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The Utility of Applying Environmental Management Accounting Techniques and Prioritizing them Using the AHP method in Companies with ISO 14001 in Iran

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ABSTRACT

The aim of this paper is to assess the adequacy and desirability of applying environmental management accounting techniques and to prioritize them using the AHP method in companies with ISO 14001 certificate in Iran. As Islamic companies they adhere to Islamic principles and standards and protect the environment according to Sharia law in Islam. First, through questionnaires, we examined the desirability of applying environmental management accounting techniques in companies with ISO 14001 and then by analytic hierarchy process (AHP), they were ranked according to their importance. The statistical population of the research is the companies with ISO 14001 in Iran. Statistical tests were used to assess the mean confidence interval of the population and SPSS and EViews software were used to analyze these companies. The findings showed that the surveyed population had only a strong understanding of the importance of environmental activities, and the environmental management accounting techniques used in these companies were not adequate and desirable. The high precision power indicates that companies tend to use environmental management accounting techniques, but due to lack of appropriate guidance and relevant standards in this area, companies have difficulty implementing environmental protection accounting.

Keywords:

Environmental management accounting, Environmental costs, ISO 14001.

1. Introduction

Looking at the verses and traditions of the Ahl al-Bayt (AS), it becomes clear that no school such as Islam has paid attention to nature and the environment. On the other hand, the Holy Quran in many verses has called people into the study of nature and its elements. Many principles and norms in Islam have been emphasized. Some of these include the attention to monotheism, divine caliph, society, justice, benefaction, knowledge and chastity, which have human relationships with his surroundings in them. Therefore, in the cosmology of the Holy Quran, nature and the environment are examples of divine verses (McLean & Salmani, 2013).

In the Holy Quran, God has introduced man as his caliph on earth. The Holy Quran says: "And when your Lord said to the angels, I will set a successor on earth (Surah Baqara, verse 30). Succession and Caliphate require that human beings preserve the trust of the earth to the good and protect it from any destruction and corruption, and by using knowledge and science attempt in relation to the development and optimal use of the earth, and guarantee the living space of other beings, and provide the possibility of benefiting universal and permanent access for all beings on earth (Rania & et al., 2006).

The emergence of environmental issues is the result of human activities, including cutting of trees, pollution, carbon emissions and climate change, which has raised serious concerns over the Earth due to serious health impacts on the planet. For this reason, commercial organizations that use human resources in the business for their business activities are under the pressure of a variety of internal and external factors (Altib & et al., 2010). The pressure that the community has put on business organizations has led their managers to use environmental management accounting techniques. Researches show that the hidden costs of environmental activities cannot be disclosed through the traditional accounting system, and therefore, environmental management accounting techniques are used to overcome the limitations of environmental information provision (Sepasi & Esmaeili, 2015, Altib & et al. 2010).

The interests of many inter-organizational and extra-organizational stakeholders depend on their environmental performance. For example, company employees are a group of stakeholders within their organization. If the environment in which these employees are involved are contaminated, they will be harmed by irreparable harm. External stakeholders also include stakeholders, customers, suppliers, environmental advocacy groups, government legislators and the general public that are affected by environmental pollution. With this in mind, organizations and accountants should be sensitive to environmental issues (Ranganatan & Dietz, 1996).

In general, the purpose of this research is to investigate the desirability of applying environmental management accounting techniques and their ranking using Analytic Hierarchy Process (AHP) in companies with ISO 14001 Certificates in Iran, and these companies as Islamic companies, observe Islamic principles and regulations of environmental protection in accordance with Sharia law in Islam. The use of hierarchical analysis (AHP) is for us to see which one of the environmental management accounting techniques has the most application for companies with ISO 14001 and to rank them in order of the most applicable to the least.

2. Literature Review

Basically, ISO 14001 focuses on the environmental management system and is designed to improve the organization's environmental activities. As such, the ISO 14001 has the benefits of improving environmental performance, minimizing waste, protecting energy and water, enhancing corporate credibility, reducing the risk of natural disasters, and also the desirability of setting laws for organizations (Cassel & et al. 2011, Bensal & Boughner, 2002, Zillani & Vahid, 2006). According to the International Federation of Accountants (IFAC) guidelines during researches conducted by Soleiman & Mokhtar in 2010, it is mentioned that recognizing environmental management accounting techniques collects useful financial and physical information for decision making and analysis. Physical data, such as information about energy consumption and materials including waste, while environmental financial information relates to information on costs, earnings, and savings. Extending this information can definitely help organizations to overcome the limitations in the traditional accounting system in relation to the nature of the environment (Soleiman & Mokhtar, 2010).

The US Environmental Protection Agency (1995) considers environmental management accounting to be

a concept that focuses on providing information for the purposes of inter-organizational decision-making (Vahouni, 2009). Borit (2004) states that environmental management accounting is related to the information needs of managers regarding the activities of business units that affect the environment, as the environment affects commercial entities. Environmental management accounting is stated as follows in the definitions:

"Collection, analysis and use of financial and non-financial information to optimize the economic and environmental performance of business units to achieve reasonable consumption of natural resources in the business unit" (Molanazar, 2003).

