The Impact of Environmental Accounting on Strategic Management Accounting: A Research on Manufacturing Companies

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ABSTRACT

The aim of this study is investigating the sensitivity of manufacturing companies operating in the organized industrial zone of Diyarbakır to environmental issues and environmental accounting approaches within the scope of social responsibility accounting as well as investigating the applicability of these concepts in the enterprises and as a result their impacts on strategic management accounting. According to the basic findings of the research and their responses to environmental accounting concepts and approaches, it is believed that enterprises applying environmental accounting get a competitive advantage and the added value of the company also increases as a result of the concept of social responsibility.

Keywords: Environment Accounting, Environment Cost, Strategic Management Accounting
JEL Classifications: M41, Q29, Q20

1. INTRODUCTION

The influence of environmental factors on the decision making process of the companies increases day by day. This increased influence forces enterprises to minimize their environmental costs, include environmental factors in the strategic management decisions and try different ways to cope with increased competition conditions. They reduce various costs by minimizing the operating costs using strategic management accounting methods, which are the most important techniques to reduce the costs.

Recently, the reason for the increasing importance of environmental factors can be explained by commitment of enterprises to the concept of social responsibility; because, as a requirement of the concept of social responsibility, recognition of environmental factors has become widespread among companies. These companies will both take their interests into consideration and fulfill their responsibilities to the environment as a social responsibility. In the past periods, although companies used to take environmental issues into consideration in order to monetize them, they now consider

them as a strategic management tool (Hoekstraa et al., 2006. p. 376). For this purpose, both environmental accounting and strategic management accounting data are seen as one of the most important ways to survive in this competitive environment. In addition, the increased influence of corporate activities regarding environmental issues conducted by stakeholders has led to an increase in the environmental costs (Burritt et al., 2002. p. 39). As a result, enterprises have begun to use environmental accounting as a strategic tool to reduce costs.

2. LITERATURE REVIEW

Environmental accounting is used to identify the benefits of enterprises gained as a result of the use of the assets already present in nature and the costs occurred as a result of this usage (Bengü and Can, 2009. p. 156-157). Environmental accounting, which is also defined as "green accounting" in the literature (Alagöz and Yılmaz, 2001. p. 150; Soylu and İleri, 2009. p. 310; Memiş, 2009. p. 90; Aymaz, 2009. p. 35; Taşdemir, 2011. p. 33; Akcanlı, 2010. p. 14), is defined as recording the impacts arise as a result of the manner of use of environmental resources either positively or

negatively (Melek, 2001. p. 25; Raouf and Hamid, 2002. p. 26-28; Esmeray and Tanç, 2009. p. 243).

Environmental accounting is a general term referring to combination of information and environmental costs in various accounting practices used for the attempt of studying mutual relations between accountants and ecology, awareness of the environmental cost information or settled environmental costs, distribution to the appropriate products and processes (EPA, 1995. p. 31; Çelik, 2007. p. 156), activities in the environmental field, environmental policies and strategies of the organizations (Shapiro et al., 2000. p. 3).

Environmental accounting, which ensures improvement of financial and non-financial accounting systems (Gray et al., 1993. p. 7; Çetin et al., 2004. p. 63), measurement of negative effects of the environment (Çetin et al., 2004. p. 63; Güvemli and Gökdeniz, 1996. p. 24; Alagöz and Yılmaz, 2001. p. 150; Aymaz, 2009. p. 36; Çalış, 2013. p. 176), recognition, monitoring and reporting of events in the financial nature related to the environment (Altuğ, 2008. p. 275; Pearce et al., 1993. p. 107; Aslan, 1995. p. 22; Alagöz and Yılmaz, 2001. p. 150; Çalış, 2013. p. 180; Haftacı and Soylu, 2008. p. 94), is also used to identify the effects of environmental issues on conventional accounting disciplines (Yakhou and Dorweiler, 2002. p. 24).

