

# INTEGRATION OF ENVIRONMENTAL COSTS INTO ACCOUNTING INFORMATION SYSTEM

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## ABSTRACT

*The purpose of this paper is to examine the extent to which Jordanian industrial companies listed in Amman Stock Exchange have integrated environmental costs into accounting information system. The study demonstrates the importance of integration in improving the stakeholders' decision-making process regarding: the availability of environmental cost information, the companies' commitment to implement environmental policies and procedures, and the disclosure of environmental cost information. To achieve the objectives of this research, the study employed a questionnaire survey method and a T-test to illustrate the impact of environmental cost information on stakeholders' decision making. The study found that there were lacks of availability of environmental cost information, inappropriate of companies' environmental commitment, and insufficient disclosed environmental cost information. This paper highlights the practical importance of environmental integration, which creates environmental awareness and environmental development to the dominant traditional cost accounting system. In conclude, the paper suggests that government and non-government accounting bodies can play an important role in developing the accounting information system to improve the decision-making process.*

**Keywords:** Environmental Costs, Accounting Information System, Decision-Making.

## INTRODUCTION

Environmental damage is one of the pressing issues facing the world in recent times. It has an economic, social and environmental impact on the performance of nonprofit and for-profit organizations. Even those responsible for setting the company's goals to maximize short and long-term profits realize that the company's environmental performance has an impact on its earnings and its ability to generate revenue (Gray, 1992; Alqtish & Qatawneh, 2017). Therefore, given the importance of environmental management and environmental costs, the accounting profession has an important role to provide more relevant information to decision makers.

Specifically, environmental dilemmas are more relevant to the industrial sector (Christine, 2003). Predominantly, the sector is more vulnerable to environmental liabilities (Magara et al., 2015). Although this phenomenon is not new, the diversity of sources of environmental deterioration and their adverse effects on the environment, have been increasingly identified (Baba, 2012). Industrial companies, for example, routinely dispose their waste by leaving it in the air, discharging it into the sea or burying it in the ground, leaving a huge negative impact on the environment (Gray et al., 1995a).

As a result of persistent environmental problems related to industrial activities, such as energy production and consumption, pollution and climate change, which have adverse effects on the environment, many studies are emerging and are aimed at clarifying the consequences of environmental damage on the public health, the natural environment and the companies' performance (Gamble et al., 1996; Wang et al., 2018; Khalid, et al., 2017; Cooper & Kaplan,

1992). These results create challenges for corporate businesses for intervention, (Freedman & Jaggi, 1988b). Previously, cost accounting in many industrial firms is limited to production costs without considering environmental costs, and thus, resulting in unrealized profits and consequently, misleading financial statements (Mahdavi et al., 2015).

Suttipun & Stanton (2012) demonstrate that insufficient accurate accounting information leads to weakening the confidence in the financial statements provided. Because the achievement of corporate objectives requires extinguishing part of the environment and causing environmental damage, the classification of manufacturing costs, in the form of materials, labor and other overhead, do not properly reflect the value of production costs consumed in the production process. By accepting this argument, the environment has become an important factor in the production process and, therefore, there is a need to measure the costs of exploiting the environment in the manufacturing process. These costs are called "*environmental costs*".

The environmental accounting aspect entered an important phase after the World Bank requested that environmental accounting is to be included in the national income or GDP accounts, which measure the economic activity of the entire society, taking into account that the environmental costs of the disposal of industrial waste are to be calculated (Lee, 2011). The Bank urged environmental practices related to environmental protection, environmental awareness and environmental education through development of scientific framework which covers environmental aspects for measuring and analyzing environmental costs and improving the quality of accounting information. Lee (2011) argues that if the World Bank proposal is accepted, many industrial companies face the challenges of measuring, analyzing and disclosing environmental costs in their financial statements. Taygashinova & Akhmetova (2019) find that traditional accounting suppresses environmental costs in manufacturing costs and indirect services, resulting in distorted and inaccurate accounting information, and thus misleading decisions.

Epstein (1996) and Burnett & Hansen (2008) demonstrate that given the importance of industrial companies and the need to carry out their environmental responsibilities, it is important to highlight the impact of environmental problems on the accounting profession as a tool that provides stakeholders and decision makers with appropriate accounting information and environmental performance of companies besides financial information. Their opinion is that the negligence of integrating environmental cost information into production costs may lead to deceptive information and adversely affects the investment decisions, planning and pricing policies. Thus, environmental issues challenge accountants to measure and analyze environmental costs in addition to production costs. This challenge reinforces the value chain concept and adds another dimension to the accounting profession, which usually recognizes only financial and monetary aspects, and neglects environmental responsibility towards society (Charles & Dennis, 2013).

Further, environmental accounting is one of the accounting streams that focuses on activities, concepts and systems that have an environmental impact. Therefore, environmental reports, which are issued to internal and external users, are of great importance in the decision-making process (Al-Nimer, 2015; Lopez-Menendez et al., 2014). In other words, on one hand, financial accounting relates to environmental issues and requires disclosure of environmental performance. On the other hand, cost accounting is related to measurement, recording and analyzing of environmental costs, as well as control procedures.

In short, this study examines the importance of environmental cost accounting in improving the quality of financial information and decision-making process. Thus, this study

explores this aspect and forms a cornerstone in the environmental cost research in the Jordanian context.