Japan's Ministry of Environment (2005) defines environmental management accounting as a means of achieving sustainable development, maintaining good relations with the community and implementing effective and efficient environmental protection activities. These accounting procedures allow the company to identify the benefits of these activities and environmental costs in the business unit's normal operating cycle and provide the best quantitative measure and support the transfer of its results (Dehghan & Khalili, 2011).

Therefore, the application of environmental management accounting techniques can enable organizations to identify, collect, and analyze environmental data related to internal decision making. Subsequently, the system will help organizations understand the benefits of environmental activities, including reducing operating costs, identifying new opportunities and improving the performance of the organization (Cassel & et al., 2011).

Recently, Muslim and non-Muslim scholars have been interacting with each other about their thinking on accounting and the environment based on Islam principles. According to the studies conducted by Ahmad in 2012 titled "Accounting from the Islamic Perspective", it can be argued that accounting from the viewpoint of Islamic areas has attracted the attention of researchers to think about it. Johnson also pointed out in his research in 2012 entitled "The Relationship of the Islamic Sharia to the Indigenous Issues of Muslims," that most Muslim scholars advocate Islamic accounting standards for accounting for environmental activities (Ahmad, 2012, Johnson, 2012).

During a research by Malekian and Salmani (2013) entitled "Environmental accounting from the perspective of Islam," he examined Islamic views on the importance of environmental accounting, and argued that the traditional accounting system was unable to provide environmental information which are the result of the activity of commercial firms due to relying on financial perspectives. Also, Hejazi and Ghanbari (2011) in their research entitled "Introduction to Environmental Management Accounting" state that optimal management of environmental costs has improved the environmental management system and has important benefits to the health of the community and the success of the business unit. In this regard, management accounting should be structured to gather useful information about the environment and use them in the report for management decisions.

Abbasi and Mohammadi, in a study entitled "Investigating the Financial Reporting of Environmental Performance of Polluting Companies Accepted in the Tehran Stock Exchange", reviewed five issues of environmental performance report of 47 polluting companies from 9 industries during the period from 2002 to 2008. Their research results showed that polluting companies disclose their environmental financial performance in at least 50% of the observations in the explanatory notes of financial statements and the board's report to the shareholders' general meeting, which shows that polluting companies tend toward environmental activities and disclosure of their environmental performance, but because of the lack of specific guidance on accounting techniques for environmental activities and their disclosure, they turn to explanations in the explanatory notes and the reports of the board of directors.

During another research by Sepasi and Esmaeili (2015), via 29 environmental experts, identified the variables that have an impact on the disclosure of environmental activities and provided a model for disclosure, and concluded that identifying revenues and costs of environmental activities and their disclosure will be an effective step for organizations to move towards green accounting.

3. Methodology

In this research, information was gathered using a sampling method through a questionnaire from companies that have received the ISO 14001 certificate. Companies with ISO 14001 are more

interested in reducing the negative effects of their activities on the environment than other companies and utilize environmental management accounting techniques more (Ranganatan & Dietz, 1996), and therefore these companies are members of the statistical population. The questionnaire uses the Five Point Likert scale, which range from "strongly oppose" to "highly agree".

Regarding the environmental management accounting techniques in this study, according to Ismail and Ramli (2014), 5 cases have been investigated which are as follows (Ismaeil & et al., 2014):

1) Identification, classification and allocation of environmental costs to products and analysis of its effects
2) Training staff and explaining environmental protection policies and rules
3) The degree of innovation of products and services in terms of environmental compatibility
4) Understanding the importance of bearing environmental costs and the impact of environmental activities on the quality of products and services
5) Improvement of the company's external performance through the use of environmental accounting

In this research, we first examined the degree of application of environmental management accounting techniques in ISO 14001 companies through a questionnaire and then through Hierarchical Analyzes (AHP), ranked the environmental management accounting techniques of companies with ISO 14001 based on the degree of their importance.

The questionnaire's questions are designed to provide them with the appropriate information to examine the hypotheses of this research. The structure of this research consists of five hypotheses for environmental management accounting, which are defined as follows:

Hypothesis 1: Identifying, classifying and allocating environmental costs to products and analyzing their effects in companies with ISO 14001 are done well.

Second hypothesis: Training employees and legislating environmental protection laws and policies are done well in companies with ISO 14001.

Third hypothesis: The degree of innovation in products and services in terms of environmental compatibility in companies with ISO 14001 is in the best status.

Fourth hypothesis: The level of understanding of ISO 14001 companies from the importance of bearing environmental costs and the impact of environmental activities on the quality of products and services, are desirable.

Fifth hypothesis: The external performance of companies with ISO 14001 is highly desirable.

The statistical tests used to test the hypotheses include estimating the mean confidence interval of the population and the ratio tests and t-student. The binomial test was used as the population studied has double statuses, and the proportion of the group that responded more than three (according to the rating of very low to very high answers in the questionnaire from 1 to 5), can be compared and assessed with the proportion of the group that responded less than three for each group of questions related to each of the hypotheses; in which the test statistic is determined using the following equation:

$$Z = \frac{p - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$

In this equation, p is the significance level for the normal distribution $0.05 = \alpha$, with two groups around it and n is the sample size. The null hypothesis is rejected if $|Z| > Z_{1-\alpha/2}$. By determining the estimation of the population confidence interval, t-student like the ratio test, starts with the definition of the null hypothesis (H0) and the first hypothesis (H1), and then the test statistic is obtained using the following equation:

$$t = \frac{\bar{x}\_\mu}{s/\sqrt{n}}$$

For descriptive statistics and inferential statistics of the hypotheses, SPSS and EViews software were used and Excel computational tools was used for analytic hierarchy process (AHP).

