

Providing an effective model on environmental management accounting system in petrochemical and metal industries in Iran

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Abstract

The purpose of this study was to provide a proposed model affecting the environmental management accounting system in the petrochemical and metal industries in Iran. In order to conduct research, first, by studying the literature and research background with the method of documentary and library studies and the exploratory method, interview questions and research questionnaires have been identified. After analyzing the interviews, in addition to identifying the dimensions and factors affecting the research variables, it is possible to provide a model and conceptual framework for the research. The statistical population of the research in the qualitative sector is all knowledgeable managers in the petrochemical and metal industries and experts in the accounting profession in the country. The analysis consists of two parts: qualitative and quantitative. Interviews were conducted with 15 experts and theoretical foundations of the research, and in a small part of the work, a questionnaire was distributed and collected among 130 employees of petrochemical and metal industry experts. First, the validity and reliability of reagents and constructs were determined using different tests such as mean-variance and Cronbach's alpha. Then, the research variables were examined using the output of software algorithms (SmartPLS 3). These two outputs show the path coefficients between the variables and the value of the t-statistic. Prioritization of effective components on the implementation of environmental management accounting system in petrochemical and metal industries using Friedman analysis of variance showed that the environmental results component has a better rank and has the first rank and the customer environmental cooperation component ranks second and the management component The indoor environment ranks third.

Keywords: accounting system, environmental management, petrochemical and metal industries in Iran
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Introduction

In recent years, the situation of pollution and environmental degradation in our country has been increasing [29]. Therefore, company managers should be aware of the harmful consequences and environmental risks arising from the activities of their companies and factories, because in addition to the above issues, many environmental costs can be

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covered by better decisions, better management accounting and design. Again, it greatly reduced the processes and products of production or eliminated their destructive effects [36].

Environmental management system, in addition to improving environmental performance, will also have a direct positive impact on financial performance [30, 13]. In fact, for example, the optimal and controlled consumption of natural resources, on the one hand, will improve environmental performance and lead to sustainable development; on the other hand, by reducing the consumption costs of natural resources such as water, electricity, gas, fuel, raw materials, etc., it will improve business performance and financial profit [9]. The internal management accounting system in companies helps managers in the correct implementation and efficient management of financial and physical resources, identifying opportunities to reduce costs and make better decisions. Externally, the technique also provides useful information to stakeholders, such as shareholders, creditors, analysts, financial organizations and environmental organizations [16]. Environmental management accounting as a support mechanism for environmental performance management, in many countries of the world, has attracted increasing interest and attention, both in the field of research and in the field of implementation and practice. But in our country, Iran, this field of accounting has remained intact and even its theoretical concepts have not been fully discussed [20].

Given that the world today has increased pollution, environmental problems and countries' concerns about the environment. With increasing environmental concerns from consumers, governments and communities around the world and manufacturing companies are seeking to develop environmentally friendly programs such as environmental management systems, green product development, green branding and green technology. These concerns have spread to various industries, so much so that today one of the most important factors in the activities of companies, from the supply of raw materials to the production process of a new product in the factory and the issues that occur during consumer use of the product, it is an environmental consideration [3]. Numerous factors affect environmental performance, among these factors can be referred to the environmental management system.

On the other hand, the petrochemical industry, like many industries that use harmful chemicals in their production process, faces many green considerations. Careful studies have not yet been conducted on the harms of products such as artificial stone and its chemical compounds, and consumers are concerned about the degradability of these products in nature. The issue of environmental protection is considered necessary and ethical and damage to it has adverse consequences for humans and organizations. Among the wide range of measures to protect the environment, the environmental movement that has emerged in the last decade around the world has caused consumers to rethink the products they buy [26]. In fact, consumers by buying products which are less harmful to the environment can significantly contribute to the protection of the environment. Therefore, the main question is: what is the proposed effective model for environmental management accounting system in petrochemical and metal industries?

Research questions

The main question

What is the proposed model affecting the environmental management accounting system in the petrochemical and metal industries in Iran?

Sub-questions

1. What are the effective components on the implementation of environmental management accounting system in petrochemical and metal industries?
2. What is the ranking of the components affecting the implementation of the environmental management accounting system in the petrochemical and metal industries?
3. What is the conceptual model for implementing the EMA system?

A review of the theoretical foundations of the environmental management accounting system

System definition

A system is a group of elements that are combined to achieve a common goal. For example, in an information center, human resources, computer and information are combined to achieve a common goal, which is to provide information to employees or managers of the organization [19]. In any system five input elements. There is output,

conversion, control mechanism and finally goals. As the system moves so that the input is converted to output, the control mechanism monitors the conversion process to ensure that the system's goals are achieved. The control mechanism is connected to the flow of resources by its open loop. As the feedback loop obtains information from the system output and makes it accessible to the control mechanism. The control mechanism adapts the feedback signals to the targets and leads to signals to the input element until the system needs to change its operation [36].