### **Research Problem**

Industrial sector is increasingly concerned about environmental issues due to the enormous costs incurred by companies to preserve the environment. Several studies in different geographic areas have indicated a dramatic increase in environmental costs in industrial companies, which amounted high percentage of operating costs (Saymeh & Al Shoubaki, 2013; Al-Nimer, 2015; Alqtish & Qatawneh, 2017). Under the stakeholder pressure, environmental disclosure of environmental performance has increasingly become necessity (Gray et al., 1995a). Corporate businesses need to respond by providing adequate environmental cost information and reporting on their environmental performance.

In Jordan, environmental issues have become the debate of public, politicians, environmentalists and a wide spectrum of corporate businesses. Jordan has become an attractive country for investment since the beginning of the 21st century due to the unstable circumstances in the Middle East. It is clear to the researcher that the environmental responsibility is still below the required level, and the typical concept is that the preservation of the environment is the responsibility of the government only. In order to justify the irresponsibility, companies avoid implementing an environmental costing system, claiming that environmental costs are immeasurable (Shakkour et al., 2018).

Thus, environmental issues challenge Jordanian industrial companies to measure and analyze environmental costs in addition to production costs. This challenge reinforces the value chain concept and adds another dimension to the accounting profession, which usually recognizes only financial and monetary aspects, and neglects environmental responsibility towards society (Rogers & Kristof, 2003). The new dimension highlights the challenge of measuring, analyzing and classifying environmental costs, and requires studies and methods to consider, measure and analyze environmental obligations resulting from the activities of Jordanian companies that exploit the environment. In the end, the availability of environmental costs empowers stakeholders to make the right decision (Owen et al., 1997; Cho et al., 2010). Accordingly, the researcher asks the following three questions in order to seek answers to the research problem:

1. Does the availability of environmental cost information in industrial companies in Jordan improves the decision-making process?
2. Does the commitment of industrial companies in Jordan to implementing environmental policies and procedures improve the decision-making process?
3. Does the disclosure of the environmental costs of industrial companies in the Jordanian context improves the decision-making process?

### **The Study Objectives**

This research aims to achieve the following objectives:

1. Examining the relationship between the availability of environmental cost information and improving the decision-making process in the Jordanian context.
2. Examining the relationship between environmental commitment, as a response to present/ potential environmental damage and liabilities and improving the decision-making process in the Jordanian context.

3. Examining the relationship between disclosure of environmental cost information and improving the decision-making process
4. Conducting a field study to identify and analyze environmental costs in the Jordanian industrial companies listed on the Amman Exchange Market. The study examines environmental cost applications and how companies interpret these costs and improve the decision-making process.

### The Importance of the Study

The importance of environmental cost accounting is the result of many field research and studies in different countries as tools to support companies in providing environmental cost information for planning and controlling of corporate activities. Examples of such researches and studies include (Gray, 1992; Wang, 2014; Sajjadi & Jalili, 2007; Amanova et al., 2017; Khalid et al., 2017; Henri et al., 2016). Despite global interest in the environment and environmental cost accounting, the empirical and field study in Jordan is very limited.

Also, the importance and the objective of this study are to keep up with the efforts carried out by international and national profit and non-profit organizations to preserve the environment. In addition, more environmental attention by individuals and governments is increasing due to environmental damage and pollution by industrial companies (Chou & Yeh, 2015; Alam, 2014; Kitzman, 2001). Therefore, this research adds another call to minimize the environmental damage and improves products quality.

Accordingly, this study is important for the following reasons:

1. This study deals with a subject that adds scientific value to one of the contemporary accounting fields which is the environmental costs that improves the decision-making process.
2. Environmental issues are a broad area of research and affect many aspects of our lives. The technological revolution has positive and negative effects on the environment. This research shed light on one of the environmental issues which is the environmental costs.
3. This study enables industrial companies to measure and analyze environmental costs and thus improve environmental performance and decision-making process.
4. This study ensures the importance of accounting for environmental costs and increasing environmental awareness in industrial companies.

### The Research Model

In order to achieve the objectives of this study and to examine whether there is statistical influence between the independent variables and the dependent variable; the researcher designed the following study model. The below Table 1 illustrates the variables relationships model.

<b>Table 1</b>	
<b>VARIABLES RELATIONSHIPS MODEL</b>	
<b>Independent Variables</b>	<b>Dependent Variable</b>
• Availability of environmental cost information	Decision-making process
• The commitment of industrial companies to environmental policies and standards	
• Disclosure of environmental costs	

### The Study Hypotheses

Regarding pursuing to achieve the study objectives, the researcher presumes the following hypotheses:

1. There is a positive correlation between the availability of environmental cost information in industrial companies in Jordan and improving the decision-making process.

2. There is a positive correlation between the commitment of industrial companies in Jordan to implementing environmental policies and procedures, and improving the decision-making process.
3. There is a positive correlation between the disclosure of the environmental costs of industrial companies in Jordan and improving the decision-making process.

## The Study Limitations

The study limitations are presented as follows:

**Spatial Constraints:** Field study is limited to a sample of industrial companies listed in Amman Stock Exchange in Jordan. These companies interact directly with the natural environment through the use of natural resources and waste disposal. Therefore, the industrial sector is an ideal environment for conducting this research and studying the implications of environmental cost accounting.

**Respondents' Limits:** This field study is limited to respondents who have managerial and accounting knowledge and who work in the industrial companies listed in Amman Stock Exchange.