Additionally, it is used to investigate and report the use of environmental resources and the probable effects arise as a result of the use of these resources (Gautam, 1997. p. 1), definitions of environmental resources, costs, expenses and risks concerning various groups, private companies or special departments in these companies, projects or processes (Gale and Stokoe, 2001; Bengü and Can, 2009. p. 157).

The subjects of environmental accounting contain an extremely large area and the information obtained can help to decisions made by many users (government, business partner, business management, competitors, etc.,) in the stage of decision-making (Şendroiu and Roman, 2007. p. 45; Akcanlı, 2010. p. 14). It has been seen that environmental accounting was not considered by companies in the past; however, they used to take environmental impacts into account while they make decisions.

The purpose of environmental accounting can be expressed as producing information in accordance with reality in an honest and impartial manner by considering interests of the whole community and taking the concept of social responsibility into account. Furthermore, it is used to determine the level and use of resources, to prepare financial statements according to the data and identify in what amount air, water and soil will be used during their activities (Pearce et al., 1993. p. 93-95).

Similar to other accounting systems, the main purpose of environmental accounting is generating and sharing information. At the same time, environmental accounting aims to show interactions among areas such as enterprises and environment and economy and environment by sharing the information obtained. For this purpose, environmental accounting gathers

both economic data and environmental data under the same roof by determining the value of environmental resources within a macroeconomic point of view. From the micro-economic point of view, environmental accounting ensures environment to be considered in the accounting system by giving it a fiscal nature (Kırlıoğlu and Can, 1998. p. 56; Eray, 2011. p. 33).

Considering the investigation of environmental accounting in macro level, it has been aimed to determine the use of natural resources and take necessary measures to prevent the destruction of these resources so we can use them in the future (Akcanlı, 2010. p. 20). Considering the investigation of environmental accounting in micro level, reductions in natural resources should be evaluated in addition to taking them into account during domestic income calculations (Güney, 2005. p. 54, 55).

Any activity conducted by enterprises in their environments leads to the emergence of environmental costs. Some of the environmental costs arise as a result of actions taken to protect the environment and occur as a result of the use of environmental resources. Another part of these costs arises due to environmental pollution caused by these companies. Environmental costs can be divided into three different groups as follows: reduction costs, operating costs and damage costs (Kırlıoğlu and Can, 1998. p. 119; Otlu and Kaya, 2010. p. 45; Gül, 2005. p. 42; Aslan, 1995. p. 42; Lutz and Munasingle, 1991. p. 47; Çalış, 2013. p. 183).

Environmental costs are the costs endured by companies in order to protect the environment, prevent environmental problems and minimize the damages to the environment (Kılıç, 2008. p. 13; Özbirecikli and Melek, 2002. p. 85; Çalış, 2013. p. 183). According to another definition, reduction costs arise in order to meet the existing or future emission standards (Özbirecikli, 2002. p. 51).

3. METHOD

3.1. Objective and Significance of the Study

In this study, it has been aimed to investigate the sensitivity of manufacturing companies operating in the organized industrial zone of Diyarbakır to environmental issues and environmental accounting approaches within the scope of social responsibility accounting as well as investigating the applicability of these concepts in the enterprises. The staff of accounting departments of these companies was asked about environmental accounting subjects and applicability of these concepts in their operating activities. The research was conducted on 81 out of 196 companies operating in the organized industrial zone of Diyarbakır. In this sense, the findings of the study are limited since not all the companies are included and cannot reflect all the characteristics of the universe.

The scale used in this study is prepared to measure attitudes of the companies included in the study towards environmental concepts and their approaches in addition to environmental accounting concepts and applicability of these concepts. In the analysis of data, reliability and validity analyses, factor analysis, confirmatory factor analysis and frequency analysis were used. For

each proposition in the scale, there was a five-point Likert-type choice list including the answers like "strongly agree," "agree", "neutral", "disagree" and "strongly disagree".

