

BARRIERS OF ENVIRONMENTAL MANAGEMENT ACCOUNTING PRACTICES IN DEVELOPING COUNTRY

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Abstract

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The use of environmental management accounting (EMA) benefits organisations by providing them with different information for decision-making (Burritt, Hahn, & Schaltegger, 2002; Adams & Zutshi, 2004; International Federation of Accountants [IFAC], 2005). EMA has received increasing attention since 2000 and is now considered an effective tool for dealing with environmental issues and the economic performance of companies and countries (Elhossade, Abdo, & Mas'ud, 2021). This paper purposes to present an empirical case for research in EMA. The paper provides an analysis of the current status of EMA practices in manufacturing companies operating in Libya and identified the barriers preventing such practices. Data were collected from a sample of companies in Libyan manufacturing industry contexts utilizing a questionnaire survey. To analyse these data, two statistical techniques were employed: factor analysis and descriptive tools analysis. The current level of EMA adoption among manufacturing companies in Libya was found to be low. The findings of the study reveal that institutional barriers constituted the greatest obstacle to the adoption of EMA in manufacturing companies in Libya. This was followed by management barriers, informational barriers, financial barriers, and, lastly, attitudinal barriers. This paper concluded that Libyan universities should include EMA in the management accounting syllabus, provide books, and conduct research into practices related to EMA. Furthermore, the Libyan government and other stakeholders should play an active role in enacting and enforcing further strict environmental regulations and laws. This would be useful, as it would increase the concern of local communities about environmental issues; this would, in turn, make companies more concerned about improving their environmental performance.

Keywords: Environmental Management Accounting, Environmental Performance, Corporate Social Responsibility, Environmental Barriers, Manufacturing Companies, Libya

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1. INTRODUCTION

While it is true that economic growth, by increasing a nation's total wealth, enhances its potential for human development and capacity to solve social problems, the growing scale of the economic system strains the ecological balance, stability, and security of the planet. The need to protect the environment and the components of the ecosystem is now one of the most important foundations for economic development, not only for the current generation but also for future generations (Ashby, 2016). Given the importance of the environment and the attention environmental issues are currently receiving concerning both public and private organisations, it has become essential for companies to consider the impact of their activities on the environment. This may involve modifying traditional economic and accounting models, built only on the philosophy of maximising profits, incorporating environmental issues into strategic planning and project evaluation, providing external environmental reports and implementing energy efficiency and waste minimization programmes (Aldrugi, 2013; Jalaludin, Sulaiman, & Nazli Nik Ahmad, 2011).

As global interest in environmental protection has grown, demands for environmental data about companies and other organisations have increased (Al-Khuwiter, 2005). This has resulted in a growing need for accounting to play a role in enabling organisations to assess their environmental impact and performance (Al-Khuwiter, 2005; Gray & Bebbington, 2001; Schaltegger, Müller, & Hindrichsen, 1996). This has laid the groundwork for the emergence of environmental accounting. Environmental accounting is an inclusive field of accounting but also represents a broader term that relates to the provision of relevant firm-level environmental performance information to internal and external stakeholders (Chang & Deegan, 2008; Deegan, 2003). Similar to traditional accounting in general, environmental accounting can be divided into two parts – environmental financial accounting (EFA) and environmental management accounting (EMA).

EMA, in particular, has emerged as an extension of conventional management accounting in response to calls for accountants to adopt better environmental management and accounting practices. Regarded as a subset of environmental accounting, EMA can aid in the identification, classification, allocation and control of environmental costs, leading to better decision-making and environmental management than traditional management accounting systems (Ismail, Ramli, & Darus, 2014; Swamy, 2010). EMA has been developed to help managers make decisions that improve corporate environmental performance (Christ & Burritt, 2013). EMA is an increasingly important phenomenon used by companies to achieve a variety of benefits. These include the identification of opportunities for cost savings; improved product pricing and pricing decisions; improved environmental performance; more informed decision-making, enhanced innovation (Burritt, Hahn, & Schaltegger, 2002; Adams & Zutshi, 2004); improved corporate image and better relations with stakeholders (Ferreira, Moulang, & Hendro, 2010); increased staff retention; minimising

regulatory attention, and enhancement of competitive advantage (Dunk, 2007; Setthasakko, 2010).

Despite the benefits that accrue from the adoption of EMA, there are empirical studies that point to the fact that there are various barriers to the adoption of EMA. Notable among these studies are Chang and Deegan (2008), Jamil, Mohamed, Muhammad, and Ali (2015), Setthasakko (2010), Lee (2011), Olalekan and Jumoke (2017). The majority of these studies were carried out in newly industrialised countries such as Malaysia. Meanwhile, in emerging developing countries, such as Libya, the topic remains largely unexplored. Given the fact that significant cultural, social, economic and political differences exist between countries and these often affect accounting practices, it is inappropriate to apply the findings from studies conducted in developed or newly industrialised countries to emerging developing countries (Aldrugi, 2013; Belal, 2001; Gao, Heravi, & Xiao, 2005; Ibrahim, 2015; Tsang, 1998). Therefore, similar studies in developing countries could provide a greater understanding of the current level of EMA adoption. The scarcity of work exploring the adoption level of EMA practices and barriers associated in general and in companies operating in developing countries, in particular, represents a gap in the accounting research. To narrow this gap, this study explores the level of adoption and the barriers associated with EMA within the Libyan context, and can thereby further enrich research on EMA.

The industrial sector is a substantial economic resource for Libya, yet it is also considered to be the most polluting sector (Nassar, Aissa, & Alsadi, 2018). Given this, industries must pay particular attention to environmental issues. As far as the authors are aware, there is currently no single study conducted in the context of Libya that focuses on adopting EMA in the industrial sector in particular. Recognizing this, the present study attempts to explore the barriers associated with EMA adoption in manufacturing companies in Libya. Given that Libya's economy is now in a period of transition, such a study is expected to contribute to helping the transitional economies to move towards development that is truly sustainable. To address the research problem, two research questions are addressed:

RQ1: To what extent have manufacturing companies in Libya adopted EMA practices?

RQ2: What are the barriers associated with EMA adoption within manufacturing companies in Libya?