Responsive counterparts are the chief executive, financial director, senior accountant and accounting experts of the companies who can directly contribute to environmental policies and activities and they were asked to answer the questionnaire questions about the past 3 years of the company. The statistical population of this study is all Iranian companies with ISO 14001 certificates. However, due to the fact that the number

of these companies is not clear in Iran, the sample size was calculated using the Cochran formula with the error level of 10% and with the uncertainty assumption of the total number of the population and 167 members were selected for the sample. Part of the questionnaires were sent to the companies in person and part of it by email, and 42 questionnaires were completed and collected by repeated follow-ups.

3.1. Analytic Hierarchy Process (AHP)

This process is a mathematical synthesis and an arbitrary decision-making method with relative scale. This method is used by using a system network, different indicators, and multiple criteria with prioritized multi-level structures to rank or determine the importance of different options for a complex decision process.

3.2. How to use AHP

To apply the AHP method to solve the decision-making problem, there are four essential steps as follows:

3.2.1. Building a tree of decision hierarchy

Whenever AHP is used as a decision tool, an appropriate hierarchy tree should be initially provided that reflects the problem being studied. The decision hierarchy is a tree that has several levels due to the subject under study. The first level represents the purpose of the decision, and the final level represents the options that are compared and competed for selection. The middle ground of this tree is the factors that are the comparison criteria for the options. For example, in order to determine the most widely used environmental management accounting method, the decision tree hierarchy is presented as follows in this research: (Figure 1)

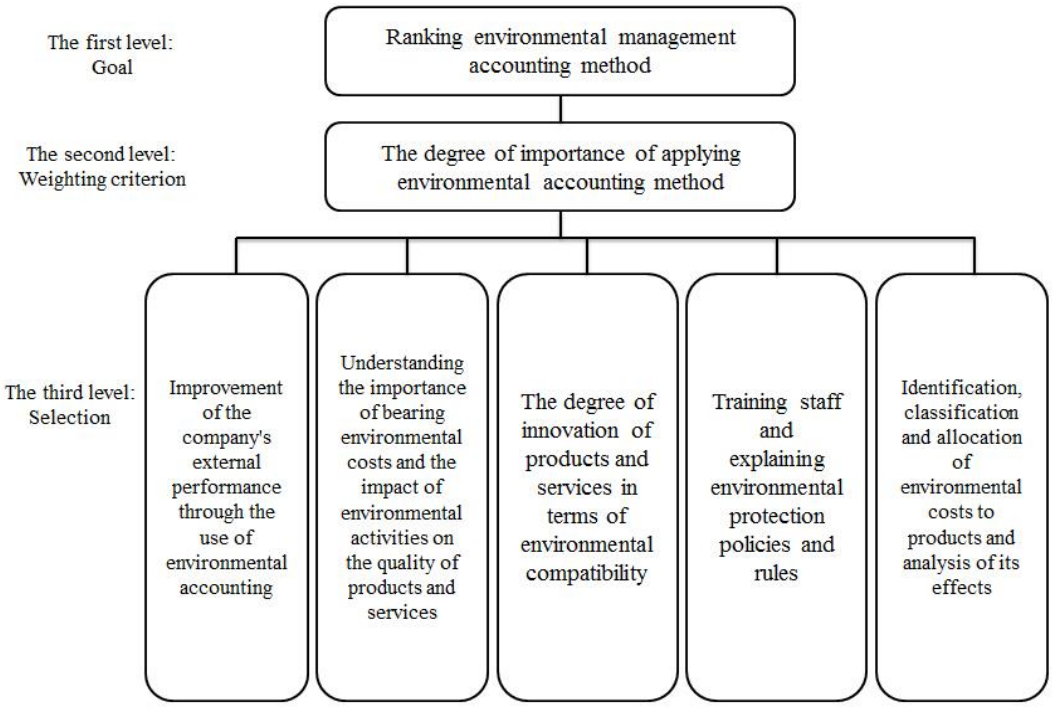


Fig. 1. After this stage, the AHP's mathematical operations begin in order to reach the goal.

3.2.2. Paired comparison

At this stage, the criteria or factors are compared in a bifurcate manner. For example, in choosing a mode of environmental management accounting techniques, for a decision maker, for example, the first mode is twice as preferable as the second mode. In this case, the two-way comparison matrix will be as follows:

Table 1. Sample matrix of paired comparison

Second mode	First mode	
2	1	First mode
1	0.5	Second mode

The value of 2 in the first row of the second column indicates that when choosing the best mode, the first state, in terms of the hypothetical decision maker, has double value than the second mode. In the first column, the second row of the reverse is numbered 2, ei 0.5, meaning that when selecting the best mode by the decision maker, the second mode is preferable half of the first mode. The diameter of the matrix is 1, and it means equal priority of a mode or option toward itself.