**Period Restrictions:** This research is conducted in 2019.

**Subject limitations:** While environmental issues are broad and can be linked to political, economic, social and environmental aspects, this research is limited only to environmental issues and their relationship to environmental cost accounting.

## LITERATURE REVIEW

The international community has shown increasing interest in the issuance of human rights conventions, which also cover provisions for environmental protection against environmental hazards (Gray, 1992; Papaspyropoulos et al., 2012; Deegan et al., 2000; Gray and Bebbington, 2001; Egbunike et al., 2017; Cooper & Kaplan, 1992). Environmentalists are exercising increasing pressure on the sources of environmental damage to remove and /or suspend environmental causes of environmental problems resulting from companies' operational activities (Deegan & Gordon, 1996).

Todea et al. (2010) report that an increasing number of organizations and businesses are responding to the compliance with environmental rules, regulations and treaties. As a result, new elements of environmental costs and obligations are emerged, leading to the interaction of accounting bodies in different geographic areas. Many environmental studies have been on the agenda of accounting regulators and organizations, and many researches have been carried out to recognize, measure and disclose environmental costs for inclusion in the accounting information system (Shakkour et al., 2018). Therefore, environmental aspects pose a challenge for the accounting bodies to determine the environmental accounting standards to be implemented by corporate businesses. The implementation of environmental standards examines the commitment with environmental responsibilities and enables disclosing the accounting environmental information to the concerned internal and external parties (Mahdavi et al., 2015). Such environmental information enables the stakeholders to evaluate the company's efficiency regarding the exploiting of the economic resources, the commitment towards preserving the environment, and the ability to make decisions that improve environmental performance (Magara et al., 2015).

In responding to environmental activities that have taken place worldwide, the environmental cost accounting has emerged as a result of dealing with costs and obligations relating to compliance with environmental laws, regulations and rules (Akdogan & Hicyorulmaz, 2015). Therefore, there is a need to measure, analyze and disclose the environmental costs. Such environmental cost practices support sustainable development, rationalize using economic

resources and create clean environment (Charles & Dennis, 2013). No doubt, implementing environmental rules form a challenge to the profession of accountants and auditors.

As a passage of time, academics have started paying attention to environmental cost literature (Taygashinova & Akhmetova, 2019; Christine, 2003; Kitzman, 2001; Epstein, 1996). Wang et al. (2018) point out that environmental costs include: the cost of reducing losses from corporate operations, the cost of recycling waste (solid, liquid, and gases) and the cost of environmentally friendly products. According to this concept, environmental costs are a positive return because the company can recognize and measure the costs associated with available and used economic resources.

Precisely, Wang et al. (2018) classify environmental costs into three categories. The first category is called preventive costs. These costs include activities to prevent the production of pollutants or wastes that cause environmental degradation; costs of environmental studies and research; costs of supplier evaluation and contracting; costs of assessment and selection of production machines that prevent pollution, recycling costs and waste management.

The second category includes exploration costs. These are the costs of the company's activities which determine whether its products, processes and systems are compliant with environmental requirements. Such costs include: the cost of product inspection and environmental auditing; the cost of controlling pollution rates and environmental development assessors.

The third category is divided into internal failure costs and external failure costs. Internal failure costs occur when the company fails to avoid environmental costs within the company, leading to the production of pollutants and waste. These costs include fines imposed on the company for non-compliance with environmental regulations. The costs of external failure are the environmental costs which result from the activities of the company in the form of production of waste and pollution. For example, contamination cleaning costs. Robert stresses that the costs of external failure include environmental costs paid by the society without realizing that the company is the source of environmental damage or pollution.

Todea et al. (2010) view is that the classification of environmental costs is important to provide the company's management with environmental information in order to set policies and make decisions which consider the overall social, environmental and economic dimensions with specific focus on the manufacturing costs and the quality of the products.

Saymeh & Alshoubaki (2013) conducted a field study to explore the impact of contemporary economic variables on the needs of industrial companies to review their current course on environmental issues and problems. Saymeh & Alshoubaki (2013) found that corporates profits from their activities ultimately affect the national income but do not represent the actual corporates performance (profit) unless environmental costs are recognized and measured in the final product costs.

A study prepared by (Suttipum & Stanton, 2012) aimed at providing a framework for an environmental cost system found that there is an increasing environmental awareness among investors and consumers who show environmental interests in the activities of industrial companies. In this regard, the responsibilities of accountants are to provide faithful representative information that enables stakeholders to make sound decisions.

Egbunike et al. (2017) cited the reasons why accountants did not provide sufficient information relevant to corporate activities which affect their environmental assessment. Some of these reasons include: the lack of legal standards enables corporations to avoid environmental costs and reducing damage; the desire of many companies is not to disclose their environmental

costs related to their environmental damage, realizing such practice maintain a positive public image about their financial and environmental performance. Egbunike et al. (2017) added that the auditing programs focus on financial performance but not on company's environmental performance, and therefore, enough environmental information is not a prerequisite for measuring companies' performance.

A field study by (Al-Nimer, 2015) aims at examining the effect of environmental disclosure in public companies in Jordan, found that the environmental disclosure is not sufficient, and in many cases, was descriptive and requires deep development.

Alqtish & Qataweh (2017) draw attention to the role of accounting in the current environmental crisis. The authors argue that an economic entity that aims only at maximizing profit will not have the motive to preserve the environment. This situation can be attributed to the traditional trend that natural resources (air, soil and water) are free, which in turn may affect negatively its financial position if ideal use of available resources takes place. In its quest to maximize profits and expand the use of the natural resources, the society would bear the costs resulting from misusing the natural resources. The authors concluded that maximizing profit would be at the expense of society and damage to the natural resources.