To answer these questions a questionnaire survey was administered to collect data from manufacturing companies operating in Libya. To analyse these data quantitatively, two statistical techniques were employed: factor analysis and descriptive tools analysis of the data.

The structure of this paper is as follows. Section 2 reviews the relevant literature. Section 3 provides and explains the research design of the methodology that has been used to conduct empirical research on the barriers associated with EMA adoption within manufacturing companies in Libya. Section 4 provides and analyses the findings. Section 5 discusses the findings, and Section 6 concludes the study.

2. LITERATURE REVIEW

2.1. Environmental management accounting in context

In the accounting literature, EMA is defined as the generation, analysis and use of monetary and physical (or financial and non-financial) environment-related data to improve organisational financial and environmental performance (Bartolomeo et al., 2000; Bennett & James, 1998). Elsewhere, EMA is described as a technique that generates, analyses, and uses both financial and non-financial information to improve the environmental and economic performance of a company, and contributes towards a sustainable business (Deegan, 2003; Ferreira et al., 2010). While opinions within the literature differ about EMA's scope or boundary of application, one of the most often-quoted definitions from the International Federation of Accountants (IFAC) describes it in the following terms:

“The management of environmental and economic performance through the development and implementation of appropriate environment-related accounting systems and practices. While this may include reporting and auditing in some companies, environmental management accounting typically involves life-cycle costing, full-cost accounting, benefits assessment, and strategic planning for environmental management IFAC” (IFAC, 2005, p. 19).

As this definition suggests, EMA is not a separate system; rather it adds value to conventional management accounting systems and provides useful information to help firms improve their economic and environmental performance and bring about sustainable development (Jamil et al., 2015; IFAC, 2005). The primary utilization of EMA is normally for internal management and decision-making; however, EMA information is increasingly being utilized for external reporting purposes in financial reports or annual environmental reports. According to Jasch (2003), a key application of EMA data includes assessment of annual environmental costs/expenditures, product pricing, budgeting, investment appraisal and calculating investment options, calculating costs and savings of environmental projects, design and implementation of environmental management systems, environmental performance evaluation, indicators and benchmarking, setting quantified performance targets, cleaner production and eco-design projects, external disclosure of environmental expenditures, investments and liabilities, external environmental or sustainability reporting, and other reporting of environmental data to statistical agencies and local authorities.

Adopting and implementing an EMA system comes with several benefits. IFAC (2005) notes that organisations using EMA are likely to conduct more extensive research and design activities to produce environmentally-friendly products and develop techniques that are less harmful to the environment. The use of EMA typically benefits organisations by providing them with different information for decision-making (Adams & Zutshi, 2004; Burritt et al., 2002). Such information may reveal hidden opportunities, such as better waste management processes, reduced energy and material

consumption, or opportunities for material recycling (Christ & Burritt, 2013) and reduce their pollution levels, which is likely to produce future cost savings and minimise future environmental liabilities (Ferreira et al., 2010). EMA offers some indirect benefits to corporations. For example, Adams and Zutshi (2004) suggest that improved corporate image and better relations with stakeholders, enhanced staff retention and the minimisation of regulatory attention are some of the benefits that come with implementing EMA. According to Ferreira et al. (2010), the improvement in organisational reputation can arise from good citizenship behaviour and from offering environmentally friendly products. By providing information on social and environmental issues, organisations may also reduce the risks of consumer boycotts and enable stakeholders to assess their environmental performance by providing them with opportunities to understand the way the organisations conduct its activities (Ferreira et al., 2010). Furthermore, EMA adoption is likely to result in the enhancement of competitive advantage (Dunk, 2007; Setthasakko, 2010).

2.2. Prior empirical studies on barriers associated with EMA

There has been little work exploring the barriers to adopting EMA practices, save for Chang and Deegan (2008), Setthasakko (2010), Lee (2011), Jamil et al. (2015), and Olalekan and Jumoke (2017). Chang and Deegan (2008) examined the current accounting practices for managing major environmental costs and sought to identify the barriers influencing EMA adoption within universities in Malaysia. Findings from this research revealed 14 factors that impeded the EMA adoption which were grouped under five key barriers: attitudinal, financial, informational, institutional, and management barriers. In addition, an exploratory case study conducted in the pulp and paper industry in Thailand (Setthasakko, 2010) also investigated the obstacles to EMA adoption. It identified three further barriers: lack of building organisational learning, a narrow focus on economic performance, and the absence of guidance on EMA.

Moreover, Lee (2011) explored the current status of EMA at the industrial level. One of the objectives of this study was to identify the difficulties associated with adopting EMA within the Korean manufacturing industry. Lee found that many companies lacked adequate systems for measuring and managing environmental costs, there were little or no incentives for managers to adopt EMA practices, and most managers felt that adopting EMA practices did not reward work but rather placed additional burdens on them. Meanwhile, Jamil et al. (2015) found that lack of resources, the efficiency of financial considerations, and environmental costs were not considered significant factors, but rather that difficulties collecting or allocating environmental costs were the most important barriers to the adoption of EMA practices in small-to-medium manufacturing firms in Malaysia.

More recently, Olalekan and Jumoke (2017) studied the barriers to implementing EMA practices in Nigeria and South Africa. They found that institutional barriers were the major factor inhibiting the growth of EMA practices in Nigeria.

This was followed by management barriers, informational barriers, attitudinal barriers, and lastly financial barriers. In South Africa, by contrast, financial barriers were the main inhibitor, followed by management barriers, institutional barriers, attitudinal barriers, and lastly by informational barriers. In a similar study to Olalekan and Jumoke (2017), Iredele and Ogunleye (2018), reached the same conclusions in their examination of the level of EMA practices in Nigeria and South Africa and identified barriers to practice.

Hossain (2019) identified the environmental accounting challenges in selected manufacturing enterprises in Bangladesh. He highlighted some critical challenges to implementing environmental accounting in manufacturing enterprises in Bangladesh. The perception of respondents about the challenges are: cost involvement, lack of skilled manpower, lack of set rules about environmental accounting, inadequate environmental accounting standard, low adoption of environmental accounting, no specific principles of environmental accounting.

