International Journal of Studies in Business Management, Economics and Strategies
Volume 02, Issue 11, November, 2023
ISSN (E): 2949-883X
Scholarsdigest.org

THE ROLE OF GREEN MANUFACTURING IN ENVIRONMENTAL PERFORMANCE-ANALYTICAL STUDY AT DAR AL-WARITH PRINTING

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Abstract
The research aims primarily to determine the role of green manufacturing in improving environmental performance at the level of Dar Al-Warith Printing and Publishing Press, and based on a major problem that was diagnosed with several questions, the extent of awareness of the influential relationships between variables in the field. An expressive intellectual framework for the research was formed, as green manufacturing was adopted as a variable. It is independent and consists of four dimensions (reducing waste - recycling - reuse - redesign), and environmental performance was adopted as a dependent variable (one-dimensional), which was measured with six items. The sample consisted of (61) workers at Dar Al-Warith Printing and Publishing Press. To analyze the data, a set of statistical methods available in the statistical program (SPSS.V.25) was used. The research reached several conclusions, including (the results showed the impact relationships between manufacturing Green and the environmental performance variable. There is a high interpretation rate for the ability of green manufacturing to explain the changes that occur in environmental performance, amounting to (0.958). The research resulted in a set of recommendations, including (the printing press management should collect waste, waste, and parts resulting from industrial processes with the aim of benefiting from them in other industrial processes.

Keywords: Green Manufacturing - Environmental Performance - Dar Al-Warith Printing And Publishing Press.

Introduction

The expansion of the productive environment and the spread of industries of various types led to a clear and rapid increase in environmental pollution, so many studies and research were conducted on various methods and methods to reduce the pollution crisis and the scarcity of natural resources. In recent years, researchers' interest in the environment has prompted the industry to take the industry as a fundamental step in developing green manufacturing processes and designing recyclable materials with the aim of reducing the negative impact on the environment that results, whether directly or indirectly. Therefore, new manufacturing

methods have been proposed suitable for providing green products and reducing Its negative impact on the environment during production processes and the development of sustainable programs with the aim of eliminating environmental pollution problems, as modern machinery and equipment were used in designing new products to reduce emissions and waste resulting from the manufacturing process and consume less energy to maintain a sustainable environment.

This research represents an attempt to measure the impact of green manufacturing in improving environmental performance because the topic is of great importance due to its fundamental role in the success of the printing press in competing at the local level. Since the production process depends primarily on the following elements (human resources - advanced technologies - chemicals), which are considered the main driver of the progress of the manufacturing process, it needs management that guarantees the safety of workers inside the printing press, the community, and the environment outside the printing press. Therefore, the concept of green manufacturing requires organizations to adopt innovative production techniques aimed at getting rid of waste and recycling it through the use of green energy and resources in order to reduce environmental pollution and waste of resources to meet the needs of current customers and achieve profitability without compromising the environment, which leads to sustainable development and thus the The aim of this research is to determine to what extent the environmental performance of this printing press can be improved using green manufacturing. Based on the above, this research was divided into four sections: The first section: Research methodology, The second section: The theoretical framework of the research, The third section: The practical framework of the research, The fourth section: Conclusions and recommendations.

FIRST SECTION: RESEARCH METHODOLOGY

First: The Research Problem: Given the importance of providing environmentally friendly products that prevent pollution, reduce the appearance of waste, and protect human health and the environment, industrial organizations, especially in developed countries, are interested in manufacturing systems, including green manufacturing. As a result, the organization must pay attention to these requirements with the aim of converting waste into new materials used in manufacturing. This prompted the researchers to address the issue of green manufacturing and describe the degree of its impact on achieving healthy environmental performance. In addition to that, the difficulties that Iraqi industrial organizations were exposed to as a result of the lack of attention to old and damaged goods. Based on the above, the following questions can be used to formulate the research problem:

1. Do green manufacturing aspects have a clear role in achieving healthy environmental performance in the studied printing press?
2. Are the concepts of green manufacturing and environmental performance clear among survey participants?

Second: The Importance Of The Research: The field and intellectual importance of the variables (green manufacturing and environmental performance) determine the importance of this research, and the following points were used to describe this importance:

1- The major role that green manufacturing plays in maintaining sound environmental performance.
2- The importance lies in identifying the reality of the variables in the printing press that is the subject of the research.
3- The academic importance of the research lies in filling part of the knowledge gap by creating a unified model that brings the variables together.

Third: Research Objectives: The research aims primarily to determine the impact of green manufacturing and its sub-dimensions in improving environmental performance at the level of Dar Al-Warith Printing and Publishing Press. There are other sub-goals according to the structure and axes of the research, which are as follows:
1. Identifying the weak points in the application of green manufacturing at Dar Al-Warith Printing and Publishing Press.
2. Building a good system based on green manufacturing practices at Dar Al-Warith Printing and Publishing Press.
3. Determine the impact relationship between green manufacturing indicators and achieving outstanding environmental performance at Dar Al-Warith Printing and Publishing Press.

Fourth: The Hypothetical Research Diagram: Figure (1) below represents the hypothetical research diagram, which shows the relationship between the independent variable (green manufacturing) and the dependent variable (environmental performance):

