



# Possible Implications of the Relationship between Environmental Management Accounting Techniques and Sustainable Competitive Advantage

Khudair Majeed Allawi<sup>a\*</sup>, Sabah Hasan Mijbil<sup>b</sup>, Ahmed Mohammad Hamzah<sup>c</sup>,  
<sup>a</sup>Al-Furat Al-Awsat Technical University- Technical Institute /Diwaniya, <sup>b</sup>Ministry of Higher Education and Scientific Research, Department of missions and cultural relations. <sup>c</sup>Summer University, College of Administration and Economics.  
Email: <sup>a\*</sup>[khud.dw@atu.edu.iq](mailto:khud.dw@atu.edu.iq)

This study aims to demonstrate the relationship and potential impact between environmental management accounting techniques and sustainable competitive advantage, and the effect of these technologies in rationalising cost and time, improving quality, enhancing sustainability, creativity and energy conservation, providing a safe and clean environment and reducing waste in the production process, to achieve a sustainable competitive advantage as well as to achieve the purpose of this study. A questionnaire was prepared and distributed to 350 account managers and production staff management of industrial companies in Iraq. The study concluded that environmental management accounting techniques play an important role in promoting the dimensions of sustainable competitive advantage within the organisation, which calls for these companies to adopt the application of environmental management accounting techniques in order to stay and continue in the competitive environment in a way that achieves sustainability for them.

**Keywords:** *Environmental Management Accounting Techniques, Sustainable Competitive Advantage.*

## Introduction

In the last two decades, environmental problems have become a global focus of attention due to their association with the industrial economic units' consumption of materials, water and energy, which led to their exhaustion. Also, the release of toxic gases in the air and the generation of solid and liquid wastes in water and soil resulting from the exercise of these units' activities has harmful effects on the environment. As a result, economic units of different types,



orientations, and sizes face a range of problems and difficulties, perhaps the most prominent of which is the lack of awareness of those units of the large costs generated by the effects of their activities on the environment, which are difficult to track when using traditional management accounting techniques, because those costs are because these costs are usually implicit (hidden) in the financial statements. For this reason, the Environmental Management Accounting (EMA), which provides environmental information (material and financial) about environmental impacts and costs and the disclosure and transparency of these impacts and costs, has emerged to enable economic unit managers to manage them in a way that results in economic and environmental benefits (Doorasamy, 2014: 36-37); (Namakonzi & Inanga, 2014: 6). It also shows the possibility of using accounting information management in managing environmental problems, especially by linking environmental management with management accounting. Examples include the United States of America in preparing accounting reports, and environmental management and accounting reports in accordance with environmental regulations and legislation, which encourages other countries such as Canada and Ukraine to provide Such reports, in addition to the increasing demand towards reducing environmental impacts, is one of the drivers of environmental management accounting that helps determine the costs and benefits of environmental programs, which stimulated EMA care and development. Its implementation, therefore, increased academic and applied research in the 1990s towards the use of EMA in environmental performance management, which greatly assisted the development and use of EMA (Chang, 2007: 33-34).

Accordingly, the 1990s witnessed a noticeable increase in EMA tools such as total cost accounting, cost accounting for material flow, product life cycle cost, etc. Also, many economic units included environmental impacts and costs in administrative decision-making. However, its explanation and interpretation were weak. As a result, the Environmental Protection Agency in the United States of America prepared an official program to encourage reliance on EMA, as meetings and publications from relevant experts at the United Nations Division for Sustainable Development crystallized many ideas towards developing and implementing EMA. Apart from that, many economic units in more than 30 countries began to strengthen and implement EMA, and also began publishing guidance documents for environmental management accounting, including the Environmental Protection Agency (1995), the Association of Administrative Accountants in Canada (1996), and the Environment Canada (1997) ), The National Service for the Defence of Environmental Quality in the United States of America (1999), the United Nations / Sustainable Development (2001), and the German Ministry of the Environment (2003). Moreover, there were guidelines available that related to environmental cost issues for accounting, finance and reporting, including the Institute of Chartered Accountants in England Wells (1996), the United Nations Organisation, the Trade and Development Conference (1999), the European Commission in Brussels (2001 and 2003), and we can also find a number of excellent environmental and management accounting books that have spread widely. All of these books and guiding documents helped



to a great extent with understanding and implementing EMA (Qian & Burritt, 2008: 234-235); (Jasch & Savage, 2008: 321).