A study by Saymeh & Alshoubaki (2013) of the Jordanian Petrol Refinery found that the profit would be higher if the environmental cost was taken into consideration when integrating environmental costs into production processes. The author's opinion is that such practice provides the company's management with insights that improve environmental decision-making process. Preventive measures could be in place to avoid more excessive environmental costs.

Khalid et al. (2017) also found in a study that the industrial sector in Jordan has not implemented environmental procedures for measurement, recording and disclosure. The author recommends the issuance of environmental regulations that improve environmental performance in the industrial sector in Jordan. Also, the study recommends that companies need to sustain their environmental responsibilities even in the absence of environmental standards and regulations.

Regarding the "*Availability of environmental costs information improves the decision – making process*" the results of the study have shown consistency with the literature found in the studies of (Saymeh & Alshoubaki, 2013; Alqtish & Qataweh, 2017). Related to the "*Commitment of industrial companies to implement environmental policies and procedures improves the decision-making process*" the results of the study have shown consensus with the studies of (Gray, 1992; Magara et al., 2015; Todea et al., 2010; Shakkour et al., 2018; Khalid et al., 2017). Concerning the "*Disclosure of environmental costs improves the decision-making process*" the results of the study have shown an unanimity with the studies of (Deegan et al., 2000; Freedman & Jaggi, 1988b; Gray et al., 1995a; Egbunike et al., 2017).

## RESEARCH METHODOLOGY

This study explains the methodological approach employed to conduct this study in order to answer the questions relevant to the research problem and the research objectives. The methodological approach includes a description for the type and the nature of this study. It encompasses the study community, the study sample, reliability of the study tool, and Likert scale to scaling responses in the survey research. These approaches are employed in many studies such as: (Cooper & Kaplan, 1992; Yakhou & Dorweiler, 2004; Pahuja, 2009; Mahdavi et al., 2015).

The descriptive analysis and testing hypothesis approaches were employed in the study to evaluate the environmental cost applications in order to display the results and recommendations stemmed from the role of environmental costs in improving decision making process in the industrial companies in the Jordanian context. The descriptive approach considers collecting data about respondents' opinion regarding the quality of environmental cost accounting information. The analytical approach requires scientific analysis to extract the level of significance and to link the dependent and independent variables together, examines and explains the results, and consequently presents the conclusion and recommendations.

The one Sample T-test is commonly used to test the statistical difference between a sample mean and a known or hypothesized value of the mean in the population (Murray et al., 2006; Adams et al., 1998). To test a hypothesis, a T-test is used by testing the significance of differences between the average of answers and the average default scale (3: Neutral). In other words, the one T-test is used to test whether a population mean is significantly different from some hypothesized value. Accordingly, the one sample T-test is used to determine the significance of differences in the three research hypotheses. Therefore, T-test is employed in this research to assess the degree of deviation from these hypotheses in order to examine the quality of the results.

### Population and Sample of the Study

The study community is limited to the industrial companies listed in Amman Exchange Market during the study period 2019. A questionnaire survey was conducted in this study for 104 respondents. Amman Exchange Market is considered one of the most important markets with high reputation, transparency regarding the compulsory financial and non-financial information, and with high quality of clearing system (Saymeh & Alshoubaki, 2013; Khalid et al., 2017)

A sample of 25 companies was chosen from the industrial sector listed in Amman Exchange Market in Jordan. The sample was chosen randomly after comprehensive investigation from the companies' financial and non-financial annual and interim reports. The sample is consisted of senior accountants in these Jordanian industrial companies by considering the accountants demographic characteristics. Five groups of questionnaires were distributed to (25) companies bringing the total number of questionnaires distributed (125) questionnaire. After reviewing the questionnaires, (104) of them were subjected to analysis. The respondents were asked to reflect their degree of 'agree or disagree' with their companies' environmental policies, practices and responsibilities.

<b>Questionnaires</b>	<b>Number</b>	<b>Percentage</b>
Questionnaires distributed	125 questions were distributed to 25 companies – each company received five questionnaires	100%
Questionnaires received	108	86.4%
Questionnaires excluded	4	3.2%
Questionnaires analyzed	104	83.2%
Questionnaires not received	17	13.6%

The study sample is described in Table 2 below. It provides information relevant to the number of questionnaires distributed, received, excluded, analyzed and not received, as well as the calculated percentages out of the total number of the questioners distributed.



The total number of received questionnaires was (108) constituting 86.4% of the distributed questionnaires, and 4 questionnaires were excluded because they were not valid as they are incomplete answers. The numbers of questionnaires that are subject to statistical analysis are 104 (83.2% of the total number of distributed questionnaires which is a good ratio).

### Description of the Study Sample

The individuals of the sample study are distributed according to their age, qualification, professional qualification, job title, and years of experience. These characteristics are illustrated in Table 3.

