

**The Impact of Environmental Management
Accounting Adoption on the Environmental
Performance: Evidence from Oil and Gas
Sector in Egypt**

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Abstract:

There is a growing body of literature that recognizes the significance of Corporate Social Responsibility (CSR) of the firms to accomplish the sustainable development. Environmental Management Accounting (EMA) is considered one of the most indispensable instruments of CSR that contributes to attaining sustainability. EMA copes with the valuation and disclosure of environmental related activities. Thus, the principal purpose of this study is to scrutinize the possibility of adopting and applying EMA, explain its concepts, its distinctive features, and recognize the application dilemmas of this approach, and its role in upgrading the Environmental Performance (EP) in the Oil and Gas sector in Egypt. The research approach is a mixture between deductive and inductive approaches: the research makes an attempt to scrutinize the extent of grasping EMA values through conducting a survey as a research strategy in the oil and gas sector in Egypt (*Deductive Perspective*). In contrast, the study is looking to decide the imperative impact of applying EMA on the business's environmental performance (*Inductive Perspective*). However, the predominant research approach is deductive and the information will be handled quantitatively. The major findings of this research paper are: (1) there is an enormous significance regarding the initiatives that should be encouraged to fulfill compliance with the environmental policies and regulations, (2) there is a crucial need for managing several training sessions concerning the EMA system and classifying the major environmental costs, and (3) applying EMA technique has an essential role in developing the firm's environmental performance (EP) from numerous perspectives; compliance, eco-efficiency, and strategic position.

Key Words

EMA, Environmental Performance, Oil and Gas Sector, Egypt.

أثر تطبيق المحاسبة الإدارية البيئية علي الأداء البيئي:

بالتطبيق علي قطاع النفط و الغاز في مصر

ملخص البحث:

هناك عدد كبير من الدراسات الحديثة في السنوات الأخيرة في مجال المسؤولية الاجتماعية للشركات. و تعتبر المحاسبة الإدارية البيئية واحدة من أهم أدوات المسؤولية الاجتماعية للشركات و التي تساهم في تحقيق التنمية المستدامة. حيث تقوم المحاسبة الإدارية البيئية بتقييم و تحليل و التقرير عن الأنشطة المرتبطة بالبيئة. و بالتالي يتمثل الهدف الرئيسي للدراسة في " تحليل مبادئ و أهداف و المشكلات المرتبطة بنظام المحاسبة الإدارية البيئية و دورها في تطوير الأداء البيئي للشركات و ذلك بالتطبيق علي قطاع النفط و الغاز في مصر". و منهج البحث هو مزيج بين المنهج الإستراتيجي و المنهج الإستقرائي حيث يهدف البحث إلي تحليل درجة فهم و إستيعاب مدخل المحاسبة الإدارية البيئية كأحد أدوات المحاسبة الإدارية الحديثة و ذلك من خلال إجراء مسح شامل كإستراتيجية بحث رئيسية في قطاع النفط و الغاز في مصر (المنهج الإستراتيجي). و في المقابل يتطلع البحث لإظهار الأثار الهامة لتطبيق ذلك المفهوم الجديد في المحاسبة الإدارية علي الأداء البيئي للشركات (المنهج الإستقرائي). و مع ذلك فإن منهج البحث المسيطر و السائد هو المنهج الإستراتيجي و سوف تتم معالجة البيانات كميًا. و خلصت الدراسة التطبيقية الي عدة نتائج أهمها: (١) هناك إهتمام كبير من قبل عينة الدراسة المختارة بالمبادرات التي يجب تبنيها للإمتثال و الإستجابة لسياسات و الأنظمة و الإجراءات البيئية في مجال إستهلاك الموارد و إنتاج منتجات آمنة لبيئة الأعمال المحيطة ، (٢) يحتاج نظام المحاسبة الإدارية البيئية إلي أن تعقد الشركات مجموعة من الدورات التدريبية التي تهدف إلي تثقيف العاملين و المهتمين بمجال المحاسبة الإدارية بمفاهيم و أدبيات و سياسات مفهوم المحاسبة الإدارية البيئية و بيان أهمية تصنيف و تحليل أنواع التكاليف البيئية المختلفة، (٣) إن التطبيق الجيد لمفهوم المحاسبة الإدارية البيئية له العديد من الأثار الإيجابية الفاعلة علي الأداء البيئي للشركات و من أهمها ما يلي: تحقيق الإمتثال و الإستجابة للقوانين و الأنظمة البيئية ، زيادة درجة الكفاءة البيئية للشركات ، تحسين و تطوير عملية إتخاذ القرارات خاصة القرارات طويلة الأجل.

الكلمات الإفتتاحية:

المحاسبة الإدارية البيئية - الأداء البيئي - قطاع النفط و الغاز - مصر

1. Introduction

In current years, environmental accounting has been an essential concept in the study of the firm's performance (some academics entitled environmental accounting as Green Accounting, *for instance*; Duman et al, 2013; Qian and Burritt, 2007). Consequently, environmental accounting can be used to determine the advantages of firms obtained as a consequence of the use of the assets already present in nature and the costs take place attributable to of this usage (Tanc and Gokoglan, 2015). Moreover, various worldwide parties have addressed the indispensable effect of environmental activities on the firms' performance, for example Hojna and Kafkova (2015) pointed out that European union revealed the important target of the European environmental policy to enhance the quality of the environment, to safeguard the health of the population, to realistically exploit the natural resources, and finally to enforce international measures so as to cope with global and local environmental concerns. As well, the term environmental accounting is alluded to the joining between accounting information and environmental costs which underlines the mutual relationships between accountants and ecology, environmental cost data, several activities in the environmental field, environmental policies and strategies of the companies, environmental reporting, and insights of social responsibility approach (Tanc and Gokoglan, 2015).

As a result of the improvement of environmental accounting approach, environmental management accounting (EMA) has been showed up in the 1970s reacting to the ecological themes and interests. EMA is the process of identification, allocation, generation and use of physical and monetary environmental information to reinforce the decision making process with the aim of accomplishing the aims of a sustainable development in the firms. It includes a number of accounting instruments from financial accounting, cost accounting, managerial accounting, and material flow balances which can augment material effectiveness, lessen environmental impacts / dangers, and costs of environmental protection (Mokhtar et al, 2016). In addition, EMA is another space of accounting which utilizes the principal accounting theory to decide, order, assess, and report the

environmental activities and their effects on the entire performance of the business (Larojan and Thevaruban, 2014). Consistent with Tajelawi and Garbharran (2015), EMA is an accounting approach that adapts to various accounting methods, connecting the crevice between environmental costs and costs associated to products; this will prompt giving the base to pinpoint the deterrents of conventional cost accounting, EMA is also extremely basic to managers to identify the true cost of material wastes related to their ineffective operations. In addition, a successful fulfilling of EMA approach helps advance the performance measurement through upgrading the environmental performance (EP) in the firm, EP may perhaps encompass; developing corporate image, supporting environmental practice of the firm, and cultivating the utilization of sustainable environment (Fuji et al, 2016). Despite the vital role of EMA, Ariffin (2016) indicated that EMA is still in its developing stage due to the lack of empirical literature explaining on the factors that affect the application of EMA especially in the developing countries as these countries are still far behind developed countries in terms of grasping and employing the environmental accounting approaches and practices. Nonetheless, there is a plausible role of EMA in the future within developing countries.

