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An examination of relationships between contextual variables and Environmental Management Accounting (EMA)

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Abstract

Environmental management accounting (EMA) has been emerged over last decades as a result of increasing awareness of the impacts of companies on their environment. There was limited attention relating to the importance attached to EMA's techniques and the importance of benefits derived from EMA's techniques. Drawing off the contingency theory literature, the current study examined the relationship between size, intensity of completion, type of industry, cost structure, and the importance attached to EMA's techniques and the importance of benefits derived from these techniques. Data was collected using a sample of 100 accountants in Bahrain. The results indicated that there were significant relationships between size, type of industry, cost structure, and the importance attached to EMA's techniques. With regards to benefits derived from EMA's techniques, the results indicated that the type of industry and cost structure were significantly influencing the importance of benefits of EMA's techniques. The study determined many potential for future research including understanding factors influencing the allocation of environmental costs to products/services, and using other contextual variables in order to gain understanding of EMA in less developed countries.

Key words: EMA's techniques, size of the organization, intensity of competition, type of industry, cost structure

1. Introduction:

In recent years, environmental issues have emerged and organizations are required to respond to these issues and consider the effects of their activities on the environment. According to Xiaomei (2004),environmental issues include global warming, soil and water pollution, noise pollution, and contaminated oceans and rivers. In addition, Medley (1997) recognized that organizations have faced with increased environmental legislations and growing environmental awareness from stakeholders including: consumers, bankers, investors, employees and senior managers. Schaltegger et al. (2000) suggested that shareholders are interested in financial results and may only partially interested in information relating to pollution information in physical units. On the other hand, environmental protection agencies are interested in physical units relating to pollution and waste and less interest in financial information such as cost of pollution and waste reduction.

Traditional management accounting has been criticized in the ground that It has failed in addressing the need for providing explicit considerations of environmental issues with environmental costs normally hidden in general overhead accounts and potential environmental benefits are often missing to report or even ignored (Jasch,

2003; Papaspyropolulos et al., 2012). The United Nations Division for Sustainable Development (UNDSD) stated:

> "Conventional management accounting systems attribute many environmental costs to general overhead accounts, with the consequence that product and production managers have no incentive to reduce environmental costs and executives are often unaware of the extent of environmental costs.... When environmental costs are allocated to overhead accounts shared by all product lines, products with low environmental costs subsidize those with high costs. This results in incorrect product pricing which reduces profitability "(UNDSD 2001, p. 1)

Also, Burritt (2004, p. 14) argued that traditional management accounting tends to neglect identification, classification, measurement and reporting of environmental information; therefore, many organizations do not incorporate environmental aspects (i.e. environmental costs) in their decisions-making process.

Environmental management accounting (EMA) have been emerged to overcome the criticisms of traditional management accounting. Many researchers (e.g. Burritt et al., 2002; de Beer and Friend, 2006) argued that EMA may overcome limitations of traditional management accounting by providing a better understanding and quantifying environmental related aspects for decision making.

EMA have been established over the last decades through the published work of researchers and professionals. During 1990s, professional organizations (e.g. ACCA, 1995; CMA, 1996) have promoted the role of environmental accounting in the identification and allocation of environmental costs, the investigation of alternate use of environmental waste, and supporting the company's establishment and operation of an environmental management system. International Federation of Accountants (IFAC) (2005) presented a broad definition of EMA as the identification, collection, analysis and use of two type of information for internal decision making: the first is physical information on the use, flows, and fates of energy, water, and materials (including waste) and the second is monetary information on environmental-related-costs, earnings and savings. According to Xiaomei (2004) and Jasch (2011), Environmental Management Accounting (EMA) aims to bring together both financial and physical information (non-financial) relating to environmental impacts and performance of a business. Furthermore, Schaltegger et al. (2000) classified the two dimensions (i.e. monetary and physical) into two sub-dimensions past oriented and future oriented. For monetary past oriented includes annual environmental costs from cost accounting; however, for monetary future oriented involves budgeting, investment appraisal, and calculating costs, savings, and benefits of projects. For physical past oriented includes materials and energy flow and environmental performance indicators and benchmarking; however, physical future oriented includes physical environmental budgeting and investment appraisal, and setting quantified performance targets. EMA includes: life-cycle costing, full-cost accounting, benefits assessment, and strategic planning for environmental management, and materials and energy flow accounting (IFAC, 1998; Schaltegger et al. 2012).

Previous research have focused on promoting EMA and its potential benefits (UNDSD, 2001). Also, there are many case studies (e.g. Burritt et al., 2011; Herzig et

al. 2012) in different developed countries that showed specific organization experience with EMA. There is a little attention given to the explanatory factors for EMA practice. Ferreira et al. (2010, P.940) call for future research to investigate the relationship between EMA use and other potential benefits empirically. They suggest may other factors that could be used in studying EMA such as legal requirements, stakeholder pressure and the attitude of organizations towards environmental issues. Furthermore, Christ and Burritt (2013, p.171) suggest replication of their study across different setting in order to determine whether the results obtained are globally applicable.

Given the small number of research, this research aimed to examine the contextual factors influencing EMA practices, it seems important to study EMA practices. Also, Bahrain is an Asian country where there is no formal information relating to EMA. Bahrain has issued Law No.7 in 1980 titled "Environmental protection" that aims to protect against all sources of pollution. Therefore, studying the importance attached to and the benefits derived from EMA's techniques in Bahrain is of particular importance.

2. Research objectives

The purposes of this research are to:

1. determine the accountants' perception of the importance attached to EMA techniques.

2.determine the accountants' perception of the benefits derived from EMA techniques.

3.explore contextual variables that may affect the accountants' perception of the importance attached to and the benefits derived from EMA techniques.

The reminder of this research is organized as follows. Section 3 focuses on previous research relating to EMA. The research hypotheses are presented in section 4 and the research design and method used to measure the variables tested in the research are presented in section 5 and 6. Section 7 presents the research findings and the final section (section 8) contains a discussion of the limitations of the research and the potential for future research.