<b>Age</b>	<b>Number</b>	<b>percentage</b>
Less than 29	28	26.9
30 - 40	27	26.0
41 – 50	23	22.1
More than 51	26	25.0
<b>Total</b>	<b>104</b>	<b>100.0</b>
<b>Qualification</b>		
Bachelor	62	59.6
Post graduate Diploma	8	7.7
Master	23	22.1
PhD	6	5.8
Other	5	4.8
<b>Total</b>	<b>104</b>	<b>100</b>
<b>Professional qualification</b>		
Chartered certified accountant (Jordan)	8	7.7
Chartered certified accountant (Arab countries)	3	2.9
Chartered certified accountant (USA)	2	1.9
Chartered certified accountant (United Kingdom)	4	3.8
Other	18	17.3
None	69	66.3
<b>Total</b>	<b>104</b>	<b>100</b>
<b>Job title</b>		
Operational manager	6	5.8
Financial manager	21	20.2
Costs accountant	29	27.9
Financial accountant	25	24.0
Internal auditor	11	10.6
External auditor	9	8.7
Other	3	2.9
<b>Total</b>	<b>104</b>	<b>100</b>
<b>Years of experience</b>		
Less than 5 years	27	26.0
6-10	20	19.2
11-15	19	18.3
16-20	17	16.3
21-25	12	11.5
More than 25	9	8.7
<b>Total</b>	<b>104</b>	<b>100.0</b>

## Reliability of the Study Tool

Cronbach's alpha coefficient for internal consistency among questionnaire items has been calculated (Table 4). This study employs the same approach as that of (Vivien, 2014; Bebbington et al., 2001). The value of Cronbach's coefficient reaches (0.972) for the aggregate questionnaire items; and for the independent variables ranged between (0.893-0.942). These values refer to the reliability of the study instrument.

Independent variable	No. of Items	Cronbach's alpha coefficient
Availability of environmental costs information improves the decision-making process	8	0.942
Commitment of industrial companies to implement environmental policies and procedures improves the decision-making process	8	0.939
Disclosure of environmental costs improves the decision-making process	9	0.893
All Items	25	0.972

## Likert Scale

Alewine, H.C. (2010) and Jean-Francois et al. (2017) suggest and recommend using Likert scale to help decisions makers to choose for an alternative over another (Table 5). The degree of approval of the study variables has been estimated by determining the degree of approval of the scale items according to the following equation: the extent of the scale = (5); strongly agree = (5), strongly disagree = (1). Accordingly, we find the class length according to the following equation: class length = range ÷ number of levels (low, medium, high) = (4 ÷ 3 = 1.33), so the range of the classes for "degree of agree" are as follows:

1. Range (1 - 2.33) refers to the low approval.
2. Range (2.34- 3.67) refers to the medium approval.
3. Range (3.68-5.00) indicates a high degree of approval.

#	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
Measures	5	4	3	2	1

## Statistical Analysis Findings

In this section, the results of the descriptive analysis are displayed (percentage distribution, Mean and standard deviation) and testing hypothesis:

### **Descriptive analysis: Availability of Environmental Costs Information Improves The Decision-Making Process In The Jordanian Industrial Companies**

Paragraph	Strongly	Agree	Neutral	Disagree	Strongly

No.		agree				disagree					
		F	%	F	%	F	%	F	%		
1	The company ensures implementing environmental cost accounting strategies and plans	1	1.1	3	2.9	13	12.5	62	59.6	25	24.0
2	The environmental cost information provided by the company informs internal and external users and relies on them to make their decisions	2	1.9	4	3.8	9	8.7	71	68.3	18	17.3
3	The environmental information system used allows to measure the company's activities impact on the environment	0	0.0	3	2.9	14	13.5	68	65.4	19	18.3
4	Environmental cost information ensures measuring the company's environmental performance and thus facilitating comparisons	0	0.0	6	5.8	8	7.7	78	75.0	12	11.5
5	The company has the motivation to participate in environmental protection	2	1.9	2	1.9	13	12.5	74	71.2	13	12.5
6	The company's competitors motivate the company to include environmental costs to improve environmental protection programs	1	1.0	6	5.8	11	10.6	72	69.2	14	13.5
7	The company measures, records and analyses environmental costs	0	0.0	0	0.0	15	14.4	81	77.9	8	7.7
8	The company promotes responsiveness to environmental regulations and standards	1	1.0	1	1.0	20	19.2	68	65.4	14	13.5

Table 7 MEAN AND STANDARD DEVIATION FOR AVAILABILITY OF ENVIRONMENTAL COSTS INFORMATION IMPROVES THE DECISION-MAKING PROCESS					
No.	Paragraph	Mean	Standard deviation	Relative importance	Rank
1	The company ensures implementing environmental cost accounting strategies and plans	1.97	0.76	low	8
2	The environmental cost information provided by the company informs internal and external users and relies on them to make their decisions	2.05	0.77	low	6
3	The environmental information system used allows to measure the company's activities impact on the environment	2.01	0.66	low	7
4	Environmental cost information ensures measuring the company's environmental performance and thus facilitating comparisons	2.08	0.65	low	4
5	The company have the motivation to participate in environmental protection	2.10	0.70	low	3
6	The company's competitors motivate the company to include environmental costs to improve environmental protection programs	2.12	0.74	low	1
7	The company measures, records and analyses environmental costs	2.07	0.47	low	5
8	The company promotes responsiveness to environmental regulations and standards	2.11	0.67	low	2
	<b>All overall average: The availability of environmental costs information improves the decision-making process.</b>	2.06	0.58	low	---

It's shown in Tables 6 and 7 that there is a low degree of approval for “*availability of environmental costs information improves the decision-making process*”. In general, the average of the total degree is (2.06) and standard deviation is (0.58). At the level of the paragraphs, it is noted that all are of low degree of approval. The highest degree of approval is for paragraph (6),

with arithmetic mean (2.12) and standard deviation (0.74). It states that "The company's competitors motivate the company to include environmental costs to improve environmental protection programs". The lowest degree of approval is for paragraph (1) with an arithmetic mean (1.97) and standard deviation (0.76). It states that "*The company ensures implementing environmental cost accounting strategies and plans*".