As a result of the study, the findings obtained were analyzed using the SPSS 21.0 software package. Cronbach's alpha value was calculated as 0.69 in the reliability test performed to determine the reliability and validity of the data. According to this value, the level of reliability of the data is sufficient. The first condition for validity of a survey is its reliability. Thus, the upper limit that can be reached for validation is equal to the square root of the reliability coefficient. Therefore, the validity value $\sqrt{0.69} = 0.83$ seems to be highly reliable. Although reliability can determine the upper limit for validity, it cannot guarantee the validity (Karagoz et al., 2010. p. 10).

In the study, the frequencies and percentages of data obtained from the survey filled by accountants or managers of accounting departments were calculated. Then, the factor analysis of enterprises for a 10-item scale towards their environmental approaches was performed.

3.2. The Key Findings of the Study

The main findings of the research regarding demographic characteristics, business sectors, operating periods, number of staff and their responses regarding environmental costs are summarized in Table 1.

According to the main findings of the study results, the study was conducted mostly on medium-sized enterprises and 0.63 of these enterprises mentioned the existence of the environmental costs. 0.79 of these companies mentioned the existence of

Table 1: Main findings regarding demographic characteristics

	Percentage
Demographic characteristics	
Food	14.8
Textile	14
Electronic	9.9
Industry	16
Construction	22
Other	23.3
Business of the annual period	
1-5 years	34.6
6-10 years	43.2
11 years and above	22.2
Number of personnel	
5-10	9.9
11-50	59.3
51-100	18.5
101 and above	12.3
Business scale	
Small	12.4
Medium	80.2
Large	7.4
Existence of environmental costs	
Yes	63.0
No	37.0
Investments made on environmental activities	
Yes	79
No	21

investments in environmental activities. According to the findings obtained, the majority of enterprises have knowledge about the environment.

Factor analysis contributes to provide better definitions of any subject by analyzing the basic components of the subject (Sait and Yıldız, 2008. p. 305). In this regard, the questions asked to companies were divided into factors and their responses related to environment were tried to be grouped.

The study analyzed by factor analysis should also be evaluated by Kaiser-Mayer-Olkin (KMO) test. In the KMO test, the values ≥0.5 indicate that the measurement is insufficient and factor analysis can be applied. Similarly, the significance level of Barlett test should be <0.05 (Karahan and Ulusoy, 2010. p. 373).

In Table 2; average, standard deviation and factor load values of four factors towards environmental accounting concepts and approaches are given. In addition, average, standard deviation and factor load values of six factors towards environmental accounting concepts and approaches are given in Table 3.

Factor 1: Factor loads vary between 0.518 (1st item) and 0.727 (3rd item). Considering the rotation values, they can explain 17.764% of the total variance. This shows that the best accumulation is in the 1st factor. Its eigenvalues is equal to 1.776. This factor can be named as "environmental perception" by considering the contents of the sub-items of Factor 1.

Factor 2: Factor loads vary between 0.413 (4th item) and 0.870 (6th item). Considering the rotation values, they can explain 16.539% of the total variance. Its eigenvalues is equal to 1.776. This factor can be named as "monitoring environmental problems" by considering the contents of the sub-items of the factor.

Factor 3: Factor loads vary between 0.843 (7th item) and 0.846 (8th item). Considering the rotation values, they can explain 16.260% of the total variance. Its eigenvalues is equal to 1.626. This factor can be named as "business environment" by considering the contents of the sub-items of the factor.

Factor 4: Factor loads vary between 0.643 (9th item) and 0.738 (10th item). Considering the rotation values, they can explain 12.793% of the total variance. Its eigenvalues is equal to 1.279. This factor can be named as "environmental audit" by considering the contents of the sub-items of the factor.

Factor 1: Factor loads vary between 0.437 (6th item) and 0.750 (1st item). Considering the rotation values, they can explain 11.366% of the total variance. This shows that the best accumulation is in the 1st factor. Its eigenvalues is equal to 2.273. This factor can be named as "environmental accounting operation" by considering the contents of the sub-items of Factor 1.