2. Literature Review

2.1. EMA: A Synopsis

The traditional management accounting assigns most of environmental costs to overhead accounts instead of allocating them directly to the cost objects that generated the cost. This leads to imprecise treatment of the environmental costs which results in inexact cost calculation. Also, the analysis of environmental costs is very essential to accomplish the goals of sustainability development as suggested by Tsui (2014), this study showed that financial accounting may not copiously fortify sustainability development since the financial accounting rules and principles resulted in deficient depicting and presentation of environmental costs. As a consequence, EMA has been raised in order to effectively deal with the environmental costs and take an interest in supporting the

sustainability development. In keeping with International Federation of Accountants (IFAC, 2005), there is no single and direct for the most part acknowledged meaning of EMA however it is to a great extent communicated to be the identification, gathering, examination and usage of two sorts of data for internal decision making process (this information is broken down into physical information and monetary information). Moreover, Tsui (2014) defined EMA as the accumulation, investigation, and utilization of environmental cost data to sustain environmental management systems and environmental reporting to the interested individuals. Besides, MishelleDoorasamy and Garbharran (2015) pointed out that EMA is an environmental management instrument that follows environmental costs directly to the cost objects, so emphasizing problem areas that need to underline when thinking the application of cleaner production (CP).

Moreover, Dutta (2014) referred numerous advantages and benefits of EMA, these advantages may comprise; reinforces indispensable information relating to production level and structure of production, presents the investment on environmental costs, scrutinizes the environmental influence on the business for decision making process, deals with the obstacles of materials, waste, energy, water, and oil, and finally supports instruments for environmental transparency in reporting. A number of studies have discussed the aspects of EMA (Tsui, 2014; Baumann, 2015; IFAC, 2005; Dutta, 2014; Wahyuni, 2009; and Kamruzzaman, 2012). Consistent with Tsui (2014), EMA comprises two categories of information: namely monetary and physical which depicts the core structure of EMA (*in the rest of this research paper, these two types of information are called MEMA and PEMA*). Moreover, Wahyuni (2009) pointed out that a fundamental difference between MEMA and PEMA is the type of measurement used and information resulted, in other words financial and nonfinancial measures and data. Briefly, MEMA provides the influence of environment on the firm's financial performance, while PEMA sheds the lights of the direct effects on the environment. Besides, Tsui (2014) indicates that PEMA information provides the stream of energy, water, materials and wastes which enables the company to estimate and report the physical features of its environmental performance and sequentially helps generate

environmental performance indicators (EPIs), whereas MEMA refers to the necessary costs required for the consumption of natural resources (water, energy) together with the costs of raw materials that the firm purchases for coping with and avoiding the environmental damages and also for cleaning up and waste treatments.

Likewise, EMA can accomplish various benefits for the firms, for instance as stated in United Nations (2001), the firm can use the physical flow data and monetary data supported by EMA in carrying out the decisions that underline the environmental and financial performance of the firm. As well, the preceding study also emphasized that EMA makes up a great value for external reporting targets that can be used to collect data for external stakeholders to sustain compliance with environmental rules and regulations or to demonstrate environmental commitment for progressing the firm's image. As a final point in this study, EMA information is considered a good opportunity to establish and diminish the environmental costs that can be employed in reinforcing the profit margins or permitting lower product prices, which can assist retain or increase the market share.

Besides, Tsui (2014) indicated that the industrial and merchandizing firms can attain several benefits from adopting and applying EMA, these benefits may contain; cost decreases, enhanced product pricing, attraction of human resources, and reputational amendments. Likewise, EMA provides detailed information concerning the environmental costs which are now separately categorized, classified and allotted for advanced cost analysis and potential cost reductions. Additionally, according to the study of Munteanu (2013), the literature debates numerous benefits that can be accomplished from adopting and implementing EMA including: (1) generating eco-efficiency indicators that help decrease costs and environmental influences through more effective usage of resources, (2) attaining cost-effectiveness which can augment the internal efficacy by determining and allocating the environmental costs that will facilitate an appropriate pricing process, (3) EMA can be established for attaining investment assessment as it provides an improved measurement of the economic effects of the business's environmental performance.

Furthermore, IFAC (2005) classified the uses and benefits of EMA into three sorts; namely compliance, eco-efficiency, and strategic position. Compliance means that EMA provides environmental protection through compliance with the environmental policies and regulations, eco-efficiency involves that EMA supports the incessant cost lessening throughout the effective usage of water, materials, and energy in the internal operations and final products and services. Finally, the strategic position of EMA refers to adopting numerous programs for assuring the firm's long-term strategic position. Nevertheless, there are several restrictions and barriers that impede the proper adoption and application of EMA (Tsui, 2014; Duman et al 2013; Jalil et al, 2016; Jamil et al, 2015). The study of Tsui (2014) addressed that the execution of EMA is costly as customers are more focused on quality and lower prices than environmental responsibility and also managers are reluctant to apply EMA as they are not eager to be held responsible for environmental costs. In another study, Jalil et al (2016) pointed out that the hindrances of EMA application are mainly as a result of the reluctant of the firms to disclose their environmental data and the absence of regulations concerning the transparency of the environmental costs of the businesses. Likewise, Jamil et al (2015) mentioned five different impediments to EMA application; these impediments may include attitudinal blockades (e.g. resistance to change), financial obstacles (e.g. efficiency of financial considerations), informational obstacles (e.g. problems in collecting environmental costs), institutional obstacles (e.g. absence of institutional pressure), and management obstacles (e.g. rare motivations offered to cope with environmental costs).

2.2. Environmental Costs

A few endeavors have been made to underline the significance of investigating the environmental costs (Dutta, 2014; Duman et al, 2013; Alyuni, 2009; Constantin et al 2012; Jasch, 2003; Marelli and Miolo-Vitali, 2008). In accordance with the study of Dutta (2014), environmental costs can be characterized as the cost of crushing environmental quality for the different demonstrations did by society and organizations, and these costs can't be covered up in the overhead

expenses. In addition, the study addressed that the Canadian Institute of Chartered Accountants (CICA, 1998) pointed out that environmental costs can create advantages of the current period supporting numerous details in this respect, so such costs comprise direct environmental costs (i.e. cleanup costs), indirect environmental costs (i.e. compliance costs), and capitalized environmental costs (environmental research costs). In another current study, Duman et al (2013) underlined that environmental costs can be broken down into two groups; specifically internal costs and external costs. Internal costs may contain conventional costs, hidden costs, contingent costs, and image and relationship costs. But external costs encompass environmental degradation costs and human impact costs. Furthermore, Wahyuni (2009) revealed that environmental costs are referred to all costs concerning environmental damage and protection, the United Nations Division for Sustainable Development (UNSD) illustrates that business environmental costs are the costs of polluted sites, emission control technologies, and waste removal. Moreover, Constantin et al (2012) and the majority of aforementioned studies in the area of EMA habitually have grouped environmental costs into major four categories: namely, first: waste and emission treatment (i.e. related employees, depreciation for associated equipment), second: prevention and environmental management (i.e. R&D, supplementary expenditures for cleaner technologies), third: non-product output material costs (i.e. raw materials, energy) fourth: non-product processing costs (costs other than raw materials purchased such as idle time and idle capacity). As well, environmental revenues may include revenues created from waste sales and grants loans.

Assessing and scrutinizing environmental costs is extremely significant topic in giving supportive and important data to the decision making process. Thus, Wahyuni (2009) indicated that collecting the environmental costs and non-environmental costs in overhead account results in distorted computation which delays improvement opportunities and accomplished savings. Accordingly, measuring and estimating environmental costs permits management to effectively exploit raw materials by declining dangerous operating materials for diminishing emissions and waste. Also, Jasch (2003) gave additional examples for the importance of environmental costs to

managers, these examples are the savings that can result by replacing toxic organic solvents by non-toxic alternatives, thus removing the increasing costs of regulatory reporting and other costs associated with contaminated and poisonous materials. Also, Marelli and Miolo-Vitali (2008) explained three major questions for appraising and investigating the environmental costs and the indispensable role of such costs for businesses, these questions comprise; what is the influence of environmental costs in decision making process, how environmental costs are calculated, and why environmental costs are used?.