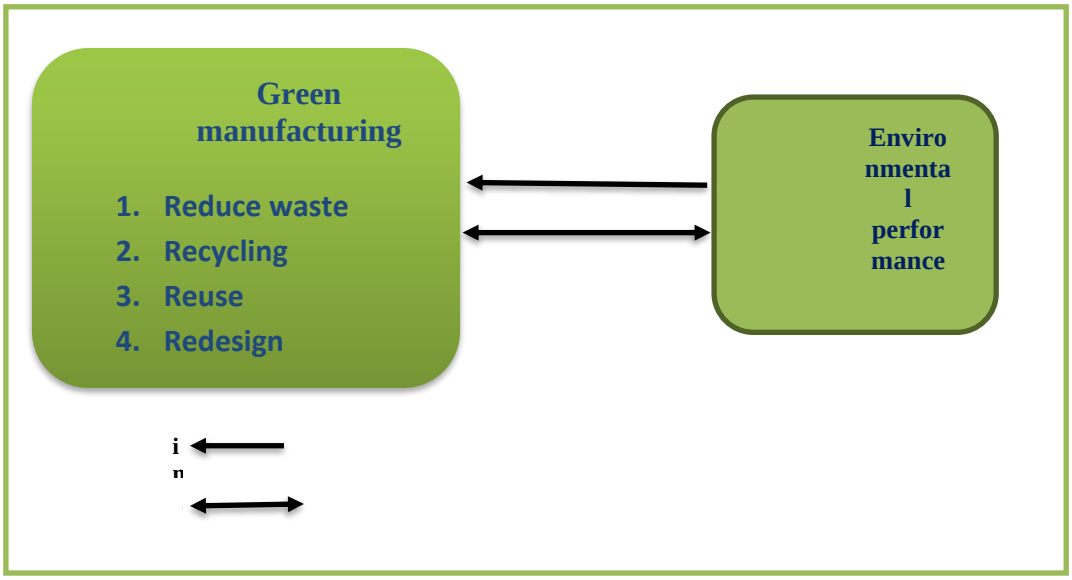

Figure (1) Default search scheme

Source: Prepared by the researchers

It is clear from the figure above that the hypothetical research scheme consists of two variables, the first is the independent variable **(green manufacturing),** which will be measured in four dimensions (reducing waste - recycling - reuse - redesign), and the dependent variable is **environmental performance**, which will be measured with six items (scale one-dimensional).

Fifth: Research Hypotheses:

A. Correlation Hypothesis: - The research is based on the following hypothesis **(there is a positive, statistically significant correlation for green manufacturing and the environmental performance variable).** The following sub-hypotheses emerge from it:

1. There is a positive, statistically significant correlation between the waste reduction dimension and the environmental performance variable.
2. There is a positive, statistically significant correlation between the recycling dimension and the environmental performance variable.
3. There is a positive, statistically significant correlation between the reuse dimension and the environmental performance variable.
4. There is a positive, statistically significant correlation between the redesign dimension and the environmental performance variable.

B. Impact Hypothesis: - The research is based on the following hypothesis **(there is a positive, statistically significant impact relationship for green manufacturing and the environmental performance variable).** The following sub-hypotheses emerge from it:

5. There is a positive, statistically significant relationship between the waste reduction dimension and the environmental performance variable.
6. There is a positive, statistically significant relationship between the recycling dimension and the environmental performance variable.
7. There is a positive, statistically significant relationship between the reuse dimension and the environmental performance variable.
8. There is a positive, statistically significant relationship between the redesign dimension and the environmental performance variable.

SECOND SECTION: THE THEORETICAL FRAMEWORK OF THE RESEARCH

First: The Concept And Definition Of Green Manufacturing

For several years, manufacturing practices have focused primarily on meeting the needs and desires of customers while maintaining competitiveness in terms of product quality, delivery time, creativity and innovation. The term green manufacturing extends to include terms such as green recycling, green processes, green design and green supply chain. The main goal of this model is to prevent... Pollution and energy savings through the discovery and development of new knowledge and reducing or eliminating the use or generation of hazardous materials in the design, manufacture and application of chemical products or processes (e.g., Aminuddin, 2015: 47; Abdali, 2023: 1452). Therefore, environmental concerns and pressures have contributed to organizations taking a proactive role in designing recyclable products in addition to developing cleaner manufacturing services and processes. Thus, green manufacturing has emerged as a philosophy and operational approach to reduce the negative impact of the organization's products and services on the environment as well as improve the environmental efficiency of its operations, while continuing to achieve Its financial goals (Garza, 2015: 19)

pointed out (Li et al, 2019: 2) pointed out that implementing green manufacturing will face certain pressures in the short term due to limited capacity and high costs, but in the long term it will achieve many competitive advantages and is an opportunity for future development. (Abd Ali et al, 2020: 1452) referred to flexible manufacturing as an industrial system that has flexible technology, appropriate and trained employees, and information connectivity that responds to increasing changes in fluctuations in consumer needs and desires as well as market demand. Green manufacturing includes complete green practices linked to environmental concerns, which endlessly includes the processes of manufacturing environmentally friendly goods. It involves converting raw materials into finished goods that leave fewer environmental risks but with high efficiency. Therefore, green manufacturing takes into account reducing or preventing waste at the source. And recycling and green product designs (Eshikumo & Odock, 2017: 106). Green manufacturing practices mean effective product design and production processes that use inputs with low environmental impacts and are capable of producing minimal or no waste or pollution. Green product design ensures that the number of components in product to a minimum (Mutingi et al, 2014: 7), simplifying assembly and disassembly processes, and enhancing material recovery, reuse and recycling. In addition, green manufacturing consists of environmentally friendly processes that reduce the use of raw materials, energy use, waste, and emissions. The end result of green remanufacturing is reduced material costs, energy costs, and occupational safety expenses, as well as improved production efficiency and corporate image (Sharma et al, 2023 : 85).

Figure (2) reflects how green manufacturing is an intersection of product development practices (design and manufacturing) with environmental issues and concerns. The greater the interference between these axes, the greater the extent to which manufacturing practices work to embody environmental issues.

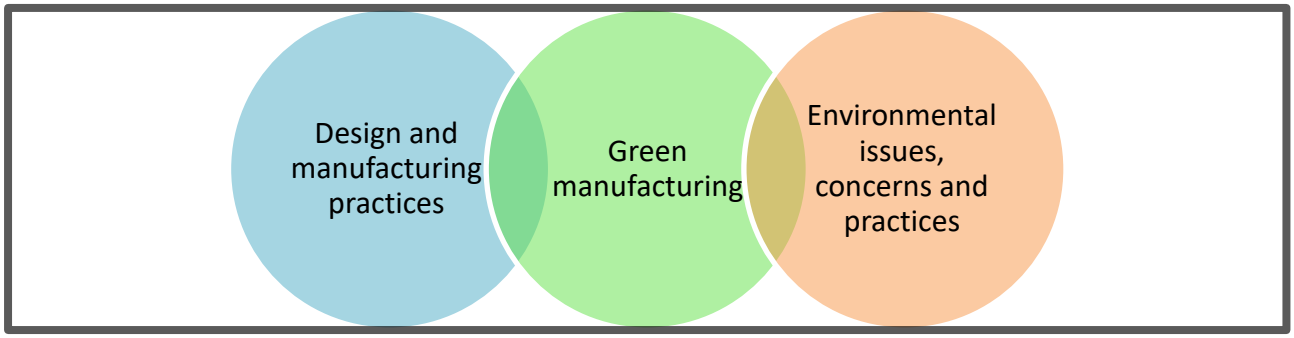

Figure (2) Green manufacturing – critical intersection

Source: Singh, P. J., & Sangwan, K. S. (2011). "Management commitment and employee empowerment in environmentally conscious manufacturing *implementation"*. In *Proceedings of the World Congress on* Engineering (Vol. 1). p 2.