Systems method and system perspective

In general, every institution needs a system vision to continue its workflow. A system vision that monitors all parts of the input and output and the conversion process through the control mechanism and feedback loop, and a kind of integration in decision making. Which is a prerequisite for the success of an institution, creates a consideration for the effects of each decision in other seemingly unrelated areas [10]. Recognize themselves and develop effective data collection systems. They recognize the need for performance metrics and good communication networks with their employees. All of these are components of accepting a systemic thinking. The term systemic concept is used to illustrate this view.

The result of a systemic approach is the use of models to describe phenomena. An abstract model is what is called an entity. There are four types of models. Physical, narrative, graphic, and mathematical, all of these models allow the user to better understand and relate to the "existing," through which other elements are understood. A general model of corporate systems can be used to analyze any type of organization, but one can not expect a model to be built for a particular organization [1]. The true value of the general model of systems, when a person has just graduated and started working is revealed. The model will help the person to set up their partnership. In the beginning, everything will be new: new faces, new facilities, new vocabulary (terminology) will not surprise anyone, because the model will provide a mental image of what is expected of the person. We must remember that the best systems will not succeed if users do not use it. Today, systems and models are designed with computer tools and systems, and rarely manual methods are used for the system or model [2].

The concept of accounting system

Management accounting system is the most important pillar of management and in recent years has attracted the attention of many human resource management researchers. Green human resource management is an activity that seeks to optimize the use and conservation of scarce environmental resources [21].

Research background shows that the traditional functions of the management accounting system have reached a low level of employee involvement in participatory and supportive processes in which employees do not have the appropriate opportunity to develop skills, knowledge and attitudes [33]. In an age of increasing awareness of environmental management and sustainable resource development, green human resource management focuses on corporate environmental management practices in which human resource management serves as a platform for linking human resource management practices to corporate environmental management activities. It works [34]. Thus, management accounting system is a vital area of business management [4].

Management accounting system refers to all the actions that are performed in the evolution and follow-up and continuity of a system so that the human resources of an organization are aware of their professional and personal lives. Management accounting system is defined as the emergence of functional dimensions of human resource management such as job analysis, recruitment, selection, training, performance appraisal, reward. In other words, all tasks, functions and roles of management should be aligned with green goals and programs [35].

Environmental management accounting system is also defined as "policies, procedures and systems that guide the organization's employees in the interests of individuals, society, the environment and green business" [4].

Based on various empirical studies, researchers argue that a set of measures of the environmental management accounting system - including green recruitment, green training and participation, green performance management, green service compensation - have a positive effect on greening an organization. These practical actions should be taken by the people in charge of leading a team, with the aim of creating environmentally friendly motivations in the workplace [37].

1- Attract and hire green

To build and maintain a green workplace, the organization must consider selecting and hiring an employee who is supportive and environmentally friendly [23].

2- Green education and development

Due to growing environmental issues, organizations are more inclined to give green training to their employees.

Green training enables employees to acquire special skills to participate in the organization's environmental issues and to pay attention to environmental developments and thus meet the goals of the organization [11].

3- Green performance evaluation system

This system includes how to measure green performance standards among employees and departments and work units and collect useful data on their environmental performance. Human resource managers use green/environmental indicators to evaluate employees' job performance [11].

4- Compensation for green services

The green reward and reward system is a tool to encourage employees towards the organization's environmental goals through financial and non-financial rewards. It is also an attempt to prevent the departure of talented employees and attract new employees familiar with green practices to the organization [24].

Existing articles show that the environmental management accounting system has evolved from the old way of working such as low level of employee involvement to more participatory and supportive processes in which employees gain opportunities to develop skills, knowledge and attitudes [32, 21].

It was once thought that organizations and manufacturers were solely responsible to shareholders and employees, or that they had to deliver the best consumer product to the customer at a lower price and higher quality. Intense competition, population growth and resource scarcity, environmental pollution led to new approaches to organization and management, which resulted in commitment and social responsibility. In fact, it can be said that the introduction of this responsibility was a response to environmental needs and challenges. Social responsibility looks at the customer comprehensively and even takes into account environmental problems or long-term well-being. Social responsibility is a form of management in which organizations perform activities that have a positive impact on society. In fact, social responsibility seeks to eliminate the negative effects of the organization on society. Paying attention to green human resource management and greening human resource activities is a step towards increasing the social responsibility of organizations.