After determining the relative weight of the criteria by decision makers using the geometric mean, the weight of each criterion is determined toward the other criterion.

3.2.3. Extracting preferences from the group comparison table and selecting the best option

At this stage, the relative weights of factors of each level from the levels of the hierarchy of the model are calculated. For this purpose, the concept of normalization and averaged balancing are used and after normalizing, the mean of the values of each row is taken. The values of the balanced mean indicate the priority (degree of importance) of the competitor's option.

3.2.4. Consistency ratio calculation (CR)

The fourth step is to calculate the consistency ratio. Consistency ratio is the mechanism that shows the degree of confidence in the obtained priorities. So that if CR is less than 0.1, the consistency of comparisons can be accepted, otherwise the comparisons should be resumed.

4. Results

In this section, the results of descriptive analyzes of data collected from companies with ISO 14001 are displayed, the first four sections of this questionnaire are related to the responsive features, and the next five sections are devoted to questions related to each of the five research hypotheses.

In order to determine the quality of the questionnaire as a sampling tool and its proper implementation, a questionnaire draft was tested on 20 accountants and students of the accounting field before the distribution. The reliability of the research (Cronbach's alpha = 0.753) showed that internal consistency of variables of environmental management accounting activities is at the optimal level.

4.1. Responsive Features

This section includes job status, work experience, ratio of time spent to total work time and type of industry that the responsive person belongs to.

4.1.1. Job status;

Table 2 indicates the frequency of job status of respondents in sampling, which shows that almost 55% of respondents are accounting experts, 28.6% senior accountants, 11.9% financial managers and 4.8% are managers of the companies.

4.1.2. Work experience;

Table 3 shows the results of the work experience of the respondents in the organization in which they are currently working. The results indicated that 59.5% of respondents worked for their organization for 5 years and over, which shows that the majority of respondents have enough experience. Also, 7.1% had a history of three to four years, 21.4% had a history of one to two years, and 11.9% had a work experience of less than one year.

4.1.3. Percentage of time spent on environmental management accounting;

Table 4 shows the time spent by respondents on environmental management over their total work time, which shows that 76.2% of respondents spent less than 29% of their time on managing environmental activities. Also 16.7% spent their time between 30% to 49% and 7.1% between 50% and 69% in this area.

4.1.4. Industry type

Selected industries are selected from industries classified in Tehran Stock Exchange. Table 5 shows the results of the surveyed industries in sampling, which is classified in 10 branches. The results show that 35.7% of the sampled companies are automotive and metal parts. Also, 14.3% were contracting companies, 11.9% were pharmaceutical industries, 7.1% technical and engineering services, 7.1% agriculture and livestock industry, 7.1% food industry, 4.8% wooden products industry, 2.4% chemical industry and 9.5% are other industries.

Table 2. Job status

Cumulative frequency	Relative frequency	frequency	Job title	row
4.80%	4.80%	2	Manger	1
16.70%	11.90%	5	Financial manager	2
45.20%	28.60%	12	Senior accountant	3
100%	54.80%	23	Accountant expert	4
	100%	42		Total

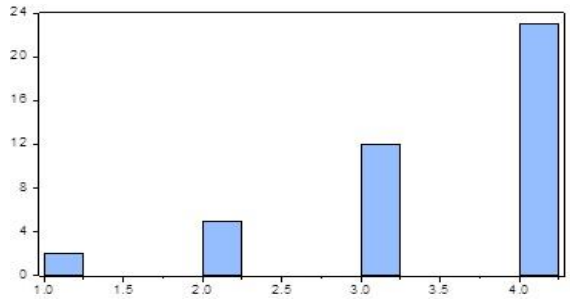


Table 3. Work Experience

Cumulative frequency	Relative frequency	frequency	Work experience	row
11.90%	11.90%	5	Less than one year	1
33.30%	21.40%	9	One to two years	2
40.50%	7.10%	3	Three to four years	3
100.00%	59.50%	25	Five years and over	4
	100.0%	42		Total

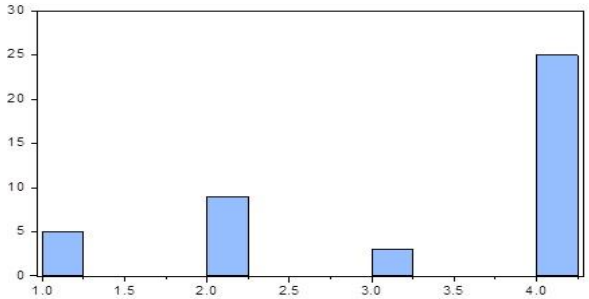


Table 4. Percentage of time spent on environmental management accounting

Cumulative frequency	Relative frequency	frequency	Time spent	row
76.20%	76.20%	32	29% to 1% between	2
92.90%	16.70%	7	49% to 30% between	2
100.0%	7.10%	3	69% to 50% between	3
100.0%	0.0%	0	to100% 70% between	4
	100.0%	42		Total

