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Investigating Environmental Accounting and its Role in Reducing Environmental Costs (Case Study: Iran Noubaft Textile Company)

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Abstract

Purpose - The aim of the present study was to investigate the environmental accounting and its role in reducing the costs, especially in Iranian textile companies.

Design/methodology/approach - Information on variables was collected and measured by distributing the modified questionnaire of Graaf et al. (1998) among the managers and senior staff. Then, using regression analysis, the costs associated with environmental benefits were investigated.

Findings - The results show that environmental costs have a significant relationship with the advantages of the environmental accounting. However, after analysis of the cost factors, the results did not show any significant relationship. Therefore, it is inferred that not only these factors affected the environmental benefits, but there are also other factors playing a role in this regard.

Originality/value – This paper is the first paper of its kind to have been conducted in developing countries.

Introduction

Environmental accounting, is a comprehensive field in accounting. Environmental accounting provides some reports for inter-organizational and extra-organizational users. Among the environmental accounting information to assist management decisions are help to pricing, controlling overhead, capital budgeting, and disclosure of information to the public about the benefits and the financial community. However, the internal use of accounting is known as environmental management (Bartonella et al., 2000). Identifying and systematic defining the environmental costs structure in the current market conditions which is also very competitive will lead to improved performance and strategic decision-making about the structure of costs in the short and long term (Henri et al., 2016). A permanent and important topic in environmental economics is development of appropriate accounting systems and reliable estimates of environmental damages (Nordhaus et al., 1999). According to the World Energy Outlook in 2013, sustainable energy policies should be planned so that enhance economic growth and protect the environment (López-Menéndez et al., 2014). Companies consider such costs as their general overhead. Lack of accurate recording of the environmental costs and attributing them to the related processes and products will result in providing false information for making decisions about the environmental protection projects (Lourenco et al., 2001). Environmental disorders caused management's commitment to provide environmental reports; so that he could direct the activities of the organization to convert it to a green and eco-friendly organization (Bouten and Hoozée, 2013). Experience shows that manufacturing firms that define specific budget for environmental costs in their management accounting have fewer obstacles than firms that consider the environmental costs in overhead costs (Cho and Pattern, 2013). As a decision support system in dealing with the real costs suffered by business firm, the management accounting inevitably breaks up the environmental costs from other costs and provides financial information on this issue with a different view. Therefore, by focusing on cost issues and helping to make optimize decisions by the managers, the accounting systems can play a valuable role in reducing these costs. In larger companies in Iran, more environmental and social information are disclose than in smaller firms; the active firms in sensitive environmental industries haven't benefited from disclosed environmental and social information as an instrument of gaining legitimacy. Perhaps the reason for this is that

Iranian companies are faced with little pressure and regulatory requirements for environmental compliance issues and social and environmental information disclosure, on the other hand, if they are not able to solve the environmental problems, they won't be inclined to disclose the information (Mahdavi et al., 2015).

Theoretical Foundations of Research

Environmental pollution comes from many different sources. One of the industries that have a devastating environmental impact in this regard is the textile industry with its contamination factors are briefly alluded. Paint waste water is produced in factories or paint consumer industries such as textile, paper, leather and pharmaceutical industry. Entering such wastewater into the environment causes severe disruption in the aquatic environment and slowing the process of photosynthesis due to the lack of light penetration (Lourenco et al., 2001). Another environmental pollutant, especially in the textile industry is noise pollution. Experiments show that exposure to excessive wavelength noise causes physical and psychological harm to employees (Van Kempen et al., 2002). Another type of pollution is air pollution. Any contaminants such as solid, liquid, gas in the air that are compromising for the quality of human life or cause damage to property (Lourenco et al., 2001). Biological methods are often more effective and efficient compared to other methods of refinement and their use is simple and inexpensive and are often used to remove organic matter from textile wastewater (Borghei et al., 2011). Iran Noubaft is one of the textile companies, which includes spinning and dyeing sections. The dyeing section has dyeing wastewater including the following pollutants: hydrogen peroxide and hydrogen peroxide stabilizers (carboxylate and phosphonates) and softener (carboxylate) and detergents and paints (Iran Noubaft data archives, 2017).