2.3. Selected Applications of EMA

There is a large volume of published studies describing the likelihood of adopting and applying EMA in various industries which leads to portraying applicable comparisons among different industries in terms of employing EMA. Jamil et al (2015) conducted an empirical study to investigate the factors and hindrances that affect the practice of EMA in small medium manufacturing companies (SMEs) in Malaysia. This study argued that coercion is a prevailing factor for realizing EMA, so Malaysian government and other authorities should exert supplementary efforts to resolve the practical obstacles in moving forward EMA practices. Moreover, this study also pointed out that adopting EMA requires numerous effective factors including: organizational learning device, an appropriate guidance on EMA, incorporate accounting professional bodies into supporting an enhanced framework for EMA practices, and support a financial budget for esteeming EMA activities. In a different contemporary study, Jalil et al (2016) carried out a case study to scrutinize the application chances of EMA in leather factory in Iran. The leather industry has been selected as a case study because it is considered a contaminating sector and has dangerous impacts on the environment. This case study assumed that establishing an environmental management system (EMS) is very indispensable to define the environmental policy of the firm, also providing environmental knowledge for the accountants and organizations have a huge influence on the financial decisions carried out by the businesses. Then again, this investigation clarified that the deterrents for EMA

selection are mainly attributable to the hesitance of the organizations to uncover their environmental data and the nonappearance of strategies and rules identifying with the clearness of the environmental costs of the firm.

Additionally, Larojan and Thevaruban (2014) carried out an exploratory study investigating the influence of EMA practices on the financial performance of listed manufacturing firms in Sri Lanka. This study argued that there are statistically positive relationships between EMA practices and financial performance of the firm. Hence, the outcomes of this study bolster rules concerning creating an intense knowledge foundation for future EMA advancement and the government should launch authorized and regulatory structure for environmental concerns. In an alternate contemporary study, Marelli (2015) scrutinized the expanding role of EMA in internal decision-making process; the study implied that managers assess EMA data as crucial for enriching company picture, business effectiveness, and environmental ambitions. In addition, the study explored that there is an imperative role of monetary environmental performance measures although it is not entirely reinforced and well-framed, so the study has connected the exploration of EMA practices to the question of whether EMA data can grant decisional support and whether evaluating and administering environmental costs is valuable. According to Dunk (2007), EMA practices smooth the relationship between product quality and competitive advantage of organizations when the confidence of EMA is high. Alternatively, EMA does not play a fundamental role when organizational confidence is low. In another study, Jankovie et al (2011) revised the role and relationship of EMA in hotel management systems through scrutinizing the likelihood for an EMA structure and ask how managers in the Croatian hospitality industry assess the improvement and protection of hotel environment.

Subsequently, the outcomes of previously mentioned investigation in the hospitality industry pointed out that managers should concentrate on a few regions for measuring, assessing, and reporting the environmental costs as a quality cost, these areas may encompass; adapting with the customer requirements and desires,

supporting guidance for legislation compliance, offering guidance for standards compliance, and guaranteeing conditions for eco-processes in the entire product life cycle. In a different sector, Honja and Kafkova (2015) have conducted an investigated study to scrutinize the importance of EMA in The Czech Republic; they addressed that EMA is an essential and helpful source of information for the decision making processes implemented by the firm. Even though this study emphasized that the use of EMA in the selected sample is not very pervasive, but the current study found out that EMA can achieve numerous objectives for the firm, these objectives may include; scrutinizing the environmental costs of entrepreneurial bodies, enriching the firm's image and its competitiveness, easing the compliance with the authorized regulations linked to environmental protection, and lastly the current study considered EMA is a fundamental instrument towards a speedy rehabilitation of the environment.

3. The Oil and Gas Industry in Egypt

Egypt is one of the oldest energy producers in the Middle East, with a history of commercial oil production dating back more than a century. Even though the sector's investments have been squeezed by slowing commodity prices over the last five years, the country has still been able to attract new attentiveness and global investments (Oxford Business Group, 2016). As well, currently the Egypt's energy sector is encountering central fluctuations such as increasing population and economic (industrial) advancements, these changes led to an enormousness expansion in the demand for energy products in all sectors along with the ever-increasing of consumption of oil, gas, and electricity. Moreover, according to Hegazy (2015), the unsteadiness in the Egyptian economy since the revolution in 2011 has an enormous influence on the overall energy sector specifically with respect to foreign investments, so Egypt has issued a unified investment law before the Economic Development Conference (13-15 March 2015 in Sharm Al-Shaikh) in order to enhance the business atmosphere by heartening and attracting the local and worldwide investments particularly in the energy sector. Accordingly, the Egyptian government is creating a new strategy to reinforce the sector and

connect the gap between supply and demand over the forthcoming five years. As stated by Hegazy (2015), the intended energy strategy has three major pillars; security, sustainability, and governance. Firstly, the principal objectives of security are implementing energy effectiveness measures and supporting new explorations. Secondly, the most important targets of sustainability are reforming energy subsidies and creating a database on the consumption rates of different energy products. Thirdly, the indispensable targets of governance are furthering the governance of the gas sector and evolving a national energy strategy. In this manner, EMA selection fundamentally affects the gas and oil industry in Egypt with the reason for concentrating on the monetary and physical issues of the businesses and their impact on the overall environmental performance.

4. Research Limitations

This study examines the likelihood of adopting and actualizing EMA in the Egyptian oil and gas sector for several reasons: this technique – to some degree – is a contemporary practice in the Egyptian business environment, it is concentrating on managing environmental impacts, building up an environmental management system (EMS), controlling the business's physical and monetary resources, accomplishing sustainable development, augmenting the environmental performance of the firms, and finally it is a thorough technique that is carrying out various targets promptly. Furthermore, the current study is not significantly focusing on the organizational, behavioral, ethical, and regulatory features behind EMA adoption rather it is underlining the accounting and environmental features of EMA owing to time and resources' restrictions. Furthermore, there are several factors that impact the improvement of environmental performance (EP) including strategic management, environmental regulations, input prices, group regulations and policies, environmental management system (EMS), top management support (TMS), and adoption of EMA. Nevertheless, the current study will discuss the last three factors in details due to their significance and their basic role in advancing the firm's environmental performance (EP).

5. Research Hypotheses

5.1. Environmental Management System (EMS)

Environmental management system (EMS) has been appeared due to the crucial importance of environmental management and its role in operating and decreasing environmental effects together with sustaining companies in carrying out their targets (Jamil et al, 2015; Marelli and Miolo-Vitali, 2008; Masanet-Llodra, 2006, Wijethilake, 2016). Further, EMS contains various elements that can play a role in advancing, executing, attaining, revising, and assisting environmental policies and regulations, these elements may comprise; resources, methods, practices, planning activities, and creating structure. Hence, there is an imperative necessity to integrate EMS into the adoption and implementation of any environmental activity within the firm including EMA. In addition, Jalil et al (2016) argued that EMS can be very beneficial for environmental data gathering through four factors; Plan, Do, Act, and Check (PDAC), EMS can contribute to realizing sustainable development of the systems and achieving the anticipated objectives. Likewise, Tsui (2014) pointed out that there is a vital link between EMA and environmental management because the stakeholders will assess the firms' performance in diminishing their environmental influences. Also, many international standards such as ISO 14000 and BS7750 have been generated to provide a framework to manage the firm's environmental performance and create the necessity of EMA for the decision making process. As such, Mokhtar et al (2016) argued that implementing EMS impacts the advancement of environmental accounting practices and then enriching the firm's environmental performance. In accordance with the above discussion, it is sensible to suppose that environmental performance (EP) is more likely to be developed when organizations have adopted EMS philosophy. Thus, hypothesis one can be expressed as follows:

H1: Firms that construct and progress environmental management system (EMS) are more likely to accomplish a greater extent of environmental performance (EP).