Asiri, Khan, and Kend (2020) examined the extent to which EMA practices are implemented in non-financial listed firms from eight MENA countries. The findings indicated an overall poor widespread of the use of EMA practices in the selected firms. In addition, the findings suggest that technological capabilities significantly influence how EMA practices are implemented, but not to a great extent.

Mohd Fuzi, Habidin, Janudin, and Ong (2019) studied the critical success factors of EMA practices in Malaysian manufacturing industry. Their findings indicated that companies in the manufacturing industries need to obtain critical success factors of EMA practices implementation to enhance performance, particularly for Malaysian manufacturing industry.

Sari, Pratadina, Anugerah, Kamaliah, and Sanusi (2021) determined the effect of EMA on organisational performance and the mediating effect of process innovation on the relationship between EMA and organisational performance. They found the implementation of EMA exerted a positive effect on organisational performance.

Elhossade, Abdo, and Mas'ud (2021) examined how such adoption of EMA is impacted by four contingent factors, namely, company size, company age, environmental management system adoption and business type. Their results indicated that the relationship between coercive pressures and EMA adoption varies as a function of company size. This result indicates that when companies face pressures, the way they respond depends on specific circumstances and characteristics of the company such as company size.

By reviewing the above-mentioned studies regarding the barriers associated with EMA adoption, it becomes clear that the majority was undertaken in the context of newly industrialised countries such as Malaysia. While identifying the barriers to EMA is critical to successfully supporting widespread adoption, as previously mentioned, it is inadvisable to apply the findings from studies conducted in newly industrialised countries in emerging developing countries. Similar research in the developing countries will provide more understanding of the consistency and

the differences amongst countries with regards to EMA barriers. The lack of work exploring the barriers to adopting EMA practices in general and in developing countries, in particular, represents a gap in the accounting research. To narrow this gap, the current study examines the barriers associated with EMA adoption in the Libyan context, and it can further enrich the research on EMA.

Of the studies already conducted in the context of Libya, most of those related to environmental accounting has sought to evaluate the extent to which environmental disclosure practices have been adopted in Libyan companies (Ahmad, 2004; Elmogla, 2009; Pratten & Abdulhamid Mashat, 2009; Aldrugi, 2013). Recognizing this, the present study attempts to examine EMA adoption in manufacturing companies in Libya. Motivated by the lack of research in developing countries in general, and in Libya, as an example of a developing Arab country, it aims to bridge the gap in the accounting literature by exploring the issues, outlined above, surrounding EMA in manufacturing companies operating in the country. Moreover, this research is a direct response to the calls made in a number of previous studies such as Qian, Burritt, and Monroe (2011) and Christ and Burritt (2013) for further studies to be undertaken in developing countries in general, and in Libya in particular, to examine the adoption level of EMA and to explore the reasons why companies don't adopt EMA.

3. RESEARCH DESIGN

The nature of the study focuses mainly on surveying phenomena in order to obtain objective evidence to help to answer the research questions. Given the exploratory nature of the study, a quantitative approach is deployed and this is served by the survey method as a data collection tool. However, such as this research can be conducted by using a quantitative approach and case study method. This would be more appropriate if the research aims to obtain more details about the obstacles and barriers facing the use of environmental accounting.

3.1. Research population

Manufacturing companies are widely considered to be the most polluting sector (Christ & Burritt, 2013). The damaging environmental impact of manufacturing companies is addressed by Libyan environmental law; these companies must pay particular attention to environmental issues. The research population is confined to medium and large manufacturing companies in Libya with small companies excluded. The reason behind this is that medium and large companies are expected to have well-designed accounting systems in general and management accounting systems in particular, while small companies may rely on informal systems instead of sophisticated management accounting systems such as EMA (Boukr, 2018; Leftesi, 2008; Szychta, 2002). Therefore, and in line with previous studies, this study considers 97 manufacturing companies operating in Libya. The list of companies compiled was extracted from the Documentation and Information Center of Industries and Economics and the National Oil Corporation. This population consisted of different industrial companies in

the manufacturing sector in Libya. The research evaluates EMA by manufacturing companies in Libya whether they are private or state-owned and local, foreigner or mix. The target population includes those who are responsible for management accountant activities in industrial companies. In particular, the data are obtained from the accountant of sampled companies who takes the position of financial directors, financial managers, senior management accountant, or senior cost accounting. The reason for choosing these respondents is that they are in a good position to fill the questionnaire and should have the necessary knowledge to provide accurate and useful data regarding the EMA in their companies. The paper uses stratified sampling and then uses probability sampling techniques in choosing the targeted units. The population for the current study consists of 97 manufacturing companies in Libya. The targeted sample in this study covers manufacturing companies operating in Libya. Based on the generalized scientific guideline for sample size decisions of Krejcie and Morgan (1970), the sample size required for this research is 76 of a population 97. A sample of 76 manufacturing companies was selected across different industries.

3.2. Research method and measurement of variables

To answer the research questions, an online questionnaire survey was developed and administered to collect data from manufacturing companies operating in Libya. Data were obtained from key personnel at the sampled companies; our respondents hold positions as financial directors, financial managers, senior management accountants, and senior cost accountants. The questionnaire was originally constructed and written in English. It was then translated into Arabic because the field study target is Libya, the respondents were native Arabic speakers, and English is not an official language in Libya. The Arabic version of the questionnaire for the current study was piloted and pre-tested with 1) five academics who work as lecturers in the accounting department at the University of Benghazi and 5 managers and 2) employees working in accounting departments in different industrial companies in the manufacturing sector in Libya.

The questionnaire is segmented into three sections. Section 1 sought personal information about the respondents. Section 2 asks the respondents to indicate the current state of EMA practices in manufacturing companies operating in Libya. In order to measure the extent of EMA adoption (dependent variable), this study embraced a list of 13 EMA practices. These items were adopted from lists developed by Ferreira et al. (2010), Christ and Burritt (2013), and Burritt et al. (2002). The practices are as follows:

- identification of environment-related costs;
- estimation of environmental-related contingent liabilities;
- classification of environment-related costs;
- environmental life cycle costing;
- environmental target costing;
- introduction or improvement to environment-related cost management;
- creation and use of environment-related cost accounts;

- development and use of environment-related key performance indicators (KPIs);
- elaboration of monetary environmental operational budgeting;
- elaboration of monetary environmental capital budgeting;
- environmental life cycle budgeting;
- environmental life cycle and target pricing;
- assessment of potential monetary environmental impacts associated with capital investment decisions.