What environmental factors penalize the company?

Dyeing wastewater must conform to the standard wastewater output into the environment to avoid Iran Noubaft Textile Company penalizing from the Environmental Protection Agency. The only way to reduce the environmental crime was reducing the physical and chemical parameters of wastewater by establishing refinery (Iran Noubaft data archives, 2017).

Table 1. The standard of wastewater output into the environment. Adapted from Iran Noubaft data archives

No	parameter	unit	Surface water discharge **mg/l**	.Agriculture and irrigation use **mg/l**
1	PH		6.5-8.5	6-8.5
2	COD	ppm	60	200
3	BOD	ppm	30	100
4	DO	ppm	2	2
5	Color	Co. Lt	75	75

Performing which factors will cause a reduction in the refinery costs?

1. Repairing the strainers at the beginning of the refinery which result in increased separation of insoluble materials prior to entering into the refinery.
2. Implementation of anaerobic and aerobic biological refinement in a series to help reduce COD (Chemical Oxygen Demand) and water waste color.
3. Increased sedimentation ponds before ultrafiltration device.
4. If possible exposure to the chemical and physical steps after biological refinement to reduce chemical injection (Iran Noubaft data archives, 2017).
5. The use of UV radiation and oxidizing separately creates slight decrease in the COD. While the use of these two factors simultaneously will decrease COD in color samples and wastewater of COD to a large degree and will increase the refinement efficiency (Hashemian. 2004). But it should be noted that using UV is expensive. But because the aim is increasing the efficiency of dyeing wastewater refinement system, its use can reduce long-term damage to the environment and reduce the environmental costs imposed on the factory.

Increasing the oxidation of color by using the UV / CIO_2 can be explained as follows: when water or wastewater sample is in the presence of chlorine dioxide, they will decompose into oxygen and chlorine and heat (Hashemian, 2004).

$CIO_2 \rightarrow CI_2 + O_2 + Heat$

But when water samples containing chlorine dioxide are under UV radiation, radicals are formed.

$CIO_2 + UV \rightarrow CIO_2$

Environmental Accounting Benefits

Some of the benefits of environmental accounting can be briefly stated below:

- Environmental costs, capital and currency, are increasing dramatically.
- Environmental costs may be hidden in overhead accounts or otherwise be overlooked.
- Environmental hazards may be led to significant environmental liabilities and consequently, organizations or business units may suffer large payments which seriously affect the financial position and liquidity.
- Cost accounting and environmental performance can support the development and implementation of environmental management systems (EMS) and ISO 14000 certification (Dehghan Khanghahi and Khalili Shomia, 2011).

A variety of environmental costs, including (Sajadi and Khalili, 2007): **normal expenditures**, costs caused by the use of raw materials, water, electricity, fuel and capital goods and accessories that are not in the environmental costs. **Potential hidden costs**, the potential costs are hidden costs that may be hidden from the view of management (Schmidt, 2015). For example, the use of renewable energy sources to 17% can reduce the environmental costs in performance and production systems (Vance et al., 2015). **Primary environmental costs**, the first group of costs that are built prior to start the process of production, operations, system design, etc. Considering these costs as overhead costs with the research and development costs, this is possible that these costs be forgotten when managers and analysts focus on the operation costs of production, system design or providing requirements. **Obligatory or legal costs,** the costs imposed to the company for

the governmental rules related to the environment. **Environmental discretionary cost**, these are the costs of the economic entity not for compliance with legal environmental requirements, but the economic unit incurs them to improve the environment and or environmental credibility among customers. **Probable costs,** these costs are identified as probable liabilities or expenses causing probable liabilities. **Image/Relation cost**, these costs are incurred to influence on management thinking, customers, employees, society and legislators and are mentioned as image-relation costs. The costs such as environmental advertising costs play an important role in helping companies to inform, convince current and potential customers about the nature of its production process and being eco-friendly (Leonidou et al., 2014).