As a result of the growing international interest in developing and implementing EMA, the International Federation of Accountants (IFAC) decided to work out an EMA certification document together with the EMA working group at the United Nations by providing a framework and set of EMA definitions as comprehensive and consistent as possible. The user is currently in line with the work of an EMA certification document (Jasch & Savage, 2008: 322). Therefore, this study aims to demonstrate the potential implications of the relationship between environmental management accounting techniques hereby represented (MFCA), environmental costs based on activities ABC, Environmental Quality Technology (EQ), Product Life Cycle Assessment Technology (LCA), Product Life Cycle Cost Technology (LCAC), Environmental Balanced Scorecard (EBSC) and the sustainable competitive advantage of price, quality, time, efficiency, delivery speed, etc. The problem of the study is that most economic units are still using the same traditional methods in production while ignoring environmental impacts and environmental pollution caused by frequent emissions associated with production processes. And that these methods also neglect the importance of environmental, material and monetary information provided, which helps decision makers in implementing their strategies and achieving a sustainable competitive advantage.

## **Literature Review**

Several previous studies dealt with the concept of environmental management accounting and its techniques as a study. (Abdullah, 2009) presented the definition of the environmental management accounting concept in general, the determination of the environmental cost using the environmental management accounting methodology, as well as the evaluation and assessment of the environmental impacts of products through tracking their life cycle. The study focuses on using the life-cycle cost technology to evaluate the environmental impacts of products by using the input-output analysis technique to determine waste and losses in each of the production units. Al-Timi and Al-Zaidi (2012) stated that adopting the strategy of environmental economic efficiency as an introduction to the application of cleaner production will be reflected in the philosophy of strategic cost management techniques and tools in support of the environmental dimension as a major competitive precedence. The study (JAV et al., 2016) aimed to shed light on the extent of the cement company in the Kurdistan Region by applying environmental management accounting methods, as well as knowing the extent to which these companies can keep pace with modern technological developments in the field of the environment, and the extent to which companies measure and determine environmental costs and accounting for them for internal use purposes within the company. It indicates (Al-Tamimi, 2016) the analysis of recent trends in the field of environmental management accounting methods and techniques and the factors that helped their emergence. It also and



studies and analyses the role of the administrative accountant in light of the recent environmental trends of management accounting in support of strategic ministries with environmental impacts for economic units. It is also concerned with the study and analysis of the importance of using environmental management accounting methods and techniques for providing appropriate and necessary information to support programs and strategic decisions with environmental impacts while trying to present a proposed model for the application of environmental management accounting in the Iraqi industrial economic environment (Abdul Halim, 2005). In his study, he tried to rebalance the scorecard by introducing the environmental dimension and discussing the causal chain included in strategic planning with a focus on the concept of corporate sustainability and its impact on indicators and performance measures in the Balanced Scorecard. (Al-Sabou ', 2009) tried to find out the extent to which industrial companies adopt the technology of environmental management accounting, and to know whether these companies are accounting for the costs of treating waste and radiation for internal use, as well as accounting for the costs of environmental protection and management, accounting for a value of materials purchases, and accounting for operating costs for internal use (Ibrahim, 2015). This study aims to explore the extent to which Syrian companies use environmental management accounting tools, measure environmental costs, as well as explain the most important obstacles of implementing environmental management accounting in Syrian companies (UNSD, 2001). It is focused upon a model for determining environmental costs that include the cost of outputs for unproductive units such as material losses, environmental management and protection costs, as well as waste and emission treatment costs, and research and development costs minus environmental savings. Stasiškienė & Staniskis (2003) discussed the importance of material flow information and associated costs in making the decisions necessary to achieve sustainable development, as the success of the EMS depends on methods of determining environmental costs, for example integrating environmental costs into the capital budget in order to assess environmentally efficient projects, especially cleaner production projects or the use of environmental costs in environmentally friendly product design decisions. Another study (Vinayagamoorthi et al., 2012) aims to know the environmental activities carried out by economic units in India, which helps determine hidden costs in calculating general expenses. In addition to that, it shows the most important environmental management accounting techniques that are used to assess environmental costs, which are important for decision-making in the business organisation. Doorasamy (2014) has shown the importance of using environmental management accounting in generating potential environmental and economic benefits due to its ability to provide environmental information that is used in implementing current production technologies and techniques for the steam production process in the South African boiler plant (Schaltegger et al., 2008). He explained (Alkisher, 2013: 26) that environmental management accounting techniques are among the effective tools that help in providing environmental information (material and financial) used in decision-making, especially concerning implementing production, evaluating investment, improving environmental and economic performance, and achieving sustainable development

of economic units. Jinadu et al. (2015: 587) believes that environmental management accounting is the management of environmental performance since it takes advantage of its environmental information to reduce environmental impacts and costs and increase the efficiency of material use.