3. Previous studies

The research relating to EMA provides cases that demonstrate many aspects of EMA. For example, Burritt and Saka (2006) examined the link between eco-efficiency measurement and EMA in Japan. They examined many case studies and the major conclusion of their study is that EMA is underutilized and there is need for further promotion for EMA. Gale (2006) applied EMA's framework to the financial reports of a Canadian paper mill. There was no environment account that the environmental costs are included in overhead accounts. EMA framework is centered around

classifying environmental costs into four groups: (1) waste and emission treatment costs; (2) prevention and environmental management costs; (3) material purchase value of non-product output costs; and (4) processing costs of non-product output. The study indicates that the total environmental costs under EMA are at least twice as much as would be normally reported. Also, Staniskis and Stasiskiene (2006) argue that EMA is important for environmental management decision, product and process design, cost allocation and control, capital budgeting, product pricing, and performance evaluation. Companies that use EMA as a part of integrated management system are provided with accurate information for measurement and reporting of environmental performance. Investigating current state of EMA practices in Lithuania indicates that there are many similarities in what improvements can be suggested for environmentally concerned companies both in terms of environmentally sound operation and for reporting of environmental management accounting information. In addition, Lee (2012) explores the role of environmental management accounting and, in particular, the eco-control approach for carbon management as part of the management of a firm's supply chain. A case study of Korean automobile manufacturers aims to examine the roles and usefulness of eco-control as a means of identifying and measuring carbon performance in a production plant. The results indicate that eco-control can support alignment between a firm's carbon management strategy and carbon performance measurement, and provides useful quantified information for corporate decision makers. Furthermore, viable mapping of carbon flow in production provides important opportunities to improve carbon performance within the supply chain.

Examining prior case studies indicates that most of case studies have been undertaken in different developed countries including-for example- Australia (Gale, 2006), Austria (Jasch, 2006), Korea (lee, 2012), and Lithuania (Staniskis and Stasiskiene. 2006). There is no evidence relating to the current situation in Bahrain. Also, using a case study methodology is always criticized on the ground that it fails in generalizing the results to other organizations.

There are many research try to explain the observed practice relating to some aspects of EMA. The contingency theory of management accounting provides a basis for explaining the differences in perceptions among accountants relating to importance attached to EMA's techniques and derived benefits from those techniques. The basic of idea of contingency theory have been demonstrated by Otley (1980). He suggests that "particular features of an appropriate accounting system will depend upon the specific circumstances in which an organisation finds itself. " (Otley, 1980,p. 413). This implies that the contingency theory research focuses on fit between contextual factors and aspects of an accounting system must somehow fit together for an organization to be effective. Drazin andVan deVen (1985) identify two forms of fit relating to structural contingency theory—the selection and interaction approaches. The first examines the relationship between contextual factors and organization structure without examining whether this context-structure relationship affects performance. In contrast, the second (i.e. the interaction) seeks to explain variations in organizational performance from the interaction of organizational structure and

context. Thus, only certain designs are expected to give high performance in a given context, and departures from such designs are expected to give lower performance. Given that organizations are assumed to have varying degrees of fit, the task of the researcher is to show that a higher degree of fit between context and structure is associated with higher performance.

In terms of management accounting control systems research the vast majority of studies have adopted the selection approach to fit (e.g. Chenhall, 2003; Luft and Shields, 2003) whereby characteristics of the accounting system represent the dependent variable. Accounting researchers have justified the selection approach based on the assumption that rational managers are unlikely to use accounting systems that do not assist in enhancing performance (Chenhall, 2003). Also, Christ and Burritt (2013, p.166) argued that the use of selection approach is considered as an initial stage of studying EMA. This study will use the selection approach to be consistent with prior research.

There are some studies used survey methodology in order to examine EMA at many companies (i.e. surveys) and, therefore; to be able to generalize the results For example, Forest and Wilmshurst (1998) have examine the environmental accounting (i.e. environmental management accounting) within Top 500 Australian companies. The results indicated that environmental information was most often incorporated in internal decisions, investment appraisal, and the budgeting system. However, the use of environmental information for performance evaluation seems limited. Furthermore, Forest and Wilmshurst (2000) examined the association between environmental sensitivity industry and the adoption of environmental –related management accounting procedures. The results indicated that environmental sensitivity industry does not appear to be the only factor that explain the adoption of environmental-related management accounting.

Recently, there are two studies (i.e. Ferreira et al., 2010; Christ and Burritt, 2013) that used the contingency theory to explain aspects of EMA. Ferreira et al. (2010) have undertaken a survey that examined the relationship between business strategy, process innovation, product innovation and EMA use. The results indicated that there was a positive association between process innovation and the EMA use. They also found no significant relationship between business strategy and EMA use. They have noted that the type of industry was the key driver for EMA use. Furthermore, Christ and Burritt (2013) have examine the relationship between environmental strategy, organizational size, and environmental-sensitive organization and the accountant's perception for the current and future use of EMA. Using a sample of Australian accountants, the results indicated that there were association between, environmental strategy, organizational size, environmentally-sensitive industry, and present and future use of EMA. This study highlighted that the potential role of the contingency theory in understanding reasons that explain the adoption, use, and benefits of EMA.

4. Research hypotheses

A literature review was undertaken to identify the potential contextual factors that may influence accountants' perception for importance and benefits derived from EMA's techniques. The following contextual factors are examined:

1. Size of the organization
2. Intensity of Competition
3. Type of Industry
4. Cost structure

4. 1. Size of the organization

The contingency theory literature suggests that size of the organization may affect the design of organizational structure and the use of management accounting system. Many writers (e.g. Williamson, 1970; Merchant, 1981, 1984; Ezzamel, 1990) argue that, as the firm's size increases, the management accounting system tends to be more sophisticated. For example, Khandwalla's study (1972) indicated that organization size, as measured by sales revenue, was positively associated with the sophistication of control and information systems. Furthermore, Moores and Chenhall (1994) have found size to be an important factor influencing the adoption of complex administrative strategy. This implies that large organizations have relatively greater access to resources to use in the introduction of more sophisticated accounting systems (i.e. Environmental Management Accounting (EMA)). Also, Christ and Burritt (2013) found that size of the organization is positively associated with accountant's perceptions of the present role and future role of EMA at organizational level. Drawing off the above discussion, the size of the organization could explain the adoption of some EMA's techniques and accountants' perception of the importance and benefits derived from EMA's techniques. Therefore, this study considered the following hypothesizes:

H1: There is a positive association between the size of the organization and the accountants' perception of the importance of EMA techniques.