Respondents were asked to indicate the extent of adoption based on a 5-point Likert scale rating from 1 = "Does not do at all" to 5 = "Does to a very great extent". This was then coded as follows:

- 1 = Does not do at all;
- 2 = Does to some extent;
- 3 = Does to a moderate extent;
- 4 = Does to a great extent;
- 5 = Does to a very great extent.

Section 3 was concerned with the respondents' opinions regarding the factors that impede the adoption of EMA. According to Chang and Deegan (2008), Jamil et al. (2015), and Olalekan and Jumoke (2017), barriers associated with EMA practices have been classified into five categories: attitudinal, financial, informational, institutional, and management barriers. This section comprised 23 items covering these five categories. Some of the items were adopted from previous studies, notably Chang and Deegan (2008), Leftesi (2008), Setthasakko (2010), Lee (2011), Jamil et al. (2015), Olalekan and Jumoke (2017) and Boukr (2018), while other items were self-developed. Again, respondents were asked to indicate the extent to which items in the list impeded the decision to adopt EMA in their companies using a 5-point Likert scale ranging from 1 to 5, where 1 represents "strongly disagree" and 5 represents "strongly agree".

4. ANALYSIS AND FINDINGS

4.1. Response rate

Table 1 shows the number of questionnaires distributed, questionnaires returned, ineligible, and usable questionnaires. As can be seen, of the 76 questionnaires distributed to manufacturing companies in Libya, 60 questionnaires representing 60 different companies were returned. Of those, 9 questionnaires were deemed usable. Therefore, the number of usable responses received through the online questionnaire and other methods totalled 51 for a response rate of 67%. A usable response rate such as this is considered to be very satisfactory for two reasons. Firstly, the literature indicates that the likely response rate for questionnaires in business studies is between 30-50% (Saunders, Lewis, & Thornhill, 2015; Sekaran & Bougie, 2016). Secondly, the response rate in this study is higher than in other studies which have similar objectives and have investigated EMA in different countries (Christ & Burritt, 2013; Ferreira et al., 2010; Ismail et al., 2014; Jalaludin et al., 2011; Jamil et al., 2015; Lee, 2011; Mokhtar, Jusoh, & Zulkifli, 2016). It is also higher than other studies conducted in Libya in the broader management accounting field, notably Leftesi (2008) at 53% and Boukr (2018) at 41.2%. Hence, the response rate of this study is adequate for further analysis.

Table 1. Analysis of the questionnaire response rate

Description	Frequency/rate
The number of questionnaires distributed	76
Returned questionnaires	60
Returned and usable questionnaires	51
Returned and excluded questionnaires	9
Response rate	78%
Valid response rate	67%

4.2. Profile of respondents

As Table 2 shows, the largest group of respondents, 41.2% (21), occupied financial manager positions, followed by financial accountants with 23.5% (12), then assistant financial managers who represented 17.6% (9) of respondents. Cost accountants represented 9.8% (5), and the least represented position was managerial accountant, at just 7.8% (4) of all respondents. Although the data collected indicated that few participants were in the position of cost or managerial accountant, the other participants occupied positions that are also relevant to the questionnaire content. In addition, around 64.7% of participants occupied senior positions within the company, and about 41.1% processed and prepared accounting data for decision-making purposes. Thus, all respondents to this research questionnaire were well-placed to provide relevant information about EMA practices and to give an informed opinion.

Table 2. Demographic summary of respondents

Demographic classification	Frequency	Percent	
Current occupation	Financial manager	21	41.2
	Assistant financial manager	9	17.6
	Financial accountant	12	23.5
	Cost accountant	5	9.8
	Managerial accountant	4	7.8
	Total	51	100.0
Work experience	Less than 3 years	4	7.8
	3-5	17	33.3
	6-10	20	39.2
	11-15	8	15.7
	More than 15 years	2	3.9
	Total	51	100.0
Academic qualification	Bachelor's degree	27	52.9
	Postgraduate (e.g., MSc, MBA, PhD)	24	47.1
	Total	51	100.0

Concerning their experience, on average, 29.2% of respondents have 5 years of experience or less, while the majority (58.8%) have experienced for more than 6 years. In general, the respondents are highly experienced in terms of accounting and finance. Therefore, the respondents to this research questionnaire are sufficiently knowledgeable regarding the companies' practices to provide relevant information about EMA. Table 2 also represents the participants' academic qualifications. All the respondents who participated in the study were highly educated. Accordingly, this result should increase the reliability of the data obtained by the questionnaires.

4.3. Reliability and validity analysis

Principal component analysis (PCA) is a common statistical technique being used in management accounting research in general and EMA studies in particular (Christ & Burritt, 2013; Jalaludin et al., 2011; Leftesi, 2008; Mokhtar et al., 2016; Wang, Wang, & Wang, 2019). It is used to test the content validity requirements in this research. PCA reduces the original set of variables into smaller sets of combined variables. PCA was used on the barriers scale to find out whether these items lead to any patterns of dimensions and whether they confirmed the EMA practices and the barriers specified in the literature.

An initial PCA test with varimax rotation was performed on the thirteen items in the EMA scale. The initial PCA test showed a high Kaiser-Meyer-Olkin (KMO) value and supported the retention of a single component containing all thirteen items. However, factor loadings for EMA 8 was less than 0.4, so based on the factor loading criteria items it was eliminated. The PCA was repeated with 12 EMA items. Table 3 summarizes the KMO and Bartlett's test results. As can be seen, the KMO value is 0.907, which is not only above the minimum requirement but is regarded as a superb value. The result of Bartlett's test is highly significant (Sig. = 0.000). Based on these results, factor analysis is appropriate for this scale.

The first factor was chosen (see Table 3) because it explains about 77.9% of the total variance and can be logically named. The extraction of a single component meant no rotation of the solution was required. Based on this, the EMA items returned a single component. Cronbach's alpha test was conducted to measure the reliability of EMA measurement. The reliability result demonstrated a high level of reliability with Cronbach's alpha values of 0.973.