Hence, environmental management accounting (EMA) can be defined as "a part of the environmental accounting that identifies and analyses environmental information represented by financial information such as environmental costs, and physical information related to material, water and energy flows that are used to support internal decisions related to environmental issues, which assists managers of economic units in the implementation of environmental strategies and thus improve environmental and economic performance, all of these ultimately leading to achieving sustainable competitive advantages" (IFAC, 2005). Environmental management accounting has many techniques, the most important of them being the following:

- Accounting for material flows (material balance): economic units use the material flow accounting technique to track all material inputs and outputs in order to ensure accounting for unimportant quantities of materials, water and energy (Jasch, 2003: 668), as the balance of materials depends on an assumption that basically, all material inputs must eventually take the shape of products, waste and emissions. Outputs that are not found in the form of products are called unproductive outputs (material losses), so the balance of materials in physical units of materials, energy and water is considered, within the system's boundaries, to be the primary meaning of environmental information management (Kotzee, 2014: 30); (Jasch, 2003: 668).
- Environmental cost based on activity (ABC): this technology aims to separate disguised or hidden costs from overhead costs. The United Nations report made it clear in 2001 that this technology focuses on the proper allocation of costs on products, on which pricing of products and other administrative decisions depend. (Allawi et al, 2019: 20)
- Product life cycle (LCA): This technology deals with the costs related to the life of the product and associated with the full environmental impacts, which include the stages of design, production, use, and even the transformation of the product into waste).
- Cost accounting for material flow (MFCA) is an administrative tool that is used to improve material productivity and reduce costs in order to improve the environmental and economic performance of the economic unit and is a tool for measuring material flows and balances in operations or production lines in physical and monetary units. Thus, the information generated from the use of technology (MFCA) serves as an incentive for managers in economic units because it is used to reduce environmental impacts and costs through improved use of materials (Schaltegger & Zvezdov, 2015: 4).
- Environmental quality cost determination technology (EQC): determining the cost of environmental quality is one of the most important technologies (EMA), because it helps in providing information to management regarding environmental product quality and then assists

managers in making decisions related to the process of designing and manufacturing the product with environmental awareness, to reduce environmental impacts and costs and thus achieve competitive advantages (Dunk, 2007: 29-30).

- Environmental balanced scorecard (EBSC), is a set of operational and environmental measures that give a comprehensive and rapid view to senior management on business management such as customer satisfaction, internal improvement, learning and growth, finance and other perspectives related to business strategies to create a strategic map of environmental performance. According to the framework of the Balanced Performance System, it focuses on the relationship between the strategic environmental goals of the economic unit and the causes of performance in order to improve environmental performance and provide a set of strategic measures to evaluate the environmental performance (Vtnayagamoorthi et al., 2012).

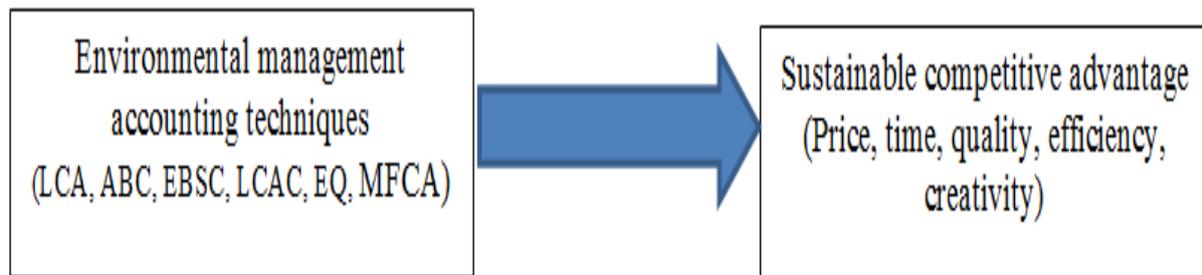
Many studies have examined the sources of sustainable competitive advantage. Some have called them elements or dimensions of competitive advantages, which are concentrated in one or more of the following points: excellence, cost, innovation, growth and alliances. Therefore, it is clear that the sources of competitive advantages have become multiple and complex due to the successive developments in the industrial fields and Figure 1 illustrates that. Armstrong & Kotler (2007) agreed that sustainability is represented by improvement strategies in order to sustain the competitive advantage, which requires the organisation to maintain a distinct performance that includes the competitive position, which is a reflection of the organisation's own capabilities and the true launch of its distinction. Excellence requires that it start from within the organisation, noting that the distinction does not depend on the distinctive products, but goes beyond all organisational aspects so that there is a competitive position for the organisation among the working organisations. In the same sector and domain, the competitive advantage can be defined as "the ability to produce goods and services with good quality and the right price at the right time, and this means meeting the needs of consumers more efficiently than other facilities" (9:13) and that "the advantage arises by the institution's discovering of new methods more effective than those used by competitors". Thus, they can be defined as: "an element of the organisation's superiority in exploiting its sources of strength and the following of innovative strategies to add value to its products, that competitors have not reached".