H2: There is positive association between the size of the organization and the accountants' perception of the importance of benefits derived from EMA techniques.

4. 2. Intensity of Competition

Many researchers (e.g. Khandwall, 1972; Simons, 1990; Libby and Waterhouse, 1996) suggest that companies facing intensely competitive markets tend to adopt more sophisticated management accounting systems. Bruns and Kaplan (1987) identify competition as the most important factor for encouraging managers to consider redesigning their management and cost accounting systems. Furthermore, Gordon and Miller (1976) argued that intensity of competition leads to the use of broad scope information in terms of financial and non-financial (i.e. the type of information in

use). Similar results were reported by Gordon and Narayanan (1984) and Chenhall and Morris (1986). As indicated earlier, EMA involves financial and non-financial information; it can be argued that the intensity of completion is associated with the accountants' perception of the importance and the benefits derived from EMA techniques.

Based on the above discussion and argument the following hypothesis are tested:

H3: There is a positive association between the intensity of competition and the accountants' perception of the importance of EMA techniques.

H4: There is positive association between the intensity of competition and the accountants' perception of the importance of benefits derived from EMA techniques.

4.3. Type of Industry

According to Abrahamson (1991), diffusion of innovation may be clear within the same industry. The implies that organizations within the same industry type may imitate other organizations. Shields (1997) argues that the design of cost and information systems are dependent on the characteristics of industries. Therefore, the imitation may result in similar accounting systems being adopted within specific business industry.

Forst and Wilmshurst (2000) suggest that it is logical to assume that a firm within the retail industry will have different environmental management procedures than a similar counterpart firm in Chemical industry. Also, Ferreira et al. (2000) found the type of industry to be significant predictor of EMA practice and Innovation in Australia. Christ and Burritt (2013) suggest that the degree of environmental sensitivity in an industry would be positively associated with the current role and future role of EMA. The results indicated that there were an association between present and future use of EMA and type of industry. Therefore, the following hypothesizes are tested:

H5: There is a positive association between the type of industry and the accountants' perception of the importance of EMA techniques.

H6: There is a positive association between the type of industry and the accountants' perception of the importance of benefits derived from EMA techniques.

4.4 Cost structure

Cost management's studies focus on the proportion of direct costs and indirect costs to the total costs and their effect on the sophistication of cost systems. Kaplan and Cooper (1998) argue that firms with high indirect costs should assign these costs using sophisticated cost system. Brierley et al. (2001) indicated that direct materials costs tend to be higher than indirect costs. This implies that indirect costs represent a relatively small portion of the total costs in some industries it may not be worthwhile investing in sophisticated accounting systems to allocate indirect costs. In EMA

literature, many researchers (e.g. Epstein and Young, 1999; Bennett et al., 2003; Jasch, 2003; Papaspyropolulos et al., 2012) argues that environmental costs are hidden and allocated using manufacturing overhead costs pools. The percentage of environmental costs varies across companies. According Forst and Wilmshurst (2000), Cost-benefits analysis has been undertaken for environmental issues including: energy efficiency, by product use, pollution minimization, site cleanup, site contamination, and recyclable containers. This implies that the percentage of environmental costs to overhead can affect cost-benefit analysis; therefore, it can affect the importance of EMA's techniques and the importance of benefits derived from these techniques. In other words, a small percentage of environmental costs do not warrant a special treatment and , in turn, the importance of EMA's techniques is minimized.

Following that cost management literature, it can be argued that firms with high environmental costs may use a separate cost pool for environmental costs. This implies that firms with high environmental costs are more likely to perceive EMA techniques as important and, in turn, they will appreciate the benefits that are derived from those techniques.
Based on the above discussion the following hypothesis are tested:

H7: There is a positive association between the percentage of environmental costs to total overhead costs and the accountants' perception of the importance of EMA techniques.

H8: There is a positive association between the percentage of environmental costs to total overhead costs and the accountants' perception of the importance of benefits derived from EMA techniques.

5. Research design and data collection

A questionnaire survey was used to collect the data. A random sample consisting of 100 certified accountants in Bahrain was chosen from Bahrain Accountants Association (BAH). The questionnaire was distributed by hand and collected by post. Distributing questionnaires by hand allowed for face to face interaction with respondents. Efforts have been made in order to encourage respondents to answer. A total number of 36 questionnaires were returned from a sample of 100. This yielded a response rate of 36%.

The questionnaire included three sections. In section (A), two questions were included relating to the importance attached to EMA's techniques and the importance of benefits derived from EMA's techniques. Section (B) included 5 questions relating to four contextual variables which were: number of employees, type of business industries, level of competition, and cost structure. The final section, section (C), contained questions relating to demographic variables including length of time working at the organization and length of time of qualifying as an accountant.

Respondents were asked to tick a box if they wanted to receive a copy of the results. 31 respondents ticked this box; therefore, the content of this questionnaire was of particular importance to the respondents.

It is widely accepted that the covering letter is an motivation tool (de Vaus, 1996, p.116). Therefore, the cover letter incorporated all possible statements that could encourage accountants to complete the questionnaire. Also, definition of basic concepts used is included in order to make sure that concepts were defined clearly. A copy of the questionnaire and covering letter are shown in appendix. In order to test the validity of the questionnaire, it was distributed to a sample of 10 persons (5 academics and 5 accountants). They suggested some amendments and clarifications of some items. After taking their comments into accounts, a final version of the questionnaire was ready to sent out to the accountants.

A non-response bias test, based on the assumption that later respondents more closely resemble non-respondents was undertaken, by comparing the early 10 responses with the last 10 responses in respect of all variables used in the research. The results indicated that there were no significant difference between early and late responses; therefore, there was no evidence of non-response bias.