Table 3. PCA and Cronbach's alpha on EMA

Items	Description	EMA
EMA 1	Identification of environment-related costs	0.862
EMA 2	Estimation of environmental-related contingent liabilities	0.869
EMA 3	Classification of environment-related costs	0.895
EMA 4	Environmental life cycle costing	0.943
EMA 5	Environmental target costing	0.916
EMA 6	Introduction or improvement to environment-related cost management	0.799
EMA 7	Creation and use of environment-related cost accounts	0.885
EMA 8	<i>Deleted</i>	0.355
EMA 9	Elaboration of monetary environmental operational budgeting	0.871
EMA 10	Elaboration of monetary environmental capital budgeting	0.891
EMA 11	Environmental life cycle budgeting	0.936
EMA 12	Environmental life cycle and target pricing	0.852
EMA 13	Assessment of potential monetary environmental impacts associated with capital investment decisions	0.863
Percentage of variance explained		77.9
KMO measure of sampling adequacy (MSA)		0.907
Bartlett's test of sphericity		0.000
Cronbach's alpha		0.973

Furthermore, a PCA with varimax rotation was performed on the 23 items on the scale of barriers associated with EMA practices. The PCA test showed an excellent KMO value and yielded five components with eigenvalues > 1. Five components were identified as constructs that measure the barriers associated with EMA practices. The factors that emerged from running the factor analysis were easily labelled as institutional, management,

information, financial and resources, and attitudinal barriers. Thus, it is clear that these factors are, to a large extent, consistent with the literature. As such, there was sufficient evidence of reasonable fit between the literature, and the data and the measure were accepted for use in further analysis. Table 4 summarises the results of the PCA and Cronbach's test for barriers variables. The Cronbach's reliability estimates indicate acceptable scores for all variables.

Table 4. PCA and Cronbach's alpha on barriers factors

Construct	Items	Factor loading					Cronbach's alpha
		1	2	3	4	5	
Attitudinal barriers (ATT)	ATT 1: Low priority of accounting for environmental costs					0.800	0.897
	ATT 2: Low focus toward environmental performance					0.791	
	ATT 3: Reluctance to change					0.700	
Financial barriers (FIN)	FIN1: High cost				0.587		0.882
	FIN2: Lack of financial resources				0.798		
	FIN3: Lack of relevant employee skills				0.724		
	FIN4: Cost of implementation outweighs the benefits				0.672		
Informational barriers (INF)	INF1: Complexity of EMA			0.638			0.910
	INF2: Difficulties in measuring environmental costs			0.794			
	INF3: Difficulties in allocating environmental costs			0.828			
	INF4: Lack of guidance			0.552			
Institutional barriers (INS)	INS1: Lack of up-to-date publications	0.809					0.934
	INS2: Lack of shareholder pressure	0.684					
	INS3: Lack of stakeholder power	0.762					
	INS4: Lack of local training program	0.676					
	INS5: Lack of relevant courses in academic institutions	0.759					
	INS6: Lack of communication	0.770					
	INS7: Lack of environmental legitimacy	0.676					
Management barriers (MGT)	MGT1: Lack of management incentives		0.840				0.933
	MGT2: Lack of management convenience		0.667				
	MGT3: Lack of environmental responsibility and accountability		0.559				
	MGT4: Lack of integration of the environment into strategic planning		0.784				
	MGT5: Lack of management support		0.848				
Percentage of variance explained		83.215					
KMO-MSA		0.790					
Bartlett's test of sphericity		0.000					
Overall Cronbach's alpha		0.962					

4.4. Level of EMA practices

As Table 5 shows, all the listed EMA practices had been adopted by at least 45% of the responding companies. Two practices had been adopted by more than 60% of the sample, six by at least 51%, and just four by fewer than 50%. By mean score, the current adoption level of EMA, as perceived by the responding companies, was found to be low, with an overall score of 2.07 (from a theoretical range of 1 to 5). The overall scores indicate that the group of EMA practices that the responding companies intended to adopt more widely (with a mean score of 2.2 or more) are: 1) identification of environment-related costs (mean = 2.27); 2) estimation of environmental-related contingent liabilities (mean = 2.25); 3) classification of

environment-related costs (mean = 2.22); and 4) creation and use of environment-related cost accounts (mean = 2.20). The second highest group (with a mean score less than 2.2 and more than 2) comprises: 1) assessment of potential monetary environmental impacts associated with capital investment decisions (mean = 2.18); 2) introduction or improvement of environment-related cost management (mean = 2.18); and 3) elaboration of monetary environmental operational budgeting (mean = 2.10). The third group (with a mean score of 2 or less) includes: 1) environmental life cycle costing (mean = 2.00); 2) environmental life cycle budgeting (mean = 1.96); 3) elaboration of monetary environmental capital budgeting (mean = 1.88); and 4) environmental life cycle target pricing (mean = 1.78).

Table 5. Descriptive statistics for the level of EMA adoption

<i>Items</i>	<i>Adoption rate %</i>	<i>Mean</i>	<i>SD</i>
<i>Overall mean score</i>		2.07	1.03915
Identification of environment-related costs	56.9	2.27	1.372
Estimation of environmental-related contingent liabilities	58.8	2.25	1.278
Classification of environment-related costs	58.8	2.22	1.238
Environmental life cycle costing	51	2.00	1.200
Environmental target costing	47.1	1.92	1.181
Introduction or improvement to environment-related cost management	64.7	2.18	1.108
Creation and use of environment-related cost accounts	64.7	2.20	1.184
Elaboration of monetary environmental operational budgeting	54.9	2.10	1.188
Elaboration of monetary environmental capital budgeting	49	1.88	1.032
Environmental life cycle budgeting	45.1	1.96	1.216
Environmental life cycle and target pricing	47.1	1.78	0.986
Assessment of potential monetary environmental impacts associated with capital investment decisions	58.8	2.18	1.144

4.5. Barriers associated with EMA practices

This study analyses the problems identified to explore barriers to EMA practices. Consistent with the previous studies presented earlier, the barriers consisted of 23 items covering five dimensions: 1) institutional barriers, 2) management barriers, 3) information barriers, 4) financial barriers, and 5) attitudinal barriers. This sets out the overall descriptive results relating to these barriers based on the participants' perceptions. Table 6 sets out the barriers related to the five dimensions identified in this study.