5.2. Top Management Support (TMS) for Environmental Activities

Embracing and executing EMA approach can't be viably proficient without an intense support from the top management in view of the fact that top management represents an investment center in the firm that has the authority to sustain these types of contemporary practices fiscally and ethically. Munteanu (2013) revealed that the support of top management is an indispensable issue in undertaking EMA, lacking such assistance, EMA risks to be a one-time exercise rather than daily practice. Also, according to Munteanu (2013), if there is an absence of interest from the external shareholders regarding EMA, the resources assigned to EMA will be very restricted. Too, Young and Jordan (2008) pointed out that top management support can be executed in various ways such as providing sufficient resources, conducting training courses about the EMA approach, and presenting awards for brilliance accomplishment. Furthermore, as mentioned in De Palma and Dobes (2010), if the firm does not have a future vision of strategic management which reinforces the strategic initiatives and proposals, there will be a resistance to change to the achievement of sustainable enterprise strategy that included EMA and EP. Generally, top management should support the environmental-related activities by the required resources for the EMA application and improving EP including quick access to information and equipment, thorough information about the environmental regulations and policies, conducting training sessions of the EMA philosophy, and finally stimulating the employees' participation in the process of decision making. Hence, hypothesis two can be articulated as follows:

H2: Firms that have strong top management support (TMS) concerning the environmental-related initiatives and activities are more likely to adopt EMA approach and contribute to augmenting environmental performance (EP).

5.3. Environmental Management Accounting (EMA)

Adoption

A number of researchers have attempted to scrutinize the benefits and uses of EMA application and its imperative role in boosting the firm's environmental performance (EP) (Wahyuni, 2009; MishelleDoorasamy and Garbharran, 2015; Jasch, 2003; Tajelawi and Garbharran, 2015; Dutta, 2014; Duman et al, 2013; Fuzi et al, 2016; IFAC, 2005; Cullen and Whelan, 2006; Jinadu et al 2015). According to the study of MishelleDoorasamy and Garbharran (2015), adopting EMA as an environmental instrument can sustain the organizations in gathering, estimating, and interpreting the required information to assess the potential for cleaner production savings and take decisions to select among the substitutions of cleaner production. In a different study, Jasch (2003) argued that EMA is an essential technique which represents a joint approach from several accounting fields as well as material flow balances, this approach can be carried out to attain numerous goals to the companies containing; developing material efficiency, diminishing environmental risk, reducing environmental protection costs, appraising yearly environmental costs/revenues, setting the environmental performance indicators, planning the external environmental reports, and creating product pricing policies.

In addition, the study of Duman et al (2013) has discussed numerous benefits and usage fields for EMA and its critical role in sustainable business and environmental performance. This study confirmed that EMA concentrates on both reporting costs related to the activities of environmental obligations and other environmental liabilities together with providing information to decision-makers in the firm about the raw materials, energy flow, and so on. In addition, EMA focuses on a number of application areas that can be undertaken in the business management, these areas may include; environmental management systems, eco-friendly product/service design, product pricing, capital budgeting, environmental performance measurement, and announcement of environmental costs and investments. Overall, Duman et al (2013) found out that although EMA has an enormous number of advantages and usage fields but they can be sorted under three broad headings; compatibility, eco-efficiency, and strategic

position. Moreover, Wahyuni (2009) indicated several benefits of EMA application and its contribution in upgrading the environmental performance, these benefits may involve; cost lessening, innovation, cleaner production, better product pricing, improved shareholder value, eco-efficiency, cost savings, and analyzing the environmental costs. To conclude, Fuzi et al (2016) defined the environmental performance (EP) as *"the environmental control of the organization based on the objectives, policies, and environmental goals"* (Fuzi et al, 2016; p137). Likewise, EP can improve environmental management, environmental expenditures, and environmental costs; EP can also help the firm to create environmental knowledge to augment the environmental management and to enrich the quality of production. Based on the above-mentioned discussion, hypothesis three can be stated in the following manner:

H3: Firms that have implemented the EMA approach are more likely to achieve numerous aims regarding the environmental-related issues and ultimately to develop the environmental performance (EP).

6. Research Method

6.1. Sample

In accordance with the research limitations, the current research is seeking to determine to what extent the oil and gas industry in Egypt be acquainted with EMA, its role in enhancing the firm's EP, and what are the challenges and hindrances of implementing EMA technique. Consequently, a random sample of 87 respondents was sketched from the selected sector and the questionnaires have been sent to them so as to answer the questionnaire as they would be experienced of the company's approaches, particularly regarding the environmental-related activities. This study depends on various ways to collect data including postal survey, email, and personal submission of the questionnaires. Likewise, the researcher used a telephone to follow-up and explains the main research idea to some of respondents. The respondents have been selected from numerous fields including production managers, accountants, and one member from the senior

management (if available). A total of 32 (36.78%) were returned, the low response rate was expected since EMA and EP are - to a large extent - contemporary accounting and management instruments in the Egyptian business environment. Thus, the statistical analysis is based on a sample size of 32.

6.2. Research Design

The fundamental research idea is "*Has EMA been recognized in the gas and oil industry in Egypt together with to what extent EMA application could contribute to developing the firm's environmental performance (EP)*". Subsequently, the research approach is a combination between deductive and inductive approaches; (1) the research makes an attempt to scrutinize the extent of understanding EMA philosophy throughout conducting a survey as a research strategy in the oil and gas sector in Egypt (*Deductive Perspective*). In contrast, (2) the study is seeking to determine the crucial impact of adopting and applying EMA on the business's environmental performance (*Inductive Perspective*). Nevertheless, the dominant research approach is deductive and the data will be dealt with quantitatively. Besides, the survey depends on a questionnaire that was developed to gather data from the selected sample. To develop the questionnaire, a pilot study was formulated to revise and/or eliminate the number of variables and questions, the comments and feedback were collected from academics (especially managerial accountants, university's colleagues, and managers) and few specific managers. Additionally, the questionnaire was structured based on the tools and items that have been derived from a number of previous related studies (Mokhtar, 2016; Jasch, 2003; Marelli, 2015; Dutta, 2014; Tsui, 2014; Fuzi et al, 2016; Dunk, 2007; Jamil, 2015; Al-Mawali, 2015; Mieseigha and Ihenyen, 2007; Larojan and Thevaruban, 2014; Jalil et al 2016). The questionnaire is segmented into four sections. Section one seeks information about environmental management system (EMS). Section two asks the respondents to indicate the role of top management support (TMS) in applying and adopting EMA and sequentially what is the impact of such support on the firm's EP. Section three is attempting to collect data regarding the extent of

usage of EMA approach and its influence on the firm's EP, and finally section four discusses the different features of the firm's EP.