6. Measurement of the variables

The following sub-sections discussed the measurement of each of the variable included in this study

6.1 Size of the organization

The contingency theory literature used many proxies for measuring company size. According to Mullins (1994, p. 340), "size is not a simple variable" and the most common measure of the size variable is the number of employees in the company. Ahmed and Courtis (1999) argued that corporate size can be measured by number of employees. Likewise, Bjornenak (1997) suggested that number of employees to measure a company's size is one way to discriminate between firms' sizes. Also, Christ and Burritt (2013, P. 168) used the number of employees as a measure of the size of the organization. In this study, respondents were given two groups of employees. The first one less than 50 employees and the second one is more than 50 employees. This method is used to distinguish between small and large size organization. The two groups were used for many reasons. First, the pilot study revealed that it was easy for respondents to answer without referring back to the organizations' records. Second, it is consistent with the argument of research methodology that suggests low response rate in the case of asking respondent for referring to company's data (Dillman, 2007). Finally, Christ and Burritt (2013, p.169) used four groups of employees and then group respondents into two groups because there were a very low number of respondents in other groups.

6.2 Intensity of competition

Intensity of competition was measured using a question adapted from Khandwalla (1972). Respondents were asked to indicate the level of competition in the market place for the major products/services of their companies. The scale is ranging from 1 (Not intensive at all) to 5 (Extremely intensive).

6.3 Type of industry

Frost and Wilmshurst (2000, p. 349-350) presented two methods for measuring the type of industry (i.e. environmental sensitive or not). The first method was developed by Deegan and Gordon (1996). In this method, respondent were asked to rank their industries on a sacle of 1 to 5 (5= being most environmental sensitive). The second method was to use the classification of environmental sensitive industries that appeared on the previous literature. Many researchers (e.g. Deegan and Gordon, 1996; Frost and Wilmshurst, 2000) determined the more sensitive environmentally sensitive industries. They include: uranium mining, chemicals, coal, transport, oil and gas explorers and producers, plastics manufacturing, gas distributors, and forest, paper, and pulp. Christ and Burritt (2013, P. 168) used this classification and industries that had not included were grouped together as "less environmentally sensitive". This study used two groups; one is for less environmentally sensitive and the other is for high environmentally sensitive. The first page of the questionnaire includes a list of industries that are considered environmentally sensitive.

6.4 Cost structure

Respondents were asked to specify the percentage of environmental costs to total overhead costs. Respondents were accountants working at their organizations and, therefore, it is expected that they will be familiar with the percentage of environmental costs.

6.5 Perceived importance of EMA techniques

According to UNDSD (2001, p.9; 2003, p. 668) EMA includes the following:

- Estimation of annual environmental costs.
- Product pricing
- Budgeting
- Investment appraisal, calculating investment options
- Calculating costs, savings and benefits of environmental projects
- Environmental performance evaluation including indicators and benchmarking
- Setting quantified performance targets

Environmental Management accounting (EMA) techniques were measured using an instrument adapted from prior studies. Ferreira et al. (2010) develop 12 items relating to EMA activities drawn from prior academic and professional literature. The

respondents were asked to indicate on a seven point Likert scale the extent to which each of the 12 items were used in their organizations over the last three years. Ferreira et al. (200), used three anchors; they were:0= Has not done at all, 3= Has done to some extent, and 6= Has done to a great extent.

The 12 items used by Ferreira et al. (2000, p.298) were:

(1) Identification of environment-related costs.
(2) Estimation of environment-related contingent liabilities.
(3) Classification of environment-related costs.
(4) Allocation of environment-related costs to production processes.
(5) Allocation of environment-related costs to products.
(6) Introduction or improvement to environment-related cost management.
(7) Creation and use of environment-related cost accounts.
(8) Development and use of environment-related key performance indicators (KPIs).
(9) Product life cycle cost assessments.
(10) Product inventory analyses.
(11) Product impact analyses.
(12) Product improvement analysis.

Staniskis and Stasiskiene (2006, p. 1258) pointed out that case studies in Lithuanian industries indicated that there is a need for adequate treatment of contingent costs for the assessment of investment decisions. According to Christ and Burritt (2013, p. 168), Ferreira et al. (2010) did not cover the assessment of environmental impacts on capital investment decision. They included additional item relating to the assessment of potential environmental impacts associated with capital investment decision. Therefore, the total number of items included in the construct were added up to 13 items. However, there is a difference in the construct developed by Christ and Burritt (2013) is that it focused on the extent to which respondents believed that their organizations would engage in the 13 activities in the next three years. In other words, Ferreira et al. (2010) focused on current use; however, Christ and Burritt (2013) focused on future use. In the current study, 13 items were used but respondents were asked to indicate the perceived importance attached to each item. Also, the current study used a five point Likert Scale since respondents would find it difficult to answer on seven point scale as indicated through the pilot study. Respondents were asked to indicate the level of importance attached to each techniques. The scale is ranging from 1(not important at all) to 5 (extremely important).

6.6 Perceived benefits derived from EMA techniques

There are several potential benefits attributed to EMA. These include cost reductions, improved product pricing, attraction of human resources, and reputational improvements (Bennett et al., 2003; Burritt et al., 2002; de Beer and Friend, 2006). Also, EMA can provide different information for decision maker that may help in better waste management processes, reduced energy and material consumption or opportunities for material recycling(Adams and Zutshi, 2004; Bennett et al., 2003; Burritt et al., 2002). Similarly, Gale (2006, p.1238) claimed that the adoption of EMA

is likely to lead to cost saving opportunities and opportunities to create value within current activities. Also, Lee (2012, p.84) argued that firms may achieve cost saving through ecological efficiencies. Furthermore, EMA could enhance quality performance and create competitive advantage (Dunk, 2007).