Costing the Environmental Hidden Costs

Environmental costs are among the hidden costs of product costing. The system of MFCA identifies these costs. One the characteristics of MFCA system is environmental analysis to analyze the flow of materials in the production process. In this system, energy level, costs, and materials consumed in the production process is calculated (Schmidt, 2015). The system costs are calculated with the following formula:

$$P_i \cdot x_i = S_i + \Sigma_j P_j \cdot X_{ij}$$

Si: System costs of the process i (labor, capital)

pj: Price of the pre-product j (in $/kg)

xij: Quantity of the pre-product j for the process i (in kg)

pi: Price of the product i (in $/kg)

xi: Quantity of the product i produced (in kg)

In production systems, work force, materials, energy and capital are input and the product is output. In addition to final manufactured products, waste and environmental pollutants are also output in the manufacturing process, so, its monetary value must also be calculated (Schmidt, 2015).

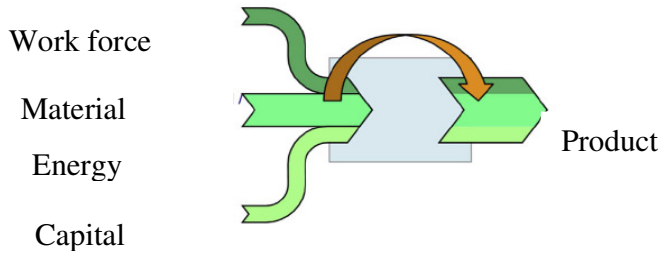

Figure 1. Allocation of the cost to the product of the unit. Adapted from esm ketab, nevisande,sal,nasher,

Research Background

Ribeiro et al. (2016), in a study showed that the development of environmental accounting and reporting practices in local governments in Portugal is low. In addition, the accounting rules and environmental management styles are important to clarify the factors affecting the development of environmental accounting styles. The results of the implementation of environmental audit at a company of Fujitsu (2001) in Japan show that environmental accounting is essential to assess the raised costs of effort to improve the environmental performance and managing these effects. In a study, Barter et al. (2013) showed that: investigating the organizational theories of environmental accounting is impressive in developing and creating sustainable methods of environmental accounting and social accounting. Hsiao et al. (2014), in a study showed that lack of legal requirement in reporting on environmental accounting and information about the companies' social responsibility and annual financial reports, is one of the discouraging factors of companies in providing the environmental reports. Chou and Yeh (2015), in a study examined the effects of carbon dioxide emissions and assessed the environmental cost calculation system in building construction industry and they offer that architects and engineers also consider the assessment and environmental risk in their construction. Bassey et al. (2013) in their research entitled "Effect of environmental accounting on organizational performance" using Pearson correlation among oil and gas companies in Nigeria indicated that the environmental costs have significant relationship with the company's profitability. The results of a study conducted by Li and Fang (2014) shows that green accounting in valuation of domestic and national products as well as their market and non-market values is effective in making decisions at the macro level. Ascui (2014), in a study is concluded that

pollution accounting is a combination of critical and philosophical issues which in direct contact with pollution management accounting, national accounting and disclosure of national reports. Sepasi and Emaeili Kojani (2015) in a research showed that recognition of revenues and environmental activities expenses and their disclosure is an effective step in the organizations' move towards green accounting. Alamshah (2014) show that 1) low priority of environmental costs accounting, 2) resistance to change traditional methods, 3) performance or considerations of costs and benefits, 4) limited resources and expertise, 5) the difficulty of collecting and allocating environmental costs, and 6) external pressure are factors which are influential in the decision-making process for the adoption or non-adoption of the procedures.