Factor 2: Factor loads vary between 0.598 (7th item) and 0.771 (10th item). Considering the rotation values, they can explain 11.080% of the total variance. Its eigenvalues is equal to 2.216. This factor can be named as "accounting process of environmental

Table 2: Converted component table

Items	X	S	1	2	3	4
Factor 1						
"Protecting environmental quality" should be among the criteria of development of the countries	4.0864	0.77778	0.727			
Economic activities play a role in the formation of environmental problems either in a direct or in-direct way	3.8765	0.87153	0.61			
The adoption of environmental measures will extend the life of the available resources	4.4074	0.49441	0.518			
Factor 2						
Increasing environmental issues also limit the living space of enterprises	3.7778	1.1068		0.87		
Considering cost-benefit analysis, the investment decisions should be consistent with environmental protection decisions	3.7901	0.60655		0.712		
Environmental problems are limited with environmental pollution only	2.3704	1.27911		0.413		
Factor 3						
Companies should make various financial sacrifices by focusing on environmental investments	4.0864	0.88314			0.846	
It is necessary to show the business environment among stakeholders	3.8148	0.83832			0.843	
Factor 4						
Authorities should force enterprises to announce the environmental information related to their operations	3.9136	0.88314				0.738
The current regulations and standards are sufficient in the presentation of environmental problems	2.9877	1.31808				0.643

Table 3: Converted component table

Items	X	S	1	2	3	4	5	6
Factor 1								
In order to improve environmental accounting systems, relevant institutions and organizations as well as the companies should be in cooperation and they need to reveal their expectations mutually	3.679	0.90591	0.75					
Accounting, which is a part of ongoing economic, technological and sociological systems, should be responsible of the environment	3.6545	1.10861	0.668					
Financial transactions related to environment should be accounted	3.9753	0.68875	0.587					
Environmental accounting is needed for companies in order to calculate, classify, report, monitor an audit the costs that may occur as a result of the environmental investments and convert these data into a format that can be used during decision-making process by managers	3.8184	0.77639	0.547					
An accounting system that doesn't take the subject of environment into account is incongruous with social responsibility	3.6914	1.25142	0.502					
Considering environmental problems, economy and accounting should engage in research related to the environment as other disciplines	3.7284	1.11817	0.437					
Factor 2								
The current accounting system is sufficient in taking the necessary measures for environmental problems	3.321	1.19192		0.771				
Using environmental accounting as a system contributes to an increase in the environmental awareness	3.8148	0.9369		0.665				
Environmental costs should be kept separately from other costs in the accounting system	3.6296	0.88663		0.635				
Increased environmental problems indicate that these problems need to be considered in an accounting system	3.679	0.72158		0.598				
Factor 3								
Considering the current system, environmental accounting system should be created as a separate system with its own rules without integrating to the current system	3.5432	0.79135			0.746			
Difficulties may arise while considering environmental problems as environmental costs in the accounting system.	3.7531	0.76699			0.708			
Excluding data related to the problems and excluding the use of natural resources in accounting will make impartiality, reliability, righteousness and integrity of the information generated by accounting department questionable	4.0741	0.60782			0.703			
Factor 4								
In the integration of environmental costs into the accounting system, companies should act impartially and these costs must be documented	4.0988	0.6246				0.669		
A separate financial statement system should be created for environmental costs, which increase due to environmental issues	3.4938	1.18452				0.625		
As a result of the use of environmental accounting, the approach of company to the environment and environmental practices may influence the decisions of investors	3.5432	0.93607				0.537		
Factor 5								

(Contd...)

Table 3: (*Continued...*)

Items	X	S	1	2	3	4	5	6
Integration of environmental accounting as a sub-system to existing accounting systems will cause problems in adaptation of the companies	2.5926	1.48137					0.767	
The use of environmental accounting and announcement of these results will contribute to the company's image	4.1111	0.79057					0.729	
Factor 6								
The use of environmental accounting requires the development of environment audit activities and environmental auditors	3.6667	0.80623						0.835
The use of environmental accounting should be perceived as setting up a new accounting system	3.7407	0.90523						0.613