To summarize, benefits derived from EMA include:

- Determining hidden environmental costs (UNDSD, 2001; Gale, 2006)
- Cost reduction (Bennett et al., 2003; Burritt et al., 2002; de Beer and Friend, 2006, Burrit and Saka, 2006)
- Cost saving (Lee, 2012)
- Enhance innovation (Hendro et al., 2008)
- Cleaner production (Gale, 2006)
- Better product pricing (Staniskis and Stasiskiane, 2006)
- Increased shareholders value (Staniskis and Stasiskiane, 2006)
- Enhance performance quality (Dunk, 2007)
- Create competitive advantage (Dunk, 2007)

Respondents were asked to indicate the level of importance attached to each benefit derived from each technique. The scale is ranging from 1(not important at all) to 5 (extremely important).

7. Research findings

Responses indicated that 13 (36.1%) of respondents were qualified as accountants for a period less than 2 years, 15 (41.7%) of respondents were qualified for period ranging from 2-5 years, and 8 (22.2%) of respondents were qualified for more than 5 years. Similarly, 17 (47.2%) of respondents were working at the company for a less than 2 years, 10 (27.8%) of respondents were working at the company for a period ranging from 2-5 years, and 9 (25%) of respondents were working at the company for a period more than 5 years.

Table (1) showed descriptive statistic for the importance attached to the importance of EMA's techniques. It appeared from Table (1) that respondents were assigned different degrees of importance to each of EMA's techniques. The most important techniques was the identification of environmental-related costs with Mean = 3.22. This implies that environmental costs determination was the initial step that triggered the other techniques. In other words, determination of environmental costs can lead to better product pricing, incorporating environmental costs into investment decisions, product life cycle cost assessment, and the others techniques.

Table (2) demonstrated descriptive statistics for the importance attached to benefits derived from EMA's techniques. Respondents perceived that better product pricing as being the most important benefit derived from EMA's techniques. The Mean equals to 3. The insensitivity of competition may interpret such results. In other words, when intensity of competition increase, the importance attached to pricing decision would increase.

Table (1): descriptive statistics for the importance attached to EMA's techniques.

EMA techniques	N	Min.	Max.	Mean	Std. Dev.
1. Identification of environment-related costs	36	1	5	3.22	1.245
2.Estimation of environment-related contingent liabilities	36	1	5	3.00	1.394
3.Classification of environment-related costs	36	1	5	3.19	1.390
4.Allocations of environment-related costs to production process.	36	1	5	3.08	1.422
5. Allocations of environment-related costs to products	36	1	5	3.03	1.276
6. Introduction or improvement to environment-related cost management	36	1	5	2.92	1.180
7. Creation and use of environment-related cost accounts	36	1	5	2.78	1.174
8. Development and use of environment-related key performance indicators (KPIs)	36	1	5	3.00	1.195
9.Product life-cycle cost assessments.	36	1	5	3.14	1.533
10. Product inventory analyses (i.e. the specification of the types and quantities of materials and energy required and the amounts of residues released to the environment)	36	1	5	3.03	1.383
11. Product impact analyses (i.e. assessment of the environmental effect of competing product designs)	36	1	4	2.67	1.069
12. Product improvement analysis (i.e. identification of opportunities for reduction of environmental impact)	36	1	5	2.78	1.124
13. Assessment of potential environmental impacts associated with capital investment decisions.	36	1	5	3.03	1.230

Table (2):descriptive statistics for the importance attached to benefits derived from EMA's techniques.

	N	Min.	Max.	Mean	Std. Dev.
1. Determining hidden environmental costs	36	1	4	1.97	1.000
2. Cost reduction	36	1	4	2.56	.909
3. Cost saving	36	1	5	2.81	1.327
4. Enhance innovation	36	1	5	2.83	1.134
5. Cleaner production	36	1	5	2.75	1.052
6. Better product pricing	36	1	5	3.00	1.265
7. Increased shareholders value	36	1	5	2.69	1.261
8. Enhance performance quality	36	1	5	2.78	1.333
9.Create competitive advantage	36	1	5	2.86	1.515

Table (3): descriptive statistics for size and type of industry

Variable	Frequency	Percent (%)
Size		
Small (less than 50)	14	38.9
Large (more than 50)	22	61.1
Type of industry		
Less environmentally sensitive	13	36.1
More environmentally sensitive	23	63.9

Table (3) showed descriptive statistics relating to size and type of industry. It is apparent from this table that 14 (38.9%) of respondents were from small size companies; however, 22 (61.1%) of respondents were at large size companies. According to type of industry, 13 (36.1%) of respondents from industries that were less environmentally sensitive and 23 (63.9%) of respondents were from industries that were more environmentally sensitive. Also, table (4) showed that there were different levels of intensity of competition. It is clearly observed that 12 (33.3%) of respondents indicated that the competition is not intensive at all, 11 (30.6%) of respondents perceived that the competition is below average intensity, 10 (27.8%) of respondents indicated that there were average intensity of competition, 2 (5.6%) of respondents perceived that the level of competition was above average, and only one respondent perceived that the competition was extremely intensive. Therefore, the majority of respondents (63.9%) were perceived that the intensity of competition is below average or not intensive at all.

Table (4); descriptive statistics for the intensity of competition

Intensity of competition	Frequency	Percent
Not intensive at all	12	33.3
Below average intensity	11	30.6
Average intensity	10	27.8
Above average intensity	2	5.6
Extremely intensive	1	2.8
Total	36	100.0

Table (5) showed descriptive statistics for the percentage of environmental costs to total overhead. 9 (25%) respondents determined that the percentage was less than 5%, 7 (19.4%) respondents determined that the percentage was ranging from 5 to 7%, 13 (36.1%) respondents perceived that the percentage was ranging from 7 to 10%, and 7 (19.4%) of respondents determined that the percentage was ranging from 10 to 20%.