Methodology

To test the hypotheses, the modified questionnaire of Graaf et al. (1998) was used. This consisted of 4 items regarding the accounting benefits and 14 items regarding the types of environmental costs, using 5 categories , from very low, low, average, good and to very good in the company and includes seven factors from initial, obligatory, normal, discretionary, probable, future, and to image/relation costs. At first a group of 60 individuals were selected for pre-test and then the questionnaire's reliability and validity were examined. The pre- test indicates the reliability of the questionnaire. Then the questionnaire were distributed among 100 managers and senior staff of the textile company to investigate the relationship between environmental accounting and reducing the costs and the Kolmogorov-Smirnov test was performed to investigate normality of the distribution of the dependent variable, and then the regression analysis was performed to examine the hypothesis of the study, first, as a whole, and then by splitting the independent variables.

The Research Hypotheses

Due to its role in monitoring and evaluation and managers' decision-making and its extra-organizational reporting, the use of appropriate accounting systems for recording and reporting of environmental costs can play an important role in removing non-value-added activities and creating profitable activities. Therefore, the main research hypothesis is formulated as follows:

H_0 : Environmental accounting has a significant relationship with reducing the environmental costs.

H1: Environmental accounting has a significant relationship with reducing the environmental normal costs.H2: Environmental accounting has a significant relationship with reducing the environmental initial costs.

H3: Environmental accounting has a significant relationship with reducing the environmental obligatory costs.

H4: Environmental accounting has a significant relationship with reducing the environmental future costs.

H5: Environmental accounting has a significant relationship with reducing the environmental discretionary costs.

H6: Environmental accounting has a significant relationship with reducing the environmental probable costs.

H7: Environmental accounting has a significant relationship with reducing the environmental image/relation costs.

Statistical Population and Sample

The study population included all managers and staff of Iran Noubaft Textile Company in Isfahan. The statistical sample included 100 managers and senior staff of Iran Noubaft Textile Company which were randomly selected.

Data Collection Procedure

Data collection was conducted through questionnaire and analyzed by SPSS and Excel software.

Research Models

Study models to test hypotheses are model 1 and model 2. Model 1 to test the main hypothesis and model 2 is used to test the secondary research hypotheses.

Model 1:

$$EA_{it} = \beta_0 + \beta_1 EC + \varepsilon_{it}$$

Model 2:

$$EA_{it} = \beta_0 + \beta_1 REC_{it} + \beta_2 UEC_{it} + \beta_3 CEC_{it} + \beta_4 FEC_{it} + \beta_5 PEC_{it} + \beta_6 VEC_{it} + \beta_7 IREC_{it} + \varepsilon_{it}$$

EA_{it}= environmental advantages

EC_{it}= environmental costs

REC_{it}=regulatory environmental costs

UEC_{it}=upfront environmental costs

CEC_{it}=conventional environmental costs

FEC_{it}=future environmental costs

PEC_{it}=potentially environmental costs

VEC_{it}=voluntary environmental costs

$IREC_{it}$=image/relation environmental costs

Data Analysis

Validity and Reliability

Cronbach's alpha coefficient was used separately for each group of questions to measure the questionnaire reliability. The value of Cronbach's alpha coefficient for environmental advantages and for environmental costs is estimated as 0.75 and 0.79, respectively and since the values are more than 0.7, the questionnaire enjoys from an acceptable reliability.

Research Findings

The results of Hypotheses Testing

In order to test hypotheses and to investigate the relationship between the amount of environmental costs consideration and its impact on increased costs of accounting, the regression analysis was used. Before regression model fitting, the normality of dependent variable distribution was studied. First, the Kolmogorov-Smirnov test was used to test the normality of distribution of the dependent variable which its results are shown in Table 2 below.

Table 2: Results of Kolmogorov – Smirnov test

Kolmogorov – Smirnov test	Non-standard Remainders
Number	100
Normal Parameters	3.9775
Std. Deviation	0.61247
Most Extreme Differences	0.195
Positive	0.195
Negative	0.122
Kolmogorov-Smirnov Z	1.316
Asymp.Sig. (2-tailed)	0.062

As can be seen, the Kolmogorov-Smirnov test statistic and its significance level were estimated as 1.316 and 0.062, respectively, which is more than 5% of the test error. Therefore, the H0 of the Kolmogorov-Smirnov test for abnormality of dependent variable distribution is rejected, so the variable is pursuing a normal distribution at 5% error level. The regression analysis results are given below:

Table 3. The results of analysis of variance

Change resource	Total	Degree of freedom	Mean	F statistics	Significance level
Model	2.963	1	2.963	8.497	0.004
Remainders	34.174	98	0.349		
Total	37.137	99			

Given the results of variance analysis in table 3, we could see that the value of F statistic and its level of significance are respectively 8.497 and 0.004, respectively. Since the level of significance of F statistic is less than the test error level (5%), we conclude that the H0 of F test, concerning the linear regression model insignificance, is rejected, regression model is significant and the environmental cost coefficient Is opposite to zero. Hence, there is a linear relationship between environmental costs and environmental benefits.

Table 4. The results of regression analysis

Variables	Non standardized coefficients		Standardized coefficients	T statistics	Significance level
	Estimated coefficient	Standard error	Estimated Coefficient of β		
Intercept	2.341	0.564		4.149	0.000
Environmental costs	0.423	0.145	0.282	2.915	0.004
Multiple correlation coefficient	0.282				
The coefficient of determination	0.080				
Adjusted coefficient of determination	0.070				

Coefficient of determination of the fitted model is reported as 0.08 in table 4, which suggests that the environmental costs under study only describe about 8% of changes of environmental-accounting advantages in the sample under study. The amount of modified coefficient of determination is also 0.07, which is roughly equal to the coefficient of determination and this shows the appropriateness of the regression model. Now, given the probability value (level of significance) of the independent variable in regression analysis table, we evaluate the research hypothesis and the significance independent variable coefficient. The level of significance related to Independent variable coefficient test (environmental costs) is estimated as 0.004, which is less than level of test error (5%). So, H0 concerning the significance of environmental costs coefficient is rejected and the coefficient is significant at 5% error level. Thus, we could say that there is a significant relationship between environmental costs and environmental advantages. Moreover, the variable coefficient of the environmental costs was reported 0.423 which is positive and means by increasing the attention to the environmental costs, the benefits of these costs increase which it is possible to interpret that the increase of benefits because of paying more attention to costs, leads to the decrease of costs. Therefore, this hypothesis is confirmed. Considering the obtained correlation coefficient for environmental costs and environmental benefits variables which was 0.282 it can be noted that by increasing one unit in the attention to the environmental costs, environmental benefits increase 0.282 for each unit. In the following, in order to evaluate each of the cost factors, all environmental costs in accordance with the subjects mentioned will be divided into seven factors, to deal with the effect of each of the cost factors and test the secondary research hypotheses.

The results of the regression analysis are as follows:

Table 5. The results of analysis of variance

Change resource	Total	Degree of freedom	Mean	F statistics	Significance level
Model	4.569	7	0.653	1.844	0.088
Remainders	32.568	92	0.354		
Total	37.137	99			

The results of the analysis of variance in Table 5 indicate that the F statistic was 1.844 and its significance was 0.088. Since the obtained significance for the F statistic is greater than

the error level (%5), it can be concluded that the null hypothesis which states that the linear regression is not significant is accepted and the regression model for the error level is not significant and the coefficients of the independent variables are not significant. In other words, the linear correlation between the independent variables and environmental benefits in the error level of %5 is rejected. Regarding the point that the significance level of F statistic (0.08) is lower than the error level (%10), the significance of the regression model in this error level is accepted it can be mentioned that there is a linear relationship between the independent variables and environmental benefits by the confidence interval of %90.

Table 6. The results of regression analysis

Variables	Non standardized coefficients		Standardized coefficients	T statistics	Significance level
	Estimated coefficient	Standard error	Estimated Coefficient of β		
Intercept	2.418	0.591		4.089	0.000
Environmental Obligatory costs	0.123	0.128	0.117	0.959	0.340
Environmental initial costs	0.020	0.114	0.020	0.173	0.863
Environmental normal costs	0.064	0.122	0.062	0.525	0.601
Environmental future costs	0.107	0.088	0.147	1.206	0.231
Environmental probable costs	0.221	0.157	0.176	1.401	0.164
Environmental discretionary costs	0.032	0.120	0.033	0.270	0.788
Environmental imaginary costs	0.051	0.097	0.056	0.533	0.595
Multiple correlation coefficient	0.351				
The coefficient of determination	0.123				
Adjusted coefficient of determination	0.056				