Depending on literature and previous studies, the following main hypothesis study is assumed:

**H1:** There is a statistically significant effect of environmental management accounting on sustainable competitive advantage.

**H2:** There is a statistically significant correlation between environmental management accounting techniques and sustainable competitive advantage.

**Figure 1.** Study framework



## Research Methods

The purpose of this research paper is to test the possible implications of the relationship between environmental management accounting techniques to achieve sustainable competitive advantage. A questionnaire has been prepared for this purpose and has been distributed to 350 account and production managers of industrial companies in Iraq. After only one month, the received and valid forms amounted to 286, which represents 81.71 % of the total number of distributed forms. Several methods were employed in analysing the study variables and finding the causal relationship between them, including the Likert pentatonic scale and path analysis through the AMOS statistical analysis, V.24 and relied on the scale and scope of previous studies such as the independent variable (Environmental Management Accounting Techniques) according to the scale of Bhanot et al (2015) consisting of 28 paragraphs and the dependent variable (sustainable competitive advantage) according to the scale of Sachitra (2017); Gumaraes et al (2017), consisting of 17 paragraphs.

## Results and Discussion

The degree of stability and internal consistency was measured by using the Alpha Cronbach coefficient and through the use of the SPSS program. It was found that the value of the Alpha Cronbach for the study variables is 0.907, which is higher than the Alpha Cronbach coefficient 0.60. This is a good result which shows the reliability of the results of the study. Also, the self-validity of the questionnaire has been calculated and it represents the square root of the alpha, having reached 0.822 which is a good indicator of the validity of the resolution shown in Table 1.

**Table 1:** Stability and reliability of the questionnaire

Research variables	Dimensions of the scale	Alpha Kronbach
Environmental management accounting techniques	MFCA	0.894
	EQ	0.897
	LCA	0.896
	LCAC	0.893
	EBSC	0.896
	ABC	0.913
Total stability of a scale of environmental management accounting techniques	0.891	
Sustainable competitive advantage	Price	0.916
	Efficiency	0.909
	Quality	0.897
	Creativity	0.898
	Time	0.894
Total stability of the feature	0.895	
Sustainable competitiveness	0.907	
Total stability of the scale		

To test the effect relationship between the main variables of the study, this test was conducted using path analysis by AMOS, V.24 statistical analysis program for the purpose of verifying the effect relationship between environmental management accounting and sustainable competitive advantage, and the results shown in Table 2 and Figure 2 were reached.