### Testing Hypothesis: Availability of Environmental Costs Information Improves the Decision-Making Process

To test if the environmental costs information improves the decision-making process, a one sample T-test is used, by testing the significance of differences between the average of answers and the average default scale (3: Neutral):

Paragraph		(T) value	degrees of Freedom	Level of Significance
1	The company ensures implementing environmental cost accounting strategies and plans	-13.873	103	0.000*
2	The environmental cost information provided by the company informs internal and external users and relies on them to make their decisions	-12.639	103	0.000*
3	The environmental information system used allows to measure the company's activities impact on the environment	-15.282	103	0.000*
4	Environmental cost information ensures measuring the company's environmental performance and thus facilitating comparisons	-14.505	103	0.000*
5	The company have the motivation to participate in environmental protection	-13.094	103	0.000*
6	The company's competitors motivate the company to include environmental costs to improve environmental protection programs	-12.168	103	0.000*
7	The company measures, records and analyses environmental costs	-20.338	103	0.000*
8	The company promotes responsiveness to environmental regulations and standards	-13.67	103	0.000*
<b>All overall average: The availability of environmental costs information improves the decision-making process.</b>		-16.624	103	0.000*

\* Differences are significant at the ( $\alpha \leq 0.05$ ) level

Statistically, the results of one sample T-test (Table 8) shows significant difference at level ( $0.05 \geq \alpha$ ) between the total arithmetic average (2.06) and the average default scale (3), whereas (T) value is (16.624) and level of significance is (0.000). Because, all overall average for all paragraphs shows significant difference at level ( $0.05 \geq \alpha$ ), and the overall arithmetic average is lower than the average scale (3), so that we reject hypothesis (1) which states "*Availability of environmental costs information improves the decision-making process*".

### Descriptive Analysis: Commitment of Industrial Companies to Implement Environmental Policies and Procedures Improves the Decision-Making Process

No.	Paragraph	Strongly agree		Agree		Neutral		Disagree		Strongly disagree	
		F	%	F	%	F	%	F	%	F	%
1	The company implements environmental cost accounting	0	0.0	5	4.8	13	12.5	78	75.0	8	7.7
2	The company is committed to environmental laws and regulations	1	1.0	3	2.9	15	14.4	73	70.2	12	11.5
3	The company enables cost accountants to apply environmental cost accounting practices	0	0.0	2	1.9	9	8.7	85	81.7	8	7.7
4	The company applies environmental costs regardless of whether this is a legal requirement or not	1	1.0	2	1.9	14	13.5	76	73.1	11	10.6
5	The company's policies and procedures include programs that support the implementation of environmental cost accounting	3	2.9	6	5.8	11	10.6	82	78.8	2	1.9
6	The company recognizes the importance of environmental standards	0	0.0	0	0.0	15	14.5	77	74.0	12	11.5
7	Environmental considerations are the company's priority at present	1	0.9	5	4.8	10	9.6	80	76.9	8	7.7
8	The company believes that environmental expenses do not impede the implementation of environmental laws and regulations	1	1.0	3	2.9	22	21.2	75	72.1	3	2.9

No.	Paragraph	Mean	Standard deviation	Relative importance	Rank
1	The company implements environmental cost accounting	2.14	0.61	low	3
2	The company is committed to environmental laws and regulations	2.12	0.67	low	5
3	The company enables cost accountants to apply environmental cost accounting practices	2.05	0.49	low	7
4	The company applies environmental costs regardless of whether this is a legal requirement or not	2.10	0.63	low	6
5	The company's policies and procedures include programs that support the implementation of environmental cost accounting	2.29	0.73	low	1
6	The company recognizes the importance of environmental standards	2.03	0.51	low	8
7	Environmental considerations are the company's priority at present	2.14	0.66	low	4
8	The company believes that environmental expenses do not impede the implementation of environmental laws and regulations	2.27	0.61	low	2
	<b>All overall average: Commitment of industrial companies to implement environmental policies and procedures improves the decision-making process.</b>	2.14	0.52	low	---

It's shown in Tables 9 &10 that there is a low degree of approval for “*Commitment of industrial companies to implement environmental policies and procedures improves the decision-making process*”. In general, the average of the total degree is (2.14) and standard deviation is (0.52). At the level of the paragraphs, it is noted that all are of low degree of approval. The highest degree of approval is for paragraph number (5), with arithmetic mean (2.29) and standard deviation (0.74). It states that “*The Company’s policies and procedures include programs that support the implementation of environmental cost accounting*”. The lowest degree of approval is for paragraph (6) with an arithmetic mean (2.03) and standard deviation (0.51). It states that “*The Company recognizes the importance of environmental standards*”.