Table 4: Total variance explanations

Components	First eigenvalues			Extraction of total load			Rotation sums of load		
	Total	Variance percentages	Cumulative percentages	Total	Variance percentages	Cumulative percentages	Total	Variance percentages	Cumulative percentages
1	2.209	22.094	22.094	2.209	22.094	22.094	1.776	17.764	17.764
2	1.647	16.465	38.559	1.647	16.465	38.559	1.654	16.539	34.303
3	1.342	13.417	51.976	1.342	13.417	51.976	1.626	16.26	50.563
4	1.138	11.38	63.356	1.138	11.38	63.356	1.279	12.793	63.356
5	0.988	9.882	73.239						
6	0.874	8.742	81.981						
7	0.617	6.173	88.154						
8	0.513	5.13	93.284						
9	0.375	3.749	97.033						
10	0.297	2.967	100						

Table 5: KMO and Bartlett's test

KMO measure of sampling adequacy	0.539
Barlett's test	
Chi-square approach	356.997
Df	90
Significant	0.000

KMO: Kaiser-Meyer-Olkin

problems" by considering the contents of the sub-items of the factor.

Factor 3: Factor loads vary between 0.703 (13th item) and 0.746 (11th item). Considering the rotation values, they can explain 10.554% of the total variance. Its eigenvalues is equal to 2.111. This factor can be named as "environmental cost operations" by considering the contents of the sub-items of the factor.

Factor 4: Factor loads vary between 0.537 (16th item) and 0.669 (14th item). Considering the rotation values, they can explain 10.286% of the total variance. Its eigenvalues is equal to 2.057. This factor can be named as "status of environmental costs" by considering the contents of the sub-items of the factor.

Factor 5: Factor loads vary between 0.729 (17th item) and 0.767 (18th item). Considering the rotation values, they can explain 9.707% of the total variance. Its eigenvalues is equal to 1.941. This factor can be named as "environmental accounting audit" by considering the contents of the sub-items of the factor.

Factor 6: Factor loads vary between 0.613 (19th item) and 0.835 (20th item). Considering the rotation values, they can explain 8.863% of the total variance. Its eigenvalues is equal to 1.773. This

factor can be named as "the use of environmental accounting" by considering the contents of the sub-items of the factor.

Eigenvalues of items related to environmental concepts and approaches are shown in Table 4. They were found as four factors with eigenvalues >1. The first factor explains 0.22% of the variance while rotation equalizes the relative importance of factors. Four factors explain two-thirds of the total variance (0.633%).

As a result of the KMO test, which was conducted to see whether sample size is enough, the value was found as 0.539 as given in Table 5. This result suggests that the data can be used in the factor analysis (value is good if between 0.7 and 0.8 good, normal between 0.5 and 0.7; more data is needed if smaller than 0.5). The original correlation matrix of Bartlett test is same as the identity matrix (all correlation coefficients are zero) and it tests the null hypothesis. It is important to have a positive result. Otherwise, there is no relationship between variables (Zincirkıran and Tiftik, 2014. p. 320). As it can be seen in Table 5, this value is found to be zero (0.000); therefore, the result is considered to be significant.

In Table 6, eigenvalues of items related to the concept of environmental accounting and approaches are presented. They were found as six factors with eigenvalues >1. The first factor explains 11.366% of the variance while rotation equalizes the relative importance of factors. Six factors explain two-thirds of the total variance (61.9%).

As a result of the KMO test, which was conducted to see whether sample size is enough, the value was found as 0.518 as given in Table 7. This result suggests that the data can be used in the factor analysis. The original correlation matrix of Bartlett test is same as