Table (5): Descriptive statistics for the percentage of environmental costs to total overhead

	Frequency	Percent
less than 5%	9	25.0
5% to 7%	7	19.4
7% to 10%	13	36.1
10% to 20%	7	19.4
Total	36	100.0

It should be noted that the importance attached to EMA's techniques and the importance attached to benefits derived from EMA's techniques are measured using multiple items instruments. There are two methods that could be used in aggregating multiple items instruments. The first method is the average score. This method of aggregating the multiple items that measure a variable is explained by Judd et al. (1991). They demonstrated that, when an individual indicates his or her own attitude (or opinion) relating to an object on some scales, a substantial element of intuitive judgment is involved, no matter how precise the rating instructions and no matter how well trained the individual. Such judgment in the use of rating scales makes the ratings vulnerable to bias. Averaging the scores for several variable items reduces this bias. On the other hand, the second method is to aggregate the multiple-item instruments using factor analysis. Many researchers (Cortina, 1993, p. 103; Oppenhiem, 2001, pp. 166-171; Bryman and Cramer, 1999) argue that factor analysis is a useful tool in order to aggregate variables and to test for an instrument's homogeneity and unidimensionality. This technique involves the use of different methods. One of these methods, and probably the most famous one, is the principal-component method where factors are extracted with Eigenvalues of more than one.
Bearing the two methods of aggregating variables in mind, the multiple-item instruments (i.e. importance of EMA and importance of benefits derived from EMA) were aggregated using the average score. For management accounting research, Foster and Swenson (1997) claimed that a composite score has the advantage over an individual single question when either (1) the variable being measured contains multiple dimensional aspects requiring several different questions to capture the multiple dimensional aspects, or (2) there is a measurement error in an individual question that is diversified away in aggregating individual questions into a composite. Nunnally and Berstein (1994, pp. 316-317) suggested that the use of factor analysis is likely to overestimate the number of dimensions of the instruments. It is easier to interpret the aggregating of multiple-item instruments using the average score than factor analysis which is sometimes difficult to interpret without a subjective judgment. Based on the above discussion, this research used the average score method. Table (6) showed descriptive statistics for overall importance attached to EMA's techniques (Mean = 2.99) and importance attached to benefits derived from EMA's techniques (Mean =2.50)

It is widely recognized that Crobach Alpha is used to measure the reliability of an Instrument. Therefore, it was used to measure the reliability of the 13-items that were used to measure the importance attached to EMA's techniques. Crobach Alpha was 0.967 that suggesting high level of reliability. Also, Crobach Alpha was 0.846 for the 9 items that were sued to measure benefits derived from EMA's techniques.

Table (6): descriptive statistics for overall importance attached to EMA's techniques and importance attached to the benefits derived from EMA's techniques

	N	Mean	Std. Deviation
Importance of EMA's techniques	36	2.99	1.087
Importance of benefits derived from EMA's techniques	36	2.50	1.082

In order to test for hypotheses, correlation coefficients were used to test the association between the importance attached to EMA's techniques and contextual variables. It should be noted that the correlation coefficient is ranging from -1 to +1. A correlation of +1 means perfect positive correlation. However, a correlation of -1 means perfect negative correlation. However, a correlation of zero indicates that there is no relationship between variables (Bryman and Cramer, 1999, P.181). Table (7) showed the correlation coefficients between the importance attached to EMA's techniques and size, intensity of competition, type of industry, and cost structure (measured as a percentage of environmental costs to total overhead). It is appeared that there were correlation between the importance attached to EMA's techniques and the four contextual variables. The correlation coefficient between the importance attached to EMA's techniques and size was the highest (coefficient = 0.725) and significant at 0.01 level. However, the correlation coefficient between the importance attached to EMA's techniques and intensity of competition was the lowest (coefficient = 0.428) and significant at 0.01 level.

A regression model was used to test for hypotheses relating to the importance attached to EMA's techniques (hypotheses 1, 3,5, and 7). Table (8) demonstrated the results of regression model. Overall model was found to be significant (F= 48.362, p =.000). R equals.928 which is the coefficient of determination that represents the correlation between all independent variables and the importance attached to EMA's techniques (i.e. dependent variables). R square equaled to .862 that represented the proportion of variance in dependent variable (importance attached to EMA's techniques) that were explained by independent variable. Adjusted R square is an estimate of how well the model would fit another data set from the same population. Adjusted R square equaled .844 that represented independent variables were explained 84.4% of the variations in importance attached to EMA's techniques. The significant relationship between the importance attached to EMA's techniques and size (Beta=.257, t= 2.094, p =.044 < 0.05), type of industry (Beta=.481, t= 3.576, p =.001 < 0.05), and cost structure (Beta=.238, t= 2.115, p =.043 < 0.05). There was no significant relationship between the intensity of competition and the importance attached to EMA' techniques(Beta=..038, t= 505, p =.617). Table (9) summarized the hypotheses test for the importance attached to EMA's techniques. The major conclusion from this table was that the intensity of competition was correlated with the importance of EMA's techniques but with the relationship was weak. Using the regression model, the relationship was not significant.

Table (7):Correlations between importance attached to EMA's techniques and contextual variables.

	Importance of EMA's techniques	Size	Intensity of competition	Type of industry	Cost structure
Importance of EMA's techniques	1.000				
Size	.725**	1.000			
Intensity of competition	.428**	.382*	1.000		
Type of industry	.741**	.824**	.446**	1.000	
Cost structure	.709**	.736**	.377*	.773**	1.000

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 8: regression model (dependent variable: importance attached to EMA's techniques)Table 8.1:ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	35.670	4	8.918	48.362	.000[b]
Residual	5.716	31	.184		
Total	41.386	35			

a. Dependent Variable: EMA

b. Predictors: (Constant), Size, Intensity of competition, Type of industry, and Cost structure

Table 8.2

Model	Standardized Coefficients	t	Sig.
	Beta		
(Constant)		5.688	.000
Size	.257	2.094	.044
Intensity of competition	.038	.505	.617
Type of industry	.481	3.576	.001
Cost structure	.238	2.115	.043

Table: 8.3

	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.928	.862	.844	.429

Table (9): summary of hypotheses test for the importance attached to EMA's techniques