As the study focuses on respondents' perceptions of obstacles to the adoption of EMA in manufacturing companies in Libya, the mean was mainly used to measure and compare the perceptions of respondents on the obstacles to the adoption of EMA in manufacturing companies in Libya. Before analysing the results shown in Table 6, a T-test was used to test whether the mean values of the barriers analysed in Table 6 are statistically different from the neutral response of 3.00. The T-test results showed that all the mean values shown in Table 6 are significantly different from the neutral response of 3.00 at a conventional 95% confidence level.

Table 6. Overall of barriers associated with EMA

<i>Items</i>	<i>Rank overall</i>	<i>Mean*</i>	<i>Std. deviation</i>
Institutional barriers		3.98	0.73226
Lack of relevant courses	1	4.14	0.825
Lack of environmental legitimacy	2	4.08	0.717
Lack of local training	3	4.04	0.799
Lack of shareholder pressure	3	4.04	0.871
Lack of up-to-date publications	3	4.04	0.871
Lack of stakeholder power	9	3.86	0.917
Lack of communication	12	3.73	1.021
Management barriers		3.94	0.80428
Lack of environmental responsibility and accountability	3	4.04	0.747
Lack of integration of the environment into strategic planning	4	3.96	0.871
Lack of management convenience	5	3.94	0.858
Lack of management incentives.	7	3.90	0.985
Lack of management support	9	3.86	1.040
Informational barriers		3.93	0.82018
Complexity of EMA	4	3.96	0.894
Lack of guidance on environmental management accounting	4	3.96	0.894
Difficulties in measuring environmental costs	6	3.92	0.913
Difficulties in allocating environmental costs	8	3.88	0.993
Financial and resources barriers		3.93	0.82018
Cost of implementation outweighs the benefits	5	3.94	0.810
Lack of relevant employee skills	13	3.69	1.029
Lack of financial resources	14	3.55	1.137
High cost	15	3.45	1.083
Attitudinal barriers		3.87	0.86913
Low focus toward environmental performance	10	3.88	0.952
Low priority of accounting for environmental costs	10	3.88	0.973
Reluctance to change	11	3.86	0.939

Notes: All the mean values shown in Table 6 are significantly different from the neutral response of 3.00 at a conventional 95% confidence level.

As Table 6 demonstrates, respondents tended to agree that, among all barriers, institutional barriers constituted the greatest obstacle to the adoption of EMA in manufacturing companies in Libya. The overall mean score for institutional barriers, as perceived by the respondents, was found to be 3.98. Within the overall ranking, six

institutional barriers appeared in the top 10 and 1 ranked 12th. Therefore, a lack of courses related to EMA, lack of local training in EMA, lack of up-to-date publications about EMA, lack of environmental legitimacy, lack of shareholder pressure to account for environmental costs, and lack of stakeholder power to influence management decisions appear to

be strong factors in explaining the lack of EMA adoption. The above results are consistent with the findings of Chang and Deegan (2008), Jamil et al. (2015), and Olalekan and Jumoke (2017) who found that institutional barriers did influence the decision not to adopt EMA. They are also consistent with management accounting studies conducted in Libya, notably Leftesi (2008) and Boukr (2018) who also found that institutional barriers were important.

The second most significant barriers, as perceived by the respondents, were management barriers. The overall mean score for management barriers was found to be 3.94. Within the overall ranking, the five management barriers ranked among the top ten of all barriers. Thus, lack of environmental responsibility and accountability by management, lack of integration of the environment into strategic planning, lack of management belief in the advantages and benefits of EMA, lack of management incentives to manage environmental costs, and lack of management support for environmental issues all appear to exert a strong influence on the decision not to adopt EMA. These results are consistent with the findings of Chang and Deegan (2008), Jamil et al. (2015), and Olalekan and Jumoke (2017) who also found that management barriers influenced the decision not to adopt EMA.

The third barrier most significant barriers, as perceived by respondents, were informational barriers. The overall mean score for information barriers was found to be 3.93. Within the overall ranking, all four information barriers ranked among the top 10. Therefore, the complexity of EMA, lack of guidance on EMA, difficulties in measuring environmental costs, and difficulties in allocating environmental costs appear to have a strong influence on the decision not to adopt EMA. The finding of this research also provide additional support to the findings of Chang and Deegan (2008), Jamil et al. (2015), and Olalekan and Jumoke (2017) who found that information barriers lead to the decision not to adopt EMA practices.

The respondents tended to agree that financial barriers are as important as information barriers when it comes to preventing manufacturing companies in Libya from practicing EMA. The overall mean score for financial barriers was also found to be 3.93. However, within the overall ranking, only one financial barrier was ranked among the top 10, while the other three factors ranked between 13th, 14th, and 15th. Accordingly, efficiency (whether the cost of implementation would outweigh the benefits) appeared to be the strongest factor influencing the decision not to adopt EMA, while other factors, including lack of relevant employee skills, lack of financial resources and the high cost of EMA adoption, were considered to be important. The findings of this research in terms of efficiency, lack of financial resources, and the high cost of introducing EMA provide additional support to those of Chang and Deegan (2008), Jamil et al. (2015), and Olalekan and Jumoke (2017) who found that financial barriers were a challenge to EMA adoption. With regard to the lack of relevant employee skills, the study shows that this factor also leads to the decision not to adopt EMA practices. This finding is consistent with Setthasakko (2010) who revealed that insufficient environmental knowledge and lack of the skills required to integrating environmental

issues into accounting systems and practices were preventing companies in Thailand from adopting EMA.

