

Figure 3 depicts the EMA approach, including the internal, external, financial and non-financial perspectives (Bartholomeo et al., 2000).

EMA, as described by Olson and Jonall (2008, p. 19), is a combined approach representing the transition of data from financial accounting, cost accounting, and material flow cost accounting. Material flow balances, in physical units within a defined system, form the core part of Environmental Information System.

3.1.4. Empirical evidence of EMA. A large number of pilot testing projects have been conducted on EMA, demonstrating its positive contribution towards companies achieving both environmental and economic targets (Qian et al., 2011, pp. 93-28; Khalid and Dixon, 2012, p. 3; Bennette, Schaltegger and Zvezdov, 2013). A brief summary of the findings from other pilot case studies that are considered relevant, are mentioned below. A pilot testing project of EMA on 10 case studies conducted by Jasch and Schnitzer (2002, p. 6) showed that there is clearly lack of communication between the environmental manager and cost accountant in companies. The environmental manager has limited access to actual cost accounting documents and although the cost controller has most of the information, they lack the ability to separate the environmental part without proper guidance.

EMA is a combined approach to bridge this communication gap and provide for the transition of data from cost accounting and financial accounting to reduce the environmental impact by increasing material efficiency. Hence, it was implied that, in order to enable the sharing of environmental information, there was a need to stimulate management accounting practices, formal and informal interactions between different functions. Similar findings were reported by Albelda (2011, pp. 76-100) who explored the role of management accounting practices as facilitators of the environmental management.

The results showed that by reinforcing the four significant EMAS elements: commitment to continual improvement of environmental performance; compliance with environmental legislation; communication with stakeholders; and employee involvement, management accounting practices operate as a facilitator mechanism for environmental management.

Poor communication links between the accounting and technical departments result in inaccurate cost allocation, which eventually leads to managers making incorrect operational and investment decisions. This ultimately has inverse impacts on a company's environmental and financial performances. It had been discovered subsequently that many of the businesses' costs are environment-related and that

simple actions could be taken to improve environmental and business performances (Jasch and Schnitzer 2002, p. 6). Olson and Jonall (2008, p. 29) mention in their review of corporate results that, when EMA methodology was applied at a Canadian Mackenzie Paper Division paper mill, environmental costs were found to be more than twice as high as those reported in the company's year-end report. This finding concludes that many important environmental costs are hidden in other accounts and support the view that environmental costs are higher than generally perceived by management.

Porter's hypothesis of the 'win-win' scenario suggested that a strategy aimed at enhanced resource productivity will make companies more competitive (Bras et al., 2004). There is however, substantial evidence that indicates that customers prefer companies that adopt measures to innovate to improve their environmental performance, and innovation also improved the image of the business enterprise giving them a competitive edge. Khalid and Dixon (2012, p. 3) claim that, by using EMA, companies could implement proactive techniques that could prevent or reduce the environmental impact of their operational activities.

It is evident from various case studies that many organizations are not fully aware and knowledgeable on how to actually implement EMA and, therefore, are unable to experience the benefits of EMA implementation. Since this concept is new to many industries, there is clearly a need for more structured guidelines on how to adapt current management accounting practices to include environment-related information. Governments, environmental support groups and other regulatory organizations need to promote and encourage EMA adoption in various industries. EMA implementation remains a 'niche' in South Africa as organizations are reluctant to adopt new systems unless they are compelled to do so as a regulatory or legislative requirement.

Conclusion

There is a lack of awareness among South African companies of the role and importance of EMA in improving environmental and economic performance and achieving sustainable development targets. Therefore, many companies are still using conventional costing systems and are unable to make informed strategic decisions of investing in CP. However, changes in legislation will greatly impact on management's current view on CP and EMA.

This paper has presented an analysis of key issues on EMA that have been investigated by other researchers. Empirical evidence to support these findings was also discussed. A critical analysis was presented of the different views on the reasons for the challenges that organizations face in adopting an EMA system. Gaps in the studies were also realized during the literature review which allows for further research into tools of EMA.

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