Contextual variable	Hypotheses	Correlation	Regression
Size	H1: There is a positive association between the size of the organization and the accountants' perception of the importance of EMA techniques	Supported	Supported
Intensity of competition	H3: There is a positive association between the intensity of competition and the accountants' perception of the importance of EMA techniques.	Weak correlation	unsupported
Type of industry	H5:There is a positive association between the type of industry and the accountants' perception of the importance of EMA techniques.	Supported	Supported
Cost structure	H7:There is a positive association between the percentage of environmental costs to total overhead costs and the accountants' perception of the importance of EMA techniques.	Supported	Supported

In order to test for hypotheses relating to the importance of benefits derived from EMA's techniques, correlation coefficients and regression model were used. Table (10) showed the correlation coefficients between the importance of benefits derived from EMA's techniques and size, intensity of competition, type of industry, and cost structure (measured as a percentage of environmental costs to total overhead). It is appeared that there were correlation between the importance of benefits derived from EMA's techniques and the four contextual variables. The correlation coefficient between the importance of benefits derived from EMA's techniques and cost structure was the highest (coefficient = .852) and significant at 0.01 level. However, the correlation coefficient between the importance attached to EMA's techniques and intensity of competition was the lowest (coefficient = .397) and significant at 0.05 level.

The second regression model was used to test for hypotheses relating to the importance of benefits derived from EMA's techniques (hypotheses 2, 4,6, and 8). Table (11) demonstrated the results of regression model. Overall model was found to be significant (F= 37.946, p =.000, R=.911 , R square =.830). Adjusted R square = .809 that represented independent variables were explained 80.9% of the variations in importance of benefits derived from to EMA's techniques. The significant relationship between the importance of benefits derived from to EMA's techniques and type of industry (Beta=.460, t= 3.082, p =.004< 0.05) and cost structure (Beta=.588, t= 4.712, p =.000 < 0.05). There were no significant relationship between the importance of benefits derived from to EMA's techniques and the size (Beta=.107, t= .788, p =.437), and the intensity of competition (Beta=.016, t= .196, p =.846), . Table (12) summarized the hypotheses test for the of benefits derived from to EMA's techniques. The major conclusion from this table was that size and the intensity of competition were correlated with the importance of benefits derived from EMA's techniques but with the relationships were weak. Using the regression model, the relationship between the importance of benefits derived from EMA's techniques, size and intensity of competition were not significant

Table (10): Correlations between the importance of benefits derived from EMA's techniques and contextual variables

	Importance of benefits derived from EMA's techniques	Size	Intensity of competition	Type of industry	Cost structure
Importance of benefits derived from EMA's techniques	1.000				
Size	.438**	1.000			
Intensity of competition	.397*	.382*	1.000		
Type of industry	.785**	.824**	.446**	1.000	
Cost structure	.852**	.736**	.377*	.773**	1.000

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 11: Second regression model; dependent variable the importance of benefits derived from EMA's techniques

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.911[a]	.830	.809	.349

a. Predictors: (Constant), Size, Intensity of competition, Type of industry, and Cost structure

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	18.497	4	4.624	37.946	.000[b]
	Residual	3.778	31	.122		
	Total	22.274	35			

a. Dependent Variable: importance of benefits derived from EMA's techniques

b. Predictors: (Constant), Size, Intensity of competition, Type of industry , and cost structure

Model		Standardized Coefficients	t	Sig.
		Beta		
	(Constant)		6.619	.000
	Size	.107	.788	.437
	Intensity of competition	.016	.196	.846
	Type of industry	.460	3.082	.004
	Cost structure	.588	4.712	.000

Table (12): Summary of hypotheses test for the importance of benefits derived from EMA's techniques

Contextual variable	Hypotheses	Correlation	Regression
Size	H2: There is positive association between the size of the organization and the accountants' perception of the importance of benefits derived from EMA techniques.	Weak correlation	unsupported
Intensity of competition	H4: There is positive association between the intensity of competition and the accountants' perception of the importance of benefits derived from EMA techniques.	Weak correlation	unsupported
Type of industry	H6: There is a positive association between the type of industry and the accountants' perception of the importance of benefits derived from EMA techniques	Supported	Supported
Cost structure	H8: There is a positive association between the percentage of environmental costs to total overhead costs and the accountants' perception of the importance of benefits derived from EMA techniques.	Supported	Supported

8.Discussion and conclusion

The results indicated that there were significant relationships between the importance attached to EMA's techniques and size, type of industry, and cost structure. The results were consistent with contingency theory literature(e.g. Gordon and Narayanan,1984; Chenhall and Morris,1986) that the effects of size on management accounting systems. Also, Christ and Burritt (2013) found the size of the organization and industry were significantly correlated with the use of EMA's techniques. Furthermore, Forest and Wilmshurst (1998) found that the type of industry in terms of less or more environmentally sensitive had significant relationship with EMA. With regards to cost structure, it was measured using the percentage of environmental costs to total overhead . The results indicated that the more the percentage, the more it was the importance attached to EMA's techniques. This results was consistent with the evidence obtained from case studies in different countries (e.g. Bennett et al., 2003; Jasch, 2003; Papaspyropolulos et al., 2012). Also, the results indicated that there was no significant relationship between the importance attached to EMA's techniques and intensity of competition.

With regards to the importance attached to benefits derived from EMA's techniques, the EMA's literature (e.g. UNSDS, 2001; Gale, 2006; Bennett et al., 2003; Burritt et al., 2002; de Beer and Friend, 2006, Burrit and Saka, 2006) provided many normative arguments to the benefits derived from EMA's techniques; however, it seemed that there were no attempt to test such arguments empirically. This study examined the relationship between the importance of benefits derived from EMA's techniques and size, intensity of competition, type of industry, and cost structure. The results indicated that there were significant relationships between the importance of benefits derived from EMA's techniques and type of industry and cost structure. This implied that companies that were working in environmentally sensitive industry with high percentage of environmental costs would perceived high importance to EMA's techniques. Furthermore, the results indicated that there were no significant relationships between the importance attached to benefits derived from EMA's techniques and size and intensity of competition.