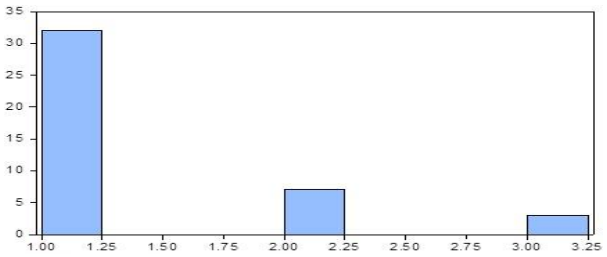
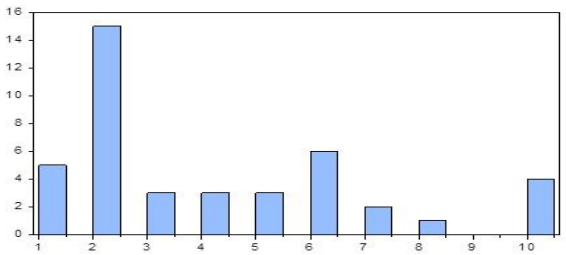


Table 5. Industry type

Cumulative frequency	Relative frequency	frequency	Industry type	row
11.90%	11.90%	5	pharmaceutical	1
47.60%	35.70%	15	automotive and metal parts	2
54.80%	7.10%	3	Technical and engineering services	3
61.90%	7.10%	3	agriculture and livestock	4
69.00%	7.10%	3	food	5
83.30%	14.30%	6	contracting companies	6
88.10%	4.80%	2	Wood	7
90.50%	2.40%	1	Chemical	8
90.50%	0.00%	0	Oil products	9
100.0%	9.50%	4	Other	10
	100.0%	42		Total



4.2. Testing hypotheses

The first hypothesis:

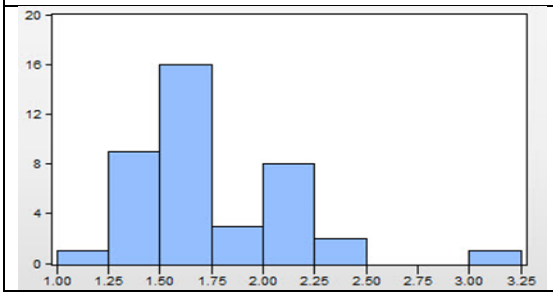
H0: hypothesis: Identifying, classifying and allocating environmental costs to products and analyzing their effects in companies with ISO 14001 are done well.

H1: Identifying, classifying and allocating environmental costs to products and analyzing their effects in companies with ISO 14001 are not done well.

To examine this hypothesis, 5 questions about the level and quality of activities related to this hypothesis were prepared as its variables and using the Five Point Likert Scale, categorized from "not at all" to "very high", The information was collected and the results are shown in Table 6 in relation to their mean.

Table 6. The results of the first hypothesis

Total	Very high	High	Average	Low	Not at all	Questions
1	0	0	0.1	0.525	0.375	5
1	0	0	0.175	0.5	0.325	6
1	0	0	0.225	0.525	0.25	7
1	0	0.025	0.075	0.275	0.625	8
1	0	0.025	0.025	0.45	0.5	9

Identification, classification and allocation of environmental costs to products and analysis of its effects		
	1.725	mean
	1.6	median
	3.2	max
	1	min
	0.383	Standard deviation
	0.585	skewness
	2.89	kurtosis
	1.0479 (0.323)	Jarque Bera normality test

The second hypothesis:

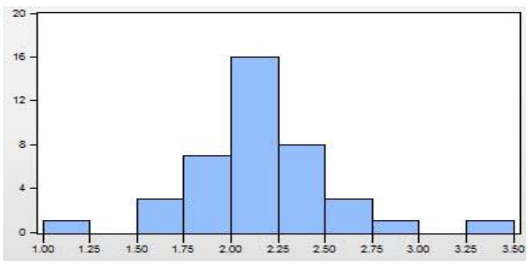
H0: assumption: Training employees and legislating environmental protection laws and policies are done well in companies with ISO 14001.

H1: Training employees and legislating environmental protection laws and policies are not done well in companies with ISO 14001.

Staff training on environmental activities and legislating laws and rules in this area can be the most important factor in the desirability of applying environmental management accounting techniques. To examine this hypothesis, 5 questions were designed as hypothesis variables to determine the quality of staff training and environmental protection rules, and were categorized using the five-point Likert scale, from "not at all" to "very high" and the results are shown in Table 7.

Table 7. The results of the second hypothesis

Total	Very high	High	Average	Low	Not at all	Questions
1	0	0.075	0.375	0.45	0.1	10
1	0	0	0.125	0.325	0.55	11
1	0	0.05	0.05	0.625	0.275	12
1	0	0.075	0.275	0.5	0.15	13
1	0	0.5	0.45	0.4	0.1	14

Training employees and legislating environmental protection laws and policies		
	2.12	mean
	2	median
	3.4	max
	1	min
	1.404	Standard deviation
	0.332	skewness
	4.882	kurtosis
	1909968 (0.0961)	Jarque Bera normality test

The third hypothesis:

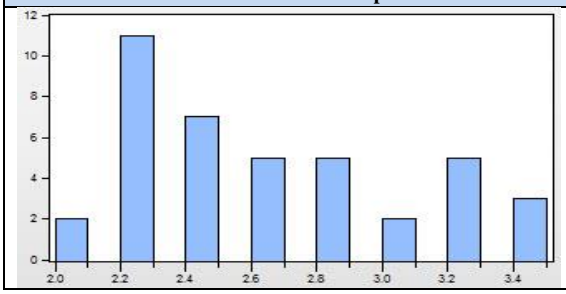
H0: The level of innovation in products and services in terms of environmental consistency in companies with ISO 14001 is in a desirable status.

