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THE IMPACT OF GREEN INNOVATION ON ENVIRONMENTAL SUSTAINABILITY

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ABSTRACT. The current research aimed to show the relationship between green innovation and environmental sustainability as the study assumes that green innovation contributes to environmental sustainability, and to test the research hypotheses, the researcher distributed (300) questionnaires to employees of the Al-Zawraa challenge site and received (295) questionnaires of which were valid for analysis (275) questionnaires and the advanced statistical program SmartPIS was used. The research reached a set of conclusions, the most important of which is that green innovation has a moral impact on environmental sustainability. Furthermore, the study has made a set of recommendations, the most important of which is for bodies and institutions and all stakeholders to push for the promotion of green innovations to advance environmental sustainability.

JEL Classification: D02,
O17, P31

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Introduction

Increased interest in the subject of environmental sustainability by many industrial and service business organizations alike has become a critical factor in their strategies and represented a dilemma that requires the search for innovative solutions, the problem seems more apparent as the application of the environmental foundations of sustainability in competing organizations, which has to keep pace with all changes in this area, and in this context, many studies have made recommendations on green innovation and proactive product development strategies as successful solutions that give a competitive advantage to organizations. From Here, these variables can be solutions to environmental sustainability. Through the preceding, the problem of the study boils down to the following question: How can green innovation be a driving force in improving the organization's environmental performance to achieve ecological sustainability? It results in a set of sub-questions as follows:

1- What is the relationship between green innovation in its combined dimensions and environmental sustainability?

2- What is the combined impact of green innovation on environmental sustainability?

Through this study, we seek to achieve a set of objectives:

1. Testing the nature of the relationship between green innovation in its combined dimensions and environmental sustainability?
2. Testing the impact of green innovation in its combined dimensions in environmental sustainability?

The importance of the current study is reflected in the following points:

- 1- It deals with renewed variables in business literature, namely, the independent changer, green innovation, and the variable of environmental sustainability.
- 2- According to the researcher, no study combined the current study variables in a single hypothetical model.
- 3- The scarcity of studies that addressed the current study variables and being critical variables in the organizations' environment.
- 4- Help the organization sample the study to make the best use of the current study variables, contributing to its success within its business environment.

1. Literature review

1.1. The Concept Of Green Innovation

The economic and technological development of the world after World War II has brought about significant positive changes in the quality and well-being of human life. At the same time, these changes have often cost damage to the quality of the environment. Environmental pollution problems have emerged in developed and developing industrialized countries (Song & Yu, 2018:55). We live in a turbulent environment. This turmoil is due to the entry of modern developments that have significantly impacted the emergence of new types of innovations. Innovations are the essential green innovation due to disruption in the working environment and environmental pressures (Mittal & Dhar, 2016:22). Green innovation became one of the recent entries that focused on the beginning of interest in environmental sustainability (Sudaryati et al., 2020:55). Green innovation can be defined as creating a new idea and turning it into a new business value or is creativity (coming up with a unique idea), implementing it, and reaching the market (Arena wt al., 2017:22).

Several studies and research have agreed that green innovation is generally formed (Khazal and Dhiab, 2019:139).

Green product innovation is a gateway to new and essentially improved products, in line with technological and environmental innovation (Arfi et al., 2018:55). Basic improvements to products are included by relying on basic technical specifications, i.e., applying innovative ideas in the design, manufacture, and marketing of new products for environmental improvement of products (Iranmanesh et al., 2015:304). The modification of current developments to reduce negative impacts on the environment during the product's life cycle and the transfer of the characteristics of green products abroad with environmental marking to refer to them (Khazal and Dhab, 2019:139).