### Testing Hypothesis: Commitment of Industrial Companies to Implement Environmental Policies and Procedures Improves the Decision-Making Process

To test if “*commitment of industrial companies to implement environmental policies and procedures improves the decision-making process*”, a one sample T-test is used to test the significance of differences between the average answers and the average default scale (3: Neutral):

Paragraph		(T) value	degrees of Freedom	Level of Significance
1	The company implements environmental cost accounting	-14.213	103	0.000*
2	The company is committed to environmental laws and regulations	-13.41	103	0.000*
3	The company enables cost accountants to apply environmental cost accounting practices	-19.8	103	0.000*
4	The company applies environmental costs regardless of whether this is a legal requirement or not	-14.603	103	0.000*
5	The company’s policies and procedures include programs that support the implementation of environmental cost accounting	-9.899	103	0.000*
6	The company recognizes the importance of environmental standards	-19.375	103	0.000*
7	Environmental considerations are the company’s priority at present	-13.227	103	0.000*
8	The company believes that environmental expenses do not impede the implementation of environmental laws and regulations	-12.196	103	0.000*
	<b>All overall average: Commitment of industrial companies to implement environmental policies and procedures improves the decision-making process.</b>	-16.841	103	0.000*

\* Differences are significant at the ( $\alpha \leq 0.05$ ) level

Statistically, the results of one sample T-test (Table 11) shows significant difference at level ( $0.05 \geq \alpha$ ) between the total arithmetic average (2.14) and the average scale (3), whereas (T) value is (16.841) and level of significance is (0.000). Also, all overall average for all paragraphs shows significant difference at the level ( $\alpha \leq 0.05$ ) and all overall arithmetic average is lower than

the average scale (3), so that we reject hypothesis (2): “*Commitment of industrial companies to implement environmental policies and procedures improves the decision-making process*”.

### Descriptive Analysis: Disclosure of Environmental Costs Improves the Decision-Making Process

No.	Paragraph	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
		F	%	F	%	F	%	F	%	F	%
1	Environmental costs are disclosed in the company's financial statements	0	0.0	4	3.8	4	3.8	77	74.0	19	18.3
2	The measurement and analysis of the company's environmental costs coincides with environmental standards, laws and regulations	0	0.0	0	0.0	13	12.5	76	73.1	15	14.4
3	The company's accounting information system produces the required information related to environmental costs	0	0.0	3	2.9	5	4.8	79	76.0	17	16.3
4	Environmental assets and accumulated depreciation are recognized separately in the company's financial statements.	0	0.0	0	0.0	20	19.2	73	70.2	11	10.6
5	The company discloses its environmental performance and reflects its social responsibility	3	2.9	4	3.8	14	13.5	78	75.0	5	4.8
6	The company reports on its environmental expenditures: industrial waste treatment, recycling and research and development	2	1.9	5	4.8	22	21.2	71	68.3	4	3.8
7	The company regularly reviews the accounting information system and international accounting standards	0	0.0	1	1.0	17	16.3	78	75.0	8	7.7
8	The company reports on its managerial responsibility to promote awareness and commitment to best environmental practices	1	1.0	5	4.8	9	8.7	84	80.8	5	4.8
9	The company reports on its environmental obligations, fines and penalties	1	1.0	4	3.8	7	6.7	92	88.5	0	0.0

No.	Paragraph	Mean	Standard deviation	Relative importance	Rank
1	Environmental costs are disclosed in the company's financial statements	1.93	0.61	low	9
2	The measurement and analysis of the company's environmental costs coincides with environmental standards, laws and regulations	1.98	0.52	low	7
3	The company's accounting information system produces the required information related to environmental costs	1.94	0.57	low	8
4	Environmental assets and accumulated depreciation are recognized separately in the	2.09	0.54	low	6

	company's financial statements.				
<b>5</b>	The company discloses its environmental performance and reflects its social responsibility	2.25	0.73	low	2
<b>6</b>	The company reports on its environmental expenditures: industrial waste treatment, recycling and research and development	2.33	0.72	low	1
<b>7</b>	The company regularly reviews the accounting information system and international accounting standards	2.11	0.52	low	5
<b>8</b>	The company reports on its managerial responsibility to promote awareness and commitment to best environmental practices	2.16	0.62	low	4
<b>9</b>	The company reports on its environmental obligations, fines and penalties	2.17	0.53	low	3
	<b>All overall average: Disclosure of environmental costs improves the decision-making process.</b>	2.11	0.44	low	---

It's shown in Tables 12 & 13 that there is a low degree of approval for "Disclosure of environmental costs improves the decision-making process". In general, the average of the total degree is (2.11) and the standard deviation is (0.44). At the level of the paragraphs, it is noted that all are of low degree of approval. The highest degree of approval is for paragraph number (6), with arithmetic mean (2.33) and standard deviation (0.72) and it states that "The company reports on its environmental expenditures: industrial waste treatment, recycling and research and development". The lowest degree of approval is for paragraph (1) with an arithmetic mean (1.93) and standard deviation (0.61). It states that "Environmental costs are disclosed in the company's financial statements".

### **Testing Hypothesis: Disclosure of Environmental Costs Improves the Decision-Making Process**

To test if "*Disclosure of environmental costs improves the decision-making process*", a one sample T-test is used, by testing the significance of differences between the average of answers and the average default scale (3: Neutral):

Statistically, the results of one sample T-test (Table 14) shows significant differences at the level ( $0.05 \geq \alpha$ ) between the total arithmetic average (2.11) and the average scale (3), whereas (T) value is (20.621) and level of significance is (0.000). All paragraphs show significant differences at the level of ( $0.05 \geq \alpha$ ). The arithmetic average is lower than the average scale (3), so that we reject hypothesis (3): "*Disclosure of environmental costs improves the decision-making process*".