H1: assumption: The level of innovation in products and services in terms of environmental consistency in companies with ISO 14001 is not in a desirable status.

A total of 5 questions were devised in terms of the level and quality of new products and the improvement of the design company's manufacturing process, and data were gathered using the Five Point Likert scale, ranging from "strongly oppose" to "highly agree." Which are shown in Table 8.

Table 8. The results of the third hypothesis

Total	Very high	High	Average	Low	Not at all	Questions
1	0	0.275	0.475	0.25	0	15
1	0	0.2	0.15	0.525	0.125	16
1	0	0.15	0.35	0.425	0.75	17
1	0	0.05	0.275	0.575	0.1	18
1	0	0.1	0.55	0.325	0.025	19

The level of innovation in products and services in terms of environmental consistency		
	2.605	mean
	2.5	median
	3.4	max
	2	min
	0.423	Standard deviation
	0.507	skewness
	2.006	kurtosis
	2.9815 (0.1859)	Jarque Bera normality test

The fourth hypothesis:

Hypothesis H0: The level of unde

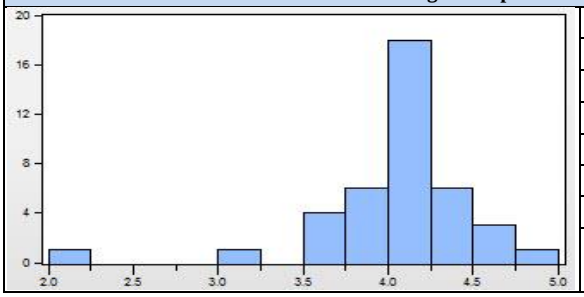
rstanding the importance of bearing environmental costs and the impact of environmental activities on the quality of products and services by ISO 14001 companies is in a desirable status.

Hypothesis H1: The level of understanding the importance of bearing environmental costs and the impact of environmental activities on the quality of products and services by ISO 14001 companies is not in a desirable status.

The high level of organization perception of the environmental management accounting system can provide the basis for the implementation of this system very well. In order to examine this hypothesis, 5 questions were considered as variables, and data was collected using the five-point Likert scale, ranging from "strongly oppose" to "highly agree", as shown in Table 9.

Table 9. The results of the fourth hypothesis

Total	Very high	High	Average	Low	Not at all	Questions
1	0.425	0.375	0.125	0.05	0.025	20
1	0.15	0.45	0.275	0.125	0	21
1	0.425	0.45	0.1	0	0.25	22
1	0.325	0.5	0.175	0	0	23
1	0.275	0.475	0.25	0	0	24

The level of understanding the importance of bearing environmental costs		
	4.035	mean
	4.1	median
	4.8	max
	2	min
	3.468	Standard deviation
	0.046	skewness
	1.152	kurtosis
	90.1656 (0.0836)	Jarque Bera normality test

The fifth hypothesis:

H0: The external performance of companies with ISO 14001 is highly desirable.

H1: The external performance of companies with ISO 14001 is not highly desirable.

Since the application of the environmental management accounting system can be effective in improving the company's external performance, five questions in this area were prepared using the Five Point Likert scale, which was classified as "Unpleasant" to "excellent", and the results obtained in this section are shown in Table 10.

According to the results obtained from the above tables, the mean of responses, confidence intervals and t value for each hypothesis were calculated, and the results are shown in Table 11.

Table 10. The results of the fifth hypothesis

Total	Very high	High	Average	Low	Not at all	Questions
1	0	0	0.125	0.475	0.4	25
1	0	0.025	0.125	0.475	0.375	26
1	0	0.025	0.4	0.4	0.175	27
1	0	0.125	0.3	0.425	0.15	28
1	0	0	0.125	0.425	0.45	29

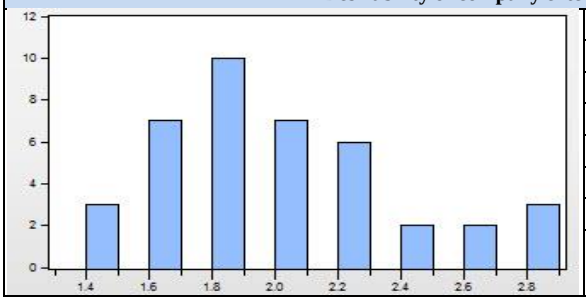
Desirability of company external performance		
	1.975	mean
	1.9	median
	2.8	max
	1.4	min
	1.384	Standard deviation
	0.638	skewness
	2.701	kurtosis
	13.5646 (0.2381)	Jarque Bera normality test