Innovation in green processes refers to modifying manufacturing processes and systems to produce environmentally friendly products and achieve environmental goals (Chen et al., 2015:88). This is done by adapting to the manufacturing process that reduces the adverse effects on the environment when purchasing materials, production, and delivery (Chiou et al., 2011:

824) and using innovative methods to reduce the negative environmental effects of production and related activities (Khazal and Wolves, 2019:139)

1.2. The Environmental Sustainability

When tracking sustainability, it was first used in political language by the Club of Rome, an international consortium of scientists, business managers, and public officials in a 1972 report entitled "Limits to Growth" (Attah,2010:7). Since then, there has been a lot of research and studies on sustainability, but it continues to be a concern for most business organizations and their leaders because the sustainability of business organizations in their work is a prerequisite for the survival, continuation, and development of the organization's work (Krause et al., 2016:22), concern for the environment has become one of the things measured by the action of states and organizations from different fields, so interest in environmental conservation has evolved until there is ecological sustainability concerned with the extent to which the goals are maintained. Environmental (Al-Azhar, Khalidi, 2018:296). Environmental sustainability is a process that is primarily taken into account due to the state's efforts and policies to enhance the capacity of individuals, organizations, and the economy to achieve the required transformation of organizations and the environment. The more effective, efficient, and integrated policies are, the faster the development process and the desired results (Rogers et al., 2012:99). David and Jaber, 2014:155, believe that the dimensions of environmental sustainability are as follows:

1) Reducing pollution

Although environmental pollution has been identified for hundreds of years, it has emerged in the wake of the Industrial Revolution because it has brought technological advances and the excessive use of sometimes irregular production processes (Jabbara, 2012:2). The problems of environmental pollution have worsened in recent years. Interest has increased in trying to find ways to stop and mitigate it. The efforts of the world's organizations responsible for the environment and all centers, research bodies, and international universities in the countries of the world to reach a world free of pollutants, or at the very least to stop this frightening collapse in the ecosystem, it is worth noting that environmental pollution has no specific habitat, pollution that occurs in a country may lead to pollution in neighboring countries, since environmental pollution is a global phenomenon that threatens all regions and ecosystems and their neighborhoods as well as the most severe threats, namely human societies so that it is necessary to monitor environmental pollution and identify and work to reduce pollution sources (Jaber, 2014: 155).

2) Rationalizing resource consumption

Rationalization of resource consumption preserves resources, namely consumables, productivity, and the development of resources available under sustainability and sustainability. The factor of environmental depletion is one of the factors that conflict with ecological sustainability, so there must be scientific management of natural sources that are linked to the environmental management system to reduce pressure on it, and this is done through a method of how to exploit the resources available economically to meet the current requirements of individuals as well as to ensure that the requirements are met Future generations without causing any harm to the environment (Azzawi, Al-Sibawi, 2013:96).

3) Reducing the impact on human health

Human health has its roots in its environment. The conditions of the environment affect its birth characteristics, as well as its growth and exposure to infection, infection or prevention of the disease, and in its treatment, immunization, nutrition, and other aspects throughout its life and is called environmental effects, especially those arising from pollution on human health and ecological health, which can be defined as "the state of availability of a healthy and stable environmental habitat for a

particular species of organisms, especially human beings, so that they can To live his life properly and carry out his vital activities."

4) Use of renewable energy

Renewable energy sources are constantly exploitable without depleting their authority, as renewable energy is the one we obtain through energy currents that are automatically and periodically repeated in nature. Renewable energy also means electricity generated from the sun, wind, biomass, geothermal, water heat, and biofuels and hydrogen from renewable sources (Coast, 2008:203)

As part of the above, the measure mentioned in the study (David, Jaber, 2014: 155) will be adopted for the current study.

2. Research Methodology

Al Zawraa General Company has a staff of 1,300 members with specialties and scientific, engineering, technical, and high management capabilities commensurate with the requirements of the production process as well as supported by higher specializations of doctoral, master's, and higher diploma holders with the ability to contribute usefully to the development of the production process and its promotion by enrolling them in specialized courses internal and external as well as procedures held by self-efforts by the company's members to achieve efficiency and efficiency productivity

The Study variables include the following:

1) Green Innovation

Green innovation is an integrated entry that has emerged with a growing interest in environmental sustainability, receiving the attention of many researchers in the innovative field, so it has become one of the most important strategic tools used to gain sustainable competitive advantage in response to increased environmental pressure, a complex process covering internal systems, workers and external environments.