Accordingly, the concepts of green manufacturing can be clarified according to the opinions of some researchers, as in Table (1) below

-	Source	Concept
1	(Sivapirakasam et al , 2011 : 8370)	An advanced manufacturing method that aims to improve process efficiency as well as reduce environmental impact and resource consumption during the manufacturing process.
2	(Rehman et al , 2013 : 49)	It is a term used to describe manufacturing practices that do not harm the environment during any part of the manufacturing process and emphasizes the use of processes that do not pollute the environment or harm consumers, employees, or other members of the community.
3	(Acharya et al , 2014 : 232)	A term used to describe manufacturing practices that do not harm the environment during any part of the manufacturing process.
4	(Aminuddin, 2015 : 47)	A manufacturing system that has little, nonexistent, or negative impact on the natural environment
5	(Li et al , 2019 : 5)	It is a modern manufacturing method with comprehensive consideration of environmental impacts and resource efficiency.
6	)Bidawid, 2021: 381(	A preventive method for preserving and protecting the environment through the use of non-hazardous materials that reduce pollutants, taking into account the use of correct methods in the production process to preserve energy sources, the use of renewable energy sources, and the use of modern and advanced technologies that improve the efficiency of production processes and reduce the emission of toxic gases and waste. Affect human health.
7	)Al-Khatib, 2022: 112(	An integrated strategy that aims to reduce pollution and waste resulting from the various stages of production by reducing the use of harmful materials and not using or minimizing hazardous materials in order to preserve human health and the environment.
8	(Machingura *et al* , 2023 : 3)	It is the application of environmental, economic and technological strategies to processes and products to optimize the use of resources and reduce the negative environmental impact on the entire life cycle of products.
9	(Mugoni et al , 2023 : 7)	A process that aims to reduce the impact of the manufacturing process on the environment at all stages.

The researchers define green manufacturing as the continuous application of an integrated environmental protection strategy in processes, products and services with the aim of increasing their economic efficiency and reducing their risks to humans and the environment.

Second: Green Manufacturing Goals

The goal of green manufacturing is to reduce, control, avoid and prevent waste during production. It is a strategy that protects the environment, consumers and workers and at the same time works to improve industrial efficiency, profitability and competitiveness. Therefore, a group of researchers (e.g., Dornfeld, 2009 : 3; Eshikumo & Odock, 2017 : 106; Ramos et al , 2018 : 179; Farias et al , 2019 : 747; Abualfaraa et al , 2020 : 14) Green manufacturing objectives with the following points:

1. Use less materials and energy.
2. Use non-toxic and renewable materials.
3. Reducing undesirable outputs: cleaner production and industrial symbiosis.

4. Converting outputs into inputs: recycling in all its forms.
5. Changing ownership and production structures: product service systems and supply chain structure.
6. Improving and monitoring pollution levels and reducing the impact of manufacturing operations on the environment in addition to providing efficient use of resources.
7. Green manufacturing aims to eliminate solid waste, hazardous waste, air emissions, sewage discharge and other forms of pollution.
8. Reduce the impact on the environment and avoid legal prosecutions

We conclude from this that green manufacturing aims to adopt strategies that will reduce pollution and waste resulting during manufacturing processes. It provides many opportunities to reduce costs, meet environmental principles, improve the company's image and reduce health risks, as the vision of the green manufacturing strategy is to create harmonious conditions between... Trade and its surroundings The mission is to create value by producing more with less resources by adopting green manufacturing strategies in a way that does not negatively impact the environment.

Third: The Benefits Of Green Manufacturing

Applying green manufacturing techniques and tools has become a duty for organizations rather than an option because the trend towards green production and manufacturing offers many benefits to both the organization, the customer and the environment.

As everyone pointed out (e.g., Deif,2011: 27; Chahal, 2012 : 407; Acharya *et al* , 2014 : 233; sabadka,2014 : 23) The most prominent benefits achieved from applying green manufacturing are as follows:

1. Reducing the overall harmful effect of the operation.
2. Providing a cleaner source of energy through technology and modern production methods.
3. Leads and helps influence the internal and external behavior of organizations to ensure sustainability.
4. Increase efficiency by enhancing productivity and increasing product quality.
5. Providing better health for customers, etc.
6. Providing a better work environment.
7. It helps adapt to and conserve environmental changes by reducing waste through efficient use of energy and raw materials.
8. Converting pollutants and waste into by-products and encouraging their use and recycling in order to conserve resources.
9. Reduce waste by optimizing processes such as selecting raw materials, selecting the appropriate fuel mixture, automation, and developing control strategies via sensors with real-time feedback.

Accordingly, the researchers believe that the great interest in environmental awareness and the intensification of global competitive pressures make adopting the green industry an opportunity for organizations to expand their market share, which creates a wider field for competition, while preserving the internal environment, which is the health and safety of workers, and preserving the external environment, which is the health and safety of society. And the climate and thus achieving the general goal, which is profit in the long term.

Fourth: Dimensions Of Green Manufacturing

(Al-Mahiawi and Nouri, 2023: 2012) identified four main dimensions to measure green manufacturing (reducing waste - recycling - reuse - redesign), which will be adopted in the current research to suit the research environment and its variables. These dimensions will be clarified according to the following points:

1. Reducing waste: Seriously striving to reduce waste at the site of its generation, and it is one of the most important practices that depend on reducing the energy and raw materials used in the production process and reducing the energy required, such as operating the product when it is in use, as organizations try to raise the efficiency of their production processes through Reducing losses and thus reducing costs (Blasim and Hassan, 2020: 427).

2. Recycling: Recycling means reprocessing materials (waste) by converting them into new and useful products or converting damaged or defective products into new products, as happens in the recycling of paper, plastic, fabrics, metal cans, iron, oils and grease, and the purpose of this process is It is to reduce potential risks and energy waste (Al-Abbasi, 2021: 289) (Mugoni et al, 2023: 7). (jamshidy,2011 : 35) pointed out that the recycling process is a series of activities applied to discarded materials, as it includes a series of collection, sorting, processing, and new product production activities. The recycling process usually requires more energy than remanufacturing and renewal processes. (Ibrahim, 2017: 135) pointed out that turning a product or material that has become waste in a certain circumstance into useful materials through a group of physical, chemical, or biological treatments is the process of identifying ways in which industrial waste can be used for other purposes without affecting society.

3. Reuse: - It means reusing materials again instead of treating them as waste and benefiting from them. This means reusing the product again, which leads to reducing the use of materials or depleting them (Blasim and Hassan, 2020: 427). (Jamshidy, 2011: 36) pointed out that reuse is any process through which one of the components of the product is used at the end of its life for the same purpose for which it was designed, as reuse can be viewed as a subset of repair and renewal.

4. Redesign: Redesign focuses on developing second generation products based on current products that have become obsolete. This process focuses on two important aspects. The first is using current products for which demand has become low and benefiting from them in developing a new product and introducing it to the markets. The other aspect is preserving Save the environment from pollution by recalling these products and redesigning them (Paras et al, 2018: 8-9). Where the organization changes the form of the product or improves the way it is used or its function, the process of redesign by transforming the form of the product is considered one of the most important, most prominent and most common methods because it does not require advanced technologies (Saleh and Yahya, 2022: 541).

Fifth: The Concept And Definition Of Environmental Performance

Environmental awareness among companies can be traced back to the 1970s when some organizations began to develop their own environmental management systems with the aim of complying with government regulations and reducing risks. There is also some limited evidence that they have been discussed in the academic literature as complementary strategies since the early 1990s. However, the ISO 14001 environmental management standard has been issued. In late 1996, which can be considered an important turning point regarding how organizations perceive the environmental dimension of their business (Garza, 2015: 5). pointed out that (Turksma, 2023: 11) environmental performance is a broad and multidimensional concept, as one of the first systematic attempts to describe environmental performance was in 1989 by the Alliance for an Environmentally Responsible Economy in response to the oil spill from the Exxon Valdez Lubricants Company (Kolk & Mauser, 2002: 25). A review of recent management literature indicates that organizations pioneering the reduction of their generation of chemical waste are changing their business organization, strategy and operations for continuous improvement by adopting environmental management practices (Theyel, 2000: 249). There are similarities and synergies between activities and programs to improve environmental protection and already existing process methods and technologies. Therefore, programs to keep pollution under control or waste free may enhance traditional process management techniques and procedures such as statistical process control, total quality control and total quality management (de et al , 2001 : 1554-1555).

Therefore, the need for packaging and its development resulted from the fact that production and consumption take place in separate places and times, and the goods produced had to be distributed and transported. Therefore, packaging has positive and negative effects on the environment, as the negative effects include the use of resources, the effects of waste, and emissions associated with packaging. As for the impact The positive is that packaging of consumer goods facilitates their distribution and thus makes it possible to obtain goods that are otherwise inaccessible and environmentally friendly packaging allows human needs to be met in an efficient manner (Pongrácz, 2007: 238-239).

Manufacturing processes generate large amounts of various solid, liquid and gaseous wastes. Apart from generating waste, the manufacturing process is an energy-intensive activity, which also indirectly affects the environment. Therefore, the implementation of stringent government regulations and increased public awareness have made environmental issues in operations one of the most important topics in Strategic manufacturing decisions (Sivapirakasam et al, 2011: 8370). The concept of environmental performance covers two different aspects. The first looks at the organization and the organization's performance indicators are called environmental performance indicators. The second looks at the external environment and the performance indicators for the external environment are called environmental status indicators (Heinimann et al, 2003: 2).

Therefore, the concept of environmental performance of organizations can be clarified by reviewing the environmental performance matrix developed by (Mazahrih, 2011: 93) to clarify and refine this concept, as in Figure (3).

the hub	**internal**	**external**
Processes	**Regulatory systems**	**Relationships with stakeholders**
Results	**Regulatory compliance**	**Environmental impacts**

Figure (3) Environmental performance matrix

Source: Mazahrih, B. J. S. (2011). ***"Incorporation of environmental issues into banks' lending decisions".*** (Doctoral dissertation, University of Waikato).p.93.

(e.g., Van, 2010: 22; Turksma, 2023: 12) pointed out that regulatory systems refer to environmental management systems and clear lines of responsibility that reach senior management for the environmental performance of companies, while regulatory compliance represents adherence to the laws and regulations that governments impose on companies and thus companies avoid fines and penalties, and clarify relations with stakeholders as publishing environmental reports and data regarding sustainability and environmental preservation, and finally clarify the environmental impacts represented by the levels of actual emissions and accidents as a result of the activities and operations practiced by the organizations.

Accordingly, the concepts of environmental performance can be clarified according to the opinions of some researchers, as in Table (2) below

	Source	Concept
1	(Theyel, 2000 : 258)	Effectiveness of companies in reducing waste generation from chemicals commonly used in factories across industries.
2	(Alanya et al , 2006 : 1)	A quantitative and qualitative expression of the improvements achieved by the organization in its environmental aspects
3	)Khanos, 2014: 96-97(	All activities carried out by the organization, whether forced or voluntary, with the aim of preventing damage resulting from its operations that negatively affect the environment.
4	) Wang et al, 2015: 163(	Environmental performance refers to an organization's relative performance in reactively and proactively complying with environmental regulations, preventing environmental crises, and training employees on environmental issues.
5	(Singjai et al , 2018 : 11)	The degree to which a company improves its performance in relation to its environmental responsibilities.
6	)Inman & Green, 2018: 7(	The ability of manufacturing plants to reduce air emissions, liquid waste, and solid waste and the ability to reduce the consumption of hazardous and toxic materials.
7	)Solikhah et al, 2021: 3(	Environmental performance is the organization's performance in creating a suitable (green) environment while taking into account employees and stakeholders.
8	) Kuo et al, 2022: 2(	Integration with the organization's external and internal management to achieve comprehensive economic performance such as increasing market share and brand image and improving the performance of their strategic partners by creating an environmentally friendly product and reducing risks associated with the environment.
9	(Mugoni et al , 2023 : 8)	The result of the organization's strategic activities and their impact on the natural environment.
10	(Carballo et al , 2023 : 7)	It reflects outputs that show the degree of companies' commitment to protecting the natural environment, and environmental performance can be evaluated through a set of indicators such as reduced environmental emissions, pollution prevention, waste reduction, and recycling activity.

Based on the concepts of environmental performance that were proposed, the researchers believe that environmental performance is the quantitative, measurable

results of the environmental management system related to the environmental dimensions that were developed on the basis of the organization's environmental policy.

Sixth: The Importance Of Environmental Performance

The environmental performance of companies has attracted great interest from academic circles and business practitioners (Fores, 2019: 2). Therefore, environmental issues have become increasingly important to a wide range of corporate stakeholders, including investors, customers, employees, employment, and the general public. From the perspective of investors, environmental pollution leads to To bear unjustified costs such as cleaning fees and the costs of lawsuits and courts. From the customer's point of view, customers always prefer to deal with organizations with a sustainable environmental orientation. From the employment perspective, most organizations have begun to employ individuals to fill senior positions in organizations with high environmental risks. From the point of view The general public has described pollution as a very serious threat to their health and the environment (Ilinitch et al, 1998: 384).

Environmental performance is of great importance in improving the image of the company and the product, reducing risks arising from environmental responsibility, and improving working conditions, as these innovations may contribute to achieving economic, environmental and social goals simultaneously. In this way, what is called a win-win situation has arisen, where there is an improvement in environmental performance, customer satisfaction, and performance. The company (e.g., de et al, 2001: 1554-1555; Bach et al, 2019: 2)

(Singjai et al, 2018: 13) pointed out that environmental performance is of very great importance in increasing environmental efficiency and reducing costs. The importance of environmental performance is highlighted in keeping pollution under control or the absence of waste and thus may enhance traditional process management techniques and procedures such as statistical process control, comprehensive quality control and total quality management (De et al, 2001: 1554-1555).

Environmental performance is important in directing companies to focus on technological innovation, paying attention to reducing pollution and production costs and, as a result, increasing sales (Lee et al, 2016: 3). While (Fores, 2019: 2) explained that environmental performance has a major and prominent role in preventing environmental pollution, reducing waste, reducing the consumption of materials, energy and water, enhancing equipment efficiency, maximizing the use of renewable energy sources, extending the life of the product, and ensuring the possibility of recycling all of the resources And products.

Seventh: Ways To Improve Environmental Performance

The pressures exerted by governments and customers and in all sectors, whether industrial or service, have forced these organizations to comply with the laws and legislation related to preserving the environment by using a set of means and methods that improve environmental performance. He pointed out (e.g., Heinimann et al , 2003 : 1; Molina *et al* , 2009:209; Lee *et al* , 2016 : 3; Eshikumo & Odock, 2017 : 106; Singjai et al , 2018 : 11; Simon *et al* , 2022 :

56 ; Ngo, 2023 : 2) To the ability of organizations to improve their environmental performance through several ways, as follows:

1. Technology: Technology provides a link between human labor and the natural resource base. To confront the limited global natural resources, the peoples of the world must strive to achieve more sustainable forms of development. Therefore, the application of environmentally sound technologies that are efficient in the use of resources has become crucial for both development and improving environmental performance. Therefore, it can Improving environmental performance through green technology innovation, learning, environmental technology innovation and continuous improvement of environmental health risks. Considering stakeholder opinions will also be crucial in this case.

2. Environmental management practices: Environmental management practices help organizations modify processes and procedures and consider environmental issues in all functions of their operations. In the context of manufacturing, environmental management activities help companies clarify specific relevant environmental goals and objectives, reduce polluting materials, and increase the use and effectiveness of Cost of environmentally friendly component parts

3. Voluntary adoption:- Environmental performance can be improved through voluntary adoption of cooperative activities by all companies.

4. Environmentally friendly design: Environmentally friendly design has direct and positive effects on environmental performance because it leads to cost savings such as reducing the cost of energy consumption and waste treatment and disposal fees.

5. Environmentally friendly packaging: Environmental performance can be improved and maintained through the use of environmentally friendly materials such as recycled materials, because packaging has positive and negative effects on the environment. The negative effects include the use of resources, waste effects, and emissions associated with packaging. The positive effect is that packaging Consumer goods and materials are easy to distribute thus enabling environmentally conscious packaging to meet people's needs in an efficient manner while not harming the environment.

THE THIRD SECTION: THE FIELD FRAMEWORK OF THE RESEARCH

First: Details Of Distributing And Retrieving Questionnaires

In order to complete the requirements of the current research, the researchers distributed (77) questionnaires based on the statistical tables of (Krejcie & Morgan, 1970: 607-610) to determine the sample size for a known population. The result for a population consisting of (95) elements was (77) elements, so the questionnaire was distributed The researchers sent 77 questionnaires to the employees of Dar Al-Warith Printing Press, and Table No. (3) shows the details of distributing and retrieving the questionnaires.

Table 3: Details of distribution and retrieval of questionnaires

The Condition	The Number	Percentage
Distributed questionnaires	77	%100
Retrieved questionnaires	66	%86
Non-refundable questionnaires	10	%13
Invalid questionnaires	5	%6
Questionnaires suitable for analysis	61	%80

Source: Prepared by the researchers.

Second: Analysis of demographic factors

Table 4: Analysis of demographic factors of survey participants

Factor	Category	Number	Ratio
Gender	Male	55	%90
	Feminine	6	%10
N		61	%100
Age	30 Years And Less	39	%64
	40-31	15	%25
	50-41	5	%8
	50 Or More	2	%3
N		61	%100
Qualification	Preparatory School	5	%8
	Diploma	7	%11
	Bachelor's	45	%75
	Higher Diploma	1	%1
	Master's And Ph.D	3	%5
N		61	%100
Years Of Service	One Year Or Less	1	%1
	2 Years - 5 Years	12	%20
	6 Years - 10 Years	8	%13
	10 Years And More	40	%66
N		61	%100

Source: Prepared by the researchers based on the results of the questionnaires.

This paragraph is concerned with analyzing the demographic factors of the respondents extracted from the questionnaire for the current research, represented by (gender - age - educational qualification - years of service). In order to identify the nature of the sample in the researched printing press.

1. The table above shows that the gender of the sample members was (55) males, which is equivalent to (90%) of the research population, and the number of females was (6), which is equivalent to (10%) of the sample. This indicates that the printing press relies on A large percentage of males are required to perform the work, and the reason may be attributed to the fact that most of the work that is done requires high physical effort, and this is something that cannot be done by females.
2. The age factor showed that the number of participants in the category (less than 30) years reached (39 workers), i.e. (64%) of the sample, while the number of participants in the age group (31-40) years reached (15 workers), i.e. (25%) of the participants, and the number

of participants in the age group from (41-50) reached (5 workers), with a percentage of (8%), and in the age group (50 and above), their number reached (2 workers only), with a percentage of (3%) of The workers in the printing press, the subject of the research, as we note that the highest percentage is in the age group (30 years and younger). This indicates that the printing press is in the process of growth and progress with the use of young energies to benefit from the maximum amount of energy and human efforts. This also indicates that the printing press possesses high physical capabilities.

3. As for educational qualifications, as shown in the table above, the number of participants holding a bachelor's degree ranked first at a rate of (75%), followed by those holding a diploma at a rate of (11%), then followed by those holding a preparatory certificate at a rate of (8%). %), followed by holders of a higher diploma (5%), and finally holders of a higher diploma (1%). As for the years of service, the first place was the years of service (10 years or more) with a percentage of (66%), and lastly the years of service (one year or less) with a percentage of (1%). This indicates that the printing press is in the process of progress and growth in the production process, and this is actually consistent with With the sample's answers in paragraph (2), which is age, as their answers showed that the age group (30 years and under) ranked first, with a percentage of (64%) of the answers of the sample surveyed, and this confirms to us the sincerity of the answer by the sample to the paragraphs of the distributed questionnaire.

Third: Statistical Testing Of The Research Scale

Verifying the stability of the research scale: for this purpose. Table No. (5) below shows the reliability percentages for each variable:

Table (5): Alpha - Cro-Nabach coefficient and consistency percentage for the research variables

Variable sequence	Variable name	Number of questions	)Alpha-Cronebach) coefficient	Consistency ratio
1	Green manufacturing	20	0.971	%97
2	Environmental performance	6	0.873	%87

Source: Prepared by the researchers based on the outputs of the statistical program)(SPSS.V.25.

The results of Table (5) show that the questionnaire and its standards are highly reliable and that there is internal consistency between the questionnaire questions.

Fourth: Descriptive Analysis

This part includes displaying the arithmetic means of the questionnaire items, their standard deviations, the level of response, the ordinal importance, and the relative importance (RII) of the research variables, which are (green manufacturing and environmental performance).

We will show the descriptive analysis of the research variables, as follows: -

A. Description Of The Green Manufacturing Variable: Table (6) shows the statistical description data for the environmental performance variable. This table shows that the arithmetic mean for this variable was (3.88) with a standard deviation of (0.856). This variable received a (high) response level. With ordinal importance (1). It obtained a relative significance (RII) of (0.77). It is of a (high) level.

This indicates that the management of the printing press aims to reduce air emissions and reduce solid waste, while the printing press workers seek to reduce the use of hazardous and harmful materials.

Table (6) Arithmetic means and standard deviations. The level of answer and relative importance. The ordinal importance of the green manufacturing variable (n= 61)

-	Main dimensions	SMA	standard deviation	Answer level	Ordinal importance	Relative importance %RII	Level of materiality
1	Green manufacturing	3.88	0.856	high	1	0.77	high

Source: Prepared by the researchers based on the outputs of the statistical program (SPSS.V.25.(

B. Describe The Dimensions Of The Green Manufacturing Variable

1 -The waste reduction dimension: Table (7) shows the statistical description data for the general average waste reduction dimension. This table shows that the overall average for the waste reduction dimension reached (3.90) with a standard deviation of (0.833). This dimension received a (very high) response level. With ordinal importance (3). It obtained a relative significance (RII) of (0.78). It is of a (high) level.

This means that the printing press's management takes specific policies and measures to reduce the raw materials and energy it uses in the production process. It also relies on advanced methods to reduce waste and adheres to local and international laws.

2 -The recycling dimension: Table (7) shows the statistical description data for the recycling dimension. This table shows that the overall average for the recycling dimension was (3.92) with a standard deviation of (0.987). This dimension received a (very high) response level. With ordinal importance (1). It obtained a relative significance (RII) of (0.782). It is of a (high) level.

This indicates that the management of the printing press, in cooperation with its employees, is working to implement the laws related to recycling of its products and educates customers about the importance of recycling by placing awareness stickers on all the products that it puts on the market.

3 -The reuse dimension: Table (7) shows the statistical description data for the reuse dimension. This table shows that the overall average for the reuse dimension was (3.91) with a standard deviation of (0.982). This dimension received a (very high) response level. With

ordinal importance (2). It obtained a relative significance (RII) of (0.782). It is of a (high) level.

We conclude from the data obtained after reuse that the printing press management is very interested in reusing parts that are considered waste and working to reuse them with the aim of reducing the negative impact of these parts on the environment.

4 -After the redesign: Table (7) shows the statistical description data for the redesign dimension. This table shows that the overall average for the redesign dimension was (3.80) with a standard deviation of (0.837). This dimension received a (very high) response level. With ordinal importance (4). It obtained a relative significance (RII) of (0.76). It is of a (high) level.

This indicates the focus and interest of the printing press management on redesigning products with the aim of reducing the use of hazardous materials, with a conscious focus on developing products in a way that facilitates redesign and manufacturing.

Table (7) Arithmetic means and standard deviations. The level of answer and relative importance. The ordinal importance of green manufacturing dimensions (n= 61)

	Main dimensions	SMA	standard deviation	Answer level	Ordinal importance	Relative importance %RII	Level of materiality
1	Reduce waste	**3.90**	**0.833**	very high	**0.78**	**3**	high
2	Recycling	**3.92**	**0.987**	very high	**0.782**	**1**	high
3	reuse	**3.91**	**0.982**	very high	**0.782**	**2**	high
4	Redesign	**3.80**	**0.837**	very high	**0.76**	**4**	high

Source: Prepared by the researchers based on the outputs of the statistical program (SPSS.V.25).

C. Description Of The Environmental Performance Variable: Table (8) shows the statistical description data for the environmental performance variable. This table shows that the arithmetic mean for this variable was (3.89) with a standard deviation of (0.859). This variable received a (high) response level. With ordinal importance (1). It obtained a relative significance (RII) of (0.78). It is of a (high) level.

This indicates that the management of the printing press aims to reduce air emissions and reduce solid waste, while the printing press workers seek to reduce the use of hazardous and harmful materials.

Table (8) Arithmetic means and standard deviations. The level of answer and relative importance. The ordinal importance of the environmental performance variable (n= 61)

	Main dimensions	SMA	standard deviation	Answer level	Ordinal importance	Relative importance %RII	Level of materiality
1	Environmental performance	**3.89**	**0.859**	high	**1**	**0.78**	high

Source: Prepared by the researchers based on the outputs of the statistical program (SPSS.V.25).

Fifth: Testing The Correlation Hypotheses: The researchers adopted the simple correlation coefficient (Pearson) to test the first main hypothesis, which is represented by the correlation relationships between the independent variable (green manufacturing) and the dependent variable (environmental performance), as Table (8) shows the matrix of simple correlation coefficients (Pearson). Among these variables, and before entering into testing the sub-hypotheses, Table (9) indicates that the sample size is (N=61), the type of test (2-tailed), and the abbreviation (Sig.) in the table indicates testing the significance of the correlation coefficient by comparing the value (t) calculated with the tabular without showing its values. If there is a sign (**) on the correlation coefficient, this means that the calculated (t) value is greater than the tabulated (t) value. The strength of the correlation coefficient is judged in light of the agency rule (Cohen & Cohen, 1983).

• Low correlation: If the value of the correlation coefficient is less than 0.10

• The correlation is moderate: if the value of the correlation coefficient is between 0.10 - 0.30

• The correlation relationship is strong: if the value of the correlation coefficient is higher than 0.30

1. Testing the main correlation hypothesis, which states (there is a positive, statistically significant correlation for green manufacturing and the environmental performance variable): Table (9) shows the presence of a (strong) correlation between green manufacturing and environmental performance, as the value of the correlation coefficient reached (0.979). **) This percentage indicates the strength of the relationship between the green manufacturing variable and the environmental performance variable at a significance level (1%) (R= 0.979**, P<0.01). This relationship shows the existence of a correlation within the level of a strong positive relationship between the two research variables (Green manufacturing and environmental performance) This indicates acceptance of the first main hypothesis.

2. Testing the sub-hypotheses emanating from the first main hypothesis

A. Testing the first sub-hypothesis, which states **(there is a positive, statistically significant correlation between the waste reduction dimension and the environmental performance variable),** as Table (9) shows that there is a positive (strong) correlation between the waste reduction dimension and environmental performance, as the value of the correlation coefficient reached (0.991**). This percentage indicates the strength of the relationship between the waste reduction dimension and the environmental performance variable at a significance level (1%) (R = 0.991**, P < 0.01), and this indicates acceptance of the first sub-hypothesis.

B. Testing the second sub-hypothesis, which states **(there is a positive, statistically significant correlation between the recycling dimension and the environmental performance variable)**, as Table (9) shows that there is a (strong) correlation between the recycling dimension and the environmental performance variable, as the value of the correlation coefficient reached (0.924*). *) This percentage indicates the strength of the relationship between the recycling dimension and the environmental performance variable at a significance level (1%) (R= 0.924**, P<0.01). This indicates acceptance of the second sub-hypothesis.

C. Testing the third sub-hypothesis, which states **(there is a positive, statistically significant correlation between the reuse dimension and the environmental performance variable)**, as Table (9) shows that there is a (strong) correlation between the reuse dimension and the environmental performance variable, as the value of the correlation coefficient reached (0.926*). *) This percentage indicates the strength of the relationship between the reuse dimension and the environmental performance variable at a significance level (1%) (R= 0.926**, P<0.01). This indicates acceptance of the third sub-hypothesis.

D. Testing the fourth sub-hypothesis, which states **(there is a positive, statistically significant correlation between the redesign dimension and the environmental performance variable),** as Table (9) shows that there is a (strong) correlation between the redesign dimension and the environmental performance variable, as the value of the correlation coefficient reached (0.984**). This percentage indicates the strength of the relationship between the redesign dimension and the environmental performance variable at a significance level (1%) (R = 0.984**, P < 0.01), and this indicates acceptance of the fourth sub-hypothesis.

Table (9) Correlations between green manufacturing and environmental performance and dimensions of green manufacturing and environmental performance (N=61)

Independent variable / Dependent variable	Dimensions of green manufacturing				
	Reduce waste	Recycling	reuse	Redesign	Overall index
Dependent variable	0.991**	0.924**	0.926**	0.984**	0.979**

Source: Prepared by the researchers based on the outputs of the statistical program (SPSS.V.25).

Sixth: Testing The Influence Hypotheses: In this paragraph, the influence relationships between the research variables will be measured based on multiple regression analysis and the (F) test in order to determine the significance of the regression equation (Effect), as there is a significant effect if the calculated value of (F) is greater than the value (F) tabular, and there is no significant effect if the calculated (F) value is less than the tabular (F) value at a significance level of 0.01. The coefficient of determination (R^2) was also used to interpret the amount of change achieved by the effect of the independent variable on the dependent variable, and to achieve this The goal must be to verify the extent to which the main research hypothesis and the sub-hypotheses emanating from it can be accepted, **as in Table (10).**

1. Testing The Main Impact Hypothesis, which states **(there is a positive, statistically significant impact relationship for green manufacturing and the environmental performance variable).** In order to know the relationship of influence between the dependent variable (environmental performance) and the independent variable (green manufacturing), a multiple linear regression model was used, as in Table (10) below. The results of the

regression model showed that the regression model is significant through the (F) value of 1347.072. With statistical significance of 0.000, which is less than 0.01, the results indicate that the independent variable (green manufacturing) explains 96%, which is the value (R2), of the change occurring in environmental performance, which is a high explanatory power. The remaining percentage, which is 4%, is due to the contribution of other variables not included in the research model. The value of (β), which explains the relationship between environmental performance and green manufacturing, came in at a value of 0.284, with statistical significance at the 0.000 level, which is less than 0.01. This means that the more green manufacturing improves By one unit, environmental performance will improve by 0.284 units. The table below also shows the results of the multicollinearity test. The results revealed that the variance inflation factor for the model was 1.000, which is smaller than 5, which indicates that there is no multicollinearity problem among the model variables.

Table (10) Regression model values for the two dimensions of green manufacturing and environmental performance (N= 61)

Environmental performance / Green manufacturing	R	R Square	F Calculated	Sig.	(β) Unstandardized Coefficients	t	Sig.	VIF
	0.979	0.958	1347.072	0.000	0.284	36.702	0.000	1.000

Source: Prepared by the researchers based on the outputs of the statistical program (SPSS.V.25).

2. Testing The Sub-Hypotheses Emanating From The Main Hypothesis

A. There is a statistically significant impact relationship for the waste reduction dimension and the environmental performance variable.

The results in Table (11) showed that the regression model is significant, through the (F) value of 4522.571, with statistical significance of 0.000, which is less than 0.01. The results indicate that after reducing waste, it explains 99%, which is the value (R2), of the change occurring in environmental performance, which is the ability High interpretability. The remaining percentage, which is 1%, is due to the contribution of other variables not included in the research model. The value of (β), which shows the relationship between the waste reduction dimension and the environmental performance variable, came in at a value of 1.230 with statistical significance at the 0.000 level, which is less than 0.01. This means that the better Reducing waste by one unit will improve environmental performance by 1,230 units. The table above shows the results of the multicollinearity test. The results revealed that the variance inflation factor for the model was 1,000, which is smaller than 5, which indicates that there is no multicollinearity problem among the model variables.

B. There is a statistically significant impact relationship for the recycling dimension and the environmental performance variable.

The results in Table (11) showed that the regression model is significant, through the (F) value of 345.292, with statistical significance of 0.000, which is less than 0.01. The results indicate that the recycling dimension explains 85%, which is the (R2) value, of the change occurring in environmental performance, which is the ability High interpretability. The remaining percentage, which is 15%, is due to the contribution of other variables not included in the research model. The value of (β), which shows the relationship between the recycling dimension and the environmental performance variable, came in at a value of 0.965 with statistical significance at the 0.000 level, which is less than 0.01. This means that the better Recycling by one unit will improve environmental performance by 0.965 units. The table above shows the results of the multicollinearity test. The results revealed that the variance inflation factor for the model was 1.000, which is smaller than 5, which indicates that there is no multicollinearity problem among the model variables.

C. There is a statistically significant influence relationship for the reuse dimension and the environmental performance variable.

The results in Table (11) showed that the regression model is significant, through the (F) value of 355.608, with statistical significance of 0.000, which is less than 0.01. The results indicate that the reuse dimension explains 93%, which is the (R2) value, of the change occurring in environmental performance, which is the ability High interpretability. The remaining percentage, which is 7%, is due to the contribution of other variables not included in the research model. The value of (β), which shows the relationship between the reuse dimension and the environmental performance variable, came in at a value of 0.972 with statistical significance at the 0.000 level, which is less than 0.01. This means that the better Reuse by one unit will improve environmental performance by 0.972 units. The table above shows the results of the multicollinearity test. The results revealed that the variance inflation factor for the model was 1.000, which is smaller than 5, which indicates that there is no multicollinearity problem among the model variables.

D. There is a statistically significant influence relationship for the redesign dimension and the environmental performance variable.

The results in Table (11) showed that the regression model is significant, through the (F) value of 1798.019, with statistical significance of 0.000, which is less than 0.01. The results indicate that after the redesign explains 97%, which is the (R2) value, of the change in environmental performance, which is the ability High interpretability. The remaining percentage, which is 3%, is due to the contribution of other variables not included in the research model. The value of (β), which shows the relationship between the redesign dimension and the environmental performance variable, came in at a value of 1.211 with statistical significance at the 0.000 level, which is less than 0.01. This means that the better Redesigning by one unit will improve environmental performance by 1,211 units. The table above shows the results of the multicollinearity test. The results revealed that the variance inflation factor for the model was 1,000, which is smaller than 5, which indicates that there is no multicollinearity problem among the model variables.

Table (11) Regression model values for the variables of green manufacturing in its dimensions and environmental performance (N= 61)

Environmental performance / Green manufacturing	R	R Square	F Calculated	Sig.	(β) Unstandardized Coefficients	t	Sig.	VIF
Reduce Waste	**0.99**	**0.99**	**4522.571**	**0.000**	**1.230**	**67.250**	**0.000**	**1.000**
Recycling	**0.92**	**0.85**	**345.292**	**0.000**	**0.965**	**18.582**	**0.000**	**1.000**
Reuse	**0.92**	**0.93**	**355.608**	**0.000**	**0.972**	**18.858**	**0.000**	**1.000**
Redesign	**0.98**	**0.97**	**1798.019**	**0.000**	**1.211**	**42.403**	**0.000**	**1.000**

Source: Prepared by the researchers based on the outputs of the statistical program (SPSS.V.25).

SECTION FOUR: CONCLUSIONS AND RECOMMENDATIONS

Based on the theoretical aspect and depending on the description and diagnosis of the study variables and the analysis of the influence relationships between green manufacturing and environmental performance, the current research will present the most important conclusions drawn from the results of the study leading to the development of recommendations.

First: Conclusions

1. The results of the statistical description of the green manufacturing variable showed that the printing press has a high-level perception of the green manufacturing variable, as the general arithmetic mean reached (3.88). The results of the statistical description of the environmental performance variable also showed that the printing press has a high-level perception of the environmental performance variable, as it reached The general arithmetic mean (3.89). This indicates the availability of the two variables in the researched printing press, but the printing press pays more attention to the environmental performance variable, and this is what the results of the analysis indicated because of its major role on the printing press, with the aim of avoiding legal accountability by the state, as well as its endeavor to preserve the environment and society.

2. The results of the statistical description of the dimensions of the green manufacturing variable also showed that individuals have a high level of perception about the extent of the interest of the management of the researched printing press in the dimensions of green manufacturing, but in varying proportions, as the printing press pays more attention to the recycling dimension, as the general arithmetic mean for this dimension reached (3.92). Then after reuse, the general arithmetic mean for this dimension reached (3.90), then after reducing waste, with a arithmetic mean of (3.90), and finally after redesign, with a arithmetic mean of

(3.80). This indicates that the printing press management is taking the necessary policies to reduce the raw materials and energy used in manufacturing. It deals with the waste of the manufacturing process in a safe manner that does not affect the environment.

3. The results of the impact relationships between green manufacturing and the environmental performance variable showed that there was a high explanation rate for the ability of green manufacturing to explain the changes that occur in environmental performance, amounting to (0.958).

4. The dimensions of the green manufacturing variable contribute to explaining changes in environmental performance at a high level and with effective percentages of influence of the dimensions inside the printing press. After reducing waste, it contributed to the highest percentage of influence on environmental performance, amounting to (0.99), then it was followed by redesign, with a percentage of (0.97), then after reuse. With a percentage of (0.93) and finally after recycling, with an interpretation percentage of (0.85).

5. The ease of applying green manufacturing themes by the investigated printing press, motivated by scarcity of resources, reducing costs, and improving quality.

Second: Recommendations

1. The necessity of encouraging the researched printing press to obtain certificates for greening processes from international associations in order to raise the level of their reputation and work.

2. The printing press management must collect waste, residues, and parts resulting from industrial processes with the aim of utilizing them in other industrial processes.

3. The need for the management of the researched printing press to pay attention to developing its internal operations and achieving a green manufacturing strategy in order to preserve the environment and improve the reputation of the printing press and in an effort to spread this culture in the Iraqi environment through:

• Reducing waste, reusing, recycling and designing products again.

• Encouraging a culture of environmental protection among customers

4. The management of the researched printing press should develop the skills, knowledge and capabilities of its employees by involving them in training courses in the fields of green manufacturing and environmental performance and everything new in these two fields, in cooperation with Iraqi universities.

5. Increased interest in redesigning products as it is an essential part of the process of preserving the environment by reducing the number of parts and using standard parts that can be reused.

6. Emphasis on conducting more studies on the current research topic with the aim of supplementing the scientific library with other studies and results.

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