Table 11. Results of Inferential statistics

conclusion	t value	(sig)	Confidence interval	Standard deviation	Responses mean	Hypotheses
H_0 rejection	-21.5799	0.0021	$1.6056 \leq X \leq 1.8443$	0.383	1.725	H1
H_0 rejection	-4.0615	0.0181	$1.6953 \leq X \leq 2.5446$	1.404	2.12	H2
H_0 rejection	-6.0517	0.0233	$2.4731 \leq X \leq 2.7364$	0.423	2.605	H3
H_0 confirmation	1.9339	0.1720	$2.9861 \leq X \leq 4.9843$	3.468	4.035	H4
H_0 rejection	-4.749	0.0098	$1.5546 \leq X \leq 2.3936$	1.384	1.975	H5

3.4. Analysis of confidence interval test

In the analysis of the confidence interval test, if the value of t of each of the factors examined is within the confidence interval, then it can be stated that H0 is not rejected. In other words, the t-test statistic for the research hypotheses is equal to -21.5799, -4.0615, -6.0517, 0.5539 and -4.749, which in all cases, except for the fourth hypothesis, calculated t value is not in the distribution interval t, ei the positive and negative values 1.96 and only the fourth hypothesis t is in this range. Also, the significance level of the calculated quantities for the first, second, third, and fifth hypotheses is 0.0021, 0.0181, 0.0233 and 0.0098 respectively, which is less than 0.05, so they are placed in the H0 rejection zone. That is, the above hypotheses ($\mu \geq 3$) are not accepted for the whole population. But the significance level of the fourth hypothesis is 0.1720, which is greater than 0.05, so H0 is not rejected.

The negative sign of the test statistic indicates that the majority of respondents tend to respond to less than moderate, low and very low responses. But the positive sign of the test statistic of the fourth hypothesis shows that respondents tend to high and very high responses in the fourth hypothesis.

4.4. Analysis of the ratio test (binomial)

In this research, using the ratio test, the status of responses was divided into two parts, more than three and less than three, and by examining the results of this test for responding to the first and second hypotheses, it was found that 100% and 97.6% of respondents respectively, have given an answer in a region less than 3 which can be deduced from the significance level obtained for the first and second hypotheses that the H0 ($\mu \geq 3$) is rejected. Also, the results of this test for the third hypothesis showed that 90% of respondents gave an answer in a region of less than 3, and thus this hypothesis was rejected according to the level of significance obtained, as in the previous two hypotheses. But the results of the fourth hypothesis show that only 30% of the respondents gave an answer in the region of less than 3, and the rest of the answers were in the region of greater than 3, which, given the significance level obtained, can be concluded that the fourth hypothesis is confirmed. In the fifth hypothesis, as in the first hypothesis, all respondents have given an answer in a region less than 3, so this hypothesis is also rejected according to its significance level.

The final result is that:

1) Identifying, classifying and allocating environmental costs to products and analyzing their effects in companies with ISO 14001 are not done well.
2) Training employees and legislating environmental protection laws and policies in companies with ISO 14001 are not done well.
3) The level of innovation in products and services in terms of environmental consistency in companies with ISO 14001 is not desirable.
4) The level of understanding of the ISO 14001 companies is of the importance of the bearing environmental costs and the impact of environmental activities on the quality of products and services are desirable.
5) The external performance of companies with ISO 14001 is not highly desirable.

4.5. Results of Analytic Hierarchy Process (AHP)

In this research, for implementing analytic hierarchy process analyzes, data obtained by the questionnaires as weighting criteria in two levels of social performance consequences and behavioral consequences of social performance, were first analyzed. To this end, weighing questions were designed so that the respondent can determine the degree of preference of applying each of the environmental management accounting techniques in his company in relation to other practices and they were asked to rate the importance of each item on The basis of the five-point Likert spectrum (from "indifferent" to "very important"). The questions raised in the questionnaire on determining the weighting between environmental management accounting techniques are as follows:

1) What is the degree of importance of identifying, classifying and allocating environmental costs to products (first hypothesis) towards training employees and legislating laws and policies related to environmental protection (second hypothesis)?
2) What is the degree of importance of identifying, classifying and allocating environmental costs to products (first

hypothesis) towards the degree of innovation in products and services in terms of environmental consistency (third hypothesis)?

3) What is the degree of importance of identifying, classifying and allocating environmental costs to products (first hypothesis) towards understanding the importance of bearing environmental costs and the impact of environmental activities on the quality of products and services (fourth hypothesis)?
4) What is the degree of importance of identifying, classifying and allocating environmental costs to products (first hypothesis) in relation to improving the company's external performance through the application of environmental cost accounting (Fifth hypothesis)?
5) What is the degree of importance of training employees and legislating environmental protection laws and policies (second hypothesis) towards the degree of innovation in products and services in terms of environmental consistency (third hypothesis)?
6) What is the degree of importance of training employees and legislating environmental protection laws and policies (second hypothesis) towards understanding of the importance of bearing environmental costs and the impact of environmental activities on the quality of products and services (fourth hypothesis)?
7) What is the degree of importance of training employees and legislating environmental protection laws and policies (second hypothesis) towards improvement of the company's external performance by applying environmental cost accounting (Fifth hypothesis)?
8) What is the degree of importance of level of innovation in products and services in terms of environmental consistency (third hypothesis) towards understanding of the importance of bearing environmental costs and the impact of environmental activities on the quality of products and services (fourth hypothesis)?
9) What is the degree of importance of level of innovation in products and services in terms of environmental consistency (third hypothesis) towards improvement of the company's external performance through the use of environmental cost accounting (Fifth hypothesis)?
10) What is the degree of importance of understanding the importance of bearing environmental costs and the impact of environmental activities on the quality of products and services (fourth hypothesis) towards improvement of the company's external performance through the application of environmental cost accounting (Fifth hypothesis)?