To obtain additional perceptions regarding the environmental-related activities, the respondents were also requested to expose their remarks, observations, and views concerning the EMA application at the end of the questionnaire. Moreover, the questionnaire is also constructed based on a five-point Likert scale to measure the degree of application for each item. The scale was ranged from 1 to 5 where 1= strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, 5 = strongly agree. Likewise, portraying the questionnaire avoided direct and superficial questions such as "Do you know EMA? Do you apply EMA? , Or do you have drawbacks in executing EMA?" Instead it recorded the attributes that depict the technique because the businesses could possibly apply the technique moderately or indirectly without being aware of that. Similarly, there are a few informal interviews that have been performed with a number of accountants and production managers. Besides, the fundamental conceptual research model combines three independent research variables (environmental management system EMS, top management support TMS, and environmental management accounting EMA), the dependent research variable (advancing the firm's environmental performance EP). SPSS program is carried out to scrutinize the relationships between variables by using descriptive analysis, factor analysis, communalities, and KMO and Bartlett's Test. In line with the above discussion, the following linear model was used to test the hypotheses.

$$Y = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + U_t$$
$$EP = b_0 + b_1 EMS + b_2 TMS + b_3 EMA + U_t$$

Where:

EP = the firm's Environmental Performance
EMS = Environmental Management System
TMS = Top Management Support
EMA = Environmental Management Accounting
U_t = the error term

7. Variable Measurement

This section discusses the empirical research outcomes throughout explaining the results focusing on factor analysis (including descriptive statistics, communalities, and KMO and Bartlett's Test) in conjunction with the crucial role of independent variables on developing the firm's environmental performance (*qualitatively*). Subsequently, the study manipulates descriptive statistics to explain the fundamental characteristics of the collected data throughout presenting simple summaries about the sample in a practicable form. Besides, factor analysis can be used as an explorative analysis so as to pinpoint the weight each variable should have in the study. Hence, the remainder of this section can be organized in two parts; the first part displays the discussion and results for each variable (*quantitative* perspective). The second part reveals the pivotal role of each variable in enhancing the business's environmental performance EP (*qualitative* perspective).

7.1. Environmental Management System (EMS)

7.1.1. Discussion and results (*Factor analysis*)

EMS was measured using five items, five-point Likert-scaled instrument which indicates the policy of the firms toward EMS and what are the activities performed to support the EMS approach along with its focal role in developing the EMA application and successively developing the environmental performance. Table 1 and Table 2 spotlight the outcomes of factor analysis of EMS variable by using SPSS.

Table 1
Descriptive Statistics of EMS

<i>Symbol</i>	<i>Item</i>	<i>n</i>	<i>Mean</i>	<i>Std.Dev</i>
<i>EMS1</i>	Your firm has a clearly defined environmental policy which comprises resources, processes, practices, procedures, planning activities, and structure.	32	2.75	0.672
<i>EMS2</i>	Your firm has taken positive environmental initiatives to enhance the environmental performance for getting ISO 14000 certification.	32	2.97	1.031
<i>EMS3</i>	Your firm maintains records about the various processes involved, the activities related to those processes, and the articulation of objectives and particular aims.	32	3.62	0.707
<i>EMS4</i>	The accounting system in your company supports precise measures for physical flows of energy, materials, and waste as well as their associated costs.	32	3.09	0.777
<i>EMS5</i>	There are many efforts undertaken in your firm to fulfill compliance with the environmental regulations and policies.	32	4.25	0.672

Table 2
Communalities & KMO and Bartlett's Test (EMS)

Communalities		KMO and Bartlett's Test	
Item	Extraction		Value
EMS1	0.861	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.405
EMS2	0.573	Bartlett's Test of Sphericity Approx. Chi-Square	4.650
EMS3	0.625	DF	10
EMS4	0.744	Sig.	0.913
EMS5	0.682		

Table 1 displays the summary statistics for EMS; it can be observed that by far the highest mean is accounted for EMS 5 (*its mean is 4.25 and std.dev is 0.672*), which means that the overall response to this question was very positive. Hence, within the selected

sample, there is an immense emphasis regarding the initiatives that should be motivated so as to carry out compliance with the environmental policies and regulations through a number of procedures including: organizing pollution control investments, scrutinizing and purchasing cost-effective substitutions for contaminated materials, and reporting environmental waste and emissions to the governmental groups. In the Egyptian industry, according to Finnish Consulting Group (2010), a compliance action plans (CAP) is a method that has been designed to realize compliance with legislation in industry which can be manipulated all over the world in environmental policy to attain compliance in a well-organized manner. Further, this method (CAP) is created to assemble substantial information about the industry to facilitate constructing an obvious structure to fulfill the compliance standards, this collected information may encompass (*for example but not limited to*): general information about the factory, the production processes, process description, water utilization, energy consumption, list of projects, current pollution units, harmful waste, and environmental management responsibilities. However, owing to the absence of expertise in completing and employing a CAP, external consultants and specialists should be hired to organize and execute a CAP in an attempt to assist both industries and authorities.

Alternatively, it can be seen from the data in table 1 that employing an environmental policy resulted in the lowest mean (*EMSI where its mean is 2.75 and std.dev 0.672*) which pointed out that there is a lack of an apparent environmental policy that reveals resources, processes, practices, procedures, planning activities, and structure. Thus, there is an urgent need to portray an environmental policy in the industrial sector in Egypt (*specifically oil and gas sector*) that can set up and manage all environmental projects so as to contribute to carrying out the EMA philosophy and enhancing the firm's environmental performance (EP). Accordingly, the Ministry of Environment in Egypt (2017) suggested that the environmental policy attempts to accomplish environmental protection throughout commencing appropriate institutional, economic, legislative, and technical structures at the local, regional, national, and global levels. Moreover, the National Environmental Action Plan (NEAP) has been

launched for environmental actions for the fifteen years (*from 2002 to 2017*); it is the foundation for developing the local environmental schemes, acts, and activities. In addition, NEAP is created to be the framework that synchronizes for forthcoming environmental activities in order to reinforce sustainable development of Egypt.

Further statistical tests, as shown in Table 2, revealed a table of communalities which indicates the amount of variance in each variable that is accounted for. The communality value that is more than 0.5 should be considered and taken into consideration for further analysis. For example, over 80% of the variance in adopting and applying a clearly defined environmental policy (*EMS1, 0.861*) is accounted for, whereas over 50% of the variance in enhancing the environmental performance to acquire ISO 14000 certificate (*EMS2, 0.573*) is accounted for. Additionally, what stands out in Table 2 is that the KMO measures the sampling suitability (which concludes if the answers provided with the sample are adequate or not). Looking at Table 2, it is apparent that KMO measure is 0.405, which is close of 0.5 and consequently can be hardly accepted. Moreover, Bartlett's test is an additional indication of the strength of the relationship among variables, as can be observed from the data in Table 2 that the Bartlett's Test of Sphericity is significant (0.913), which means that the hypothesis 1 concerning the role of EMS in applying EMA and in turn developing the environmental performance is accepted.

7.1.2. The pivotal role of EMS in developing EP (Qualitatively)

There is a perceived requirement for adopting and applying a restrained EMS which can encourage building up the firm's environmental performance from various perspectives; the company should have an obviously well-defined environmental policy which comprises the acknowledgment of environmental impacts/features, environmental action programs, estimation of essential environmental effects, and assignment of environmental responsibilities. Furthermore, there has been a restored enthusiasm for reacting to the environmental alterations and tenders by taking positive stages to acquire the ISO 14000 certification which enable firms to capture the advantages provided by such certification related to quality

management systems, accordingly allowing for enhancements in environmental performance. Besides, constructing a proficient accounting system can help the firm to enhance the environmental performance throughout exploring more precise measures for the physical flows of (energy, materials, and wastes) and their related costs, so the firm can ascertain and exploit financial savings in resources usage that cause decreases in the firm's environmental impacts.

7.2. Top Management Support (TMS)

7.2.1. Discussion and results (*Factor analysis*)

TMS was measured using three items, five-point Likert-scaled tool which points out the top management policy in the selected sample towards adopting and applying EMA principles and its role in developing the entire firm's environmental performance (EP). Furthermore, this section appraises to some extent the top management can assign adequate financial and non-financial resources to carry out EMA together with formulating and developing training courses so as to share out the EMA values to the all firm's personnel. Table 3 and Table 4 display the outcomes of factor analysis of TMS variable by using SPSS.