Other writers (Kemp& et al.;2000:3) have pointed out that the production, absorption, and exploitation of a new product, production, service, management or modus operandi, the length of its life cycle reduces environmental risks, pollution, and other negative effects of resource use compared to relevant alternatives.

2) Environmental sustainability:

The term environmental sustainability refers to systemic conditions in which human activities at the world or regional level do not disturb natural cycles more than the resilience of planets, while at the same time do not impoverish the natural capital to be shared with future generations and these constraints will be in line with the general physical nature with a third ethical constraint: The principle of equality stipulates that within a sustainable framework for everyone, including future generations, the right to the same environment is the right to the same amount of natural resources (Vezzoli & Manzini, 2008:6).

3. Results and Discussion

3.1. Descriptive Statistics

The Descriptive analysis represents the lens through which the prevalence of variable variables addressed in the study can be observed in the researched organization community by reviewing the arithmetic average, standard deviation, and percentage as follows:

1. Descriptive Analysis Of The Green Innovation Variable

Through the use of SPSS, the results of the descriptive analysis of the "Green Innovation" variable were reached as follows:

The Innovation Of Green Products

The researcher extracted the numbers, percentages, arithmetic averages, and standard deviations of the most important paragraphs of green product innovation from the respondents' point of view in the organization sample study, as shown in table (1).

Table 1. Results of the first dimension innovation of green products

Green product innovation clauses	Arithmetic average	Standard deviation	Percentage
	4.19	0.756	83.801653
	3.74	0.883	74.710744
	3.71	0.978	74.214876
	3.53	1.133	70.578512
Rate	3.79	0.93	75.801653

Table 1 data show that the results of the arithmetic average exceeded all paragraphs of the scale for the hypothetical medium (3) (when the pentagram scale is scaled) and by a significant ratio (75.8%), thus indicating the prevalence of all paragraphs in the researched organization, in addition, the results of the descriptive analysis showed relatively low values of standard deviation and variation factors, indicating consistency of responses by respondents.

Green Process Innovation

The researcher extracted the numbers, percentages, arithmetic averages, and standard deviations of the most important paragraphs of green process innovation from the point of view of the respondents in the organization sample study, as shown in table 2:

Table 2. Results of The Second Most Innovative Green Processes

Green Process Innovation Paragraphs	Arithmetic average	Standard deviation	Percentage
	3.56	1.007	71.239669
	3.57	0.956	71.404959
	3.77	1.039	75.371901
	3.77	0.955	75.371901
Rate	3.65	0.994	73.090909

Table 2 data show that the results of the arithmetic average exceeded all paragraphs of the scale for the hypothetical medium (3) (when the pentagram scale is included) and by a significant ratio (73.0%), thus indicating the prevalence of all paragraphs in the researched organization, in addition, the results of the descriptive analysis showed relatively low values of standard deviation and variation factors, indicating consistency of responses by respondents.

2. *The Descriptive Analysis Of Environmental Sustainability*

Through the use of SPSS, the results of the descriptive analysis of the environmental sustainability variable have been reached by my agency:

Reducing Pollution

The researcher extracted the numbers, percentages, arithmetic averages, and standard deviations of the essential **pollution reduction** paragraphs from the point of view of the survey sample respondents, as shown in table 3.