Then, the collected data from the questionnaire were classified into Excel software and using the hierarchical analysis paired matrix technique, we calculated the weighting values of each environmental management accounting technique. The paired matrix derived from weighting in the hierarchical analysis is shown in Table 13.

After forming a paired matrix, the data were normalized by dividing each cell by the sum of its column, and the average of each question was calculated as a coefficient of the significance level of the subject.

The AHP technique calculates the total inconsistency of judgments by the rate of inconsistency. The calculated inconsistency should be less than 10%. If this rate is higher than 10%, judgments may be contradictory and should be reviewed. Here, the calculated inconsistency rate for the matrix of significance level of environmental management accounting techniques is 0.0587, which is less than 0.1. It should be noted that when comparing an element with itself in a matrix, the number 1 is always written. So the original diameter of the matrix of paired comparisons is always a set of number one.

To determine the prioritization of environmental management accounting techniques, Table 15 shows the priority of each of the hypotheses based on the rank specified in the Analytic Hierarchy Process (AHP).

Table 13 – Paired Matrix of Importance Level

5	4	3	2	1	
2.857	1.071	1.619	2.119	1	**1**
2.809	1.283	1.571	1	0.471	**2**
4.214	1.714	1	0.636	0.617	**3**
4.261	1	0.583	0.807	0.933	**4**
1	0.234	0.273	0.355	0.35	**5**
15.142	**5.258**	**5.011**	**4.419**	**3.373**	**Total**

Table 14 - Normally Matched Levels of Significance

mean	5	4	3	2	1	
0.288	0.188	0.203	0.323	0.431	0.296	**1**
0.215	0.185	0.235	0.313	0.203	0.139	**2**
0.223	0.276	0.326	0.199	0.129	0.183	**3**
0.205	0.281	0.191	0.116	0.164	0.276	**4**
0.066	0.066	0.044	0.047	0.072	0.103	**5**

Table 15. Result of Analytic Hierarchy Results

environmental management accounting techniques	hypothesis
Understanding level of the companies of the importance of environmental activities and their impact on the quality of products	Fourth
The level of innovation in new products in terms of environmental consistency	Third
Identifying, classifying and allocating environmental costs to products and analyzing their effects	First
Training employees and legislating environmental protection laws and policies	Second
Improvement of company external performance as a result of applying environmental costs accounting	Fifth

5. Discussion and Conclusions

This study focused on how much environmental management accounting techniques are applied in companies with ISO 14001 in Iran. To deploy ISO 14001, there is a need to use environmental systems, in particular the Environmental Management Accounting System. For this reason, the use of the Environmental Management Accounting System in companies with ISO 14001 in Iran was investigated. According to the mean of variables for the first hypothesis, it was found that Iranian companies with ISO 14001 give less than the minimum level attention to identifying, classifying and allocating environmental costs to their products. Also, according to the mean of variables for the second hypothesis, it was found that the level of education and training employees towards environmental activities and legislation of environmental laws and regulations in order to protect the environment in companies with ISO 14001 in Iran are done at their minimum level.

The mean of the variables of the third hypothesis showed that the responsive parties were indifferent to the questions regarding the level of innovation of new products in terms of environmental consistency, and it was revealed that Iranian companies with ISO 14001 did not have the innovation of products and environment-friendly production processes. In the fourth hypothesis, due to its variables mean, we came to this result that Iranian companies with ISO 14001 have a high level of understanding of the importance of bearing environmental costs and the impact of environmental activities on product quality, and finally, according to the variables mean of the fifth hypothesis, it became clear that external performance of companies with ISO 14001 in Iran is not highly desirable and needs improvement.

In general, it can be concluded that companies with ISO 14001 in Iran have only a high level of understanding of the importance of environmental activities, and the environmental management accounting techniques used in these companies are not desirable. According to the conducted studies, there are many reasons for this conclusion. One of the reasons for this issue is that there are no supervisory units for the activities of companies with ISO 14001 in

Iran, which is why many companies may continue their operations after receiving the ISO 14001 certificate as before, and there is no improvement in their activities to meet environment consistency. Another reason for this is the uncertainty surrounding the number of ISO 14001 issuers in Iran. There are many ISO issuer companies that are not approved by the NACI and are issuing different ISO certificates.

But we believe that the main reason for the outcome of the research may be the lack of standards for the use of environmental management accounting techniques. According to the results, companies with ISO 14001 in Iran have only been able to understand the importance and benefits of environmental accounting, which suggests that companies tend to use environmental management accounting techniques but due to lack of appropriate guidelines and relevant standards in this area, companies have difficulty implementing this branch of accounting, and there is a need for certain rules and regulations and a specific framework in this regard.

However, contrary to what is expected, ISO 14001 companies in Iran do not implement environmental consistency methods and environmental management accounting techniques desirably. It is expected that the environmental management accounting system in Iran will be significantly improved, and more research can be done in this regard.

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