Table 3
Descriptive Statistics of TMS

<i>Symbol</i>	<i>Item</i>	<i>n</i>	<i>Mean</i>	<i>Std.Dev</i>
<i>TMS1</i>	The top management in your firm is trying to adopt and promote a strategic management which supports the importance of environmental-related activities.	32	4.06	0.759
<i>TMS2</i>	The top management in your firm assigns sufficient resources to adopt and implement EMA approach.	32	2.09	0.963
<i>TMS3</i>	The top management in your firm prepares training courses for the workforce about the importance of environmental-related activities.	32	4.09	0.689

Table 4
Communalities & KMO and Bartlett's Test (TMS)

Communalities		KMO and Bartlett's Test	
Item	Extraction		Value
TMS1	0.780	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.439
TMS2	0.799	Bartlett's Test of Sphericity	Approx. Chi-Square
TMS3	0.700		DF
			Sig.
			3
			0.572

As presented in Table 3, this table is quite revealing in several ways. First, the majority of respondents (*TMS3: its mean is 4.09 and std.dev is 0.689*) give reasonable significance to the training courses that should have been prepared by the top management so that emphasize the obligatory role of environmental-related activities in advancing the firm's EP. Thus, there is an imperative need for managing various training seminars and sessions concerning the EMA philosophy and its values internally or externally (*which proves slightly hypothesis 2*). Hence, such training sessions provide the significance of establishing a particular database for all environmental-related resources and activities, underlining the benefits of EMA, and categorizing the principal environmental costs. In the same vein, IFAC (2005) emphasized that environmental managers and accountants should collaborate in order to articulate a thorough image of environmental issues and its associated costs and benefits that will be valuable in creating long-term investment decisions. Alternatively, what stands out in table 3 is that allocating sufficient financial and non-financial resources in the selected sample resulted in the lowest mean (*TMS2 where its mean is 2.09 and std.dev 0.963*) which indicated that there is a scarcity of resources assigned to EMA activities. So, Munteanu (2013) explained that the support of top management is a crucial concern in applying EMA throughout assigning appropriate resources and reasonable awareness from external stakeholders. Otherwise, resulting in resistance to change which become obstacles to the execution of sustainable strategy that incorporated EMA.

Additionally, the most interesting aspect of Table 4 is the communalities' section which illustrates the amount of variance in

each variable that is accounted for. The communality value that is more than 0.5 should be taken into consideration for further analysis. For instance, 70% of the variance related to managing several training sessions for the personnel concerning the significance of environmental-related activities (*TMS3*, 0.700) is accounted for, whilst almost 80% of the variance in allotting proper financial and non-financial resources to approve and fulfil EMA principles (*TMS2*, 0.799) is accounted for. In addition, what is striking about the figures in table 4 is that the KMO appraises the sampling appropriateness (which concludes if the answers provided with the sample are adequate or not). As can be seen from table 4, it is visible that KMO measure is 0.439, which is close of 0.5 and subsequently can be barely accepted. Likewise, Bartlett's test is a supplementary indicator of the strength of the relationship among variables as exhibited in table 4; the Bartlett's Test of Sphericity is significant (0.572), which means that the hypothesis 2 regarding the role of TMS in applying EMA and in turn augmenting the environmental performance (EP) is agreed.

7.2.2. The pivotal role of TMS in developing EP (Qualitatively)

TMS plays a crucial role in applying EMA and improving the firm's environmental performance (EP) through various techniques and projects; firstly, the top management should embrace the philosophy of strategic management which is relying upon the identification of the essential modifications and measuring the firm's performance predictable with its vision and its responsibilities towards the general public. Similarly, strategic management is portrayed by a few elements involving; thinking about the future, focusing on the outputs and outcomes the organization desires to accomplish, delivering quality products and services to the society, and adopting flexible organizational culture. Secondly, the top management should allocate ample financial and non-financial resources to help facilitate gathering, investigating, classifying, and reporting the environmental-related activities which contribute to adopt and apply EMA and consecutively improving the firm's environmental performance (EP). Thirdly, the firm should appoint experts and specialists in the area of environmental accounting and environmental management accounting

so as to convey their accumulated knowledge and experience in this field to the firm's employees through arranging various training sessions.

7.3. Environmental Management Accounting (EMA)

7.3.1. Discussion and results (*Factor analysis*)

EMA was measured using five items; five-point Likert-scaled instrument which indicates to what extent the firm can adopt and apply the values and principles of EMA and its role in developing the entire firm's environmental performance (EP). Additionally, this section evaluates the significance of identifying, classifying, and analyzing the environmental costs to reinforce the successful implementation of EMA practices. Moreover, this section points out the obstacles that may counteract the implementation of EMA and how the firm can overwhelm such obstacles. Table 5 and Table 6 demonstrate the outcomes of factor analysis of EMA variable by using SPSS.

Table 5
Descriptive Statistics of EMA

<i>Symbol</i>	<i>Item</i>	<i>n</i>	<i>Mean</i>	<i>Std.Dev</i>
<i>EMA1</i>	Your firm has accurate data on the amounts and destinies of all the energy, water, and materials used to support its activities.	32	3.91	0.777
<i>EMA2</i>	Your firm achieves a good competitive advantage as a result of applying and implementing the principles of EMA.	32	2.53	0.621
<i>EMA3</i>	Your firm examines, classifies, and analyzes the different types of environmental costs to support the effective application of EMA.	32	4.19	0.644
<i>EMA4</i>	Your firm uses environmental reporting to inform the public about its environmental performance.	32	2.38	0.793
<i>EMA5</i>	In your firm, do you have various obstacles that prevent EMA implementation?	32	4.66	0.483

Table 6
Communalities & KMO and Bartlett's Test (EMA)

Communalities		KMO and Bartlett's Test	
Item	Extraction		Value
EMA1	0.538	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.405
EMA2	0.226	Bartlett's Test of Sphericity	Approx. Chi-Square
EMA3	0.792		DF
EMA4	0.722		Sig.
EMA5	0.645		0.088

What stands out in table 5 is the highest mean of EMA5 (*its mean is 4.66 and std.dev is 0.483*), which means that the respondents have exposed that there are various hindrances that could not carry out the appropriate application of EMA in the chosen sample. This outcome is consistent with Jamil et al (2015) that clarified three main obstacles that prevent firms from functioning EMA practices; the financial problems, the lack of abundant resources, and absence of analyzing the environmental costs. Likewise, Tsui (2014) believed that the lack of cooperation and acts between financial management and environmental management is considered one of the most critical barriers that may prevent carrying out EMA practices. As well, the outcomes displayed in table 5 draw attention to the significance of scrutinizing and categorizing the environmental costs to help progress the organization's environmental performance (EP) (*EMA3 resulted in high mean 4.19 and std.dev is 0.644*). This positive outcome is consistent with (Wahyuni, 2009; Jalil et al, 2016). Generally, these studies clearly indicate the importance of sorting the environmental costs into four major groups; waste and emission treatment (i.e.; related personnel, fees, depreciation for related equipment), prevention and environmental management (i.e.; R&D, extra expenditures for cleaner technologies), material purchase value of non-product output (i.e.; raw materials, packaging, energy), and processing costs of non-product output. Besides, Jalil et al (2016) emphasized that environmental costs should be faithfully recorded so as to identifying the benefit making opportunities, this stage is principal in developing an EMA structure (*which demonstrates-to a certain degree-hypothesis 3*).