**Figure 2.** The effect relationship between the main variables of the study



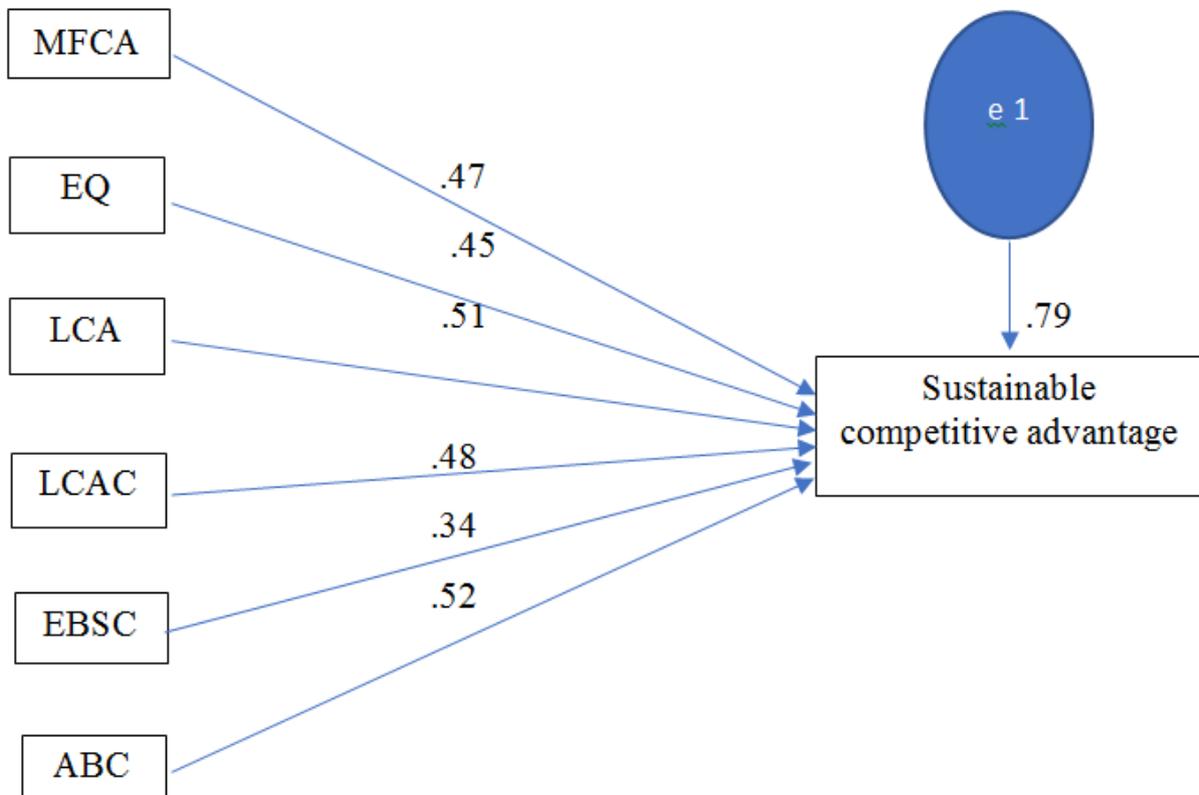
**Table 2:** The effect relationship between the main study variables

The main variables		Estimate	S.E.	C.R.	P	Conclusion
Environmental management accounting	Sustainable competitive advantage	.864	.035	24.417	***	Accept the hypothesis

As noted in Figure 2, there is a path that the independent variable (environmental management accounting techniques) takes in its influence with the adopted variable (sustainable competitive advantage). Based on what is stated in the table and figure mentioned above, we have come to accept the main hypothesis, as it is clear that there is a direct impact with statistical significance of environmental management accounting in the sustainable competitive advantage, as the CR values are greater than 1.96 and the impact amount is 0.864, and therefore the main hypothesis H1 is accepted (Fmanchnick & Fidell, 2001).

To verify the impact relationship between environmental management accounting techniques and sustainable competitive advantage, the test was conducted by path analysis using the AMOS statistical program, V.24, and the results are shown in Table 3 and Figure 3.

**Figure 3.** The relationship between the impact of the dimensions of environmental management accounting techniques on the sustainable competitive advantage



**Table 3:** The relationship between the effect of environmental management accounting techniques on sustainable competitive advantage

Path	Estimate	S.E.	C.R.	P	Conclusion
MFCA → Sustainable competitive advantage	.472	0.068	7.692	***	Accept the hypothesis
EQ → Sustainable competitive advantage	.452	0.055	7.148	***	Accept the hypothesis
LCA → Sustainable competitive advantage	.513	.031	10.075	***	Accept the hypothesis
LCAC → Sustainable competitive advantage	.482	.015	3.811	***	Accept the hypothesis
EBSC → Sustainable competitive advantage	.342	.015	8.867	***	Accept the hypothesis
ABC → Sustainable competitive advantage	.522	.016	16.328	***	Accept the hypothesis

Based on what is stated in the figure and the table above, we have come to accept the impact relationship hypotheses of environmental management accounting techniques in the sustainable competitive advantage of the presence of a statistically significant effect where the values of C.R are greater than 1.96 (Tabachnick & Fidell, 2001), and this confirms the acceptance of the main and subsidiary hypotheses.

## Conclusions

During the review of the scientific literature related to environmental management accounting, it turns out that it is one of the technologies that aims to reduce waste and emissions and protect the environment through the optimal use of resources. Iraqi companies make great efforts to preserve the environment and reduce waste, but these companies have not kept pace with the development of practices and techniques of environmental management accounting, thus environmental costs are still hidden within the additional costs.