The coefficient of determination the fitted model in Table 6 (0.123) reveals that the factors environmental costs explain almost %12 of the differences of the environmental accounting in the sample of the study. The results of Table 6 indicate that the significance level related to the Independent environmental costs: primary environmental costs, normal environmental costs, obligatory environmental costs, future environmental costs, probable environmental costs, optional environmental costs, and image/relation environmental costs are all greater than the error level of %5 and even %10. Thus, in error level of %5 and even %10 the significance of the coefficient of all independent variables is rejected and there is no significant relationship among the factors of environmental costs and environmental benefits which means by the increase or decrease of each one of the factors of environmental costs (obligatory, primary, normal, future, probable, optional, and image/relation), the environmental benefits will not necessarily increase. So, none of the research hypotheses are accepted.

Conclusion

In today's world, the need for advanced accounting systems is essential for the registration, measurement and classification of environmental costs in order to properly allocate costs in manufacturing processes, maintain and create profitability for the company's activities, and help managers to assess, monitor and improve decision-making processes for the removal of the non-value added activities and preservation of natural resources to create national wealth. Reducing the amount of COD through simultaneous use of UV/CIO2 increases the efficiency of wastewater treatment. This in turn reduces the harmful effects on the environment and, consequently, reduces the cost of wastewater treatment and environmental costs. The results of testing the hypotheses indicated that there is no significant relationship between the consideration of the environmental costs and benefits of the environmental accounting. Among the investigated costs, probable costs had the highest and initial costs had the lowest impact on the dependent variable. This indicates that there are some other factors that have a major impact on the environmental benefits. In a study Rezazadeh et al. (2011), barriers to the implementation of environmental auditing in government agencies were investigated (by using a questionnaire) and it was concluded that the lack of an appropriate framework for financial reporting is an obstacle to the implementation of environmental auditing .In fact, it can be said that little knowledge of

the role and the importance of environmental auditing is considered as an obstacle to the identification of environmental benefits and the use of green accounting. In another study Alamshah (2014), factors influencing the adoption of environmental management accounting were investigated using the questionnaire and interview method. The results showed that low priority to the environmental cost accounting, the interest of expense considerations, limitations in resources and expert labor force, as well as the difficulty in collection and allocation of the environmental costs hinder the use of environmental management accounting methods .Yet, the results of one more study in this regard showed Heydarpour and Gharani (2014), that the management approach to financial decisions is very important; the management should try to consider the environmental accounting in its financial indicators. In this study, the Delphi method was used to analyze the data gathered by a questionnaire. The results of data analysis indicated that the use of green accounting increases the production level, reduces the energy consumption level in the manufacturing sector, reduces the amount of debt, increases the absorption of donations, and reduces the waste in the manufacturing sector.

Limitations of the Study

1. In order to study and complete the questionnaire, directly talking to individuals was not possible. 2. It is possible that to influence the results of the study, the company's employees express the fact more or less. 3. Another limitation that can be named is that in doing any research, the effect of confounding variables must be controlled. Other factors may influence the relationship between environmental benefits and costs of environmental considerations that have not been considered in this study.

Suggestions for Further Studies

1. The presence of the surveillance teams to continued monitor the environmental performance of the companies can ensure that all the environmental cost factors in companies are considered and this can be useful and effective in advancing the company's success.
2. In this study, a questionnaire based on Graaf et al. (1998) was used. It is suggested that by providing distinct factors-based questionnaires, the role of environmental accounting be examined.

3. Since this study was limited to Isfahan Noubaft Textile Company and its subsidiaries, it is suggested that such research is done in other companies and wider levels.

4. In this study, regarding the type and composition of questions, regression analysis was used to examine the relationship between variables. It is suggested that this research be carried out comparatively between companies and through analysis of variance.

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