Table 6: Total variance explanations

Components	First eigenvalues			Extraction of total load			Rotations sums of load		
	Total	Variance percentages	Cumulative percentages	Total	Variance percentages	Cumulative percentages	Total	Variance percentages	Cumulative percentages
1	2.738	13.691	13.691	2.738	13.691	13.691	2.273	11.366	11.366
2	2.473	12.365	26.056	2.473	12.365	26.056	2.216	11.080	22.446
3	2.206	11.032	37.088	2.206	11.032	37.088	2.111	10.554	33.000
4	1.849	9.245	46.334	1.849	9.245	46.334	2.057	10.286	43.287
5	1.576	7.878	54.212	1.576	7.878	54.212	1.941	9.707	52.994
6	1.529	7.645	61.857	1.529	7.645	61.857	1.773	8.863	61.857
7	1.317	6.586	68.443						
8	1.091	5.453	73.896						
9	1.004	5.019	78.915						
10	0.738	3.692	82.606						
11	0.696	3.480	86.087						
12	0.540	2.698	88.785						
13	0.468	2.341	91.126						
14	0.434	2.171	93.297						
15	0.364	1.819	95.116						
16	0.287	1.434	96.550						
17	0.218	1.088	97.638						
18	0.189	0.946	98.584						
19	0.157	0.784	99.368						
20	0.126	0.632	100.000						

Table 7: KMO and Bartlett's test

KMO measure of sampling adequacy	0.518
Bartlett's test	
Chi-square approach	134.805
Df	45
Significant	0.000

KMO: Kaiser-Meyer-Olkin

the identity matrix and it tests the null hypothesis. It is important to have a positive result. As it can be seen in Table 7, this value is found to be zero (0.000); therefore, the result is considered to be significant.

4. FINDINGS AND SUGGESTIONS

After realizing that using only strategic management data is insufficient in competition with other companies in this globalized world, the opportunities offered by the environment have been taken into account. It has been moved to a whole different level with recognition of environmental costs. Today, efforts spent to minimize the effects of environmental accounting have intensified.

As a result of the study conducted, some of the basic findings obtained from the responses of accountants or managers of accounting departments of manufacturing companies operating in the organized industrial zone of Diyarbakır are as follows:

- It has been observed that managers of enterprises included in the study have general idea about concepts and approaches of environmental accounting; however, they don't have sufficient information about applicability of this information, therefore they do have an absence of knowing the importance of strategic management accounting data. Although this lack of information may not cause any problem in terms of competition with other companies in the city, it may lead them to stay behind in terms of national and international competition

- Considering the averages of the responses obtained, they answered all questions in the questionnaire form as "agree"

- The environmental accounting has gained importance in order to deal with global competition which forms the basis of strategic management accounting; because environmental costs can be minimized by applying strategic management accounting techniques

- According to one of the items given in the survey "*The use of environmental accounting and announcement of these results will contribute to the compan's image,*" the use of environmental accounting and announcement of these results to relevant people will contribute to the added value and therefore strategic management decisions of the company

- Considering the average response value of the item "excluding data related to the problems and excluding the use of natural resources in accounting will make impartiality, reliability, righteousness and integrity of the information generated by accounting department questionable" found as 4.07, it has been seen that it is not possible for companies to maintain their operations by ignoring either positive or negative outcomes offered by the environment; because, influences from the environment directly affect sustainability of the companies

- The lowest value was obtained from the items "environmental issues are limited only by environmental pollution." and "integration of environmental accounting as a sub-system to existing accounting systems will cause problems in adaptation of the companies." The low score of the first question may be caused by that enterprises are not affected by only pollution, but also noise pollution and many other environmental incidents. Secondly, since the majority of the companies take advantage of environmental conditions, we thought that they can be easily adapted to the environmental accounting

practices; therefore, it is very normal to have a low average value.

It is very obvious that environmental accounting data, which is one of the branches of social responsibility accounting, affect both national and international image of a company. For example, consumers of a company, which focuses on social activities, think that they do something good for their country and humanity when they purchase services or goods from that company and therefore, the added value of the company increases.

The importance of environmental accounting data is increasing in order to reduce costs, increase the added value of enterprises and survive in this competitive environment by implementing strategic management accounting techniques. At the same time, environmental problems cause aggravated circumstances in terms of competition between companies. It is very obvious that the importance of strategic management accounting data increases day by day in order to survive in these harsh conditions. For this purpose, companies need to pay attention to the existing or future costs caused by environmental problems by strategic cost management, which is one of the strategic management accounting techniques

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