The results of the study showed that there is a statistically significant correlation between environmental management accounting and sustainable competitive advantage. Moreover, environmental management accounting techniques contribute significantly to achieving a sustainable competitive advantage, and this is consistent with the objectives of the study and its theoretical framework. However, some fears and constraints limit the application of environmental management accounting techniques, including: i) the difficulty of measuring environmental costs, ii) the difficulty of collecting data related to the environment in light of the current accounting system, iii) the lack of coordination and cooperation between the



accounting departments and other departments, and iv) the lack of interest shown by the community with regard to environmental issues.



## REFERENCES

- Abdel-Halim, (2005). Incorporating environmental performance indicators into a balanced scorecard to activate the role of business organisations in sustainable development. Al-Azhar University / College of Commerce, Journal of Economic and Administrative Sciences, 21(2): 123-126.
- Abdullah, S. S.E.-D. (2009). Developing a model for determining environmental costs using environmental management accounting techniques / applied research in the general company for middle refineries - Dora refinery. Certificate of Accountant and Administration, Baghdad University, Council of the Higher Institute for Accounting and Financial Studies.
- Alkisher, A. O. (2013). Factors influencing environmental management accounting adopting in oil and manufacturing firms in Libya. Ph.D. Thesis, University Utara Malaysia, Othman Yeop Abdullah Graduate School of Business.
- Allawi, K.M., Mijbil, S.H., Salloomi, R.K. (2019). The compatibility between lean accounting and cleaner production for achieving competitive advantage. Polish Journal of Management Studies, 20(2).
- Al-Sabou', S. S. (2009). The extent to which Jordanian industrial companies adopt the technology of environmental management accounting and accounting for environmental costs. Jordanian Journal of Business Administration, 5(4): 433-45.
- Chang, H.-C. (2007). Environmental management accounting within universities: Current state and future potential. Ph.D. Thesis, RMIT University, School of Accounting and Law.
- Doorasamy, M. (2014). Using environmental management accounting to investigate benefits of cleaner production. Submitted in Fulfillment of the Requirements of the Master of Technology degree in Cost and Management Accounting in the Department of Management Accounting, Faculty of Accounting and Informatics, Durban University of Technology, Durban, South Africa.
- Dunk, A.S. (2007). Assessing the effects of product quality and environmental management accounting on the competitive advantage of firms. Australasian Accounting Business and Finance Journal, 1(1): 28-36.
- International Federation of Accountants (IFAC), (2005). International guidance document - environmental management accounting. USA, New York.



- Jaf, R. A. S., Aziz, B. S. and Salar, G. A. (2016). The extent of application of environmental management accounting methods and environmental costs of environmental improvement. A Field Study on Cement Companies in the Kurdistan Region of Iraq, Salahuddin University / Administration and Economics, 20(1): 147-158.
- Jasch, C. (2009). Environmental and material flow cost accounting – principles and procedures. Springer Science and Business Media B. V., Environmental Management Accounting Network (EMAN).
- Jasch, C. and Savage, D. E. (2008). The IFAC international guidance document on environmental management accounting. Environmental Management Accounting for Cleaner Production, Springer Science and Business Media, pp (321-336).
- Jinadu, O., Agbeyangi, B.A. and Mamidu, I. A. (2015). *Impact of environmental management accounting on current practices and future sustainability in South-West Nigerian polytechnics*. International Journal of Economics Commerce and Management, 3(10): 586-603.
- Namakonzi, R. & Inanga, E. (2014). Environmental management accounting and environmental management in manufacturing industries in Uganda. Working Paper No. 2014/39, Maastricht School of Management
- Schaltegger, S., & Zvezdov, D. (2015). Expanding material flow cost accounting. Framework, review and potentials. Journal of Cleaner Production, 108, 1333-1341.
- Schaltegger, S., Bennett, M., Burritt, R. L. & Jasch, C. (2008). Environmental management accounting for cleaner production. Springer Science and Business Media B. V., Volume (24), UK.
- Stasiškienė, Ž. & Staniskis, J. (2003). Environmental management accounting for CP investment project development. Environmental Research, Engineering and Management, 1(23): 60-69.
- United Nations Division for Sustainable Development (UNSD), (2001). Environmental management accounting procedures and principles. Economic & Social Affairs, United Nation, New York .
- Vinayagamoorthi, V., Selvam, M., Lingaraja, K., & Mahalingam, G. (2012). Environmental management accounting—A decision making tools. Environmental Management Accounting—A Decision Making Tools (December 12, 2012). International Journal of Management, 3(3), 144-151.