Alternatively, the most surprising aspect of the data in table 5 is the lowest mean of EMA4 concerning the environmental reporting to

notify the public about the environmental performance (*its mean is 2.38 and std.dev is 0.793*), which indicates that there is no adequate significance within the selected sample regarding the role of environmental reporting on the entire firm's environmental performance (EP). This outcome is contrary to that of several aforementioned findings (Polankova et al, 2015; Jankovic and Krivacic, 2014; Yongvanich and Guthrie, 2006). Polankova et al (2015) found that environmental reporting is a fundamental part of environmental communication internally and externally to outline the purpose and objectives of communication, it defines also the requirements for an environmental statement issued by the firm for interested parties. Also, Jankovic and Krivacic (2014) in their empirical study realized that the reliability of environmental reports is crucial to different users of environmental information that help lessen the ecological footprint. To end with, Yongvanich and Guthrie (2006) argued that social and environmental reporting concentrates on reporting non-economic performance to make firms more responsible, democratic, and apparent to stakeholders, the US firms must submit emissions data to the Environmental Protection Authority (EPA), which is made publicly accessible.

Moreover, it is apparent from table 6 that the section of communalities which displays the amount of variance in each variable that is accounted for. The communality value that is more than 0.5 should be considered for additional analysis. For instance, almost 80% of the variance related to analyzing and classifying the various aspects of environmental costs (*EMA3, 0.792*) is accounted for, whereas approximately 22% of the variance regarding the achievement of a good competitive advantage as a result of adopting the EMA principles (*EMA2, 0.226*) is accounted for, so this variable should be ignored from the further analysis. Too, it can be seen from the data in table 6 is that the KMO evaluates the sampling suitability (which concludes if the answers provided with the sample are adequate or not). It is visible from the outcome in table 6 that KMO measure is 0.405, which is close of 0.5 and consequently can be scarcely accepted. Similarly, Bartlett's test is a supplementary indicator of the intensity of the relationship among variables as exhibited in table 6; the Bartlett's Test of Sphericity is significant (0.088), which means that the hypothesis 3 concerning the role of EMA in cultivating the environmental performance (EP) is accepted.

7.3.2. The pivotal role of EMA in developing EP (Qualitatively)

Numerous studies have attempted to explain an increased interest in adopting and applying the EMA technique and revealing its imperative role in developing the firm's environmental performance (EP) from various perspectives (Kamruzzaman, 2012; Wahyuni, 2009; Sendroiu et al, 2006). Figure 1 sketches three major perspectives that EMA can attain and its impacts on the firm's EP. (This figure has been designed by the researcher).

Figure 1: The role of EMA in developing EP

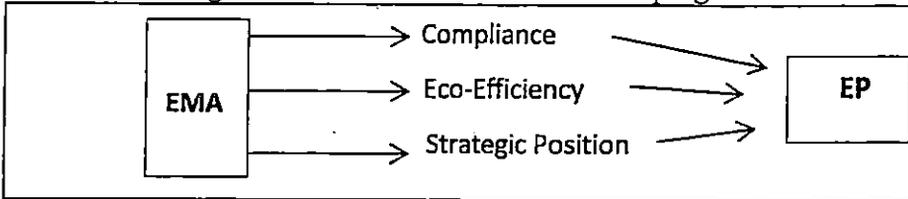


Figure 1 is quite revealing in numerous points of view. EMA sustains environmental protection throughout compliance with environmental regulations and policies which can provide a few esteems in the business market and facilitate its environmental obligations and duties on surrounded industry. Moreover, the company can achieve several programs with the aim of attaining prominent level of the compliance encompassing; arranging pollution control investments, acquiring safety materials for the production, and presenting regular reports to the authorities regarding its environmental waste and emissions (Kamruzzaman, 2012). As well, eco-efficiency is considered one of the most fundamental targets that can be achieved by adopting EMA, advantages resulting from eco-efficiency may contain cost reduction, innovation, cleaner products, better product pricing, cost savings, and applicable physical/monetary environmental data (Wahyuni, 2009). So, these benefits and targets will sequentially heighten the firm's reputation from introducing secured products into the market and implementing corporate activities with a lesser amount of dangerous influences on the environment. Likewise, executing EMA approach helps firms appraise the investment decisions and enhance the whole decision-making process. Under investment appraisal, firms need to take into account all possibly appropriate and significant costs, including environment-

related costs that may affect the return on investment (ROI). In the same context, Sendroui et al (2006) indicated that the crucial purpose of applying EMA is to support the decision making process throughout creating various objectives, these may comprise; determine the impact of environmental-related activities on the financial statements (BS, IS), recognize cost shrinkage and other enhancement prospects, improve customer value, enhance the process of product pricing, and provide for sustainable business.

7.4. The Firm's Environmental Performance (EP)

7.4.1. Discussion and results (*Factor analysis*)

The firm's environmental performance (EP) was assessed using three items; five-point Likert-scaled instrument which specifies to what extent the firm has carried out numerous endeavors to attain compliance with the authorities and regulations as well as its role in developing the entire firm's environmental performance (EP). Likewise, this section appraises the significance of diminishing costs through effective usage of water, energy, and minerals in the production processes and its impact on the firm's EP. Besides, this section emphasizes the role of environmental programs in developing the decision-making process. Table 7 and Table 8 exhibit the results of factor analysis of EP variable by using SPSS.

Table 7
Descriptive Statistics of EP

<i>Symbol</i>	<i>Item</i>	<i>n</i>	<i>Mean</i>	<i>Std.Dev</i>
<i>EP1</i>	Your firm has undertaken several efforts to support environmental protection via cost-efficient compliance with environmental regulation and self-imposed environmental policies.	32	3.41	0.665
<i>EP2</i>	Your firm supports the incessant lessening of costs and environmental effects via more effective use of energy, water, and minerals in internal operations and final products.	32	2.47	0.671
<i>EP3</i>	Your firm sustains the assessment and application of cost-effective and environmentally considerate programs for confirming an organization's long-term strategic position.	32	4.31	0.644

Table 8
Communalities & KMO and Bartlett's Test (EP)

Communalities		KMO and Bartlett's Test	
Item	Extraction		Value
EP1	0.756	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.478
EP2	0.914	Bartlett's Test of Sphericity	Approx. Chi-Square
EP3	0.676		DF
			Sig.
			3
			0.299

Table 7 shows the summary statistics for EP; it can be observed that by far the highest mean is accounted for EP3 (*its mean is 4.31 and std.dev is 0.644*), which means that the overall response to this question was very affirmative. Thus, this result is steady with various recent preceding studies (Munteanu, 2013; Fuzi et al, 2016; Kamruzzaman, 2012), the first study mentioned above has argued that EMA can result in reliable investment project decisions as it permits for enhanced assessment of the economic effects of the firm's EP. In addition, this reliable decision-making process can be reinforced by using environmental performance indicators (EPIs) which can be generated from physical and monetary information collected under EMA. Scrutinizing and reporting environmental costs and revenues assist compute the profitability of environment-related projects using net present value, payback period, residual income, and internal rates of return. Generally, Fuzi et al (2016) pointed out that the firm should examine the manufacturing processes associated to the effectiveness of the materials used and decrease the environmental pollution to facilitate evaluating the EP; EP also can be augmented by producing eco-friendly products and operations which leads to waste lessening, emission decrease, and utilize the available resources. To finish up, developing EP advances environmental management and ecological costs which cultivates the level of environmental mindfulness so as to improve the quality of production.