One of the social responsibilities defined for organizations is to pay attention to environmental issues. An organization is responsible to society and society, an economic and competitive organization and strives to perform tasks that ensure the survival and sustainability of the organization. This requires the organization to provide specific conditions and take action in this regard. Some of these conditions and actions within the organization are done through green human resource management activities to inform and empower employees about environmental issues. Green human resource management activities will increase the organization's fulfillment of social responsibilities [5].

A review of previous domestic and foreign research

Farokhi et al. [7] in a study examined the effect of green human resource management on the environmental behavior of employees by considering the moderating role of individual green values and service culture. The results showed that green human resource management practices affect employees' environmental behaviors and environmental values moderate the relationship between education and green development on employees' pro-environmental behavior and the relationship between green performance management and employees' environmental behavior but there is no moderating role on the relationship between green employment choice and pro-environmental behavior of employees. Also, service culture has only moderated the relationship between green employment and employees' pro-environmental behavior and has not had a moderating effect on other relationships. Najafi [29] in a study has investigated the relationship between environmental accounting with procedures and design of management accounting systems in Iran Railway Company. This research is applied in terms of purpose and in terms of implementation method, in the category of descriptive-correlation studies and in terms of collection method, is in the category of library studies and is designed to find answers to questions; data of 41 distributed questionnaires were analyzed using correlation test. The results showed that there is a positive and significant relationship between environmental accounting with management accounting practices and design of management accounting systems. Keshavarz [18] examines the effects of environmental strategy, environmental uncertainty and senior management commitment on environmental performance by considering the role Environmental management accounting. This research is applied in terms of purpose and based on descriptive survey data collection method. The statistical sample of this research was the senior managers of 130 companies in different industries in the Tehran Stock Exchange. Research data were collected using a questionnaire. The results showed that environmental management accounting has been a useful and important tool in providing information to achieve superior environmental performance in companies. Johnston [16] in a paper systematically analyzes environmental management systems in the structural equation model based on

management accounting. The research method was reviewed and based on systematic analysis. The results showed that so far no studies have been conducted to provide a model for implementing the performance of the environmental management system based on management accounting, and in this area the research gap is noticeable. Fabricia et al. [6] have investigated the role of environmental management accounting on innovation based on management accounting in companies. The research data were collected by analyzing data from 55 companies in Brazil from 2015 to 2017 and analyzed by PLS method. The results showed that environmental management accounting (EMA) directly affects innovation in product production and indirectly affects innovation through management accounting techniques. Ji and Miao (2020) in an article examined corporate accounting social responsibility and participatory innovation: the role of government support. The findings suggest that the social dimension of corporate accounting social responsibility may not reinforce participatory innovation in developing countries, which is in contrast to the findings of developed countries. In addition, both direct and indirect government support can enhance the positive impact of the environmental dimension of corporate social responsibility on participatory innovation, while indirectly it can also enhance the positive impact of corporate governance on participatory innovation.

Research methods

The research method in this research is applied and in terms of purpose is analytical and in terms of process and method of data collection and analysis is a mixture of qualitative and quantitative research. In the qualitative section, 15 experts and experts and theoretical foundations of research on the factors affecting the accounting system of environmental management in the petrochemical and metal industries in Iran have been interviewed. The analysis of the interview texts was done in open, central and selective coding stages.

The coding of interviews is as follows: In this study, 15 interviews were conducted, which are followed by coded tables that include part of the interviewer’s statements, semantic codes, related categories and concepts. The following were asked during in-depth and open interviews. What are the effective components on the implementation of environmental management accounting system in petrochemical and metal industries? The team analysis according to the theoretical foundations of the process is a reciprocal process in which the movement back and forth between the steps of the method in this research was done as follows over time: Step 1. Familiarity with the data: Step 2. Creating sub Topics: Step 3. Searching for Themes: Step 4. Reviewing the Themes: Step 5. Defining and Naming the Themes Step 6. Reporting: The Sixth Step begins when the researcher has a set of fully-fledged themes. Have. This step includes the final analysis and writing of the report. The manifestation of this stage in this research is a conceptual model that is located at the end of the qualitative part; in this research, in fact, after the thematicizations have been done and the sub-themes have been divided into sub-themes and the sub-themes into the main themes, the researcher has answered the research questions based on this process.

Findings

In this research, 15 people were interviewed and the texts of the research were analyzed, and we will analyze their answers in the following. The first question in this research was as follows:

What are the most important components of environmental management accounting system in petrochemical and metal industries in Iran?

Table 1: Respondents’ answers The most important variables or components of environmental management accounting system in petrochemical and metal industries in Iran

Part of the interviewee’s answer	Semantic code
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<p>Every system in computer-based information systems is like a living organism: it is born, it grows, it matures, it works, and it eventually dies. This process is called system life cycle transformation and involves the following steps: planning, analysis, design, implementation, implementation. The life cycle of a system requires the passage of standard steps, each of which requires management activities. The system may be less useful and efficient due to technical or other errors or non-compliance with changing environment. It is also possible when planning for a new system. Defects become more. The final stage of a system's life cycle is its replacement. The life span of each of these stages in systems is different. Those employees gain opportunities to develop skills, knowledge and attitudes</p>	<p>Internal environmental management and accounting system environmental management has evolved from the old way of working, such as the low level of employee involvement, to more participatory and supportive processes in which employees gain opportunities to develop skills, knowledge and attitudes.</p>
<p>Today, curves are used to indicate the life cycle of a system, and it is called the general life curve of a system. This model has four different components and stages that have a significant impact on the efficiency of any system: expansion, growth, Saturation, depreciation. Today, curves are used to indicate the life cycle of a system, and it is called the general life curve of a system. This model has four different components and stages that have a significant impact on the efficiency of any system: expansion, growth, saturation, depreciation</p>	<p>Green purchasing and green management A new management approach helps to develop the capabilities of the organization (leadership, policy and strategy, organizational partners, organizational resources and processes) to achieve sustainable success (economic results, social results and environmental results) To become an industrial leader by normalizing the behaviors and practices of the organization along with learning, creativity and innovation.</p>
<p>In recent years, with the increase of environmental pollution by various industries and, by its nature, the emergence of global protests, green management is trying to maintain the link between the capabilities of an organization and its sustainable success. The person working with the user is the systems analyst. The systems analyst helps the user identify and understand the problem and then looks at different ways to solve the problem. Each method is first proposed using documented graphs and the method that seems best. The user decides on the implementation of systems analyst theory. System analysts define problems and prepare written documents on how to help the computer solve problems.</p>	<p>Customer-environment collaboration and system analyst work is not system analysis. System analysis is an examination of an existing system to design a new or defective system</p>
<p>In order to use and use this system properly, senior managers (high levels of the organization) must have sufficient insight and insight in all operations of different parts of the organization. In accounting, engineering, etc. to be able to use this system effectively. At the same time, this system requires managers to have an initial and tacit knowledge of competitors. Economic, social, cultural and political conditions affecting and being affected by the organizational environment. The success of a company's green management depends on the environmentally friendly behavior of employees. has it. Because their behavior improves the company's environmental performance, according to social identity theory, if employees are concerned about environmental protection, they are more likely to participate in the implementation of the company's green management plans, including green human resource management.</p>	<p>Green human resource management has a positive relationship with employees' environmental behavior. Green employee behavior includes saving energy (such as turning off lights when leaving the office), using efficient resources (for example, using telephone or electronic conferencing instead of traveling to meetings), reversible logistics, and avoiding wastage (For example, editing documents electronically instead of printing them), reprocessing (such as printing drafts on waste sheets), or saving water (such as bath water leak reporting and water efficiency).</p>
<p>The green reward and reward system is a tool to encourage employees towards the organization's environmental goals through financial and non-financial rewards. It is also an effort to prevent the departure of talented employees and attract new employees familiar with green practices to the organization</p>	<p>Green intervention is an effort to prevent the departure of talented employees and attract new employees familiar with green practices to the organization.</p>

<p>A green management system is a set of management actions that enable an organization to identify and evaluate the impact of its activities on the environment, to control and ultimately improve its environmental performance. This system can help the organization meet the legal requirements of the EPA.</p>	<p>Environmental results help save material and energy consumption. It also provided more control over the organization's processes, thereby helping to reduce waste and increase the organization's productivity.</p>
<p>Based on their current track record, companies have come under pressure to identify business practices that improve not only their competitive advantage and economic performance, but also their environmental performance. Hence, they strongly seek to adopt and implement environmentally friendly behaviors and activities, such as green innovation practices, green technology, green marketing, and so on. Because companies face internal and external pressure to participate in such activities</p>	<p>The performance of the environmental management accounting system is the environmental behavior of employees as the green behavior of employees, which includes actions and behaviors that are related to environmental sustainability and prevent the destruction and pollution of the environment. These behaviors are known as job performance, organizational citizenship behavior, and environmental behaviors, they said.</p>

We now identify categories and concepts through axial coding. The codes mentioned by the interviewees in this research are as follows:

Table 2: Axial coding and identification of categories and concepts related to the question: The most important variables or components of environmental management accounting system in petrochemical and metal industries in Iran

Code	Category	Concept
<p>Internal environmental management and accounting system environmental management has evolved from the old way of working, such as the low level of employee involvement, to more participatory and supportive processes in which employees gain opportunities to develop skills, knowledge and attitudes.</p>	<p>More participatory and supportive processes</p>	<p>Internal environmental management</p>
	<p>In it, employees gain opportunities to develop skills, knowledge and attitudes</p>	
<p>Green purchasing and green management a new management approach helps to develop the capabilities of the organization (leadership, policy and strategy, organizational partners, organizational resources and processes) to achieve sustainable success (economic results, social results and environmental results) to become an industrial leader by normalizing the behaviors and practices of the organization along with learning, creativity and innovation.</p>	<p>Naturalizing the behaviors and practices of the organization along with learning, creativity and innovation, to industrial excellence</p>	<p>Buy green</p>
	<p>New management approach to develop organizational capabilities (leadership, policy and strategy, organizational partners, organizational resources and processes)</p>	

Customer-environment collaboration and system analyst work is not system analysis. System analysis is an examination of an existing system to design a new or defective system	System Analysis Examine the existing system to design a new system	Customer environmental cooperation
	Customer environmental collaboration and system analyst work	
Green human resource management has a positive relationship with employees' environmental behavior. Green employee behavior includes saving energy (such as turning off lights when leaving the office), using efficient resources (for example, using telephone or electronic conferencing instead of traveling to meetings), reversible logistics, and avoiding wastage (for example, editing documents electronically instead of printing them), reprocessing (such as printing drafts on waste sheets), or saving water (such as bath water leak reporting and water efficiency).	Green employee behavior includes saving energy (such as turning off lights when leaving the office), using efficient resources	Reversible logistics
	Reversible logistics and prevention of waste (for example, editing documents electronically instead of printing them)	
	Reprocessing (such as printing drafts on waste sheets), or saving water (such as reporting bath water leaks and optimal water consumption)	
Environmental performance and management reporting systems provide the necessary reports from interaction processing systems in a combination and provide managers with decisions to make.	Management reporting systems	Environmental function
Development of green skills and green performance evaluation system includes how to measure green performance standards between employees and departments and work units and collect useful data on their environmental performance.	Development of green skills and green performance evaluation system including how to measure green performance standards	Development of green skills
	Employees and departments and work units and collect useful data in the field of environmental performance	
Green motivation about 80% of the total number of computers in the world are used to organize enterprise information systems (MIS). MIS helps the top management by setting a goal, strategically planning and presenting business plans and implementing them. To build and maintain a green workplace, the organization must select and hire an employee who is supportive and environmentally friendly.	Organizational Information Systems Organization (MIS) is used. MIS by setting a goal, strategic planning and presenting business plans and their implementation	Green motivation
	Building and maintaining a green workplace, the organization should select and hire an employee, who is supportive and interested in the environment	

Green intervention is an effort to prevent the departure of talented employees and attract new employees familiar with green practices to the organization.	To prevent the departure of talented employees and attract new employees	Green intervention
Environmental results help save material and energy consumption. It also provided more control over the organization's processes, thereby helping to reduce waste and increase the organization's productivity.	Save materials and energy	Environmental results
	Provide more control over the organization's processes	
The performance of the environmental management accounting system is the environmental behavior of employees as the green behavior of employees, which includes actions and behaviors that are related to environmental sustainability and prevent the destruction and pollution of the environment. These behaviors are known as job performance, organizational citizenship behavior, and environmental behaviors, they said.	Actions and behaviors that are related to environmental sustainability and prevent environmental degradation and pollution.	Performance of environmental management accounting system
	Behaviors are known as task performance, organizational citizenship behavior, and environmental behaviors	

In the qualitative part of the research (review of texts and interviews with experts), the components and indicators of the environmental management accounting system in the petrochemical and metal industries in Iran have been answered.

Table 3: Components and indicators extracted from interviews and theoretical foundations

Code	Category	Concept
Environmental management accounting system in petrochemical and metal industries in Iran	Internal environmental management	Commitment of senior managers to green supply chain management in the petrochemical and metal industries.
		Middle managers support green supply chain management in the petrochemical and metal industries.
		Mutual functional cooperation to improve the environment in the petrochemical and metal industries .
		Comprehensive quality environmental management in petrochemical and metal industries.
		Compliance with the environment and auditing activities in the petrochemical and metal industries.
		Establishment of environmental management system in petrochemical and metal industries.
	Buy green	The petrochemical and metal industries provide design specifications to suppliers that include environmental requirements for the goods purchased.
		Procurement and maintenance of environmental management system product from suppliers
		Valid environmental management system such as ISO 14001
		Suppliers' purchased products have green features such as recyclable or reusable items.
		Products purchased by suppliers should not contain environmental hazards such as lead or other hazardous or toxic substances.
		In the petrochemical and metal industries, it evaluates suppliers based on specific environmental criteria.
		Evaluates the environmental aspects of second-tier suppliers.
		The petrochemical and metal industries ensure that suppliers meet their environmental goals.
		Collaborates with customers in the field of environmentally friendly design.
	Customer environmental cooperation	Collaborates with customers to produce cleaner.
		Collaborates with customers for green packaging.

	Collaborate with customers to use less energy when shipping the product. has it
	Adopt third party logistics.
	Collaborates with customers to return the product.
	Collaborates with customers for reversible logistics relationships.
Reversible logistics	Gathers goods used by customers for recycling, re-harvesting or reuse.
	Collects used packages for reuse or recycling from the customer.
	Returns products from consumers for safe refilling.
Environmental function	Reduce air pollution emissions.
	Reduces sewage pollution.
	Reduces solid waste disposal.
	Advertise the reuse and recycling of raw materials.
Development of green skills	We use the green employer logo to attract green employees.
	Our company employs employees who have green awareness.
	We develop environmental management training programs to increase employees' environmental awareness, skills and expertise.
	We have green knowledge management (linking environmental education and behavioral knowledge with the goal of developing preventive solutions).
Green motivation	The petrochemical and metal industries set green goals and responsibilities for managers and employees.
	The petrochemical and metallurgical industries set goals for achieving the environmental results contained in the evaluations.
Green intervention	The petrochemical and metal industries have a clear vision to guide the performance of employees in the field of environmental management.
	A number of formal or informal communication channels serve to promote green culture in the petrochemical and metal industries.
Environmental results	Total direct and indirect emissions of toxins have decreased.
	The volume of recycled items has increased.
	The number of environmentally friendly products / services has increased.
Performance of environmental management accounting system	Market share in the petrochemical and metal industries has grown relative to competitors over the past three years.
	The brand of petrochemical and metal industries has been identified compared to competitors during the last three years.

Then, after interviewing these people, open, pivotal and selective codes were extracted. It is noteworthy that theoretical saturation was obtained after the interview. Thus, new extracted codes were not added to the total codes in the fourteenth interview and the extracted codes were duplicate. After reaching theoretical saturation, the interview and coding were completed. In the next step, the quantitative software part of the model is analyzed.

Descriptive analysis of data in the quantitative part of the research: The present study deals with the factors affecting the environmental management accounting system in the petrochemical and metal industries in Iran. 130 complete and complete questionnaires containing demographic questions and questions related to research hypotheses were collected from the sample. After collecting the questionnaires, they were statistically analyzed. Confirmatory factor analysis was used to evaluate the validity of the questionnaire and structural equation modeling (SEM) with the help of SmartPLS 3 software was used to evaluate the research hypotheses. According to the above table, which shows the results of factor analysis of the items of the questionnaire, since the factor load of all items is more than 0.4, also the value of t-statistic is more than 1.96, so the questionnaire has a good validity. A Cronbach's alpha value above 0.7 indicates acceptable reliability.

According to the above tables, the criteria for the structure are higher than 0.7, which indicates the appropriate reliability of the model. Due to the higher coefficient of combined reliability, the variables in the above table indicate the appropriate and acceptable fit of the measurement models. Given that the AVE values for all variables are greater than 0.5, so the convergent validity of the structures is acceptable.

To test the hypothesis of normality of the studied variables, a sample Kolmogorov-Smirnov test was used. If the significance level is more than 0.05%, it is a normal variable. Otherwise the data is abnormal. Therefore, according to the table below, all variables are abnormal (Table 5).

In response to the research question, what is the conceptual model for implementing the EMA system? The model is drawn in two standard and significant modes: to evaluate the fit of the structural model of the research, several criteria are used, the first and most basic criterion is the significance coefficients *t*. The fit of the structural model using t-coefficients is such that these coefficients must be greater than 1.96 in order to confirm their significance at the 95% confidence level. Significant results of coefficients based on the value of *t*-statistic have been reported. So that if

Table 4: Cronbach's alpha coefficient, combined reliability, mean variance extracted

Variables	Cronbach's alpha	CR (Combined reliability)	AVE (mean extracted variance)
Internal environmental management	886.0	890.0	502.0
Buy green	917.0	919.0	606.0
Customer environmental cooperation	895.0	897.0	582.0
Reversible logistics	912.0	0/913	515.0
Environmental function	910.0	911.0	569.0
Develop green skills	713.0	714.0	614.0
Green motivation	802.0	806.0	619.0
Green intervention	0.763	0.764	610.0
Environmental results	0.723	0.725	669.0
Performance of environmental management accounting system	0.854	0.860	632.0
Environmental management accounting system	0.965	0.967	664.0

Table 5: Results of Kolmogorov-Smirnov test to test the assumption of normal or abnormal

Variables	Sample size	Test statistics	P-value
Internal environmental management	130	0.199	0.000
Buy green	130	0.207	0.000
Customer environmental cooperation	130	0.170	0.000
Reversible logistics	130	0.191	0.000
Environmental function	130	0.145	0.000
Develop green skills	130	0.217	0.000
Green motivation	130	0.155	0.000
Green intervention	130	0.128	0.000
Environmental results	130	0.161	0.000
Performance of environmental management accounting system	130	0.108	0.001
Environmental management accounting system	130	0.082	0.030

the value of *t*-statistic is more than 1.96, it can be concluded with 95% confidence that the independent variable has an effect on the dependent variable. In the standard mode, numbers higher than 0.4 are approved.

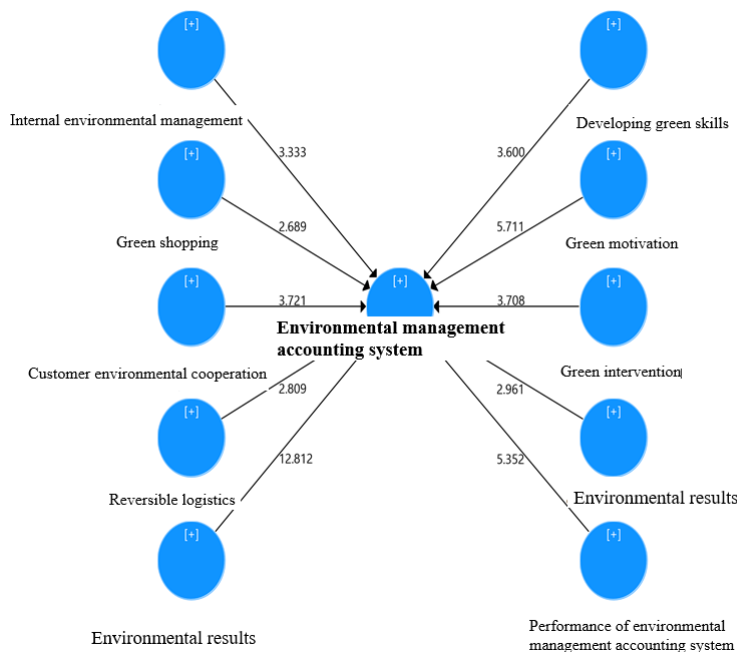


Figure 1: Significant coefficients of *t*-value in the conceptual model

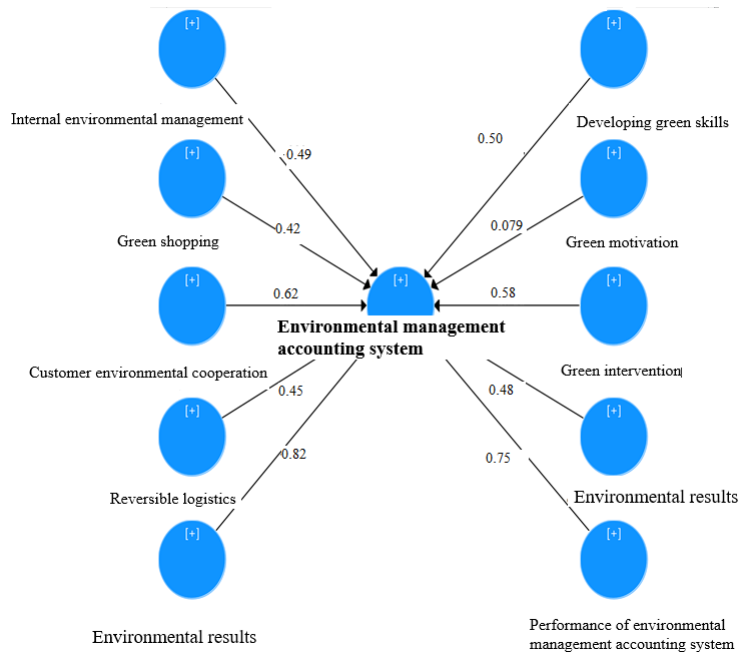


Figure 2: Path coefficient in the conceptual model

Numbers are in a strong fit mode in both standard and model significance modes. Three values of 0.01, 0.25 and 0.36 have been introduced as weak, medium and strong values for this criterion.

$$\text{Model of } GOF = \sqrt{\text{Communality} \times R^2} = \sqrt{0.647 \times 0.812} = 0.72$$

The results of Goof overall fit showed that the model has a strong fit. What is the ranking of the effective components on the implementation of environmental management accounting system in the petrochemical and metal industries? Friedman test is used.

Table 6: Prioritization of effective components on the implementation of environmental management accounting system in petrochemical and metal industries using Friedman analysis of variance

Priority	Components	Average rating
3	Internal environmental management	4.2859
4	Buy green	4.2856
2	Customer environmental cooperation	4.3055
9	Reversible logistics	4.1708
7	Environmental function	4.2168
5	Develop green skills	4.2558
10	Green motivation	4.1173
8	Green intervention	4.1846
1	Environmental results	4.3442
6	Performance of environmental management accounting system	4.2519

Here, the component of environmental results has a better rank and has the first rank, and the component of customer environmental cooperation has the second rank, and the component of internal environmental management has the third rank.

Conclusion

The purpose of this study is to present a proposed model affecting the environmental management accounting system in the petrochemical and metal industries in Iran. Results of the main research question What is the proposed model affecting the environmental management accounting system in the petrochemical and metal industries in Iran? showed that several criteria are used to evaluate the fit of the structural model of the research, the first and most

basic criterion is the coefficients of significance t . The fit of the structural model using t -coefficients is such that these coefficients must be greater than 1.96 in order to confirm their significance at the 95% confidence level. Significant results of coefficients based on the value of t -statistic have been reported. So that if the value of t -statistic is more than 1.96, it can be concluded with 95% confidence that the independent variable has an effect on the dependent variable. In the standard case, numbers higher than 0.4 are approved and are consistent with the results studies of Zayed et al. [37] and Musa and Osman [27]. Results of the first sub-question: What are the effective components on the implementation of environmental management accounting system in petrochemical and metal industries? Showed internal environmental management, green purchasing, customer environmental cooperation, reversible logistics, environmental performance, green skills development, green motivation, green intervention, environmental outcomes, performance of environmental management accounting system and with studies by Singh et al. [34], Lee [20] aligns. Results of the second sub-question: What is the ranking of the components affecting the implementation of the environmental management accounting system in the petrochemical and metal industries? Showed that the component of environmental results has a better rank and has the first rank and the component of customer environmental cooperation has the second rank and the component of internal environmental management has the third rank and is in line with the studies of Mishra [25], Jopta et al. (2019).

The results of this sub-question: What is the conceptual model for implementing the EMA system? The results of general fit of Goof showed that the model has a strong fit and is consistent with the studies of Mumtaz et al. [28] and Adnan (2018). The path coefficient between the internal environment management variable and the environmental management accounting system is 0.491 and the t -statistic is 3.333. The path coefficient between the green purchase variable and the environmental management accounting system is 0.427 and the t -statistic is 2.689. The path coefficient between the customer environmental cooperation variable and the environmental management accounting system which is 0.629 and also the t -statistic is 3.721. The path coefficient between the reversible logistics variable and the environmental management accounting system which is 0.451 and also the t -statistic is 2.809 The path coefficient between the environmental performance variable and the environmental management accounting system is 0.827 and the t -statistic is 12.812. The path coefficient is between the green skills development variable and the environmental management accounting system is 0.509 and the t -statistic is t . The path coefficient between the green motivation variable and the environmental management accounting system is 0.793 and the t -statistic is 5.711. The path coefficient between the green intervention variable and the environmental management accounting system is 0.582 and the t -statistic is t . 3.708 is the path coefficient between the environmental results variable and the environmental management accounting system which is 0.487 and also the t -statistic is 2.961 which is the path coefficient between the performance variable of the environmental management accounting system and the environmental management accounting system which is 0.752 Also, the t -statistic is 5.352 and is consistent with the studies of Mittal et al. (2008). Finally, the suggestions are based on the results of the research: creating museums of the organization and transferring the desired ideas to the minds of employees and clients, creating and developing a succession planning process to nurture new leaders in the organization and a strong relationship between performance management and green job descriptions. A solution for implementing green performance management and a way of management according to which organizations perform activities that have a positive impact on society. Ensuring the survival and sustainability of the organization and green human resource management activities in order to inform and empower employees about environmental issues Increasing population and resource scarcity, environmental pollution led to new approaches to the organization and management that commitment and responsibility Social was also the result of those developments. The strategy pays close attention to the category of human resources and organizational capabilities as the axis of competitive advantage.

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