The last barriers in order of ranking were attitudinal barriers. The overall mean score for attitudinal barriers, as perceived by the respondents, was found to be 3.87. Within the overall ranking, two attitudinal barriers were ranked among the top 10 of all barriers, while one factor ranked at 11. A low focus on environmental performance and the low is the priority given to accounting for environmental costs appeared to be strong factors influencing the decision not to adopt EMA. Reluctance to change was also considered to be an important impediment. These findings provide additional support for those of Chang and Deegan (2008), Jamil et al. (2015), and Olalekan and Jumoke (2017) who found that the low priority given to accounting for environmental costs and reluctance to change were influential factors in the decision not to adopt EMA. Moreover, the finding of this research in relation to the lack of focus on environmental performance is consistent with environmental disclosure studies conducted in Libya, notably Aldrugi (2013) and Ibrahim (2015) who found that lack of concern about the environmental performance was an important factor preventing Libyan companies from making corporate social and environmental disclosures.

5. DISCUSSION

At present, sustainability is forcing companies to find ways to improve environmental performance in parallel with economic growth. EMA has received increasing interest since 2000 and is now regarded as an effective tool to deal with environmental issues and economic performance. The findings show that EMA in Libya was found to be low. This suggests that EMA is still at an early stage among manufacturing companies in Libya. It also indicates that manufacturing companies in Libya are still based on the traditional economic models which are built only on the philosophy of maximising profits. Integration of environmental issues into traditional accounting systems is a complex and difficult task. Five barriers prevent the successfully widespread adoption of EMA including institutional, management, informational, financial and resources, and attitudinal barriers.

The findings show that institutional barriers constituted the highest factor preventing manufacturing companies operating in Libya from practicing EMA. The adoption of EMA within companies requires academic qualifications and practical experience, thus the absence of these elements adversely affects that adoption. Regarding academic qualifications, environmental accounting as an integral part of the accounting education system in Libya does not exist. No courses are dealing with this topic at the undergraduate level and only a few postgraduate programmes include an optional module that addresses social and environmental accounting. Therefore, the findings related to these barriers were to be expected. Accordingly, the lack of pressure around EMA from academic institutions in Libya and the lack of local training could explain the low level of EMA adoption among manufacturing companies in Libya. In light of this, Libyan universities, in particular their

accounting departments, should include EMA in the management accounting syllabus, provides books, and conduct research into practices related to EMA. These measures are useful to cultivate beliefs and norms among accountants and to exert pressure on firms. Also, the accounting bodies in Libya should play a greater role in promoting EMA among their members by providing training on environmental issues and raising awareness of environmental accounting and EMA. The Libyan government should also enact further strict environmental regulations and laws. One urgent step which could be taken by the Libyan government is to incorporate the need for companies to report quantifiable environmental information into existing environmental law. This would promote greater company engagement with EMA practices. It should also contain a clear punishment system for any company that contributes to the pollution of the environment in any way. In addition, the lack of concern about environmental legitimacy among the responding companies is an influential factor in the adoption of EMA, particularly in the context of a developing country. This barrier could be traced back to the lack of environmental awareness within the wider community, which results in a lack of pressure from government institutions, customer pressure, labour unions, environmental law, and from the media, non-governmental organisations (NGOs), local communities, and financial institutions.

It should be noted that the respondents' opinions regarding lack of environmental legitimacy are consistent with the findings of Ibrahim (2015) who confirmed that the dominant culture in Libya among the public is still not consistent with the principles of environmental protection. Also, Aldrugi (2013) refers to the public's lack of awareness of the importance of environmental information in Libya. Accordingly, it could be argued that the lack of civil society movements within the country impacts negatively on environmental legitimacy and this has resulted in a lack of coercive pressures in Libya. The Libyan government, in this regard, could encourage industry associations and various media organisations to increase the environmental awareness of society as a whole and encourage local communities to take advantage of their right to clean environments and community progress. This step would be useful as it would increase the concern of local communities about environmental issues; this would, in turn, make companies more concerned about improving their environmental performance, and as a result, this would promote greater company engagement with EMA practices. Furthermore, the Libyan government should provide a reward system for companies that employ good environmental management. For example, these companies should be rewarded with financial incentives such as low-cost loans and green tax incentives. This initiative will further improve the competence of the Libyan companies in EMA practices and help them to overcome the financial barriers.

Also high among the barriers associated with EMA practices in Libya are management barriers in terms of lack of environmental responsibility and accountability by management, lack of integration of the environment into strategic planning, lack of

management belief in the advantages and benefits of EMA, lack of management incentives to manage environmental costs, and lack of management support for environmental issues. According to Chang and Deegan (2008), EMA system is adopted to improve environmental accountability; therefore, when key managers are not held accountable for environmental costs incurred, EMA is less likely to be adopted. Furthermore, without holding managers to account, it is impossible to overcome the other management barriers. Thus, it can be said that the results of this study reflect both the lack of managerial awareness in terms of environmental protection and the lack of managerial accountability for environmental costs incurred, and this could, therefore, explain the low levels of EMA adoption found in manufacturing companies in Libya.

Informational barriers were also found to be significant toward preventing manufacturing companies operating in Libya from practicing EMA. About informational barriers, the high points and foundations of this barrier are the complexity of EMA and the lack of guidance on EMA. A lack of guidance on EMA causes difficulties in effectively collecting, identifying, analysing and evaluating environment-related data. The accounting bodies in Libya, therefore, should play a more significant role through the issuance of proper guidelines about EMA adoption that would satisfy the needs of different companies. Furthermore, they should also play a role in developing environmental accounting standards and environmental reporting standards. Also, the accounting bodies in Libya should play a greater role in promoting EMA among their members by providing training on environmental issues and raising awareness of environmental accounting and EMA. This initiative will further cultivate beliefs and norms among accountants about environmental issues and remove the problem of attitudinal barriers.

6. CONCLUSION

In conclusion, to successful support the widespread adoption of EMA, four primary barriers need to be removed:

- lack of relevant courses on EMA practices in academic institutions in Libya;
- lack of environmental legitimacy;
- absence of top management commitment;
- lack of guidance on EMA.

Although the samples are taken from companies in Libya, companies in other countries, which have similar cultural, social, economic, and political conditions, especially developing countries in the Arab region may gain benefit from this study. The barriers found in the manufacturing companies in Libya are probably similar to those that may be found around developing countries. While understanding the barriers to EMA is critical to overcoming them, this, in turn, contributes to various actions towards the success of the adoption of EMA and to help Libya and similar developing countries to move towards development that is truly sustainable by providing useful information for environmental strategists and government regulators to make policies that reduce the of negative impacts on the environment.