Overall this study contributed to the literature of EMA in many aspects. First, it provided results relating to accountants perception of the importance of EMA's techniques in Bahrain; however, the previous studies were undertaken in developed countries. Second, the current study examined factors that influencing the importance of benefits derived from EMA's techniques; however, prior studies were focusing on normative argument of such benefits. Finally, the results of this study may encourage companies that are working in Bahrain to adopt EMA's techniques in order to achieve benefits that are demonstrated.

This study is subject to limitations of surveys including response rate and representation of sample to the population. It should be noted that efforts have been made in order to increase the response rate including distributing the questionnaire by

hand and selecting a random sample. Also, a brief definition of concepts were included in the first page of the questionnaire in order to make sure that respondents answered according to correct meaning. Furthermore, a non response bias is always a problem with the survey. However, the results indicated that there were no existence of non-response bias.

Drawing off the results of this study, there are many areas of future research. First, future research may focus on the relationship between other contextual variables and EMA. Second, the current research may be duplicated in other countries in order to analyze the difference in EMA's practice among countries. Third, the current study revealed that the percentage of environmental costs and type of industry are the significant factors influencing the importance attached to benefits derived from EMA's techniques. Future research may focus on examining cost system design in terms of allocation of environmental costs to cost centers and products or services. Finally, future research may focus on the flow of environmental information across the organization and to examine whether companies use accounting data base or incorporating it with other information systems.

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Appendix: Covering letter and questionnaire

Covering letter

Dear Mr./Mrs.

Currently, I am undertaking a research that examines the perceptions of accountants to the importance and benefits derived from Environmental Management Accounting (EMA) techniques. The research objectives can only be achieved with your co-operation.

The attached questionnaire should take less than 15 minutes to complete. In return, you will receive a summary of my research findings. I believe that the results of my enquiry will be of significant use to companies by providing feedback on the importance and benefit of EMA's techniques.

If you do not feel able to answer any section or individual questions please leave them blank. The results of the questionnaire will be analyzed in aggregate form without any references to you or your company.

If you have any queries concerning any aspect of my research you can contact me. My postal address telephone numbers, and e-mails are shown below.

Yours sincerely,

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Questionnaire

Basics Terms:

Environmental Management Accounting (EMA):
EMA includes the identification, collection, analysis and use of two type of information for internal decision making: the first is physical information on the use, flows, and fates of energy, water, and materials (including waste) and the second is monetary information on environmental-related-costs, earnings and savings.

Environmental Costs:
Environmental costs comprise both internal and external costs and relate to all costs incurred in relation to environmental damage and protection. Environmental costs include four groups:
1. Conventional **waste and disposal and emission treatment costs** including related labor and maintenance materials.
2. **Prevention and environmental management costs** include labor costs and external services for good housekeeping as well as the environmental share of integrated technologies and the scrap share of operational plants
3. Material purchases value of non-product output.
4. Production costs of no-product output

Environmentally sensitive industries:

The more environmentally sensitive industries include:

- Mining and resources
- Chemicals
- Oil, gas and consumable flues
- Utilities
- Forest, paper and pulp

Other industries are considered less environmentally sensitive

Section (A):

A.1. Please **tick only one box** next to each of the following EMA's techniques to indicate the level of importance attached to each techniques at your opinion.

	Not important at all	Below average importance	Average importance	Above average importance	Extremely Important
1. Identification of environment-related costs	1	2	3	4	5
2. Estimation of environment-related contingent liabilities	1	2	3	4	5
3. Classification of environment-related costs	1	2	3	4	5
4. Allocations of environment-related costs to production process.	1	2	3	4	5
5. Allocations of environment-related costs to products	1	2	3	4	5
6. Introduction or improvement to environment-related cost management	1	2	3	4	5
7. Creation and use of environment-related cost accounts	1	2	3	4	5
8. Development and use of environment-related key performance indicators (KPIs)	1	2	3	4	5
9.Product life-cycle cost assessments.	1	2	3	4	5
10. Product inventory analyses (i.e. the specification of the types and quantities of materials and energy required and the amounts of residues released to the environment)	1	2	3	4	5
11. Product impact analyses (i.e. assessment of the environmental effect of competing product designs)	1	2	3	4	5
12. Product improvement analysis (i.e. identification of opportunities for reduction of environmental impact)	1	2	3	4	5
13. Assessment of potential environmental impacts associated with capital investment decisions.	1	2	3	4	5

A. 2. Please **tick only one box** next to each of the following benefits that may be derived from EMA's techniques to indicate the level of importance attached to each benefit at your opinion.

	Not important at all	Below average importance	Average importance	Above average importance	Extremely Important
1. Determining hidden environmental costs	1	2	3	4	5
2. Cost reduction	1	2	3	4	5
3. Cost saving	1	2	3	4	5
4. Enhance innovation	1	2	3	4	5
5. Cleaner production	1	2	3	4	5
6. Better product pricing	1	2	3	4	5
7. Increased shareholders value	1	2	3	4	5
8. Enhance performance quality	1	2	3	4	5
9.Create competitive advantage	1	2	3	4	5

Section B:

B.1. Please tick one box that represents the number of employees at your organizations:

□ Less than 50 □ More than 50

B. 2. On a scale of 1 to 5 circle the appropriate number below to indicate the level of competition in the market place for the major products/services of your company:

Not intensive at all	Below average intensity	Average intensity	Above average intensity	Extremely intensive
1	2	3	4	5

B.3. Please tick one box that represents **the extent to which your company is sensitive environmentally:**

□ Less environmentally sensitive □ More environmentally sensitive

B. 4. Please tick on box that represent the percentage of environmental costs to overhead costs:

□ **Less than 5%** □ **5% to 7%** □ **7% to 10 %** □ **10% to 20%** □ **More than 20%**

Section C:

C.1. Please indicate the length of time since you qualified as an accountant:

□ Less than 2 years □ 2-5 years □ More than 5 years

C.2. Please indicate the length of time since you started working at your company:

□ Less than 2 years □ 2-5 years □ More than 5 years

C.3 Please tick the box if you want a copy of the results of this study □

If you ticked the above box, please provide your details below:

Name:.....
Address:.....

Telephone No.:.....

E-mail:.....