Table 3. First dimension results- reduce pollution

Pollution reduction vertebrae	Arithmetic average	Standard deviation	Percentage
	3.87	0.903	77.4
	3.57	0.956	71.4
	3.72	0.951	74.4
	3.54	0.841	70.8

	3.98	1.033	79.6
	3.94	0.859	78.8
	3.6	1.013	72
	3.72	0.977	74.4
Rate	3.7425	0.94163	74.85

Table 3 data show that the results of the arithmetic average exceeded all paragraphs of the scale for the hypothetical medium (4) (when the pentagram scale is included) and by a significant ratio (74.8%). therefore this indicates the prevalence of all paragraphs in the researched organization, and in addition, the results of the descriptive analysis showed relatively low values of standard deviation and variation factors, indicating consistency of responses by respondents.

The Rationalization Of Resource Consumption

The researcher extracted the numbers, percentages, arithmetic averages, and standard deviations of the most important paragraphs of **resource consumption rationalization** from the point of view of the respondents in the organization sample study, as shown in table 4:

Table 4. Results of the second dimension test rationalization of resource consumption

Resource consumption rationalization clauses	Arithmetic average	Standard deviation	Percentage
	3.714	1.566	74.28
	3.8	1.188	76
	3.72	0.951	74.4
	4.04	0.841	80.8
	3.56	0.991	71.2
	3.88	0.976	77.6
Rate	3.55	1.095	71

Table 4 data show that the results of the arithmetic average exceeded all paragraphs of the scale for the hypothetical medium (3) (when the pentagram scale is scaled) and by a significant ratio (71.0%), thus indicating the prevalence of all paragraphs in the researched organization, in addition, the results of the descriptive analysis showed relatively low values of standard deviation and variation factors, indicating consistency of responses by respondents.

The Reducing The Impact On Human Health

Reducing the impact on human health is essential for study sample organizations, as shown in table (5).

Table 5. Results of the third dimension test reduce the impact on human health

Paragraphs to reduce the impact on human health	Arithmetic average	Standard deviation	Percentage
	3.8	1.054	76
	3.74	1.013	74.8
	3.93	0.887	78.6
	3.62	1.164	72.4
	3.52	1.065	70.4
	3.93	0.887	78.6
Rate	3.75667	1.034	75.13333

Table 5 data show that the results of the arithmetic average exceeded all paragraphs of the scale for the hypothetical medium (3) (when the pentagram scale is included) and by a significant ratio (75%). Therefore this indicates the spread of all paragraphs in the researched organization. In addition, the results of the descriptive analysis showed relatively low values of standard deviation and variation factors, indicating consistency of responses by respondents.

The Renewable Energy Use

Through the sample study, the researcher extracted the percentages, calculation averages, and standard deviations of the most important paragraphs of renewable energy use from the point of view of the respondents in the organization sample study in the Iraqi environment, as shown in table (6):

Table 6. Results of the fourth dimension test using renewable energy

Renewable energy use clauses	Arithmetic average	Standard deviation	Variation coefficient	Percentage
	3.73	1.095	1.200	74.545455
	3.82	1.103	1.217	76.363636
	3.64	1.041	1.083	72.727273
	3.62	1.164	1.354	72.396694
	3.34	1.107	1.226	66.77686
Rate	3.63	1.10	1.22	72.561983

Table 6 data show that the results of the arithmetic average exceeded all paragraphs of the scale for the hypothetical medium (3) (when the pentagram scale is included) and by a significant ratio (72.5%), thus indicating the prevalence of all paragraphs in the researched organization. In addition, the results of the descriptive analysis showed relatively low values of standard deviation and variation factors, indicating consistency of responses by respondents.

3.2. Testing The Hypotheses

To complement the descriptive and diagnostic processes based on descriptive analysis data and in line with the objectives of the study and a test of its model, this research aims to test the correlation relationships between variables at the macro indicator level and the level of subfactors to identify the strength of the relationship between the variables of the study and its nature, then test its hypotheses using the correlation coefficient, and use the T-test to test the morality of the link.

The first main hypothesis

Table values (32) reflect the correlation between green innovation and environmental sustainability at the macro index level and sub-indicators. The results indicated that the correlation between green innovation and environmental sustainability is positive and moral(0.427), the value of (T) calculated was more significant than the table value as well as the record of the level of significance is acceptable and more petite than (0.05) hence the first primary hypothesis has been achieved. In terms of sub-hypotheses, they are as follows:

The first sub-hypothesis

From the review of the analytical results, it is clear that there is a positive moral correlation between green product innovation and environmental sustainability amounted to (0.419), and the value of the level of significance was acceptable value and smaller than (0.05) hence this hypothesis has been achieved.

The second sub-hypothesis

The results indicated that the correlation between green process innovation and environmental sustainability is positive and moral relationship amounted to (0.365), and the value (T) calculated was more significant than the scheduling value as well as the level of significance recorded an acceptable value and smaller than (0.05) hence this hypothesis has been achieved.

Table 7. the relationship between green innovation and environmental sustainability

Variables	Environmental sustainability	Calculated T	Tabulated T		Level of significance
			0.05	0.01	
Green product innovation	0.419 **	4.621	1.66	2.36	0.000
Green Process Innovation	0.365 **	3.211	1.66	2.36	0.000
Green Innovation	0.427 **	4.725	1.66	2.36	0.000

Within the systematic treatment of hypotheses in the previous research and the test of correlations between the study variables, we will address in this research the impact relationships between variables, as shown in table 7 and the following analysis data:

First/ The fourth main hypothesis

Table 7 values reflect the impact relationships between green innovation and environmental sustainability at the macro index and sub-indicators. The results indicated that the relationship of moral impact between green innovation and environmental sustainability was the impact reflected in beta value (0.400), the value of the interpretation factor was (18.3%). The relationship is moral because the value (F) calculated is greater than the table value as well as the level of indication recorded an acceptable value and smaller than (0.05). The fourth main hypothesis has therefore been achieved, and concerning sub-hypotheses, they are as follows:

The first sub-hypothesis

From the review of the analytical results, it is clear that there is a moral impact relationship between green product innovation and environmental sustainability. Furthermore, the value of the effect is reflected in the value of beta (0.000), the value of the interpretation factor reached (00%), and that the relationship is moral because the value (F) calculated is greater than the scheduling value as well as the record of the level of significance is acceptable value and smaller than (0.05) hence this hypothesis has been achieved.

The second sub-hypothesis

The results indicated that there is a moral impact relationship between green process innovation and environmental sustainability and the value of impact reflected in beta value (0.318), the value of the interpretation factor was (13.3%), and that the relationship is moral because the value (F) calculated is greater than the scheduling value as well as the record level of significance is acceptable value and smaller than (0.05%) hence this hypothesis has been achieved.

Table 8. Results of impact relationships between green innovation and environmental sustainability

Variables	Beta value (B)	(R2)	Calculated (F) value	(F) tbulated		Level of significance
				0.05	0.01	
Green product innovation	0.357	0.176	21.354	3.59	5.75	0.000
Green Process Innovation	0.318	0.133	15.372	3.59	5.75	0.000
Green Innovation	0.400	0.183	22.215	3.59	5.75	0.000

Conclusions

The organization seeks to develop and introduce many products with new forms or services to the market. The research organization is interested in research and development to provide new ideas about products and services. The organization seeks to reduce its profit margin to follow the green process approach. The organization's poor ability to improve and develop its derivatives, as it makes minor modifications to its product designs, does not help increase customer demand. The analytical results have shown that green product innovation is the most influential element of green innovation in environmental sustainability. It is essential to focus on developing products that suit the needs and desires of customers without harming the environment. Create a renewed environmental culture among all workers and make them move towards achieving green environmental goals voluntarily. Attention to human resources training under a pre-prepared program with the periodic assessment to determine actual training needs. The organization should rely on a regular product development program based on proper planning at all stages and aims to make fundamental improvements in product design tailored to customers' growing needs and desires. Supporting working individuals with creative and innovative ideas. The need to adopt green products and work to apply their principles broadly.

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