In addition, it is clear from table 8 that the section of communalities which demonstrates the measure of fluctuation in every variable that is represented. The commonness esteem that is more than 0.5 ought to be considered for extra investigation. For example, almost 90% of the variance related to supporting the incessant reducing of costs and environmental impacts through more effective usage of energy, water, and minerals in the production processes (*EP2*, 0.914) is accounted for, while approximately 75% of the variance regarding undertaking a number of efforts and hardworking to achieve compliance with the regulations and procedures (*EP1*, 0.756) is accounted for. As well, it can be remarked from the data in table 8 is that the KMO evaluates the sampling appropriateness (which concludes if the answers provided with the sample are suitable or not). It is visible from the outcome in table 8 that KMO measure is 0.478, which is close of 0.5 and accordingly can be barely accepted. Likewise, Bartlett's test is an additional indicator of the intensity of the relationship among variables as exhibited in table 8; the Bartlett's Test of Sphericity is significant (0.299).

8. Concluding Remarks and Future Research

This study examined the possibility of embracing and applying Environmental Management Accounting (EMA) approach in the Oil and Gas sector in Egypt as well as its role in advancing the environmental performance (EP). The study presented a proper foundation in regards to previously mentioned recent studies in EMA and different studies identified with the implementation of EMA in different ventures trying to propelling a brief presentation for the major research idea. What's more, the study also distinguished the significant four classifications of environmental expenses including; waste and emission treatment, prevention and environmental management, non-product output material costs, and non-product processing costs, alongside demonstrating the environmental revenues

that created from waste sales and grants' loans. Furthermore, the research introduced numerous current studies that clarified the possibility of adopting and applying EMA in different countries such as Malaysia and Sri Lanka. The study shifts attention to a concise synopsis about the Gas and Oil sector in Egypt, currently the Egypt's energy sector is facing central changes such as increasing population and economic (industrial) advancements, these changes led to a magnitude expansion in the demand for energy products in all sectors along with the ever-increasing of consumption of oil, gas, and electricity. The current study established numerous restrictions by not focusing on the organizational, behavioral, ethical, and regulatory sides behind EMA and the study also did not emphasize all accounting aspects of EMA owing to time and resources boundaries.

Moreover, the research approach is a combination between deductive and inductive approaches; (1) the research makes an attempt to examine the extent of understanding EMA philosophy throughout conducting a survey as a research strategy in the oil and gas sector in Egypt (*Deductive Perspective*). Alternatively, (2) the study is seeking to determine the vital impact of adopting and applying EMA on the firm's environmental performance (EP) (*Inductive Perspective*). Besides, the section of variable measurement discusses the empirical research outcomes through describing the results focusing on factor analysis (including descriptive statistics, communalities, and KMO and Bartlett's Test) as well as the pivotal role of independent variables on enhancing the firm's environmental performance (EP) (*qualitatively*). Also, the study examined three major independent variables (EMS, TMS, and EMA) and its role on developing a dependent variable (firm's environmental performance). The study concluded a number of findings including; there is an immense emphasis regarding the initiatives that should be encouraged so as to carry out compliance with the environmental policies and regulations through a number of procedures including: organizing pollution

control investments, scrutinizing and purchasing cost-effective alternatives for contaminated materials, and reporting environmental waste and emissions to the governmental groups. In addition, there is an urgent need to portray an environmental policy in the industrial sector in Egypt (*specifically oil and gas sector*) that can set up and manage all environmental projects to participate in carrying out the EMA philosophy and enhancing the firm's environmental performance. Besides, the National Environmental Action Plan (NEAP) has been established for environmental actions for the fifteen years (*from 2002 to 2017*); it is the basis for developing the local environmental schemes, acts, and activities.

Furthermore, the findings of this research provide insights for organizing numerous training courses that should have been prepared by the top management in order to highlight the vital role of environmental-related activities in developing the firm's EP. Consequently, there is a crucial necessity for managing various training seminars concerning the EMA philosophy and its values internally or externally. Such training sessions provide the significance of establishing a particular database for all environmental-related resources and activities, underlining the paybacks of EMA, and categorizing the principal environmental costs. With regard to the EMA variable, the following conclusions can be drawn from the present study; (1) there are three main difficulties that counteract organizations from implementing EMA practices; the financial troubles, the lack of abundant resources, and absence of analyzing the environmental costs. (2) The significance of scrutinizing and categorizing the environmental costs to help progress the organization's environmental performance (EP). (3) There is no appropriate importance within the selected sample concerning the role of environmental reporting on the entire firm's environmental performance (EP).

Finally, the study has gone some way towards enhancing our understanding of the impact of EMA adoption on developing firm's environmental performance from a number of insights; EMA supports environmental protection throughout compliance with environmental regulations and policies which can provide several values in the business market and facilitate its environmental responsibilities and duties on surrounded industry. Besides, eco-efficiency is considered one of the most central targets that can be achieved by adopting EMA, advantages resulting from eco-efficiency may contain cost reduction, innovation, cleaner products, better product pricing, cost savings, and applicable physical/monetary environmental data. Similarly, implementing EMA approach helps firms appraise the investment decisions and improve the entire decision-making process. Under investment appraisal, firms need to take into account all significant costs, including environment-related costs that may affect the return on investment (ROI). To end with, there is a resistance from the workers towards the propelled advancements in the firm (counting EMA). This resistance could be existent because of different reasons; nonappearance of data concerning the new practice, lack of specialists who can present the logic of momentum rehearses here, nervousness from disappointment on utilizing contemporary management accounting practices, nonattendance of encourages to receive the new devices particularly the qualified staff in the Egyptian business environment, and shortage of viable research in this field. There are various suggestions for future research can be recommended toward the finish of this research paper; there is a key requirement for future research on the part of hierarchical esteems and convictions on the appropriation and utilization of EMA. Also, there is an essential requirement for extra research on significant modifications on the bookkeeping frameworks to end up plainly usual with EMA standards.

9. References

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10. Appendix: The Questionnaire

		Strongly disagree	Disagree	Undecided	Agree	Strongly Agree
(1) Environment Management System (EMS)						
1	Your firm has a clearly defined environmental policy which comprises resources, processes, practices, procedures, planning activities, and structure.					
2	Your firm has taken positive environmental initiatives to enhance the environmental performance for getting ISO 14000 certification.					
3	Your firm maintains records about the various processes involved, the activities related to those processes, and the articulation of objectives and particular aims.					
4	The accounting system in your company supports precise measures for physical flows of energy, materials, and waste as well as their associated costs.					
5	There are numerous efforts undertaken in your firm to fulfill compliance with the environmental regulations and policies.					

(2) Top Management Support (TMS)					
1	The top management in your firm is trying to adopt and promote a strategic management which supports the importance of environmental-related activities.				
2	The top management in your firm assigns sufficient resources to adopt and implement EMA approach.				
3	The top management in your firm prepares training courses for the workforce about the importance of environmental-related activities.				
(3) Environmental Management Accounting (EMA)					
1	Your firm has accurate data on the amounts and destinies of all the energy, water, and materials used to support its activities.				
2	Your firm achieves a good competitive advantage as a result of applying and implementing the principles of EMA.				
3	Your firm examines, classifies, and analyzes the different types of environmental costs to support the effective application of EMA.				

4	Your firm uses environmental reporting to inform the public about its environmental performance.					
5	In your firm, do you have various obstacles that prevent EMA implementation?					
(4) Environmental Performance (EP)						
1	Your firm has undertaken several efforts to support environmental protection via cost-efficient compliance with environmental regulation and self-imposed environmental policies.					
2	Your firm supports the incessant lessening of costs and environmental effects via more effective use of energy, water, and minerals in internal operations and final products.					
3	Your firm sustains the assessment and application of cost-effective and environmentally considerate programs for confirming an organization's long-term strategic position.					

11. Author Profile

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