The findings of this paper have several implications for practical aspects that could help Libya and similar developing countries regarding the adoption of EMA. First, the paper draws attention to all levels of society to take their responsibilities towards society and the environment in order to reach clean environments and communities progress. Second, it provides empirical evidence of how culture and the economy affect the importance and evolution of management accounting practices such as EMA. Third, the paper enhances the understanding of managers manufacturing companies in Libya and in developing countries of the key factors that must be considered to successfully support the adoption of EMA practices. Last, the paper draws attention to the Libyan universities to include EMA in the management accounting syllabus, conducts research and practices related to EMA. In addition, the accounting bodies in Libya can of proper guidelines about EMA adoption that satisfy the needs of different companies.

Although this study managed to provide satisfactory results, it is, like any other, subject to

a number of limitations. First, this study is subject to the normal limitations of survey-based research, including response and social desirability bias (Christ & Burritt, 2013). Future research could be conducted using a combined approach of survey and interview to strengthen the findings. Second, this study is classified as cross-sectional as all data used in this research were collected at one point in time rather than longitudinally. This means the results reflect the situation at a specific time. Therefore, the findings of this study must be interpreted carefully. Finally, to increase the possibility of generalising the findings, future research should widen the sampling of manufacturing companies. It is also worth conducting comparative research between industries, countries, and regions. In addition, future research could be conducted by a combined approach of survey and interview to strengthen the findings. In addition, future research could perform longitudinal design to collect data and further test the casual relationships. Furthermore, future research can conduct in other organisations in other industries such as services companies.

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APPENDIX. QUESTIONNAIRE SURVEY

Part A: Demographic information

A1. What is your current occupation? <input type="checkbox"/> Financial manager <input type="checkbox"/> Assistant financial manager <input type="checkbox"/> Financial accountant <input type="checkbox"/> Cost accountant <input type="checkbox"/> Managerial accountant Other (please specify)	
A2. How many years of work experience do you have in accounting/finance? <input type="checkbox"/> Less than 3 years <input type="checkbox"/> 3-5 <input type="checkbox"/> 6-10 <input type="checkbox"/> 11-15 <input type="checkbox"/> More than 15 years	
A3. What is the highest academic qualification you have? <input type="checkbox"/> High school level <input type="checkbox"/> Bachelor degree Professional qualification (please specify) <input type="checkbox"/> Intermediate diploma <input type="checkbox"/> Postgraduate (e.g., MSc, MBA, PhD)	

Part B: The current adoption of environmental management accounting practices

B1. For each of the following environmental management accounting practices, *if a practice is currently adopted* by the company accounting system, please circle, on the scale below, for how often the practice is adopted to indicate the extent to which the company currently engaged in each of the practices.

<i>Does not do at all</i>	<i>Does to some extent</i>	<i>Does to a moderate extent</i>	<i>Does to a great extent</i>	<i>Does to a very great extent</i>
1	2	3	4	5

<i>Practices</i>	<i>The level of adoption</i>				
Our company's accounting system identifies environment-related costs	1	2	3	4	5
The accounting system in our company estimates environmental-related contingent liabilities	1	2	3	4	5
Our company's accounting system classifies environment-related costs	1	2	3	4	5
Our company's accounting system carries out environmental life cycle costing	1	2	3	4	5
Our company's accounting system carries out environmental target costing	1	2	3	4	5
Our company's accounting system improve environment-related cost management	1	2	3	4	5
Our company's accounting system creates and uses environment-related cost account	1	2	3	4	5
Our company's accounting system develops and uses environment-related key performance indicators (KPIs)	<i>Deleted</i>				
The accounting system in our company elaborates financial environmental budgeting induced by operations effects to plan for improvement and control the environmental impacts	1	2	3	4	5
The accounting system in our company integrates environmental issues when elaborating the capital budgeting	1	2	3	4	5
The accounting system in our company carries out environmental life cycle budgeting	1	2	3	4	5
Our company's accounting system carries out environmental life cycle target pricing	1	2	3	4	5
The accounting system in our company assesses the potential environmental impacts associated with capital investment decisions	1	2	3	4	5

B2. Below is a set of reasons that might impede the management's decision not to adopt environmental management accounting. Using the scale below, could you please circle the appropriate number to indicate the level of your approval for each reason.

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Undecided</i>	<i>Agree</i>	<i>Strongly agree</i>
1	2	3	4	5

<i>Items</i>	1	2	3	4	5
Low priority of accounting for environmental costs	1	2	3	4	5
Low focus toward environmental performance	1	2	3	4	5
Reluctance to change	1	2	3	4	5
High cost to adopt environmental management accounting	1	2	3	4	5
Environmental management accounting is too complex	1	2	3	4	5
Lack of financial resources	1	2	3	4	5
Lack of relevant employee skills	1	2	3	4	5
Difficulties in measuring environmental costs	1	2	3	4	5
Difficulties in allocating environmental costs	1	2	3	4	5
Lack of guidance on environmental management accounting	1	2	3	4	5
Cost of implementation outweighs the benefits	1	2	3	4	5
Lack of up-to-date publications about environmental management accounting	1	2	3	4	5
Lack of shareholder pressure to account for environmental costs	1	2	3	4	5
Lack of stakeholder power to influence the management's decision	1	2	3	4	5
Lack of local training program about environmental management accounting	1	2	3	4	5
Lack of relevant courses on such advanced techniques in academic institutions	1	2	3	4	5
Lack of communication with other similar or superior companies	1	2	3	4	5
Environmental legitimacy does not seem to be important for the company to survive and grow	1	2	3	4	5
Management doesn't offer any incentives for managing environmental costs	1	2	3	4	5
The management is not convinced with the advantages and benefits that the company could achieve from the application of environmental management accounting practices	1	2	3	4	5
Lack of environmental responsibility and accountability by management	1	2	3	4	5
Lack of integration of the environment into strategic planning	1	2	3	4	5
Lack of management support for environmental issues	1	2	3	4	5

If you see any other factors that may have that might impede the management's decision not to adopt environmental management accounting, please refer to them below:
