Economics and Business
ISSN 2256-0394 (online)
ISSN 2256-0386 (print)
2023, *37*, 15–36
https://doi.org/10.2478/eb-2023-0002
https://content.sciendo.com

THE ROLE OF ENVIRONMENTAL MONITORING IN PROMOTING GREEN CREATIVITY

Ibrahim Mohamed TAHA[1], Ali Abdulhassan ABBAS[2]*

[1] *Sadat Academy for Management Sciences, Tanta, Egypt*
[2] *University of Kerbala, Kerbala, The Republic of Iraq*
**Corresponding author's e-mail: ali.abd.alhassan@uokerbala.edu.iq*

Received 28.12.2022; accepted 28.01.2023

Abstract. The main objective of the research article is to demonstrate the role played by environmental monitoring in promoting green creativity by creating competitive new products, services, processes, procedures and systems designed to use natural resources at the lowest level and to provide a better quality of life. The research relied upon the independent variable, i.e., environmental monitoring including different dimensions such as the technical field and environmental accounting. On the other hand, the dependent variable is green creativity and has four dimensions (such as green creative motivation, green creative thinking, green creative behaviour and green creative outcome). For this study, the researchers selected a sample of auditors and accountants associated with some of the factories in Iraq-Karbala Governorate, and the sample size was 138. To attain the objective, the analytical descriptive approach was adopted which was leveraged to answer the main question: Are the heads of organisations aware of the role played by environmental monitoring in promoting green creativity? The research question was answered by testing four hypotheses and all of them were verified. The research found that there was a weakness in environmental monitoring and green creativity in a few aspects. It was represented by the weak environmental awareness of the employees and organisations towards green creativity and environmental sustainability. The organisations did not show any interest in adopting materials with less environmental harm. Therefore, it is necessary to review the environmental laws in Iraq and reformulate them to be stringent in applying the environmental monitoring laws and imposing fines.

Keywords*: environmental monitoring, green creativity.*

JEL Classification: M41, Q01

INTRODUCTION

Environmental monitoring refers to tools and techniques that are designed to monitor the environment, characterise its quality and establish the environmental standards. The rationale behind this phenomenon is to accurately quantify the impact of an activity on the environment. With the help of these tools, the data are collected, statistically analysed and the results are published in risk assessment reports, subjected to environmental monitoring and impact assessment (Salman,

2011). Environmental monitoring process remains a source of information for management to take decisions that do not harm the environment. Further, it provides information that helps the leadership at an organisation to set future plans, develop skills among the human resources and enable them to increase their intellectual capabilities in the field of environment. Environmental monitoring also contributes to error identification in an organisation and pave the ways to find the best means to raise efficiency (Jameel, 2017).

Across the globe, it has become a necessity for all the governments to compete with one another in developing strategic plans for the advancement of their social and economic environments. However, most of the organisations do the opposite, as a result of intense competition among the organisations. Therefore, the organisations resort to achieving a rapid growth in all the fields, especially in commodity production. This scenario forces a number of organisations to increase their production and marketing share at the expense of exploiting the environment. However, when environmental monitoring is in place, it tends to enhance the organisation's search for many creative means that affect the environment. Through green creativity, an effective strategy is incorporated to overcome the challenges of achieving environmental sustainability for business organisations. This is achieved by employing technology to protect the environment, achieve sustainable development, manufacture products and provide services, processes, procedures and new competitive systems that are designed to use natural resources at the lowest level, to provide a better quality of life.

There is a set of objectives related to the research, which are to identify the concept of environmental monitoring and green creativity so as to understand the challenges faced by environmental monitoring on industrial projects in Iraq and identify the role played by environmental monitoring in measuring the commitment of industrial organisations towards the environment. Further, the study also attempts at identifying the concept of green creativity and the most important methods that need to be adopted and implemented by the Iraqi organisations. The current research seeks to achieve the following sub-goals.

1. Identification of the importance of environmental monitoring and green innovation for industrial organisations;
2. Evaluation of the attitude of industrial organisations towards the environment and sustainability and the associated issues;
3. Evaluation of the role played by environmental oversight in improving the green innovation of the organisations;
4. Proposing ideas to activate the role of environmental monitoring in increasing green creativity.

Traditional monitoring no longer meets the needs of rapidly changing environment, which demands the development of a holistic view, which is inclusive of new concepts of environmental control. Such a novel concept should highlight the importance of environmental monitoring since it is a global problem experienced by all the countries across the globe, instead of a local problem. Therefore, the objectives of environmental monitoring are to study the impact of training programs implemented by the organisations, the extent of their impact on national economy and the extent of their effectiveness in promoting green

creativity. Environmental monitoring also helps in identifying any deficiencies in the legislation related to the environment in order to address them through the development of new legislation for the environment. Environmental monitoring shows the extent to which the organisations adhere to the environmental laws and legislation for the purpose of attaining green creativity (Siam & Alkhalaileh, 2021).

1. THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

1.1. Environmental Monitoring

The European Union Committee on Environmental Monitoring defines the phenomenon as an examination process that aims at ensuring the compliance with environmental regulations and the data and information contained in the environmental report can be relied upon. All the important environmental issues have been covered in the report. The US Environmental Protection Agency defines environmental monitoring as "*a process of periodic, systematic, and credible critical examination by an independent body with the legal authority of production processes and associated sub-activities to determine their impact on the environment.*" The British Standards Institute defines environmental monitoring as "*a process of systematic evaluation to determine the compatibility of the environmental management system of the facility with the planned programs and to determine the effectiveness and suitability of that system to achieve the environmental policy of the facility*." The definition of the International Organisation of Supreme Audit Institutions for Environmental Protection is as follows: "*the independent external oversight carried out by neutral bodies, and it has three types, which are environmental financial oversight, environmental performance oversight, and compliance oversight.*" (Siam & Alkhalaileh, 2021; Jameel, 2017). Environmental monitoring includes plans and procedures that aim at ensuring that all the individuals and facilities adhere to the environmental standards and safety and prevention procedures so as to reduce the environmental pollution. This is to ensure the safety of all the living beings, and protect and preserve the human resources for future generations (Hassan & Al-Basri, 2021). It is one of the pillars and means of success in the environmental planning domain, since it represents a safety valve to ensure compliance with the environmental requirements included in the plans. Environmental monitoring also provides a corrective mechanism for feedback, which can result in amending the plans so as to achieve harmony with development goals. If necessary, the goals have to be amended to achieve it. Environmental monitoring is considered one of the components of environmental planning (Ali, 2015). It has an effective role in achieving sustainability and green creativity by striving its best to preserve the environment and natural wealth. On the other hand, it also aims at mitigating the increasing pollution rates, which are a result of increased industrial and food production rates, as well as oil and gas production operations. Thus, the ever-increasing pollution rates have made the world's eyes turn towards finding the appropriate solutions to provide equal and fair opportunities for all the individuals

in terms of enjoying the natural resources (Abdel Karim & Hamdan, 2017). There is an increased interest found among environmental monitoring enthusiasts since there is a need to regulate the relationship between the available limited resources and the levels of human activity. Further, there is a need to find an appropriate way for legalizing the situation, to achieve human interests without harming them and their resources, and to resort to scientific methods for achieving the appropriate solutions by applying green creativity. This becomes the need of the hour to reduce the pollution and various other emission rates and control the elements of disruption of the ecosystem. Environmental monitoring is required to protect the public and the environment from toxic pollutants and pathogens that get released in groups through a variety of media including air, soil, and water (Al-Bakoa'a & Khader, 2018; Salman, 2011).

The interest towards the environmental issues is increasing continuously, while the costs of preserving the environment are also increasing. The environmental disclosure of those costs and the costs of compliance with environmental laws have become the most important matters for organisations. The organisations have to draw up periodic reports on their environmental performance and such reports are subjected to regular monitoring. Two groups of pressure affect the emergence and development of environmental monitoring report such as the direct pressure, which encourages the development of environmental reports and their continuous monitoring, and the legal pressure and financial fines imposed in the event of violating the environmental conditions (Rawani, 2007). One of the most important objectives of environmental monitoring is to verify an organisation's compliance with environmental laws and regulations. Some of the activities that can best interpret the environmental monitoring outcomes are as follows:

- Periodical evaluation of the environmental management systems;
- Enhancement of an organisation's image in front of the society through its commitment to adhering to the environmental standards;
- Finding advantages for an organisation's activities and increasing its profitability;
- Systematic examination of the interactions between an organisation's operations and the surrounding environment;
- Assisting the management to achieve the goal of environmental protection;
- Facilitating the administrative oversight of environmental practices;
- Evaluation of the efficiency and effectiveness of the bodies and agencies that perform environmental monitoring in terms of its evaluation on the environmental situation affected by the environmental violations due to waste of all kinds;
- Verifying the compliance with the application of standards and requirements set for the disposal of waste in light of the executive regulations of the environmental protection and improvement law and the law of establishing the environmental monitoring bodies.

The importance of environmental monitoring stems from the fact that it helps in identifying the causes behind the failure of adherence to the required level of environmental performance in the units, subjected to audit. Further, such action also

suggests the necessary ways to bring reforms, avoid such drawbacks in the future, adopt the accuracy and safety of the environmental information to achieve the objectives of environmental national plans. Environmental monitoring is also important in raising the economies of countries. For instance, the data of Chinese Ministry of Environmental Protection show that the economic indicators of many cities subjected to the environmental control system have witnessed an upward growth, contrary to the expectations. This outcome has embarked the Chinese Ministry of Environmental Protection, since 7 April 2017, to implement the largest environmental monitoring campaign in history. It has been implemented as a component of strengthening the air pollution control efforts in Beijing, Tianjin, Hebei and surrounding cities (Al Naas, 2020; Siam & Alkhalaileh, 2021; Alsaad, 2007).

Environmental monitoring is conducted through several types (Siam & Alkhalaileh, 2021) as given below.

1. Environmental financial monitoring: It is used to determine whether the financial statements of an entity, under control, reflect its environmental costs or not. This is done by evaluating the accounting and financial documents and regulations and ensuring that the costs, obligations, and assets related to the environment have been identified and valued and, finally, a report is drawn up in this regard. This report should adhere to the generally-accepted accounting and financial rules.
2. Monitoring the environmental performance: It means to audit the funds spent for environmental activities in order to determine whether the required and the predetermined goals have been achieved. The environmental performance monitoring is used to see whether the entity, under monitoring, efficiently achieves its environmental goals.
3. Monitoring the environmental compliance: It is used to assess the extent of compliance with laws and agreements. The directives for monitoring the environmental compliance are specified herewith; monitoring the government follow-ups to comply with the environmental laws, monitoring the performance of government and other non-governmental programs related to the environment, and monitoring the environmental management systems, in addition to the evaluation of the proposed environmental policies and programs.

In this background, environmental monitoring plays an important role identifying the disadvantages, problems, and dangers faced by the administrative system of the environmental wings of the organisations. Some of the activities include the development of organisational capabilities and the capabilities of technical staff who work on applying the environmental monitoring and develop a clear vision of the requirements and elaborate scientific programs at the organisations that work for the environment such as monitoring and collection of samples and directing the training programs (Ho et al., 2005; Oliveira & Rodrigues, 2011).

1.2. Green Creativity

Green creativity is defined as the development and implementation of new products and processes that contribute to sustainable environment. This phenomenon facilitates the achievement of environmental goals and reduces the environmental footprint across the entire manufacturing processes and product life cycle. This action in turn effectively helps the organisations to enhance productivity, reputation of the organisation and the development of new markets. Green creativity consists of either green radical innovation or green gradual innovation. The importance of green creativity is understood, when an organisation enjoys a great competitive advantage at both local and international levels and promotes development. Green creativity contributes towards the enhancement of a clean environment by providing energy resources and meeting the needs of society in sustainable scientific ways that are subjected to environmental control without harming or depleting the natural resources (Habib & Sanaa, 2021; Al-Bakkoa & Al-Saegh, 2010). Green creativity is physical and programmatic creativity that is related to green products or processes, including the energy storage and conservation, prevention of pollution, waste recycling, designing green products and environmental management for the organisation. Through these measures, green creativity contributes to meeting the requirements of environmental protection and preservation. It heavily focuses on practices that reduce the environmental impact and create a clean work environment with the help of green manufacturing processes and environmentally-friendly, recyclable products (Mahmoud et al., 2022; Żywiołek et al., 2022).

The philosophy of green creativity emerged as a result of increasing interest among the organisations towards social responsibility and environmental monitoring. This is one of the reasons that prompted a number of organisations to pay attention to the new trend of green creativity, as a result of tremendously increasing environmental issues that threaten the lives of millions of people (Yousfi & Youb, 2020). Green creativity is a critical element in organisations and is directly related to the organisation's strategy. This is because the concept works to create something new of high value and has a positive impact on the surrounding environment. It represents a process to reduce the material density and the negative impact on the production activities, while it also creates added value through continuous improvement. It is important for the organisations to move their creativity towards green creativity, which adds an environmental description to those products and services that seek to protect or improve the natural environment by conserving the energy and materials and eliminating the waste and emissions (Umair et al., 2018; Abbas & Al Hasnawi, 2021).

Green creativity is the production of new and useful ideas about green products. The recent studies have shown that green creativity is positively correlated to the performance of developing green products and achieving environmental sustainability. The aim of this phenomenon is to reduce the negative impacts on the environment by the organisations so as to achieve their primary purpose, i.e., social responsibility and provide benefits to the society and the organisation which in turn improve their environmental performance (Jiang et al., 2020; Al-Talibi et al., 2021).

Green creativity is the creation of competitive new products, services, processes, procedures and systems that are designed to use natural materials at the lowest possible level to provide a better quality of life. It is also distinguished, especially at the level of products, materials, and the production processes that respect the sustainability of nature and the leading generations. The intention is also to contribute to the sustainable development and the renewal of nature. Green creativity creates technological means to address the climate change, the most important issue of the recent decades. While a number of challenges and problems are faced in this era, the effects of climate change must be mitigated and sustainable practices should be adopted. The concept of green creativity is based on the development of synonyms or related structures such as the environmental creativity and environmental efficiency (Yang et al., 2019; Abdelhadi & Fouad, 2020; Lovett et al., 2007). Green creativity is also concerned with promoting the economic growth and development, while at the time it is also about ensuring the continuity of the natural assets to provide environmental resources and services for the well-being of humanity. It also plays an important role to reduce the cost of the produced materials (Maitlo et al., 2022; McDonald, 2003). The benefits of green creativity can be identified through simple measures such as by enabling the organisations to obtain commercial rewards for creating environmentally sustainable products, achieving financial benefits that can increase the competitiveness of the organisations, improving the performance of environmental management to meet the environmental requirements and laws. Green creativity plays a mediating role in environmental ethics and returns competitiveness. It provides a great opportunity to meet the customer demands without harming the environment. Further, it can also improve the performance of the organisation, achieve efficiency in the use of resources and energy, enable the organisations to reduce costs and increase the revenues (Al-Talibi et al, 2018).

1.3. Dimensions of Green Creativity

Several researchers referred to a group of dimensions (Jiang et al., 2020; Maitlo et al., 2022; Li et al., 2020):

1. *Green creative motivation*: It refers to the internal desire in the soul and thinking of the individual to generate substantial ideas for the production and development of green products that reduce environmental pollution and achieve long-term sustainability. The presence of these individuals in the organisation will serve as the engine and catalyst for the rest of the staff to generate new fundamental ideas.
2. *Green creative thinking*: It requires individuals to possess cognitive capabilities in identifying fundamental problems, finding solutions to them in creative ways, and to enjoy cognitive flexibility in developing strategic plans and solutions in line with every new problem that appears before them, and to be able to collect different ideas from their peers and discuss them in a serious and flexible manner to reach the core idea.
3. *Green creative behaviour*: It is the ability of individuals to learn green behaviours and skills and the ability to communicate and exchange these green behaviours and knowledge in a flexible manner with others, to

achieve green creative goals through offering or developing green products, and they have the fundamental capabilities to improve their dynamic capabilities and develop their green behaviour.

4. *Green creative outcome*: An effort to develop new ideas and proposals for green products, green services, green processes, or green practices, which are judged and recognized as original, novel, and beneficial to the environment. It is a strategic effort to reduce the negative effects of production processes on the environment so as to contribute to achieving environmental sustainability. Here we emphasise the need to quickly consider the quantity, quality and value of creative ideas when employees develop and implement green products.

2. METHODOLOGY

2.1. Sample and Data Collection

For this study, the researchers selected a number of auditors and accountants working at various public and private sector organisations in the industrial field at Karbala governorate. The industrial sector was chosen for the study due to its connection to the environment and to achieve highly accurate results. In addition, some of the environmentally-active organisations provided a few directives along with the Ministry of Environment to move towards the implementation of environmental standards to reduce the pollution. This is because the pollution has become wide-spread in Iraq due to neglect and lack of interest over the previous years. Further, this has increased the importance of the sample chosen for the current study. Therefore, the current study is considered to be a basic means for the detection of weaknesses in these concepts within the study sample. The data were collected in October 2022 by selecting a random sample of accountants and auditors. The data were collected using an electronic questionnaire developed as google forms. A total of 138 complete questionnaires, valid for statistical analysis, representing (75.2) was obtained from the study population. Invalid, incomplete and inaccurately-filled questionnaires were ignored. Accountants and auditors were given a month to complete the survey. In this questionnaire, five-point Likert scale was used and the data were analysed accordingly.

2.2. Scales

Environmental Monitoring (EM): The authors developed the Environmental Monitoring Scale based on the literature (Al-Bakoa'a & Khader, 2018; Abdelhadi & Fouad, 2020), which includes two dimensions such as the technical field (TF) (5) paragraphs and the environmental accounting (EA) (14) paragraphs.

Green Creativity (GC): It was based on a scale developed in the literature (Jiang et al., 2020). It has four dimensions such as the Green Creative Motivation (GCM) (4) paragraphs, Green Creative Thinking (GCT) (3) paragraphs, Green Creative Behaviour (GCB) (2) paragraphs and Green Creative Outcome (GCO) (3) paragraphs.

2.3. Research Hypothesis

Green innovation seeks to promote economic growth and ensure that natural assets continue to provide the environmental resources and services on which the well-being of humanity depends. With the growing concern about future sustainability, we need a new pattern of economic growth that supports the demand for a model that is environmentally friendly. We cannot expect that the current production technology and consumer behaviour will lead to positive results. Therefore, it has become necessary to have environmental monitoring and green creative thinking to help separate economic growth from the depletion of natural capital. Green creative thinking will generate new ideas and models through environmental monitoring that will help build a new pattern of sustainable economic growth.

Environmental monitoring is one of the elements of environmental planning and green creativity. In the presence of environmental monitoring, both sustainability and green creativity can be achieved. It is necessary to monitor pollution and make the organisations reduce the pollution levels by following administrative procedures and developing effective control plans. This makes the organisations to search for creative ways using which the environmental pollution can be reduced (Abdelhadi & Fouad, 2020). The restrictions applied by the environmental monitoring processes motivate the organisations to increase their research and development expenditures that can reduce pollution or modify their products to become green products (Jiang et al., 2020). Environmental monitoring works to minimize the negative impacts on the environment. On this basis, the first main hypothesis has been developed from which various hypotheses branch out as given below (Al-Bakoa'a & Khaleb, 2018).

H1: *There is a significant relationship between environmental monitoring and green creativity.*

Sub-Hypotheses

H2: *There is a significant relationship between environmental monitoring and green creative motivation.*

H3: *There is a significant relationship between environmental monitoring and green creative thinking.*

H4: *There is a significant relationship between environmental monitoring and green creative behaviour.*

H5: *There is a significant relationship between environmental monitoring and green creative outcome.*

3. RESULTS

In this study, Statistical Software for Social Sciences (SPSS V. 26) and (SmartPLS 3.2.7) were used for SEM-PLS modelling to analyse the data collected. The first section describes the data preparation procedures. Section two examines

the measurement model for instrument reliability and validity. Section three includes the construction of some of the descriptive statistics and bivariate correlations. Finally, the structural model for evaluating the hypotheses underpinning this work has been built.

3.1. Data Examination

According to the literature (Hair et al., 2017), missing data, outliers, normalcy, and Common Method Bias (CMB) should all be examined in the acquired data. As a result, SPSS was used in this study to investigate the primary data issues. The issues regarding the missing data and the outliers were investigated and no problems were found. Harman's single-factor test, which is widely used by the researchers, can detect the CMB; the percentage of the factors explained and the variance determines, whether the bias is present or not. If the factor's total variance is less than 50 %, then the common method bias does not affect the results. The first component was found to explain just 28.2 % of the overall variation. Since the value was less than 50 %, it might be assumed that the CMB problem was not recognised. Furthermore, the VIF values were less than 3.3 which confirmed the absence of this condition (Kock, 2015).

Table 1. Normality Testing

Construct	N	Skewness	Kurtosis	Remark
Technical Field	138	−0.359	−0.869	***Remark***: Normality assumption attained
Environmental Accounting	138	−0.794	−0.562	
Green Creative Motivation	138	0.139	−0.965	
Green Creative Thinking	138	−0.314	−0.851	
Green Creative Behaviour	138	−0.485	−0.633	
Green Creative Outcome	138	−0.664	0.44	
Green Creativity	138	−0.785	−0.446	
Environmental Monitoring	138	−0.173	0.446	

The normality test findings shown in Table 1 demonstrate that the values of Skewness and kurtosis for all the constructs were within the range of ±2. This indicates that the variables are normally distributed (Trochim & Donnelly, 2006; Gravetter & Wallnau, 2014).

3.2. Measurement Model Assessment

This part includes the evaluation of the measurement model and some descriptive data for each item.

Table 2. Descriptive Statistics, Reliability and Validity Analyses

Construct	Dimension	Item	Min	Max	Mean	SD	Loading	CR	AVE
Environmental Monitoring	Technical Field	TF1	2	5	3.99	0.974	0.715	0.784	0.422
		TF2	1	5	3.51	1.303	0.647		
		TF3	1	5	3.72	1.208	0.625		
		TF4	1	5	3.87	1.151	0.6		
		TF5	1	5	3.64	0.935	0.655		
	Environmental Accounting	EA1	1	5	3.67	1.061	0.626	0.912	0.43
		EA2	1	5	3.57	1.073	0.49		
		EA3	1	5	3.73	1.091	0.507		
		EA4	1	5	3.51	1.154	0.548		
		EA5	1	5	3.67	1.083	0.622		
		EA6	1	5	3.76	0.948	0.754		
		EA7	2	5	3.94	0.972	0.79		
		EA8	1	5	3.93	1.122	0.673		
		EA9	1	5	3.75	0.967	0.672		
		EA10	1	5	3.72	1.025	0.648		
		EA11	2	5	3.91	0.978	0.722		
		EA12	1	5	3.93	1.055	0.726		
		EA13	1	5	3.6	0.892	0.691		
		EA14	1	5	3.83	1.043	0.639		
Green Creativity	Green Creative Motivation	GCM1	1	5	2.98	1.287	0.598	0.805	0.513
		GCM2	1	5	3.11	1.387	0.607		
		GCM3	1	5	3.28	1.367	0.785		
		GCM4	1	5	3.51	1.384	0.842		
	Green Creative Thinking	GCT1	1	5	3.8	1.255	0.683	0.801	0.575
		GCT2	1	5	4.07	0.914	0.796		
		GCT3	1	5	4.04	0.832	0.79		
	Green Creative Behaviour	GCB1	2	5	4.04	0.87	0.878	0.876	0.78
		GCB2	2	5	3.99	0.81	0.889		
	Green Creative Outcome	GCO1	1	5	3.99	0.778	0.845	0.76	0.529
		GCO2	1	5	4.02	0.85	0.816		
		GCO3	1	5	3.68	1.19	0.453		
Remark: Reliability and validity attained									

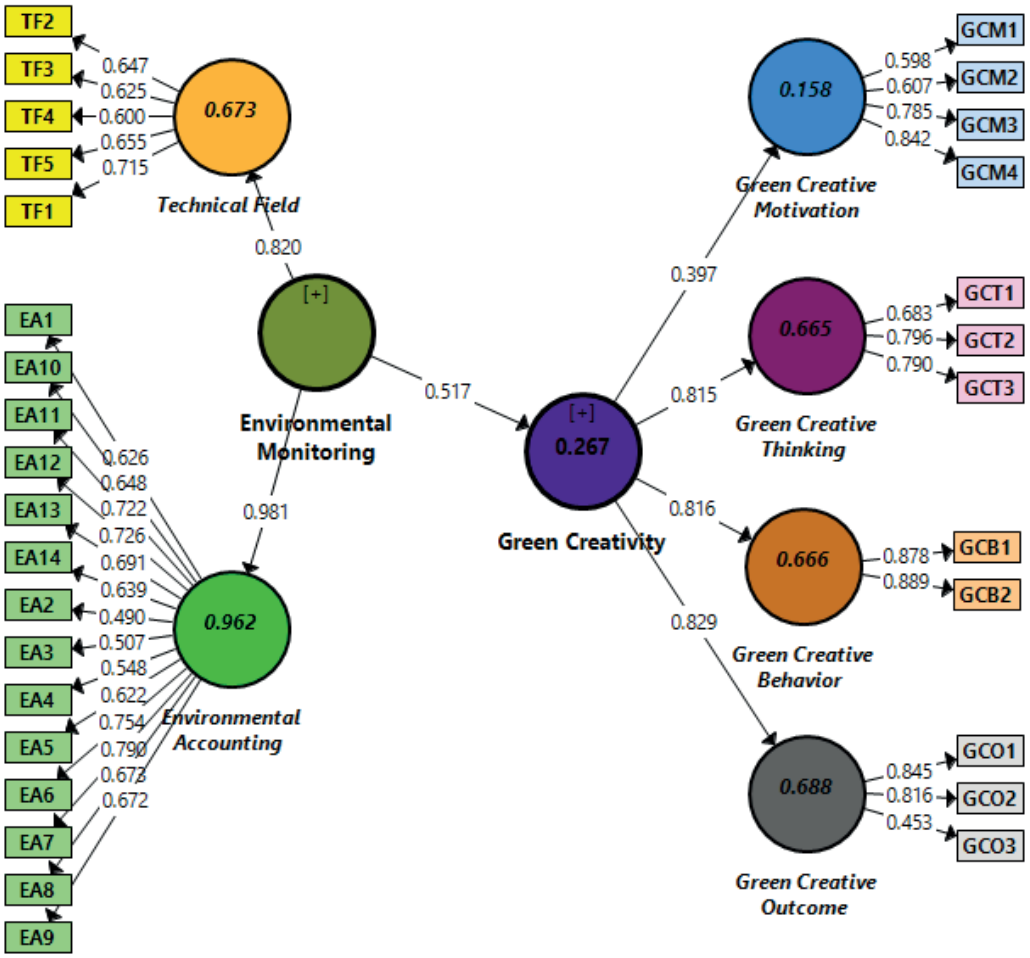


Fig. 1. Measurement model assessment.

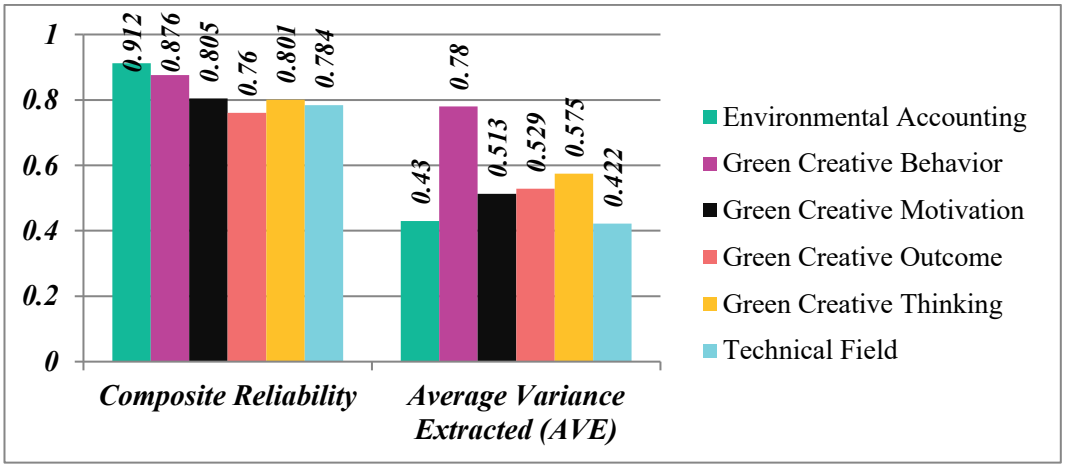


Fig. 2. Reliability and validity summary.

Internal consistency reliability, convergent validity and discriminant validity must be evaluated whenever assessing the measurement models. Table 2 displays the extracted findings of the internal reliability and convergent validity values via item loadings, composite reliability (CR), and average variance (AVE). The composite dependability assesses the internal consistency taking into account the fact that each indication has a different outer loading. The recognised value of the CR was higher than 0.7 (Hair et al., 2017). All of the CR values were more than 0.7.

Table 3. HTMT Values

	Environmental Accounting	**Green Creative Behaviour**	**Green Creative Motivation**	**Green Creative Outcome**	**Green Creative Thinking**
Green Creative Behaviour	0.608				
Green Creative Motivation	0.307	0.255			
Green Creative Outcome	0.539	0.901	0.512		
Green Creative Thinking	0.569	0.759	0.332	0.808	
Technical Field	0.89	0.701	0.31	0.571	0.503
***Remark*:** Discriminant validity attained					

Both AVE and the item loadings were used to assess the convergent validity of the reflective measurement models. The recognised values of AVE were larger than 0.5; however, the values more than 0.4 were also acceptable, provided the values of CR were more than 0.6 (Fornell & Larcker, 1981). In terms of item loadings, the values higher than 0.4 are considered to be sufficient. In line with the above-mentioned guidelines, both reliability and validity of the selected constructs were established, since the CR values were higher than 0.7 and the item loadings and AVE values were higher than 0.4. After proving the convergent validity, the discriminant validity must be investigated. The discriminant validity investigates the variance of a construct from another one. Hetrotrait-Monotrait ratio is commonly used to determine the discriminant validity (HTMT). HTMT is defined as "*the ratio of between-trait correlations to within-trait correlations*" (Hair et al., 2017). The HTMT value should be less than 1 (Gaskin et al., 2018). The discriminant validity, shown in Table 3, was constructed using these guidelines, since all of the constructs had HTMT values less than the stated threshold.

3.3. Descriptive Statistics and Multiple Correlations

After determining the reliability and the validity of the variables, it is time to present some descriptive statistics and the correlations among the selected constructs. It includes Pearson correlation coefficient, mean (M), and Standard Deviation (SD) as reported in Table 4. To establish the degree and direction of the link between the dependent and independent variables, Pearson product-moment correlation coefficient analysis was performed. Table 4 displays the Pearson correlation coefficient matrix for all the variables in this research. The correlation analysis outcomes suggest that most of the relationships were statistically significant. The correlation coefficients, marked with three stars (***), were significant at 0.001, i.e., 99.9 % confidence level, the coefficients marked with two stars (**) were significant at 0.01, i.e., 99 % confidence level, coefficients marked with one star (*) were significant at 0.05, i.e., 95 % confidence level, and finally, the coefficients marked with (NS) were insignificant at 0.05, i.e., P-values were higher than 0.05. Moreover, the significant coefficients were in the range of a weak relationship (0.225) to a strong relationship (0.921).

Table 4. Descriptive Statistics and Bivariate Correlation

Construct	1	2	3	4	5	6	7	8
1. Technical Field	1	0.672^{***}	-0.087^{NS}	0.308^{***}	0.472^{***}	0.284^{***}	0.921^{***}	0.309^{***}
2. Environmental Accounting		1	-0.088^{NS}	0.406^{***}	0.484^{***}	0.312^{***}	0.907^{***}	0.355^{***}
3.Green Creative Motivation			1	0.225^{***}	0.072^{NS}	0.298^{***}	-0.096^{NS}	0.646^{***}
4. Green Creative Thinking				1	0.484^{***}	0.422^{***}	0.389^{***}	0.733^{***}
5. Green Creative Behaviour					1	0.513^{***}	0.523^{***}	0.687^{***}
6. Green Creative Outcome						1	0.325^{***}	0.753^{***}
7. Green Creativity							1	0.362^{***}
8. Environmental Monitoring								1
Mean	3.744	3.753	3.219	3.969	4.015	3.899	3.748	3.775
SD	0.725	0.670	1.011	0.760	0.742	0.671	0.638	0.556

$^{***}P < 0.001$; $^{**}P < 0.01$; $^{*}P < 0.05$; ^{NS} Not Significant

3.4. Structural Model Assessment

Path coefficients, collinearity diagnostics, coefficient of determination (R2), effect size (f^2), predictive relevance (Q^2), and goodness of fit criteria were used to examine the structural model. Figs. 3 and 5 depict the research model with the calculated path coefficients and p-values. The results of the first hypothesis, shown in Table 5, infer that *Environmental Monitoring* has a statistically significant positive direct effect on *Green Creativity* since $\beta = 0.517$, $t = 7.429$, $P < 0.001$,

95 % CI for β = [0.344, 0.63]. Therefore, the first hypothesis is accepted. The results also confirm that the *Environmental Monitoring* has NO statistical significant effect on *Green Creativity Motivation* since β = −0.307, *t* = 1.326, *P* > 0.05, 95 % CI for β = [−0.416, 0.409]. Thus, the second hypothesis is rejected.

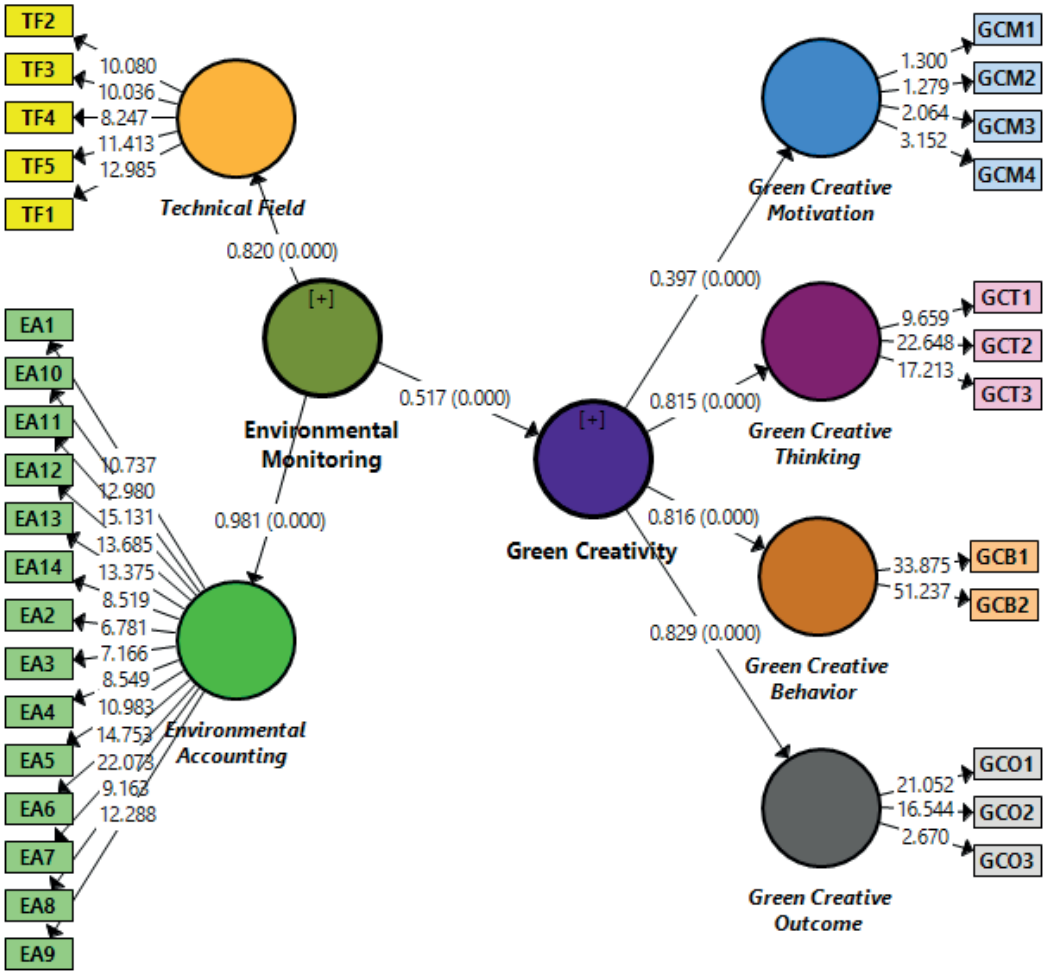


Fig. 3. The main structural model.

Furthermore, *Environmental Monitoring* has a statistically-significant direct positive effect on *Green Creativity Thinking* since β = 0.448, *t* = 6.433, *P* < 0.001, 95 % CI for β = [0.301, 0.565]. Thus, the third hypothesis is accepted. Moreover, *Environmental Monitoring* has a statistically-significant direct positive effect on *Green Creativity Behaviour* since β = 0.534, *t* = 7.927, *P* < 0.001, 95 % CI for β = [0.382, 0.647]. Thus, the fourth hypothesis is accepted. Finally, *Environmental Monitoring* has a statistically-significant direct positive effect on *Green Creativity Outcome* since β = 0.426, *t* = 5.85, *P* < 0.001, 95 % CI for β = [0.267, 0.549]. Thus, the fifth hypothesis is accepted.

Table 5. Hypothesis Testing

Path	*B*	*t-value*	*P-value*	*95% CL for B*		*Remark*
				LL	*UL*	
Main Hypothesis						
H1: *Environmental Monitoring -> Green Creativity*	0.517	7.429	***	0.344	0.63	Supported
Sub-Hypotheses						
H2: *Environmental Monitoring -> Green Creative Motivation*	–0.307	1.326	0.185 ^{NS}	–0.416	0.409	Not Supported
H3: *Environmental Monitoring -> Green Creative Thinking*	0.448	6.433	***	0.301	0.565	Supported
H4: *Environmental Monitoring -> Green Creative Behaviour*	0.534	7.927	***	0.382	0.647	Supported
H5: *Environmental Monitoring -> Green Creative Outcome*	0.426	5.845	***	0.267	0.549	Supported

$^{***}P < 0.001$; $^{**}P < 0.01$; $^{*}P < 0.05$; ^{NS} Not Significant

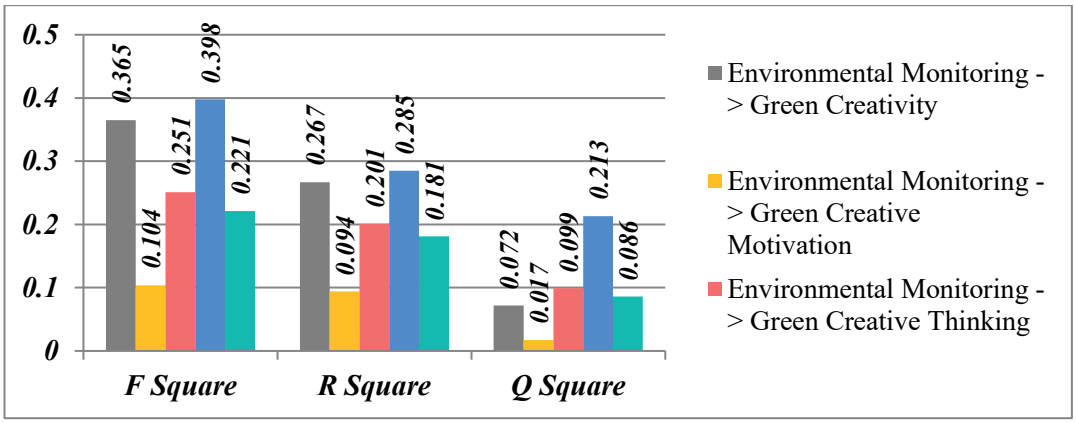


Fig. 4. Structural model assessment summary.

Table 6 shows the results which indicate that about 27 % of the variations in *Green Creativity* is explained by the variations in *Environmental Monitoring* with a high Cohen's effect size ($f^2 = 0.365$). Also, only 1 % of the variation in *Green Creative Motivation* is explained by the variation in *Environmental Monitoring* with a small Cohen's effect size ($f^2 = 0.104$).

Table 6. Structural Model Assessment

Path	F Square	R Square	Q Square	VIF
Cut-off	***> 0.02***	***> 0.1***	***> 0***	***<5***
Environmental Monitoring -> Green Creativity	0.365	0.267	0.072	1
Environmental Monitoring -> Green Creative Motivation	0.104	0.094	0.017	1
Environmental Monitoring -> Green Creative Thinking	0.251	0.201	0.099	1
Environmental Monitoring -> Green Creative Behaviour	0.398	0.285	0.213	1
Environmental Monitoring -> Green Creative Outcome	0.221	0.181	0.086	1

Cut-off values references: Chin (1998), Cohen (1988), Hair et al. (2017), Wetzels et al. (2009).

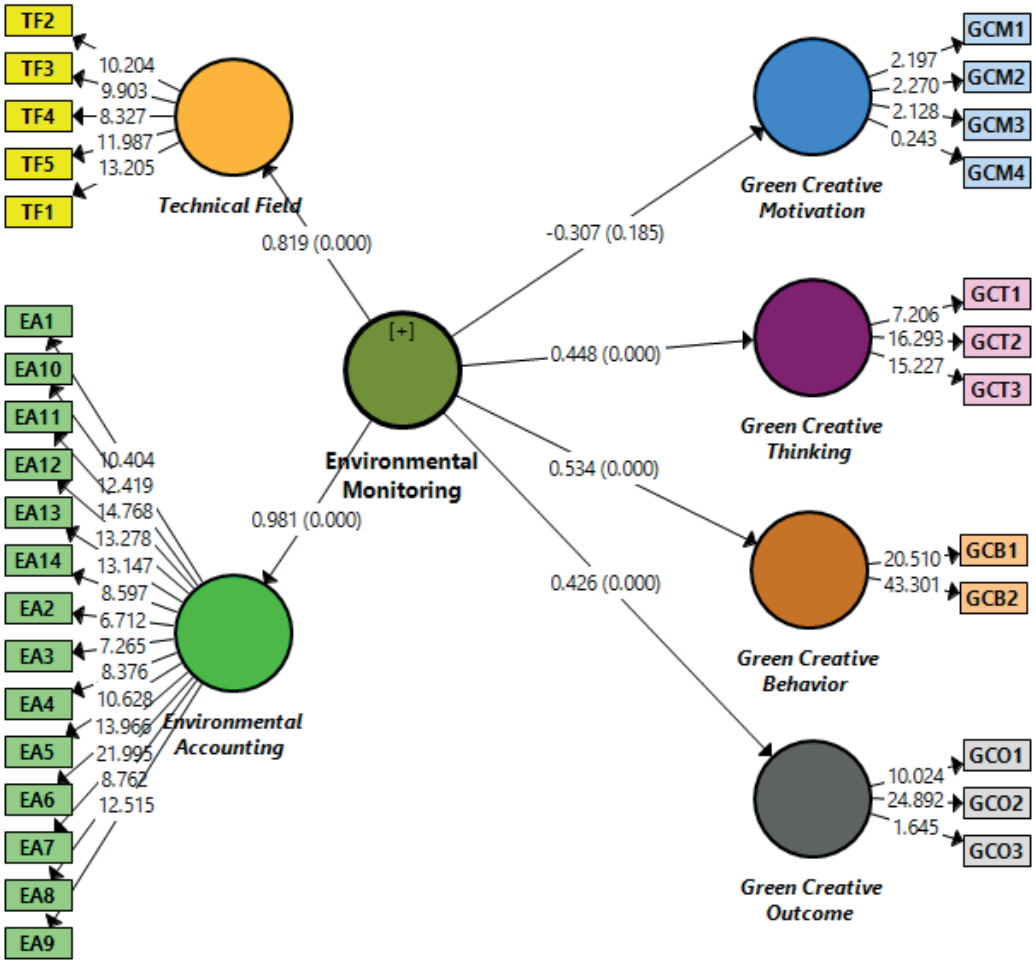


Fig. 5. Testing sub-hypotheses.

Furthermore, about 20 % of the variations in *Green Creative Thinking* is explained by the variations in *Environmental Monitoring* with a moderate Cohen's effect size as $f^2 = 0.251$. In addition, about 29 % of the variations in *Green Creative*

Behavior is explained by the variations in *Environmental Monitoring* with a high Cohen's effect size as $f^2 = 0.398$. Finally, about 18 % of the variations in *Green Creative Outcome* is explained by the variations in *Environmental Monitoring* with a moderate Cohen's effect size as $f^2 = 0.221$. All the values of Variance Inflation Factor (VIF) were below 5 which indicated the absence of collinearity problem. Then, the researchers also evaluated the predictive relevance by assessing the Stone-Geisser's Q^2 Blindfolding, which was a sample reuse technique used to calculate the Q^2 values for the latent variables. The blindfolding procedure was followed and the Q^2 values were calculated for *Green Creativity* ($Q^2 = 0.072$), *Green Creative Motivation* ($Q^2 = 0.017$), *Green Creative Thinking* ($Q^2 = 0.099$), *Green Creative Behavior* ($Q^2 = 0.213$), and *Green Creative Outcome* =($Q^2 = 0.086$). All the values were higher than 0, indicating predictive relevance for endogenous latent variables in the current study's PLS path model (Hair et al. 2017). The Goodness of Fit (GoF) was introduced by Tenenhaus et al. (2005) as a global fit metric. The GoF criterion is used to determine if GoF values are too little, too moderate, or too high to be considered for a globally-adequate PLS model. The GOF value (0.33) was between 0.25 and 0.36, suggesting a reasonable fit. Hence, it can be confidently inferred that the GoF model is sufficient to be deemed as a viable global PLS model.

4. DISCUSSION

After conducting the statistical analysis, a weakness was found in some of the aspects such as the items related to environmental control. Some of the environmental laws, regulations, and standards were not actually applied whereas the procedures related to the environment were also found to be not properly implemented as per the plan. Based on the environmental pollution reports collected in this region of Iraq, no treatments or viable solutions were found for the problem undertaken. This is because of the clear negligence on the part of state and the factories, with regard to the increase in the environmental pollution. In addition, technical personnel and the accountants working in the field of environmental control need to be trained to increase their effectiveness in dealing with environmental pollution issues. High fines should also be imposed on factories that clearly violate the environmental standards and the organisations must be urged to publish periodic reports on their environmental performance. A separate budget should be allocated by the companies to treat environmental pollution in each factory and organisations must develop environmental plans represented in setting the standards that do not violate the environment, when importing any machines or production lines. The companies should establish factories for the future that do not contribute to increased environmental pollution. Programs should also be in place to address the creative problems related to the environment and a system of rewards should be activated to arouse enthusiasm among the employees and motivate them towards green creative thinking. There should be a joint cooperation between the international and the European organisations, especially those interested in the field of green creativity and environmental fields to achieve sustainability.

CONCLUSION

Environmental monitoring reveals the extent of an organisation's interest towards the environment and the procedures and policies used to achieve sustainable environment. The rapid developments in the environment and changing views on the environment should be justified and preserved. Furthermore, the organisations should be prompted to pay attention to social responsibility and strive to achieve social profitability and environmental responsibility so that the organisations become sustainable. Some environmental monitoring activities need to be activated and executed properly to achieve maximum efficiency. An effective environmental monitoring system that is capable of diagnosing the defect points in the organisations of the study sample is missing. Many Iraqi organisations do not prioritize their strategies towards achieving environmental sustainability. This attitude is fuelled by the weak environmental awareness of the employees towards the environment and green creativity. The lack of interest among the organisations in adopting materials with less environmental harm should be overcome. Some important issues must be addressed to achieve the foundations of green creativity and environmental monitoring by forming a national level committee to prevent the entry of raw materials that harm the environment.

The current study also recommends to pay attention to the environmental monitoring processes and establish standards and procedures for environmental monitoring, emphasize the need to adopt the integrated environmental review in the organisation to achieve green creativity. Also, the need to pay attention to the environmental accounting system within the organisation must become one of the important requirements for environmental monitoring and green creativity. The environmental law must also include deterrent financial penalties and fines for violators. The environmental departments should include modern environmental laboratories and courses should be started for employees in leading foreign countries in environmental sustainability. Likewise, a strategic plan must be developed by Iraqi government on how to oblige the organisations to monitor their environment and to set the basic rules for green creativity. It is also necessary to develop the accounting staff of the organisations so that they can deal with environmental issues and green creativity. It is also necessary to enrol the accountants on environmental accounting, green creativity, and environmental sustainability courses. By adopting the concept of green creativity, the organisations can achieve many environmental benefits represented by improved natural environments, preserved societal health and environmental-friendly products that contribute to achieving sustainability. It is also necessary to increase the investment in green creativity to meet the challenges of sustainability and increase the environmental success.

ACKNOWLEDGMENT

The researchers thank their university, which supported in the completion of this article because of its important role in the environmental field. The researchers also thank the employees who information to complete the research.

REFERENCES

Abbas, A. A., & Al Hasnawi, H. H. (2021). The impact of environmental leadership on entrepreneurial success: The moderating role of green organizational behavior. *Journal Pengurusan*, *63*, 1–15. https://doi.org/10.17576/pengurusan-2021-63-12

Abdelhadi, A. H., & Fouad, M. (2020). The role of environmental control in the sustainability of natural resources (water, air, soil and groundwater) to reduce pollution: A case study of water treatment associated with crude oil extraction. *Journal of Petroleum Research & Studies*, *6*(27), A17–A40.

Abdel K., Yarob, A., & Hamdan, K. H. (2017). Environmental control of the oil industry extractive. *Journal of Accounting and Financial Studies*, *12*(38), 118–141.

Alotaibi, D. A. A., Al-Kawaz, S. M. J., & Abbas, A. A. (2021). Improving product quality under the application of lean accounting tools within the behavioral approach. *International Journal of Economics and Financial Issues*, *11*(2), 76–87. https://doi.org/10.32479/ijefi.10975

Al Naas, N. K. (2020). The Libyan audit bureau and environmental control between the text and reality. *Bright Star Journal for Scientific Research*, *1*(x), 1–19.

Al-Bakkoa, F. A. Kh., & Al-Saegh, B. A. (2010). Suggested model of developing an internal control system on environmental pollution costs in the Northern Cement General Company. *Rafidain Development Journal*, *32*(97), 156–181. https://doi.org/10.33899/tanra.2010.161911

Al-Bakoa'a, F. A.-K., & Khader, J. M. S. (2018). The role federal board of supreme audit in the environmental monitoring in accordance with into sai standards. *Iraqi Journal of Market Research and Consumer Protection*, *12*(1), 86–99. https://doi.org/10.28936/jmracpc12.1.2020.(9)

Ali, Al-Fatih Al-Tayyib A. H. (2015). *The role of environmental accounting and auditing in improving the efficiency of environmental performance* [Master's Thesis in Accounting and Finance, Sudan University of Science and Technology].

Alsaad, S. A. (2007). The environmental auditing in the Kingdom of Saudi Arabia: Current practice and future perspective: An empirical study (exploratory). *King Abdulaziz University Journal: Economics and Administration*, *1*(2), 8–150. https://doi.org/10.4197/Eco.21-2.3

Al-Talibi, A. A.-S., & Hussein, A. I. (2018). Elements of green innovation and their impact on enhancing environmental sustainability. *Journal of Cejihan University/Erbil*, *2B*, 351–380.

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. In G. A. Marcoulides (Ed.), *Modern methods for business research* (pp. 295–336). Lawrence Erlbaum Associates Publishers. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.researchgate.net/profile/Wynne-Chin/publication/311766005_The_Partial_Least_Squares_Approach_to_Structural_Equation_Modeling/links/0deec533e0f7c00f59000000/The-Partial-Least-Squares-Approach-to-Structural-Equation-Modeling.pdf

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences*. Taylor and Francis Group, New York.

Fornell, C., & Larcker, D. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50. https://doi.org/10.1177/002224378101800104

Gaskin, J., Godfrey, S., & Vance, A. (2018). Successful system use: It's not just who you are, but what you do. *AIS Transactions on Human-Computer Interaction*, *10*(2), 57–81. https://doi.org/10.17705/1thci.00104

Gravetter, F., & Wallnau, L. (2014). *Essentials of statistics for the behavioral sciences* (8th ed.). Belmont, CA: Wadsworth.

Habib, A., & Sanaa, A. (2021). The impact of strategic foresight capabilities in green creativity an exploratory study for the state company for food products. *Journal of Economics and Administrative Sciences*, *27*(125), 233–242. https://doi.org/10.33095/jeas.v27i125.2074

Hair, J. F., Hult, G. T., Ringle, C. M., & Sarstedt, M. (2017). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (2nd ed.). Los Angeles, SAGE.

Hassan, V. M., & Al-Basri, A. R. S. (2021). Environmental monitoring and its role in achieving sustainability requirements (An analytical study in the General Company for the manufacture of batteries / Babylon 1 factory). *Al-Riyadah Journal for Business and Finance*, *2*(4), 182–198. https://www.iasj.net/iasj/article/217146

Ho, C. K., Robinson, A., Miller, D. R., & Davis, M. J. (2005). Overview of sensors and needs for environmental monitoring. *Sensors*, *5*(1), 4–37. https://doi.org/10.3390/s5010004

Jameel, R. N. (2017). Environmental auditing and monitoring in light of sustainable development as one of the pillars of energy economics. *Proceedings of the Second International Scientific Conference*, Southern Technical University, 137–147.

Jiang, H., Wang, K., Lu, Z., Liu, Y., Wang, Y., & Li, G. (2020). Measuring green creativity for employees in green enterprises: scale development and validation. *Sustainability*, *13*(1), Article 275. https://doi.org/10.3390/su13010275

Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of E-Collaboration, 11*(4), 1–10. https://doi.org/10.4018/ijec.2015100101

Li, W., Bhutto, T. A., Xuhui, W., Maitlo, Q., Zafar, A. U., & Bhutto, N. A. (2020). Unlocking employees' green creativity: The effects of green transformational leadership, green intrinsic, and extrinsic motivation. *Journal of Cleaner Production*, *255*, Article 120229. https://doi.org/10.1016/j.jclepro.2020.120229

Lovett, G. M., Burns, D. A., Driscoll, C. T., Jenkins, J. C., Mitchell, M. J., Rustad, L., Shanley, J. B., Likens, G. E., & Haeuber, R. (2007). Who needs environmental monitoring? *Frontiers in Ecology and the Environment*, *5*(5), 253–260. https://doi.org/10.1890/1540-9295(2007)5[253:WNEM]2.0.CO;2

Mahmoud, M. M., Ahmed, G. M., & Al-Sammak, B. I. A.-D. (2022). The role of organizational culture in the possibility of adopting green technical innovation: an exploratory study of the opinions of managers in the Diyala State Company for Electrical Industries. *Journal of Administration and Economics / Al-Mustansiriya University*, *132*, 26–41.

Maitlo, Q., Wang, X., Jingdong, Y., Lashari, I. A., Faraz, N. A., & Hajaro, N. H. (2022). Exploring green creativity: The effects of green transformational leadership, green innovation climate, and green autonomy. *Frontiers in Psychology*, *13*, Article 686373. https://doi.org/10.3389/fpsyg.2022.686373

McDonald, T. L. (2003). Review of environmental monitoring methods: survey designs. *Environmental monitoring and assessment*, *85*(3), 277–292. https://doi.org/10.1023/A:1023954311636

Oliveira, L. M., & Rodrigues, J. J. (2011). Wireless sensor networks: A survey on environmental monitoring. *Journal of Communications*, *6*(2), 143–151. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://www.jocm.us/uploadfile/2013/0403/20130403030225404.pdf

Rawani, B. (2007). *Environmental auditing in the Algerian economic institution* [Master's Thesis in Economics, Kasdi Merbah University in Ouargla, Algerian].

Salman, N. T. (2011). The role of environmental control to reduce drinking water pollution. *Journal of Accounting and Financial Studies*, *6*(14), 185–231.

Siam, W. Z., & Alkhalaileh, H. A. (2021). The factors affecting the environmental control by the Jordanian audit bureau on public sector institutions. *Global Journal of Economics and Business*, *10*(2), 220–245. https://www.refaad.com/Journal/Article/401

Tenenhaus, M., Vinzi, V. E., Chatelinc, Y.-M. & Lauro, C. (2005). PLS path modelling. *Computational Statistics & Data Analysis, 48*(1), 159–205. https://doi.org/10.1016/j.csda.2004.03.005

Trochim, W. M., & Donnelly, J. P. (2006). *The research methods knowledge base* (3rd ed.). Cincinnati, OH: Atomic Dog.

Umair, A. A., Salahuddin, A. D. Al-Din. (2018). Green creativity is an existing strategy to meet the challenges of achieving environmental sustainability for business organizations. *Journal of Economic and Administrative Sciences*, *19*(1), 87–102.

Wetzels, M., Odekerken-Schroder, G., & van Oppen, C. (2009). Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS Quarterly*, *33*(1), 177–195. https://doi.org/10.2307/20650284

Yang, Z., Ye, L., & Guo, M. (2019). Effect of workplace status on green creativity: an empirical study. *Applied Ecology and Environmental Research*, *17*(4), 8763–8774. https://doi.org/10.15666/aeer/1704_87638774

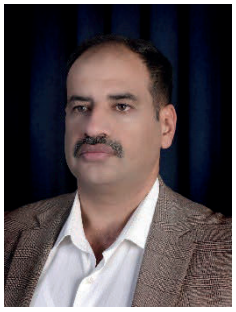
Yousfi, R., & Youb, A. (2020). The impact of adopting methods of creativity on green marketing strategy. *Annals of the University of Guelma for Social Sciences and Humanities*, *13*(1), 83–110.

Zahran, A. M. (2012). The role of environmental monitoring in improving the environmental and economic performance of business organizations. *Egyptian Journal of Development and Planning*, *20*(2), 5–34.

Żywiołek, J., Rosak-Szyrocka, J., & Abbas, A. A. (2022). Measuring the impact of the green supply chain on sustainable performance. *HOLISTICA – Journal of Business and Public Administration*, *13*(1), 19–48. https://doi.org/10.2478/hjbpa-2022-0002

AUTHORS' SHORT BIOGRAPHY

Ibrahim Mohamed Taha. He holds a Master degree in statistics. He specialises in the mathematical aspects of statistics.
Works at the Department of Mathematics, Statistics, and Insurance, Sadat Academy for Management Sciences, Tanta, Egypt.
E-mail: ibrahimaboalazm@gmail.com



Ali Abdulhassan Abbas. He holds a PhD in Business Administration. His specialization is within the field of Organizational Behaviour and Human Resources. He has translated many books in the field of business administration. Currently he works at the Accounting Department at Karbala University, College of Administration and Economics/ Department of Accounting (The Republic of Iraq) and teaches postgraduate students.
Mobile: 009647801127885
E-mail: ali.abd.alhassan@uokerbala.edu.iq, fuhrer313@gmail.com
ORCID iD: https://orcid.org/0000-0001-6860-2583