<b>Paragraph</b>		<b>(T) value</b>	<b>degrees of Freedom</b>	<b>Level of Significance</b>
1	Environmental costs are disclosed in the company's financial statements	-17.796	103	0.000*
2	The measurement and analysis of the company's environmental costs coincides with environmental standards, laws and regulations	-19.949	103	0.000*
3	The company's accounting information system produces the required information related to environmental costs	-18.87	103	0.000*
4	Environmental assets and accumulated depreciation are recognized separately in the company's financial statements.	-17.198	103	0.000*
5	The company discloses its environmental performance and reflects its social responsibility	-10.42	103	0.000*
6	The company reports on its environmental expenditures: industrial waste treatment, recycling and research and development	-9.579	103	0.000*
7	The company regularly reviews the accounting information system and international accounting standards	-17.542	103	0.000*
8	The company reports on its managerial responsibility to promote awareness and commitment to best environmental practices	-13.652	103	0.000*
9	The company reports on its environmental obligations, fines and penalties	-15.925	103	0.000*
	<b>All overall average: Disclosure of environmental costs improves the decision-making process.</b>	-20.621	103	0.000*

\* Differences are significant at the ( $\alpha \leq 0.05$ ) level

## DISCUSSION

The most important results that can be concluded from the statistical analysis and test hypothesis are as follow:

### **Availability of Environmental Costs Information Improves the Decision-Making Process**

Statistically, the results of one sample T-test shows significance differences at the level ( $0.05 \geq \alpha$ ) between the total arithmetic average (2.06) and the average scale (3), (T) value is (16.624) and level of significance is (0.000). Further, all paragraphs show significant differences at the level of ( $0.05 \geq \alpha$ ). So that we reject hypothesis (1): availability of environmental costs information improves the decision-making process in the Jordanian industrial sector. This is because the majority of the respondents assured the unavailability of environmental costs in the industrial companies, which in turn hinder making sound decisions. This is in consonance with the findings of (Chou & Yeh, 2015; Henri et al., 2016).

### **Commitment of Industrial Companies to Implement Environmental Policies and Procedures Improves the Decision-Making Process**

Statistically, the results of one sample T-test shows significant differences at the level ( $0.05 \geq \alpha$ ) between the total arithmetic average (2.14) and the average scale (3), (T) value is (16.841) and level of significance is (0.000). Further, all paragraphs show significant differences at the level of ( $0.05 \geq \alpha$ ). So that we reject the hypothesis (2): Commitment of industrial

companies to implement environmental policies and procedures improves the decision-making process. This is because the majority of the respondents assure the lack of the companies' commitment to implement environmental policies and procedures, and thus hindering making sound decisions. This confirms with the existing environmental literature of (Kitzman, 2001; Wang et al., 2018; Shakour et al., 2018).

### **Disclosure of Environmental Costs Improves the Decision-Making Process**

Statistically, the results of one sample T-test shows significant differences at the level ( $0.05 \geq \alpha$ ) between the total arithmetic average (2.11) and the average scale (3), (T) value is (20.621) and level of significance is (0.000). Also, all paragraphs show significant differences at the level of ( $0.05 \geq \alpha$ ). So that we reject the hypothesis (3): Disclosure of environmental costs improves the decision-making process. This rejection is based on the fact that the majority of the respondents assure that their companies' practices lack to sufficient disclosed environmental cost information. This is congruent with (Rogers & Kristof, 2003; Taygasshina & Akhmetova, 2019).

## **CONCLUSION**

The objective of this study is to examine the relationship between integrating the environmental costs into accounting information system and improving decision-making process. This study confirms that Jordanian industrial sector is still reluctant to integrate the environmental costs into their accounting information system. These results confirm with other studies that the integration improves the decision making-process (Kitzman, 2001; Wang et al., 2018; Shakour et al., 2018, Rogers & Kristof, 2003; Taygasshina & Akhmetova, 2019; Chou & Yeh, 2015, Henri et al., 2016). The inability to integrate the environmental costs could lead to lose opportunities and to avoid risks (Khalid et al, 2017; Catchpole et al, 2004). Overall, this study conclude that availability of environmental costs information, Commitment of industrial companies to implement environmental policies and procedures and Disclosure of environmental costs are not significant determinants of improving decision-making process.

However, there is a growing awareness by stakeholders that there is a significant relationship between determinants of integrating environmental costs and decision-making process regarding the companies' economic performance, environmental legislation and social acceptance (Deegan et al., 2000; Khalid et al, 2017; Pahuja, 2009). Therefore, in the absence of compulsory environmental laws and legislation in the Jordanian context, the benefits of making sound decisions will be limited, unidentifiable and intangible.

### **Recommendations**

Based on the study results, the researcher recommends integrating environmental costs into the companies' financial and non-financial reports. Such practice improves the industrial companies' decision-making process. Further, there is a necessity for establishing environmental auditing body in Jordan to ensure implementing environmental policies and procedures in the industrial sector. Moreover, this study revealed the importance of commitment to the quality of financial reporting through the application of environmental laws and initiatives that provides information for the quality of disclosure. The Jordanian governmental and non-governmental environmental bodies have a crucial part to intercede in this regard.

However, this paper suggests further future studies and research to explore and focus on environmental costs and their role in achieving competitive advantage in industrial companies. Another potential research could be conducted to examine the environmental role of the Jordanian auditing body, in the industrial sector, from a cost accounting perspective.

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